

TRILUX
SIMPLIFY YOUR LIGHT.

LED GUIDE

LED GUIDE

PREFACE

LED technology has long become standard. It outperforms nearly all conventional light sources in terms of service life, energy efficiency and luminous efficiency and has thus become indispensable for indoor and outdoor applications. However, only the combination of light source, optic, control system and housing enables optimal solutions for customers.

Over and over again we discover in conversations with our customers that there is partly a high level of uncertainty how to interpret established definitions with LED technology or what exactly has to be considered when planning with LED. With the new LED Guide edition we would like to facilitate your daily work and bring you up-to-date when it comes to LED. The aim of the LED Guide is to communicate basic information as well as to promote a common understanding of LED lighting.

Be inspired by our latest LED solutions for Office, Education, Health & Care, Industry, Shop & Retail and Outdoor applications. Our powerful continuous-line system E-Line LED, for example, not only illuminates your industrial hall safely and comfortably, but also features an outstanding efficiency of more than 130 lm/W. Or do you want light to be your strongest sales argument in the future? Then the LED spotlight Taro is the right choice. With its special light spectrum it illuminates shops in an inviting way and accentuates goods. We live up to one of the main future topics in the European lighting sector - Human Centric Lighting – with specially developed light solutions, which consider the effect of light on people and focus on human well-being.

No matter which LED lighting you favor, with TRILUX – SIMPLIFY YOUR LIGHT you choose the most simple and safest way to customized, energy-efficient and sustainable light solutions. To guarantee this, we rely on a wide portfolio of products and technologies as well as powerful partners within our group.

We look forward to simplifying your light!



Christian Sallach

Chief Sales Officer TRILUX Group



LED GUIDE

CONTENT

Introduction



- 008** Recommendations for applications
- 012** TRILUX Group
- 016** TRILUX
- 018** Oktalite
- 020** RSL
- 022** Medical
- 024** ITZ
- 026** TRILUX Akademie
- 030** Interview

Application areas



- 032** Office
- 042** Education
- 052** Health&Care
- 064** Industry
- 072** Shop&Retail
- 080** Outdoor

Products



- 096** Downlights
- 104** Spotlights
- 120** Multivariable systems
- 126** Recessed luminaires
- 130** Wall- and ceiling-mounted luminaires
- 134** Suspended luminaires
- 148** Continuous-line luminaires
- 152** High-bay luminaires
- 156** Weather-proof luminaires
- 160** Cleanroom luminaires
- 162** Medical supply unit
- 164** Examination and OT luminaires
- 170** Post luminaires
- 186** Bollards and columns
- 194** Ground-recessed luminaires
- 200** Wall luminaires
- 208** Spotlights and floodlights

Technology, themes and trends



- 212** Light management
- 220** Human Centric Lighting
- 224** TRILUX Tools
- 226** LED technology
- 256** TRILUX Online

LED GUIDE

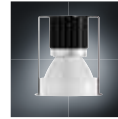
CONTENT



096
**Ligra Plus
LED**



098
Less 55 LED



100
Less 100 LED



102
Less 150 LED

Downlights



104
Quad



106
Quira



108
Taro



110
Taro



112
B. Lee



114
**Stratus
Vario 175**



116
**Nimbus
Vario Plus**



118
Grado

Spotlights



120
Coriflex LED



122
System 190



124
Sistema

Multivariable systems



126
**Arimo Slim
MRX LED**



128
**Arimo Slim
CDP LED**

Recessed luminaires



130
**Polaron IQ
LED**



132
Sanesca LED

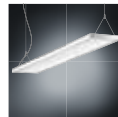
Wall- and ceiling-mounted luminaires



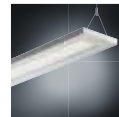
134
**Lateralo Plus
LED**



136
**Lateralo Ring
LED**



138
**Lateralo Line
LED**



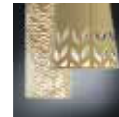
140
Luceo LED



142
Plus LED



144
LED Line

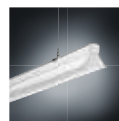


146
Lesima LED

Suspended luminaires



148
**E-Line LED
IP54 lens
optic**



148
**E-Line LED
IP54 prismatic
diffuser**



150
**E-Line LED
13.000 lm**



150
**E-Line LED
20.000 lm**

Continuous-line luminaires



152
**Mirona QL
LED**



154
**Mirona QXS
LED**

High-bay luminaires



156
**Nextrema
LED**



158
Aragon LED

Weather-proof luminaires

LED GUIDE

CONTENT



Cleanroom luminaires

160
**Fidesca-PM
LED**



Medical supply unit

162
Kubion LED



164
Aurinio L30



166
Aurinio L50



168
**Aurinio L120/
L160**

Examination and OT luminaires



170
Publisca LED



172
Conviva LED



174
98... LED



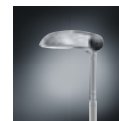
176
Viatana LED



178
**Lumega IQ
LED**



180
Cuvia LED

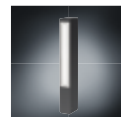


182
**Lumega 600
MLT LED**



184
**Lumega 700
MLT LED**

Post luminaires



186
Altigo LED



188
Skeo-P LED



190
8841... LED



192
ConStela LED

Bollards and columns



194
Altigo LED

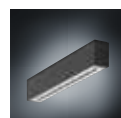


196
Altigo LED



198
Lutera LED

Ground-recessed luminaires



200
Altigo LED



202
Skeo-C LED



204
Skeo-P LED

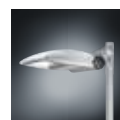


206
Pareda LED

Wall luminaires



208
Faciella LED



210
**Lumena Star
LED**

Spotlights and floodlights

LED GUIDE

RECOMMENDATIONS FOR APPLICATIONS

			TRILUX	Oktalite	RSL
Downlights	Ligra Plus LED	Page 096-097	•		
	Less 55 LED	Page 098-099			•
	Less 100 LED	Page 100-101			•
	Less 150 LED	Page 102-103			•
Spotlights	Quad	Page 104-105		•	
	Quira	Page 106-107		•	
	Taro Surface-mounted spot	Page 108-109		•	
	Taro Recessed spot	Page 110-111		•	
	B. Lee	Page 112-113		•	
	Stratus Vario 175	Page 114-115		•	
	Nimbus Vario Plus	Page 116-117		•	
	Grado	Page 118-119		•	
Multivariable systems	Coriflex LED	Page 120-121	•		
	System 190	Page 122-123		•	
	Sistema	Page 124-125		•	
Recessed luminaires	Arimo Slim MRX LED	Page 126-127	•		
	Arimo Slim CDP LED	Page 128-129	•		
Wall- and ceiling-mounted luminaires	Polaron IQ LED	Page 130-131	•		
	Sanesca LED	Page 132-133	•		
Suspended luminaires	Lateralo Plus LED	Page 134-135	•		
	Lateralo Ring LED	Page 136-137	•		
	Lateralo Line LED	Page 138-139	•		
	Luceo LED	Page 140-141	•		
	Plus LED	Page 142-143			•
	LED Line	Page 144-145			•
	Lesima LED	Page 146-147		•	
Continuous-line luminaires	E-Line LED IP54 lens optic	Page 148-149	•		
	E-Line LED IP54 prismatic diffuser	Page 148-149	•		
	E-Line LED 13.000 lm	Page 150-151	•		
	E-Line LED 20.000 lm	Page 150-151	•		
High-bay luminaires	Mirona QL LED	Page 152-153	•		
	Mirona QXS LED	Page 154-155	•		
Weather-proof luminaires	Nextrema LED	Page 156-157	•		
	Aragon LED	Page 158-159	•		

LED GUIDE

RECOMMENDATIONS FOR APPLICATIONS

			TRILUX	Medical
Cleanroom luminaires	Fidesca-PM LED	Page 160-161	•	
Medical supply unit	Kubion LED	Page 162-163		•
Examination and OT luminaires	Aurinio L30	Page 164-165		•
	Aurinio L50	Page 166-167		•
	Aurinio L120/L160	Page 168-169		•
Post luminaires	Publisca LED	Page 170-171	•	
	Convía LED	Page 172-173	•	
	98... LED	Page 174-175	•	
	Viatana LED	Page 176-177	•	
	Lumega IQ LED	Page 178-179	•	
	Cuvia LED	Page 180-181	•	
	Lumega 600 MLT LED	Page 182-183	•	
	Lumega 700 MLT LED	Page 184-185	•	
Bollards and columns	Altigo LED	Page 186-187	•	
	Skeo-P LED	Page 188-189	•	
	8841... LED	Page 190-191	•	
	ConStela LED	Page 192-193	•	
Ground-recessed luminaires	Altigo LED accent luminaires	Page 194-195	•	
	Altigo LED light lines	Page 196-197	•	
	Lutera LED	Page 198-199	•	
Wall luminaires	Altigo LED	Page 200-201	•	
	Skeo-C LED	Page 202-203	•	
	Skeo-P LED	Page 204-205	•	
	Pareda LED	Page 206-207	•	
Spotlights and floodlights	Faciella LED	Page 208-209	•	
	Lumena Star LED	Page 210-211	•	

Office

Page 032 – 041

Education

Page 042 – 051

Health&Care

Page 052 – 063

Industry

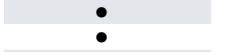
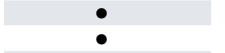
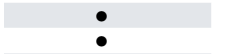
Page 064 – 071

Shop&Retail

Page 072 – 079

Outdoor

Page 080 – 095





TRILUX GROUP

UNITED EXPERTISE



Long-term know-how, a passionate commitment and international experience: the TRILUX corporate group develops efficient lighting solutions for all applications, ranging from state-of-the-art light and control technology to custom-made luminaires with a high level of technical and design sophistication. The experts at TRILUX, TRILUX Medical, Oktalite, RSL, ZALUX, BAG, ICT and watt24 work together every day to achieve their aim of making light even more efficient and providing customers with solutions in an easy and uncomplicated way. For this purpose the corporate family combines their research and development expertise under a single roof: with the help of the Innovation and Technology Centre, a source where new ideas for market-capable solutions are being created. With these innovation-oriented structures, the TRILUX corporate group represents a highly competent and pioneering partner regarding all lighting requirements for customers all around the world.

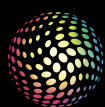


TRILUX GROUP

OUR COMMON BELIEFS
WITHIN THE GROUP

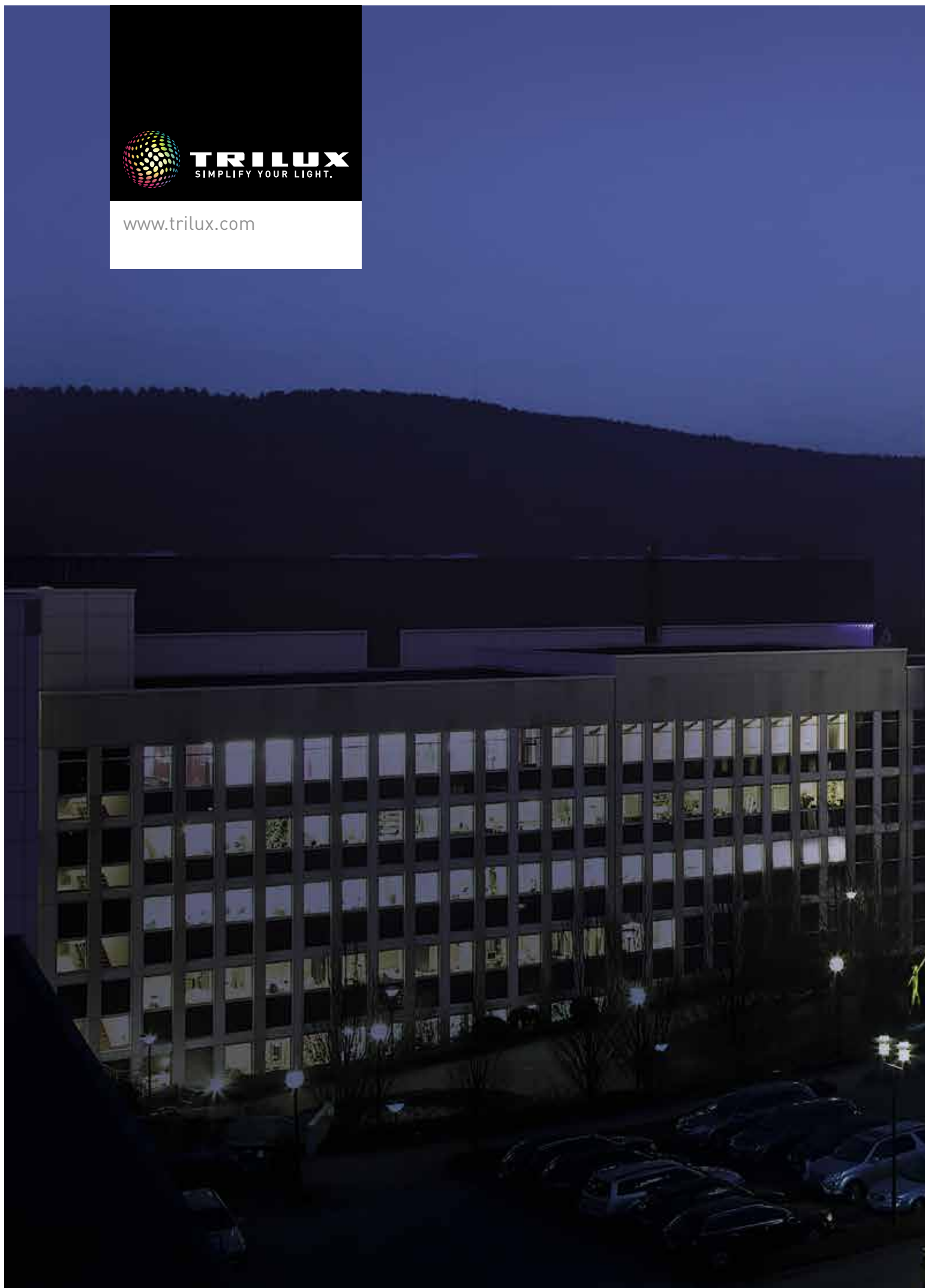


With the merger of various companies TRILUX offers a unique selling proposition on the lighting market. The expertise of lighting specialists creates lighting solutions that meet a wide range of customer requirements. The group also benefits from the active exchange that improves product development and allows realizing unforeseen projects. The combined expertise is the guarantee for light that complies with future requirements.



TRILUX
SIMPLIFY YOUR LIGHT.

www.trilux.com





TRILUX has characterised both the history and the future of light over the past 100 years, with the aim of creating artificial light that is just as efficient, diverse and sustainable as the sun itself. TRILUX today offers not only innovative luminaires for indoor and outdoor applications but also perfectly matching lighting solutions for all requirements.

oktalite

www.oktalite.com

MEMBER OF



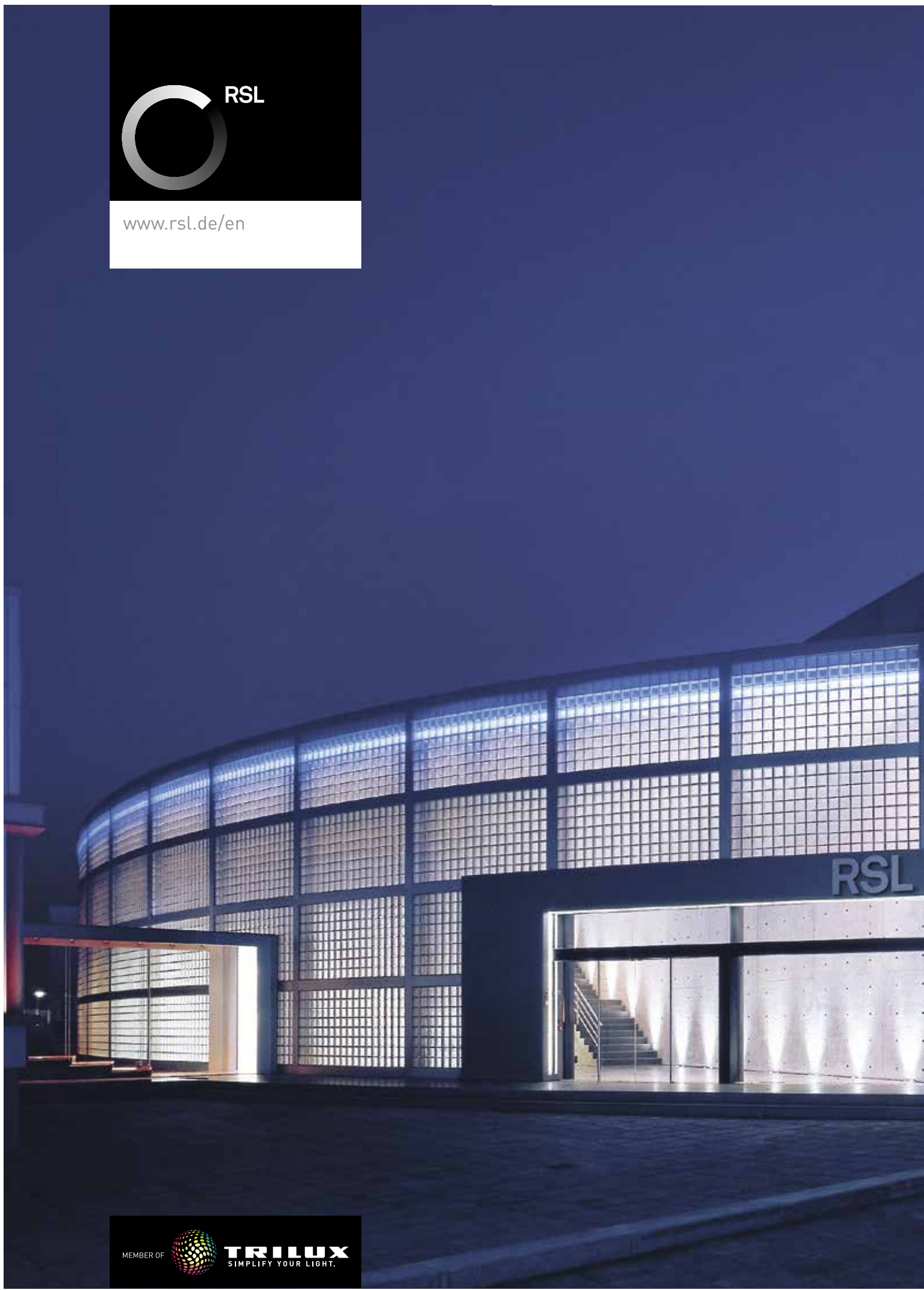
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Oktalite has been creating lighting solutions for goods presentation in the retail sector for almost 30 years. Together with its customers the company designs good business for food, fashion and retail. With 150 employees that include lighting planners, designers, architects and marketing experts, Oktalite develops innovative luminaires and sector-specific lighting solutions. The company with headquarters in Cologne, Germany is a subsidiary of the TRILUX Group and is thus represented across the world.



www.rsl.de/en



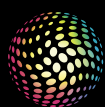
MEMBER OF



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RSL, with headquarters in Sankt Augustin, Germany constructs custom luminaires precisely according to the requirements of its customers. Here lighting designers, architects and building owners have almost limitless creativity with design. Whether small or large, decorative or functional, filigree or massive, opulent or purist – for RSL it's a matter of implementing the individual lighting concepts of its creative partners that all come from a single source: budgeting, technical development, construction, production, logistics and commissioning.



TRILUX
ENGINEERING HEALTH.

www.trilux-medical.com

MEMBER OF



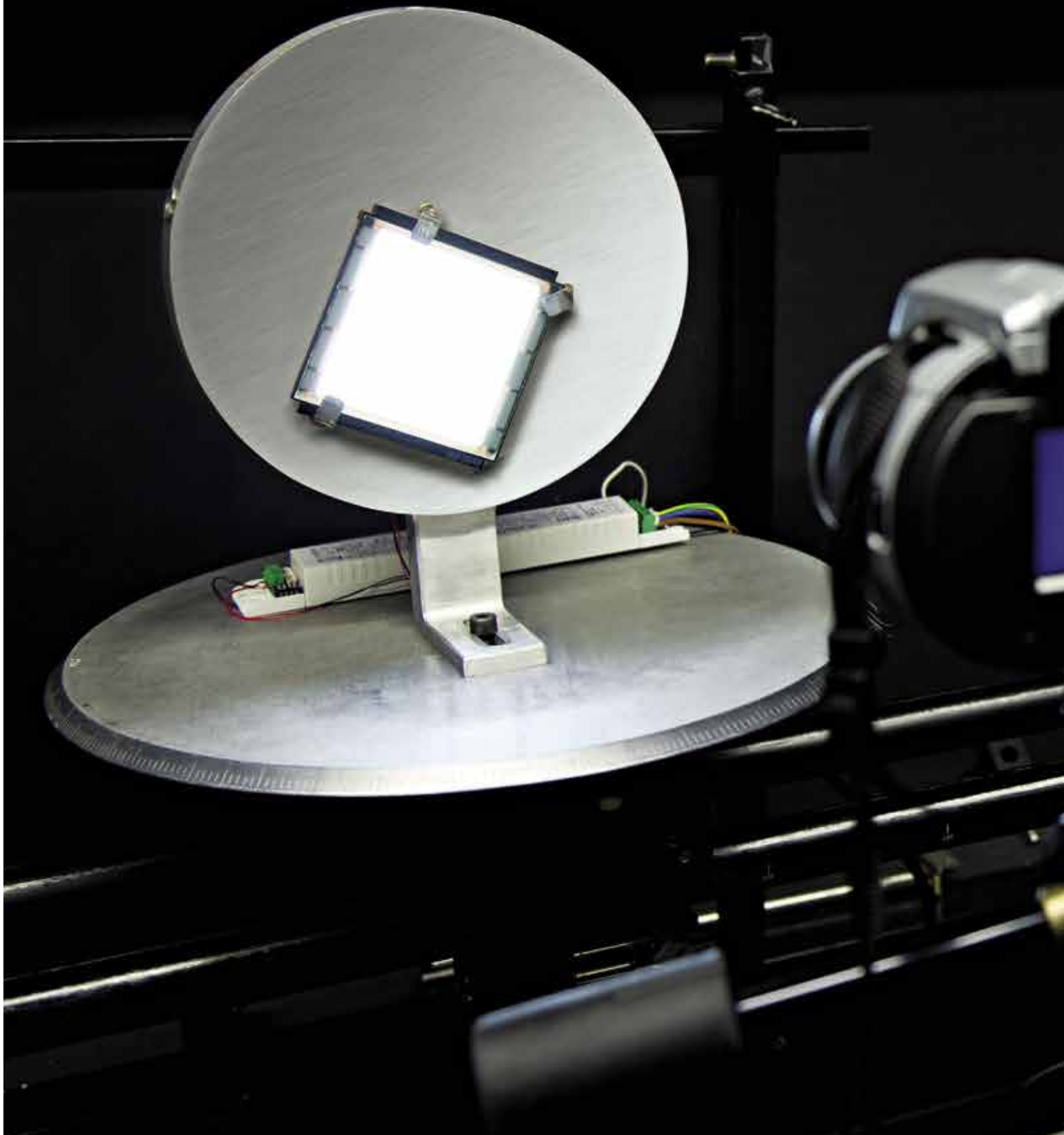
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TRILUX Medical is the answer to the ever growing and ever more specific needs for technology in clinics and hospitals. The division founded in 1962 provides lighting and supply systems for all hospital sectors.

ITZ

www.trilux.com





ITZ GmbH operates as an independent company and is a central link between the single business units of the TRILUX Group without having an influence on the independence of the brands. The combining of core expertise from the technology sectors of electronics, photometrics and mechanics enables the utilisation of greater synergies for optimal, application-oriented system solutions. Components developed are made available to individual companies of the TRILUX Group for their applications and marketing. With the setting up of a strategic technology management in the ITZ, trends in the market and future technologies are identified in good time and can be integrated into future product concepts. The basis for successful implementation includes cooperation in international networks, partnerships, associations and standardisation organisations, as well as the active participation in research projects.

A photograph of a modern office interior. The space features glass partitions with dark frames, creating a series of open-plan offices. Large, bold numbers '1' and '2' are visible on the glass. Several cylindrical pendant lights hang from the ceiling, casting a warm glow. The floor is a light-colored carpet.

TRILUX AKADEMIE

THEME DAYS
LED SEMINARS
WEBINARS

The TRILUX Akademie offers qualified training for all light professionals. This includes numerous topics such as photometric and electrotechnical basic knowledge, light application in practice, lighting planning for indoors and outdoors as well as efficiency and economy. Additionally, theme days, seminars and webinars provide participants with everything they need to know about LED.

Seminars that gain high recognition in the lighting sector communicate fundamental and practical expertise. Another path to better knowledge are the theme days held by renowned experts. The Akademie also follows new paths with webinars that offer special themes flexibly and with no travel effort.

Participants gain qualifications with all training formats depending on their previous knowledge and training targets. To increase learning and training effectiveness, a focus is placed on discussions, interactivity and direct communication between lecturers and participants.



TRILUX AKADEMIE

THEME DAYS
LED SEMINARS
WEBINARS



Examples of LED seminars and webinars in German and English:

Modular seminars: “LED driving license”

Professional use of LED technology assumes a wide basic knowledge. Seminar participants in the basic seminar gain an overview of the technological features and requirements of LED. In the “practical upgrade” seminar participants learn where and how they can use LED technology effectively in everyday practice. Specific exercises are carried out to learn more about efficiency potential as well as more detailed features, characteristics and the use of the new technology.

Seminar: “Successfully selling LED”

When efficiently planned and conveniently installed, LED opens up completely new application possibilities. To be able to competently advise in the future, the seminar informs about current topics such as LED technology, light planning and light management. The seminar also includes a workshop, where customer discussions are specifically trained and customer benefits for specific target groups are analysed.

Seminar: “Light and lighting: how LED sets new standards in energy efficiency”

Rapid changes due to technology characterise the current light market. LED has definitely arrived! But where exactly is the potential and how can this be used to improve the energy balance? This seminar gives you an overview of the options and limitations of LED, and you find out how its quality, efficiency and economy is analysed. We show you what needs to be considered.

Webinar: “Planning security with LED lighting – explanations concerning the ZVEI guideline”

With the publication of the ZVEI LED guideline, uniform definitions and terms are now available for the first time. However, different specifications are still possible with regard to service life and luminous flux reduction. This means products are often not directly comparable. The webinar provides you with the necessary background knowledge and with practice-oriented evaluations and decision guidance.



THE COMPLETE PACKAGE HAS TO BE RIGHT

The course has long been set. The future belongs to LED. But what does the transformation look like when it comes to important details? Dietmar Zembrot, TRILUX Chief Technical Officer and Dirk Pietz, head of product management, take a stand.

The LED has proven to be a catalyst for the highly rapid transition in the luminaire industry. What effects does this have on TRILUX?



Dietmar Zembrot: "TRILUX is one of the pioneering forces in the change process. We aligned ourselves at an early stage to the characteristics of this new technology, we reorganised ourselves internally and we also established sustainable networks with global LED and technology suppliers. Customers only get the optimal product with the interplay between light source, optic, control system and housing. A particular challenge here is speed. The range of tasks for us is not only to develop new products but also to equip existing

products with the very best technology. For example, with our Nextrema we managed to improve product performance by 30 % in just 1.5 years."

Are LEDs able to keep up with standard lighting solutions in terms of luminous efficiency?

Dirk Pietz: "It is no longer a matter of 'just keeping up', because LED as a technology has now become standard. The latest efficiency levels and high quality of light were the triggers for us to transform more than 50 % of the portfolio towards LED. The luminous efficiency of today's LEDs has mainly left all traditional lamps far behind. A good example here is the current E-Line LED continuous line, which sets standards in terms of efficiency and with a luminous efficiency of >130 lm/W features an almost perfect combination of LEDs and optics. It's this interaction, together with sophisticated thermal management, that achieves an optimum with regard to light output and quality."

Athletes occasionally get out of breath. What is the situation with the service life of LEDs?

Dietmar Zembrot: "LED systems can be well compared to marathon runners. At least 50,000 hours service life are the state of technology at TRILUX. An example: an office is equipped with LED luminaires and a light management system that also considers daylight use and presence detection. System utilisation can here be assumed over 15 or even 20 years. And of course without having to replace the light source, as was usual until now."

What importance or weighting does thermal management have in this sense?

Dirk Pietz: "The right thermal management, meaning the optimal dissipation of heat generated by an LED module, has a major influence on the service life. This has high relevance with product lines used in industrial applications and focussing on high luminous flux packages. The challenges in such situations are extreme temperature ranges as well as high-effort maintenance processes. That is why we have now got specialists within the company-owned Innovation and Technology Centre who deal with this topic exclusively. This is the only way to ensure maximum reliability and quality to the customers, seen perfectly with the Mirona and Nextrema product lines."

Lighting solutions based on LED technology are continually penetrating new applications. What is their success based on?

Dietmar Zembrot: "Sensible LED solutions feature three specific benefits: firstly, they are almost free of maintenance with an enormous service life of more than 50,000 hours. Secondly, they are characterised by optimal energy efficiency. This environmental aspect deserves particular attention, because LEDs not only consume less electricity, leading to less CO₂ emissions, but also produce less waste and don't contain hazardous substances such as mercury. Because LED luminaires are smaller than conventional products, packaging and transport effort is also reduced. And thirdly, LED luminaires offer planners completely new options for design. If optimal photometric systems are used, the distribution of light in the room, glare reduction or light colour can be modified. Put briefly, the optimum technology exists for all application cases ranging from offices to museum lighting and food display, and these can also be wrapped in smaller, more purist or more elegant luminaire designs."

And what does that mean specifically?
In which areas are LEDs advantageous
compared to standard luminaires?

Dirk Pietz: "In the past, the advantages of LED were obvious in terms of long service life and insensitivity to cold temperatures and vibration. Industry and outdoor applications were mainly focused on. Now though many other benefits have come to the fore that make the life of conventional lamps much more difficult. Let's take office applications as an example. Here the key factors efficiency, intelligence and quality of light play an important role, and because of the significant increase in efficiency levels just in the past two years, T5 fluorescent lamps in the future will be pushed more and more to the wayside. Added to this is the intelligent blending of LEDs as a light source with innovative optical systems to create an almost unbeatable combination of efficiency and light output ratio. This all means that today's 'still' higher investment costs are topped by rapid amortisation periods. Another factor is that electronics now offer almost unlimited options in terms of operation and individual modification – light is transformed into an experience and is more efficient and economic than ever before."

When do you recommend LED solutions?

Dirk Pietz: "This question is no longer valid for us. We now know that LED represents the best solution for all types of application. In the industrial environment the factors of reliability and robustness are highly important, whereas with office applications efficiency and intelligence are also very significant. And if we now look at other applications such as shop and retail or the health sector, enormous possibilities and potential are created when working with LED technology. We can steplessly modify colour temperatures for example by switching LEDs with minimal dimensions featuring highly differing colour spectra on a single chip and with the products developed for this. Generating spectra ranging from extremely warm white to daylight white light is no problem, and these types of lighting concepts are able to adapt to a wide range of needs within specific applications. For example accenting light and stimulating purchase behaviour with products and goods on the one hand, and increasing the sense of well-being (biological light) and the ability to concentrate on the other hand in the area of health, education and of course offices as well."

New technology, new knowledge. How do your
information policies look like in terms of LED?
Or put another way: Are TRILUX customers
up-to-date?

Dietmar Zembrot: "Absolutely: information for our customers has major priority for us. Ranging from the website to print media and the Akademie, there's a wide variety of offers, and especially with the TRILUX Akademie. The transfer of expertise with regard to LED is focused upon more and more within the TRILUX Akademie, and the most popular topic there is the 'LED driving license'. In this successful seminar, planners, installers and people from the trade are first given a grasp of the theoretical fundamentals, as with a real driving license. In the second step it tends more towards practice, and at the end of the seminar the participants not only comprehend LED technology but can sell it and use it in practice."

How does the future development of LED
technology look like?

Dietmar Zembrot: "We of course also place our confidence in the outstanding innovation and growth potential of this technology. We operate according to 'class instead of volume', and continue to improve both efficiency and cost-benefit ratios before new LED solutions are brought to market. We also do our background homework and work in initiatives such as Zhaga as well as association work such as Lighting Europe, with the aim of developing and establishing common industry standards for LED applications. We've also decided to take part in Philips Electronics' LED license luminaire programme to utilise basic technologies for the modification of light intensity and colour with LED luminaires – this means that our customers continue to benefit from products featuring the latest state of technology."

Already today, many people are talking about
OLED. What is that about exactly? What
further progress is there with OLED develop-
ment? How does TRILUX handle this?



Dirk Pietz: "OLED development will become established in the future parallel to LED. We'll experience that this technology will not exploit its added value in the future in the form of the traditional luminaire. It's more the case that the direct connection to other systems places this technology in a completely different light. Luminous walls, or giant surfaces that outcouple light when required and have a completely transparent and discreet appearance when switched off. We've already implemented initial product solutions with OLED and are working towards sensible utilisation and further development as part of research projects, and also with our own technology partners. We're making it simple. TRILUX – Simplify Your Light."

OFFICE

BECAUSE YOUR
OFFICE LIGHTING CAN
DO SO MUCH MORE



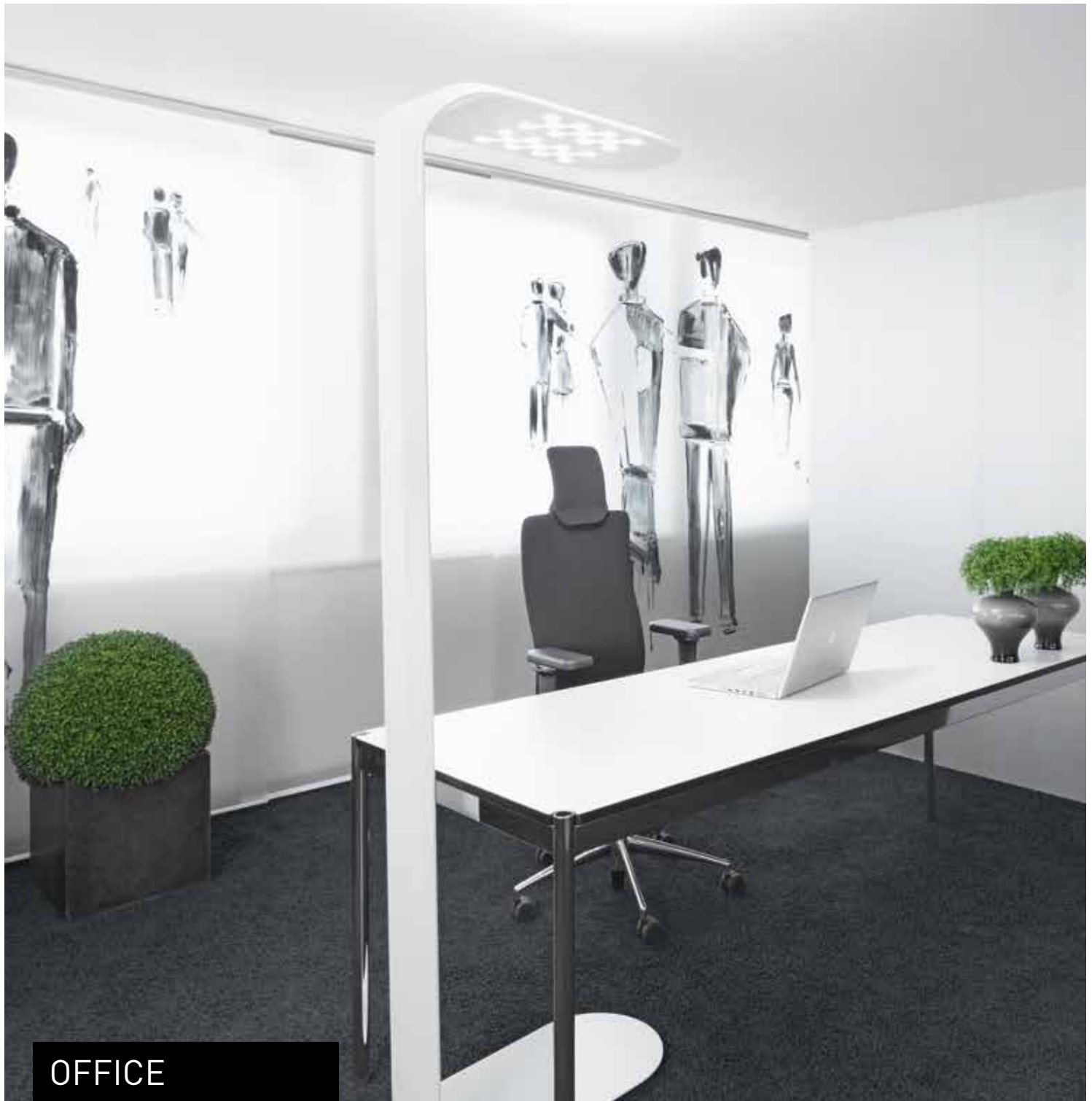
**It's hard facts that count in offices.
And especially with office lighting.**

Lighting solutions for modern office applications must fulfil many and often diverse tasks. Workstations must be ideally illuminated with pleasant, glare-free light, and therefore in compliance with standards. But it's not only optimum quality of light that counts – an intelligent lighting solution must also flexibly respond to new conditions to create good working atmospheres. And of course satisfy high demands as to cost and energy efficiency as well. To achieve this simply and conveniently in practice, TRILUX provides an extensive portfolio of office luminaires that unites maximum technical LED standards with modern and appealing luminaire design. And thanks to many intelligent details and functions, not only planning but also installation is carried out in next to no time.



The benefits of TRILUX LED in offices

- Unique design language and innovative design of light emission due to compact LED dimensions
- New flexibility with lighting design due to homogeneous and high-contrast light sources
- Optimal thermal management guarantees $\geq 50,000$ hours of service life and correspondingly long maintenance intervals
- Energy savings potential of up to 65 % with the latest LED technology



OFFICE

EXECUTIVE OFFICES

Executive offices can be seen as the business card of a company. A pleasant atmosphere combined with prestigious interior design is desired and the ideal lighting solution must satisfy the demands of premium design and energy efficiency. LED can manage this balancing act: the compact size of the light source enables new design scope for an innovative design language with low energy consumption at the same time. Targeted accents can be set and various light atmospheres created according to needs. The Neximo free-standing luminaire for example features organic light emission sculptures in a pattern style that create a unique light ambience.

www.trilux.com/neximo or www.trilux.co.uk/neximo



OFFICE

OPEN-PLAN OFFICES

Open-plan offices are frequently subject to general hecticness and place special demands on flexible lighting concepts. Ideal lighting of each individual desk and in particular of the computer screens contributes to creating a pleasant working atmosphere. A homogeneous luminaire concept is also of importance. The Arimo MRX LED features Micro-Reflector-Technology (MRX) in combination with planar elements and thus provides pleasant and glare-free light even with high luminous flux packages. Page 126.



OFFICE

CONFERENCE ROOMS

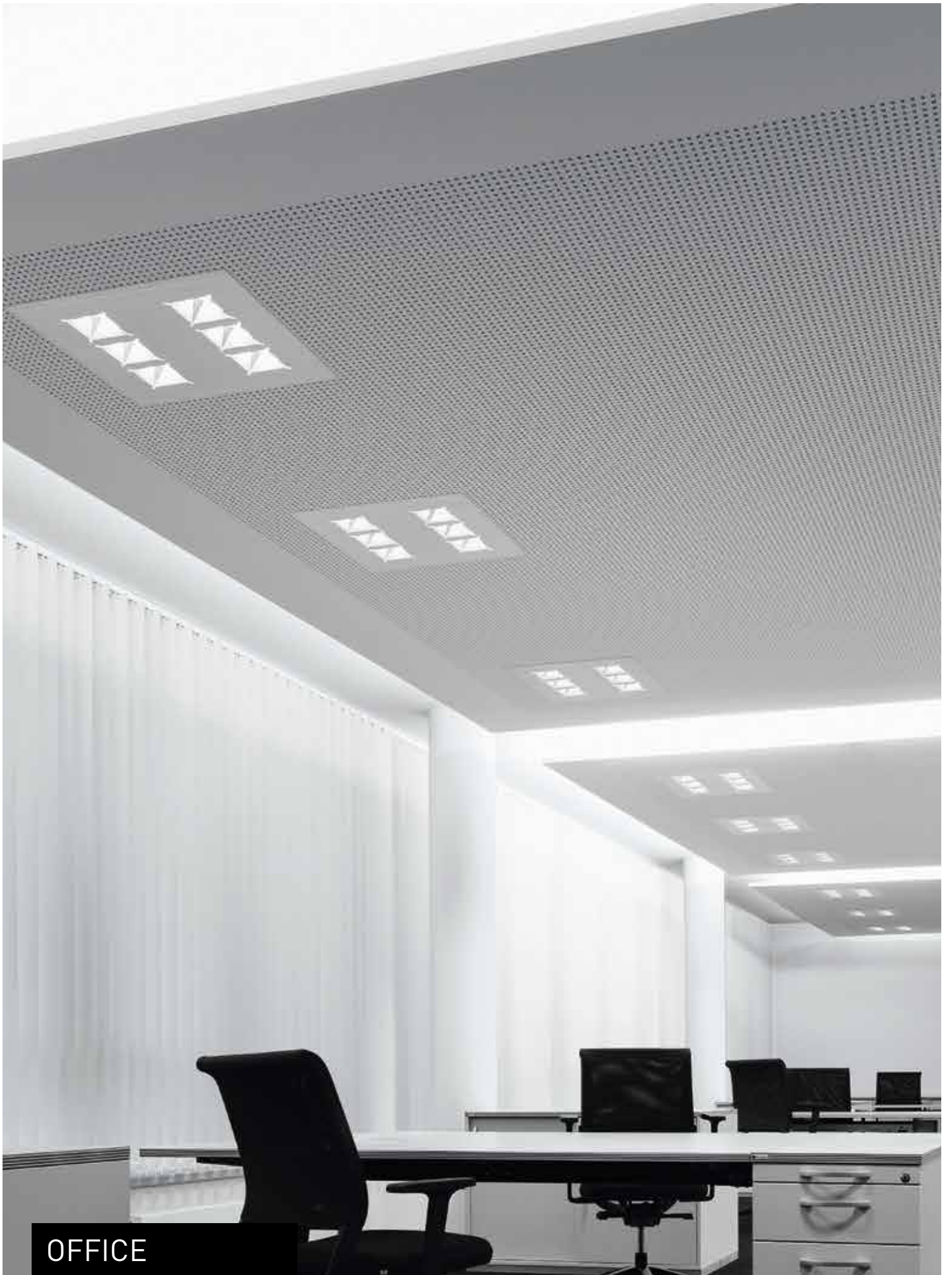
A flexible lighting concept is especially needed for conference and meeting rooms in order to fulfil the diverse requirements on ambience and functionality. Whether for presentations, business discussions or creative workshops, lighting solutions with Active luminaires using white/white control are ideal, as these improve motivation, the ability to concentrate and therefore also the productivity. For example the Liventy Active, page 223.



OFFICE

2-AXIS OFFICES

The ideal lighting solution in standard offices creates a positive, motivating light atmosphere and enables working conditions without disturbing glare. In addition, the lighting should feature a discreet design that optically upgrades the often small-sized room without dominating it. The homogeneous, wide-area light of the Arimo Slim CDP (page 128) is especially pleasant and glare-free with UGR19. It therefore supports concentrated working.



OFFICE

ENERGY EFFICIENCY

LCL Technology – direct, glare-free LED light!

LEDs are point-shaped light sources with high luminance. The impression of glare is however not only dependent on luminance in lm/m^2 but also on relative brightness. If two closely adjacent areas differ strongly in light intensity then the retina of the eye is unable to resolve these brightness gradients and glare occurs.

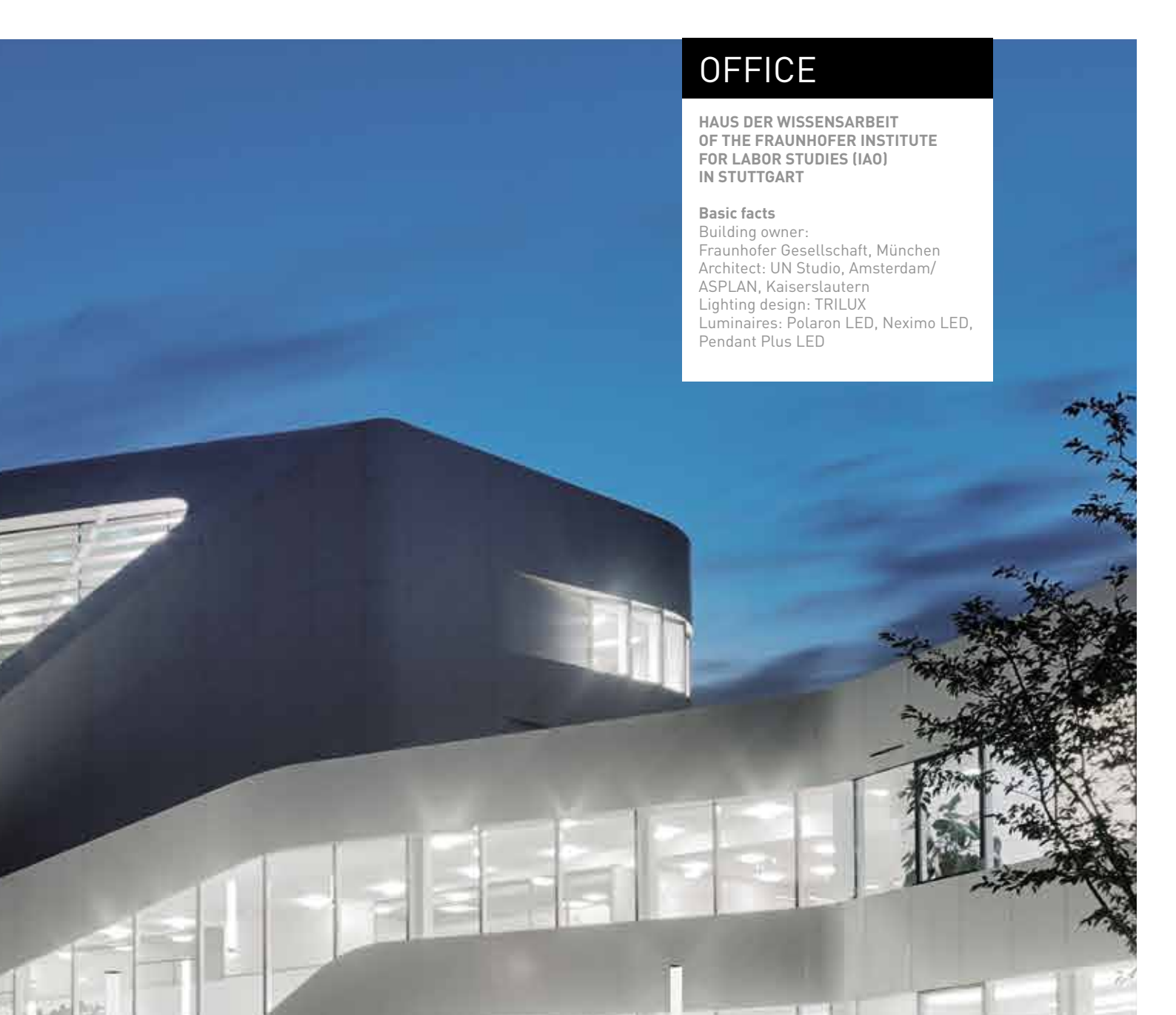
TRILUX luminaires with LCL Technology counteract this glare effect by increasing the luminance around the LEDs so that the brightness gradient is lowered and direct glare is reduced.

Energy efficiency

A practical example: by replacing six standard T8 luminaires with six Aurista luminaires, not only energy costs were almost halved but the quality of lighting was increased.

Office	Obsolete system	Obsolete system	New system
Luminaire	Old recessed luminaire (T8 - CCG)	Old recessed luminaire (T8 - ECG)	Aurista 3300 lm
Power consumption per luminaire	92 W	76 W	41 W
Number of luminaires in building	6 pieces	6 pieces	6 pieces
Total power consumption	552 W	456 W	246 W
Kilowatt hours p. a.	1,656 kWh	1,368 kWh	738 kWh
Energy costs per year	505 €	430 €	225 €
		T8 - CCG	T8 - ECG
Energy savings potential		56 %	46 %
Saved kilowatt hours p. a.		918 kWh	630 kWh
Costs savings p. a.		286 €	197 €
CO ₂ savings p.a.		0.55 tons	0.38 tons





OFFICE

HAUS DER WISSENSARBEIT
OF THE FRAUNHOFER INSTITUTE
FOR LABOR STUDIES (IAO)
IN STUTT GART

Basic facts

Building owner:
Fraunhofer Gesellschaft, München
Architect: UN Studio, Amsterdam/
ASPLAN, Kaiserslautern
Lighting design: TRILUX
Luminaires: Polaron LED, Neximo LED,
Pendant Plus LED

Individual architecture needs individual lighting solutions

The Fraunhofer Gesellschaft campus in Stuttgart Vaihingen is a large step closer to the future – or rather the future of work. It unites the objectives of cutting-edge international research with a visionary architectural concept. Working in close and sustained collaboration with the “makers of the future” at the Fraunhofer Institute, the Dutch architects from UN Studio have now created an avant-garde milestone in office architecture. A place where one can see and indeed experience the future today. Certified according to the criteria of the U.S Green Building Council (LEED certificate) and the German Sustainable Building Council, the “Haus der Wissensarbeit” was one of the first buildings in Germany to receive the Gold certificate. A decisive factor in their decision was the perfectly coordinated interplay of a system for geothermal energy production, intelligent façade regulation, holistic building automation and a lighting concept designed to be particularly energy efficient. This concept makes for an emotional lighting ambience that emphasizes the architecture and contrasts starkly with the rigid grid pattern of conventional office buildings. New approaches and ways of thinking have gained acceptance, individual and carefully tailored solutions replacing austere-looking grid patterns and inflexible lighting systems.



EDUCATION

BECAUSE IN TERMS
OF INTELLIGENCE
YOUR LIGHTING
SHOULD KEEP UP

Complex tasks – a simple and intelligent solution. Clever lighting concepts for schools and universities.

With the right lighting, learning even becomes easier for clever minds. A clever lighting solution ensures not only the very best visual comfort in classrooms, seminar rooms and auditoriums but is also able to improve concentration. In addition, the requirements on lighting systems in the educational sector are as diverse and individual as the range of subjects themselves. Classrooms for physics and chemistry need to be illuminated differently than a gymnasium for example, requiring ball-impact-resistant luminaires. Work on computer screens demands a different light to that of canteens or cafeterias, staff rooms or corridors. And of course a luminaire must not just emit the right light but also be attractive, environmentally friendly and energy-efficient. It's good to know that TRILUX has precisely the right solution for any task so that even extensive lighting concepts for a wide variety of requirements are carried out simply, competently and quickly.



Benefits of TRILUX LED in education

- Energy savings potential: 35 to 70 % compared to conventional light solutions
- Less environmental burden: reduced packaging and transport due to compact designs and less waste due to long service life
- Planning security: high quality and consistency with colour rendering as well as simple, rapid installation



EDUCATION

SPECIALIST CLASSES

Schools not only have diverse disciplines but also diverse classrooms. Specialist classrooms for physics and chemistry for example require particularly high performance and versatile lighting solutions. With practical tests the light must be bright enough to ensure optimum work and also must be dimmable to enable tests to be carried out in the dark. Luminaires with high light output ratios and daylight-dependent control are ideally suitable. The Arimo Slim CDP LED (page 128) supports concentrated work thanks to its high visual comfort – the homogeneous, wide-area light is also especially pleasant and glare-free in accordance with standards (UGR19).



EDUCATION

NORMAL CLASSES

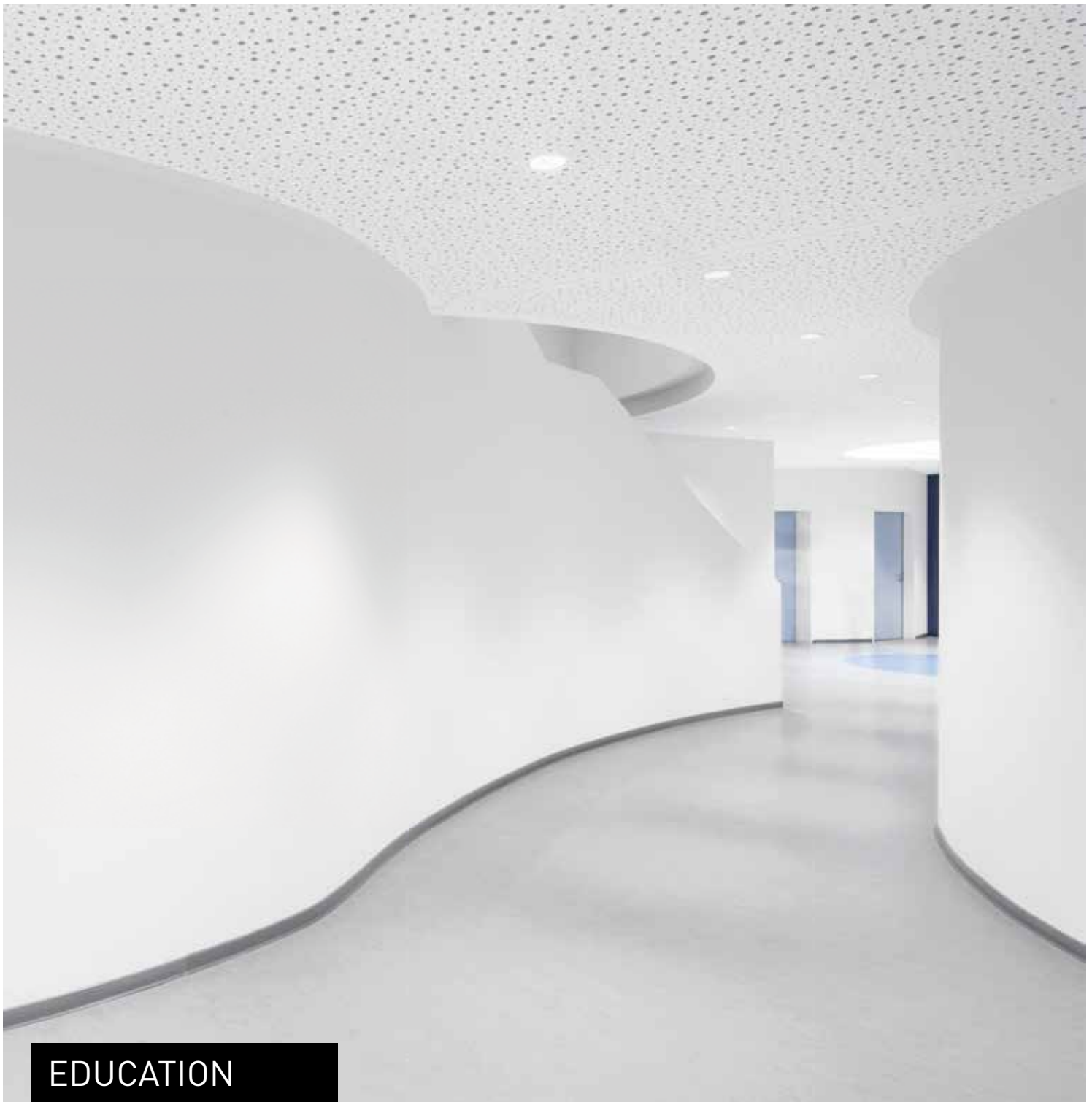
The requirements on light in educational facilities and classrooms are constantly increasing: lighting should no longer merely provide light to create pleasant learning atmospheres; cost efficiency and the ecological balance must also be considered. Energy consumption is reduced by using intelligent light management systems. Luminaires such as the Belviso LED not only feature outstanding efficiency of 103 lm/W, but as Active versions (page 223) with activating lighting are also capable of significantly supporting concentration.



EDUCATION

ADMINISTRATIVE BUILDINGS, OFFICES, STAFF ROOMS

Not only the teachers but also the lighting solutions in staff rooms and administration areas should be exemplary. Coriflex LED continuous lines (page 120) are especially economic and supply perfect light for all situations and tasks, e.g. with VDU-compliant optics in accordance with UGR19 for highly concentrated work at desks, for teacher conferences and also in breaks and relaxation periods. If desired they can also be equipped with light management systems for daylight-dependent control and presence detection or are available as dimmable versions for individually setting of lighting levels.



EDUCATION

CORRIDORS

They are "only" corridors for pupils and students, but on lighting solutions they place high demands. The distribution of light should be homogeneous, lamps should have long service lives, should be resistant to frequent switching, and the number of luminaires should be minimal. That is why hallways and corridors are perfect application areas for TRILUX LED downlights such as the Inperla Ligra Plus LED (page 96). They meet highest demands for visual comfort and energy efficiency. And thanks to the diverse design versions, the Ligra Plus LED always blends in harmoniously with the interior design. For the rapid and simple upgrading of obsolete systems, the luminaires can be installed into existing ceiling cut-outs that would normally be too large by using special cladding covers.



EDUCATION

SPORTS HALLS

Athletic performance, for the lighting system as well: Lighting in sports halls must not only be ball-impact-resistant but also extremely flexible, because competition and training situations for various types of sport demand diverse lighting conditions. To reduce the risk of injury, ideal visual conditions must be specified with the use of various lighting classes. The concept of Actison is synonymous for top performance in sports halls: less luminaires are needed, less energy is required, and the luminaire features an especially tough construction.

www.trilux.com/actison or www.trilux.co.uk/actison



Sports hall	Obsolete system	New system with presence detection and daylight control
Luminaires	Old sports hall luminaire, 3 x 58 W, LLCG	Actison RSX3 14000-840 ETDD
Power consumption per luminaire	198 W	135 W
Number of luminaires (example)	84	60
Effective operating hours p. a.*	4,500 h	2.317 h
Energy p. a.	74,844 kWh	18,765 kWh
Total investment		54,697 €
Subsidy		16,409 €
Own contribution to total investment		38,288 €
Amortisation period (years) with subsidy		2.0 a
Saving after running period (20 years)		317,533 €
CO₂ savings p. a.		75 %

* The reduced operating hours result from dimming according to needs as well as switching lighting on and off due to presence detection and daylight control.
Technical modifications reserved



Clever lighting solutions for clever students

The Brugg Campus provides 2,700 students and 880 lecturers of the University of Applied Sciences and Arts Northwestern Switzerland with ideal work conditions. That efficiency plays a decisive role at this location is also thanks to lighting solutions from TRILUX. 1,700 custom-made Belviso LED luminaires with a luminous flux of 4,200 lumens and a connected load of 45 watts have been installed. However, it was not only the efficiency calculations that convinced the building owners. The powerful LED luminaires provide a great deal of benefits over the long term and feature very convincing Total Cost of Ownership (TCO). With this method of cost analysis, not only purchase costs but also the costs of usage as well as disposal are taken into account. The method is especially important with high quality products as these are often more expensive to purchase, but then achieve fundamentally significant cost advantages.

In addition to energy efficiency and reliability a sophisticated lighting system is also characterised by a high level of lighting quality. Intelligent LED lighting solutions for the educational sector improve visual comfort and also increase the ability to concentrate in classrooms, seminar rooms and auditoriums. Combined with an intelligent light management system, they cut energy costs, unburden the environment by reducing carbon dioxide emissions and also provide optimum visual conditions.



EDUCATION

**PROJECT: CAMPUS FHNW,
BRUGG-WINDISCH**

Basic facts

Building owner: Canton of Aargau

Architect: Büro B

General contractor: HRS

Electrical planning: HKGroup

Luminaires: Belviso C1 M46 S0F

**CAMPUS
BRUGG-WINDISCH**



HEALTH&CARE

BECAUSE YOU DO NOT
MAKE COMPROMISES
WHEN IT COMES TO
HEALTH

You don't make compromises with your health.

So why should you make any with lighting?

Specialists in the health sector are indispensable, because with their many years of experience and expertise they can quickly and dependably resolve even complicated cases. A truth in fact also valid for LED lighting concepts in health care applications. With a wide-ranging and customised portfolio, TRILUX makes it simple to achieve ideal lighting solutions, whether this concerns the illumination of patient rooms or operating theatres. The products always comply with maximum demands in terms of quality and reliability, and provide requisite technical and hygienic characteristics according to the particular application. The result is custom-designed LED systems and concepts based on the latest state of technology.



Benefits of TRILUX LED luminaires

- 100 % light immediately when switched on
- Individual colour design with RGB LED, with homogeneously coloured illumination of diffuser luminaires
- Protection against tissue dehydration due to low infrared component
- More reliable and durable than conventional lamps
- Longer maintenance intervals
- Support of healing process by using Human Centric Lighting



HEALTH&CARE

CORRIDORS AND HALLWAYS

Bright but without glare: visitors, patients and personnel have to move quickly and safely in corridors. At the same time the lighting should not glare patients being horizontally transported. In addition, economic aspects are also important. LED downlights such as the Ligra Plus LED (page 96) fulfill maximum demands for visual comfort and energy efficiency. Various distribution characteristics, three luminous flux packages and diverse design styles make it the ideal solution for lighting in different applications. The Active version (page 223) is also designed to provide biologically effective lighting.



HEALTH&CARE

RECEPTION AREAS, WAITING ZONES AND RELAXATION ZONES

It's the first impression that counts, and this is especially valid for entrance and reception areas in hospitals. Harmonious lighting lends the surroundings an inviting character and creates a pleasant and relaxing atmosphere that can help in relieving the concerns and fears of both visitors and patients. LED systems with RGB colour mixing and lateral light distribution are ideal, such as the TRILUX Polaron, www.trilux.com/polaron or www.trilux.co.uk/polaron.



HEALTH&CARE

PATIENT ROOMS

Hospitals become temporary homes for many patients and should be equipped as such. Bright and colourful rooms with suitable lighting systems are able to create a homely atmosphere in normal care applications. The Sanesca LED (page 132) provides indirect room light for attractive general lighting and direct, glare-free reading light that can be expanded to examination light using a further switching option.



HEALTH&CARE

TREATMENT ROOMS

The right light is highly important in treatment rooms as it supports attending doctors in making correct diagnoses. The examination luminaire Aurinio L50 LED (page 166) with 55,000 lux and a colour rendering index of $Ra > 94$ provides optimal visual conditions. Whether permanently mounted as a ceiling or wall luminaire or as a mobile luminaire, it features enormous moveability and outstanding ergonomics, enabling rapid and precise illumination.



HEALTH&CARE

INTENSIVE CARE

In addition to being equipped with highly developed medical systems, intensive care units also require high-quality lighting that enables the care and observation of seriously ill and recently operated patients around the clock. The Fidesca PM LED (page 160) ensures optimum visual and light conditions and also benefits from extremely low maintenance effort with a service life of at least 50,000 hours. The luminaire is also suitable for the standard-compliant illumination of cleanrooms.



HEALTH&CARE

OPERATING THEATRES

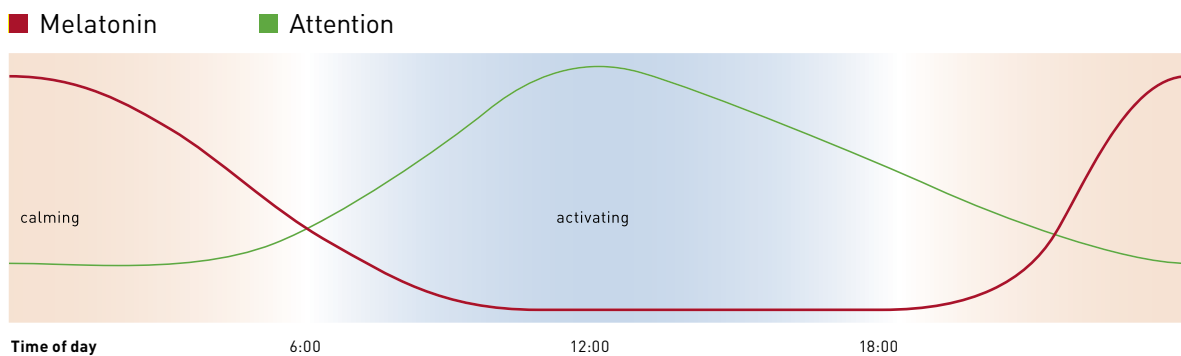
Maximum precision for medical needs are provided by LED OT luminaires. Their cool, infrared-free light illuminates the field of operation without shadows, prevents dehydration of tissue and offers surgeons optimal work conditions due to adjustment of colour temperature and illuminance. Luminaires such as the Aurinio OT LED (page 168) are a dependable proof of our expertise in this sector.



HEALTH&CARE

HUMAN CENTRIC LIGHTING

Especially in the care sector, a suitable, individual lighting concept is of high importance. One component here is biologically effective lighting, which dynamically changes its light intensity and light colour analogue to daylight. This not only increases comfort, but also well-being and accelerates the healing process. In short: it provides an optimal surrounding for patients and clinic personnel. TRILUX transfers this knowledge in Active luminaires like the Belviso LED (page 223).



Required artificial light is mixed of warm white (3000 K) and daylight white (6500 K) light sources depending on the time of day.

HEALTH&CARE

PROJECT:
MUNICIPAL HOSPITAL
MARIA-HILF, BRILON, GERMANY

Basic facts

Building owner:
Municipal hospital
Maria-Hilf Brilon GmbH
Planner: TRILUX
Interior designer: 100 % interior
Location: Brilon
Luminaires: Liventy Active Flat, Belviso





TRILUX lighting concept for the Maria-Hilf geriatrics station in Brilon, Germany

Biologically effective light provides improved quality of life in the new geriatric department of the Maria-Hilf hospital in Brilon, Germany. Circadian lighting has been installed in the patient rooms and corridors. All LED luminaires, primarily Liventy and Belviso, are controlled via a central light management system. With their light, the luminaires automatically simulate the daytime sequence of the sun, adapt light colour and intensity to the time of day and therefore also support the biological rhythm of both patients and personnel. Such lighting solutions not only prevent the disruption of the natural day-night rhythm but also fulfil the specific needs of older people for sophisticated lighting systems. This includes increased illuminance levels. A 75 year-old for example needs 20 times the intensity of light than a person in his early twenties. Planning for such target groups also requires the avoidance of mirroring, light reflections and strong bright-dark contrasts. In this way the risks of accidents or falling over are reduced. Illuminance of 600 lux is achieved in the corridors at eye height, with 300 lux at floor level. Levels of illuminance during the day vary between 600 and 1,500 lux in patient rooms. If lighting levels are suitable, they have a direct influence on the well-being of older people. More light reduces uncertainty, achieves a greater sense of balance and therefore a relaxed mind for patients.

A wide-angle photograph of a modern industrial factory interior. The ceiling is high and features a complex network of large, silver, cylindrical ducts and numerous long, rectangular LED light fixtures. In the foreground and middle ground, several orange robotic arms are visible, mounted on metal frames and working within safety cages. The floor is a light-colored, polished surface. The overall atmosphere is one of a clean, high-tech manufacturing environment.

INDUSTRY

BECAUSE YOU NEED
LIGHT FOR EXTREME
CHALLENGES

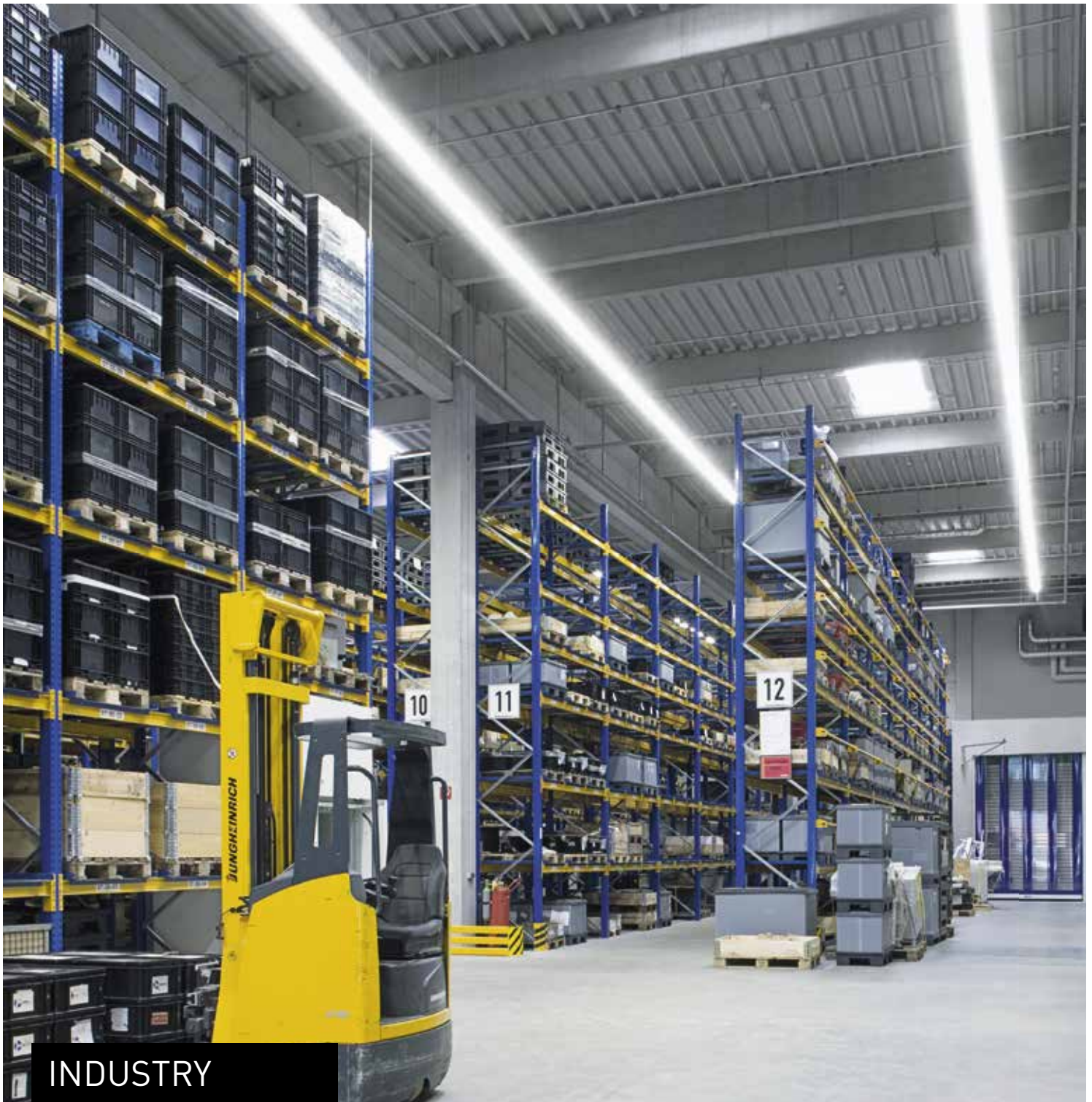
Maximum demands. The toughest framework conditions. Ideal preconditions for our LED lighting solutions.

The industrial sector demands high-performance LED lighting systems that are absolutely reliable, extremely robust and highly energy- and cost-efficient. We have listened, understood and found a solution. The result: lighting solutions that withstand dust, heat, cold and humidity, that cope with many years of use and continuous switching, and that are also resistant to impacts and vibrations. Glare-free illumination of a 15 metre high hall with 24,000 lumens? No problem. A luminaire that with its hygiene standards and colour rendering index is suitable for the food industry? Of course. An upgrading solution enabling energy costs for illuminating production halls to be cut by 50 %? Naturally. We develop custom-designed lighting systems based on close dialogue with the industry. The result is long-term, ideal production conditions and maximum levels of economy.



Benefits of TRILUX LED luminaires in industries

- TRILUX LED lighting solutions feature continuously high efficiency
- Optimised thermal management ensures a long service life with almost complete freedom of maintenance
- TRILUX only uses premium components in all LED products
- TRILUX luminaires are consistently designed for LED technology
- TRILUX provides specific LED solutions for almost all industrial applications
- Optional light management systems enable an energy-efficient lighting control tailored to needs



INDUSTRY

WAREHOUSES

Low levels of daylight or none at all, high roofs and narrow aisles: luminaires in warehouses must have specifically narrow-angle optics that emit light from the hall ceiling right down to the work areas to create safe and reliable lighting for employees. Perfect working conditions in fact for our modern LED continuous line systems such as the E-Line LED (page 148). This system is also ideal for upgrading obsolete systems: just 44 seconds are needed to completely upgrade an existing E-Line continuous line with T5 or T8 lamps to LED. Operating costs are also significantly reduced due to a high energy efficiency of up to 134 lm/W, meaning that investments are rapidly amortised.



INDUSTRY

FOOD INDUSTRY

Industrial lighting in the food industry must fulfill specific demands: On the one hand, high-quality lighting must withstand low temperatures as for example in cold stores. On the other hand, the housing and optics must be easy to clean due to high hygienic requirements and must be made of splinter-resistant materials to avoid danger to consumers. Ideal application conditions for the Nextrema LED 2 (page 156): The version with PC diffuser complies with the IFS Food and BRC standard and is thus suitable for use in food production. Thanks to optimised light effects with a new optic and improved colour rendering, the luminaire complies with current, more stringent lighting regulations for industrial workplaces and thus contributes to improved work safety.



INDUSTRY

PRODUCTION AREAS

Whether cold or warm, TRILUX LED luminaires with their optimised thermal management feature high efficiency and reliability even with extreme ambient temperatures. Ideal for the use in production halls are luminaires such as the Mirona QL LED (page 152) that ensure almost constant lighting quality even with ceiling heights of more than 13 metres and correspondingly high temperatures under hall canopies. Thus, they simultaneously contribute to better productivity and work safety. With an energy efficiency of up to 110 lm/W, Mirona QL LED also saves almost 50 % of energy costs compared to conventional lighting systems.



INDUSTRY

CANOPIED OUTDOOR AREAS

Cold, heat, rain and wind: canopied outdoor areas demand lighting solutions that withstand extreme conditions. Additional factors that can influence functionality are heavy devices, running motors, dirt and vibrations. Optimum lighting solutions for canopied outdoor areas must be tough and reliable, have a long service life and must withstand extreme conditions. Ideal preconditions for the Mirona QXS LED (page 154), providing maximum visual comfort with its glare-free, homogeneous light. This luminaire is amortised within a very short time period due to its energy efficiency of up to 110 lm/W and a long service life of 50,000 hours.



INDUSTRY

PROJECT: PLAYMOBIL LOGISTICS CENTRE

Basic facts

Luminaires: E-Line LED
Building owner: PLAYMOBIL
Planner: TRILUX
Location: Herrieden



TRILUX light solutions for the PLAYMOBIL logistics center

Illuminating high-bay warehouses not only places great demands on the photometrics itself, it also has to comply with the increased standards for illuminating work places within the industrial sector with regard to colour rendering and glare reduction. Additionally, a comfortable and energy-efficient light solution is desired. In the PLAYMOBIL logistics center in Herrieden state-of-the-art E-Line LED continuous lines by TRILUX easily fulfill these requirements. Perfect photometrics enable a homogeneous light distribution, whether on open spaces or in aisles. The already low operating costs due to excellent luminous efficiency and low maintenance effort are further reduced by using DALI dimmable luminaires, as PLAYMOBIL decided for an additional light management system to be integrated. This system measures available daylight and switches on artificial lighting only when needed and only in the required intensity. This combination enables a highly efficient and intelligent light solution. The bright and homogeneously illuminated hall ensures higher work safety and supports well-being and productivity of the employees.

SHOP&RETAIL

BECAUSE YOUR
PRODUCTS DESERVE
THE BEST LIGHT



It's about fascination

Light is magical. It has the power to attract, it touches our souls, can create moods and influences our behaviour. We specifically use light to influence purchasing behaviour. In the retail sector light is a decisive factor when it comes to displaying products appealingly, bathed in good light. Presentations however significantly depend on the needs of our customers and their target groups. Light can provide orientation, can guide, can focus attention on products and can also arouse desires. Light fascinates because it has the ability to encourage purchases in various ways.



Benefits of LED for Shop & Retail

- High colour rendering index ensures optimum recognition of colours and materials
- The right light spectrum is efficient because hardly any wavelengths are absorbed
- No infrared radiation reduces heat loads on goods
- No ultraviolet component delays the fading of goods
- Energy consumption is reduced by a combination of the right LEDs, an efficient reflector and intelligent thermal management





Light planning and store construction: ppm planung + projektmanagement gmbh, Dormagen

SHOP&RETAIL

FASHION

Light creates atmosphere via contrast, light colour and light intensity. The type of light that we see unconsciously arouses our emotions. The right light creates exactly the right atmosphere to display goods in a sales-promoting way. In the fashion sector, LED solutions are ideally suitable due to their colour rendering that ensures optimum recognition of colours and materials. For example with the Sistema (page 124), making customised general and accent lighting especially simple. Various light colours, beam angles and luminous flux packages enable individual illumination of goods. Subsequent replacement of luminaire modules is done in next to no time, a real advantage in the fashion sector where the type of merchandise presentation is often changed.



SHOP&RETAIL

FOOD

Freshness that can be seen. The demands placed on the presentation of food are as diverse as the products themselves, and extensive expertise with light is needed. The requirements on light are always the same: goods should appear authentically and look tasty. The variety of colours stipulates excellent colour rendering, and freshness is kept because of reduced heat emission. Whether it's a matter of displaying fruit and vegetables as if fresh from the garden, authentically showing the colours of meat goods at a meat counter, or using a light spectrum that highlights golden brown tones to arouse the appetite for crispy bread: LED point-shaped spotlights such as the Stratus Vario (page 114) or Taro (page 108) feature three special light spectra that convincingly display the products.



SHOP&RETAIL

SHOP

Light attracts our attention, unconsciously guides us, makes us look in a certain direction and also influences our physical sensitivity. At the same time, general lighting in retail areas also must efficiently illuminate the zones with a high merchandise density. Continuous-line systems such as the E-Line LED (page 150) create light accents with the efficient use of energy. The double asymmetric light distribution ensures goods-oriented lighting without glare in the direction of the aisle. In addition, E-Line LED has high quality and flexibility: various luminous flux packages and modular components, e.g. for spots, can be individually adapted to various lighting requirements.

SHOP&RETAIL

FASHION MEETS
FASCINATION





A modern light concept sets Oska in scene

Previous HIT technology was replaced by a better, more colour-neutral light in order to emphasise the straight-lined and discreetly extravagant style of the OSKA brand. Oktalite as the specialist for retail lighting was consulted for project implementation, both in the flagship store and for the showroom of the Munich headquarters. The store is displayed with a sober, functional look paired with stylish elements. As part of this, LED lighting and surface-mounted spotlights professionally set room and goods in scene. The contrast between bright and dark in the store window attracts the glances of customers. The goods here are displayed upon a black background, similar to limelight on a theatre stage. Vertically mounted tracks with black BLX spots achieve this effect. In addition, recessed cardanic spots were installed in the floor. The whole concept generates a dramatic, mystical atmosphere that ideally highlights the goods. The clear, concise appearance and play with light is continued in the interior. Here the lighting planners specified warm white light that sets soft accents due to suitable reflectors. Thanks to spot and medium flood reflectors, the Fano LED spotlights stylishly showcase the room and goods with 4000 lumens and a 3000 Kelvin light colour.

OUTDOOR

BECAUSE YOUR
OUTDOOR AREAS
NEED LIGHT TO BE
SHOWCASED



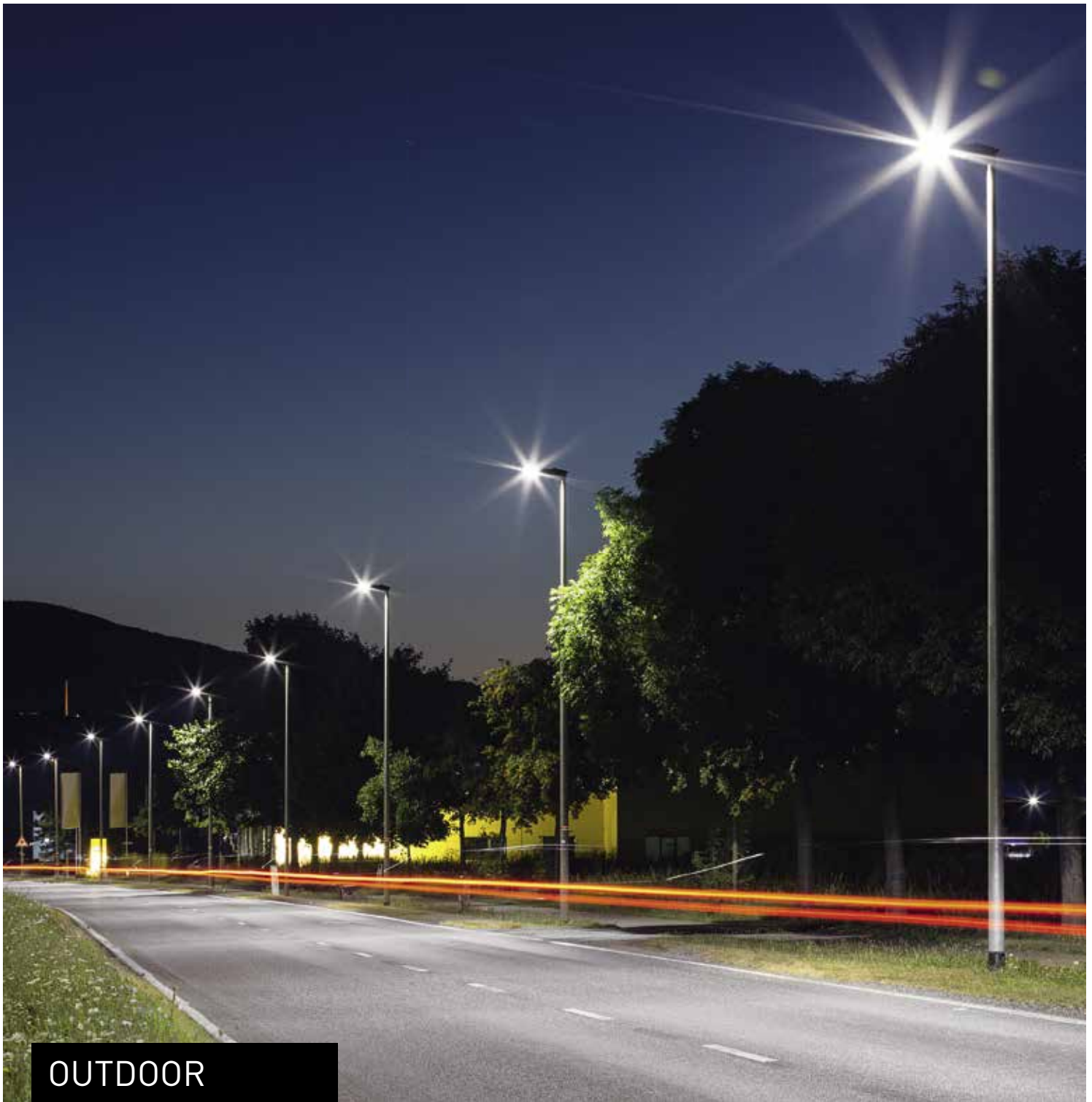
Outdoor lighting has many facets. Just like TRILUX LED outdoor lighting solutions.

Street luminaires, bollards, light columns, wall luminaires, spots, floodlights and light lines: LED outdoor luminaires are a complete universe. Despite the diversity of forms and functions, certain fundamentals exist with standards and safety aspects that are considered in all TRILUX outdoor luminaires: each solution, ranging from street luminaires for main roads, bollards for parks and spots for facade illumination, continuously withstands adverse weather conditions thanks to high-quality materials. In addition, high-performance, robust optics reliably ensure good visual conditions. The luminaires combine future-oriented and award-winning design – from classic to modern – with high-efficiency LED technology. In practice, the luminaires also score with very simple mounting and maintenance.



The benefits of TRILUX LED in outdoor applications

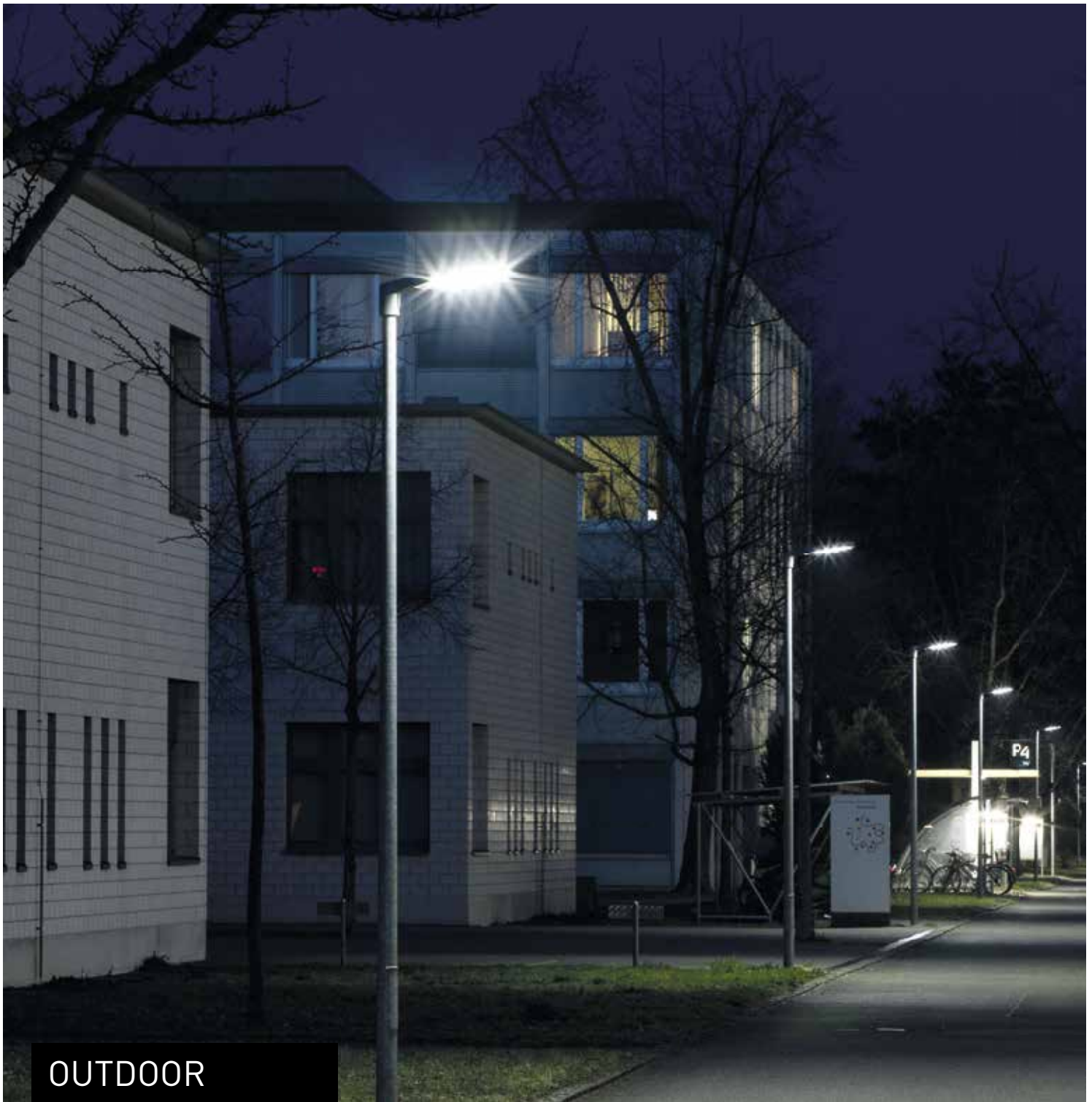
- A new language of form for optimal functionality and design
- Low environmental burden due to long service life
- Individual, coloured outdoor illuminations with all current control systems
- Low operating costs due to optimised dimensioning of luminaire luminous flux
- Precise optics with reduced light scatter for optimal light effects and high efficiency
- Easy operation due to optimised thermal management
- Resistant to fracture and vibration



OUTDOOR

TRAFFIC ROADS

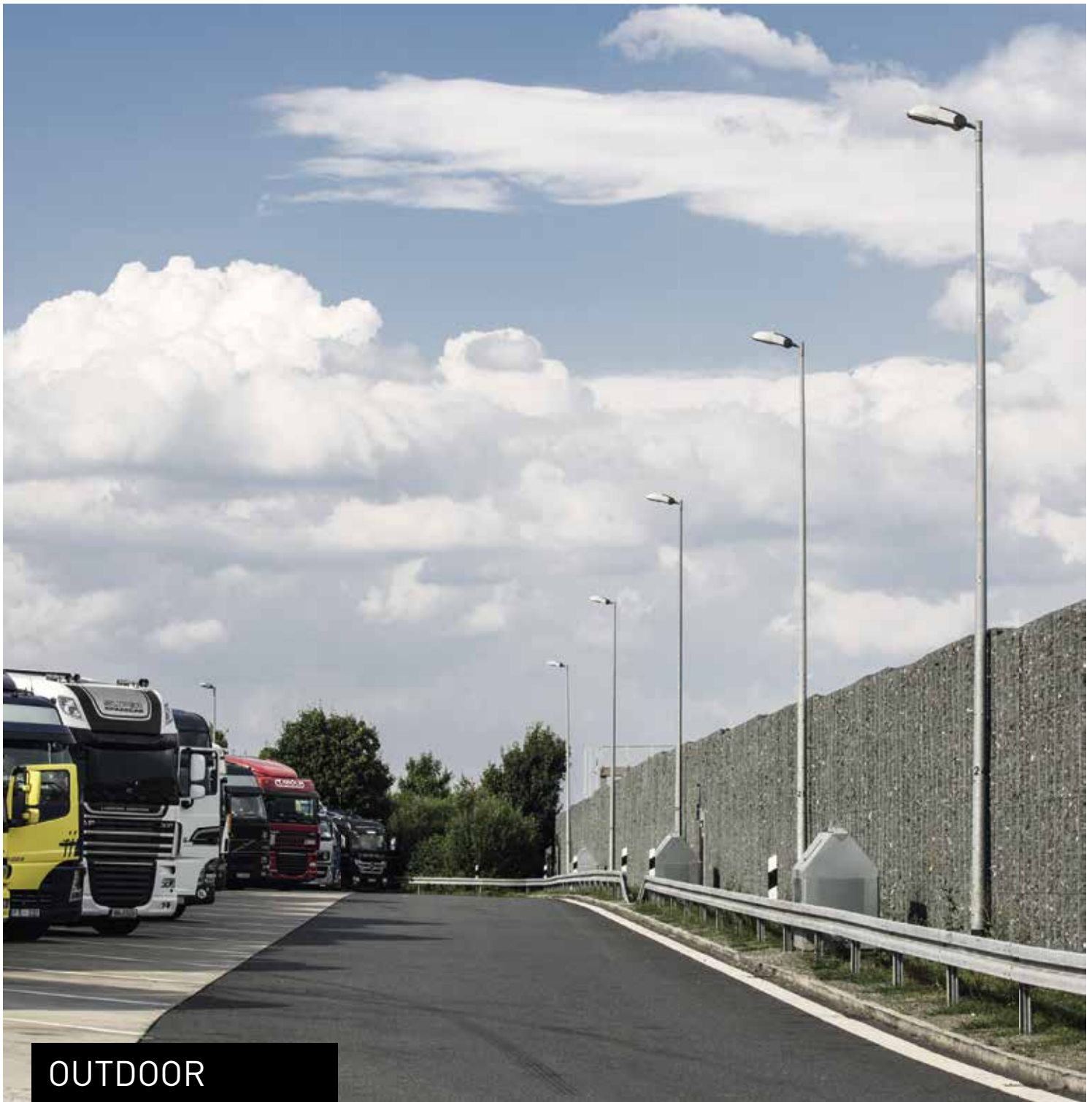
Light on public roads is a complex topic. It must be bright enough for vehicle drivers and pedestrians to optimally find their way and for preventing crime. At the same time the lighting solution should create a pleasant atmosphere, should upgrade urban areas with an appealing design and should of course be also environmentally friendly, economical and with low maintenance needs. The solution: TRILUX luminaires such as the Viatana LED, see page 176.



OUTDOOR

RESIDENTIAL ROADS

Attractive during the day and bright at night: when illuminating residential streets, the lighting solution must not only ensure safety but should also blend in perfectly with the architectural surroundings, create a positive atmosphere and also increase the quality of life. That is why our quality standards with luminaire design are especially high. With the aid of the latest LED technology, TRILUX offers lighting solutions that until recently were considered unthinkable, also in terms of cost efficiency. For example with the Convia LED, enabling energy savings of up to 79 %, see page 172.



OUTDOOR

PUBLIC FACILITIES

Security is of prime importance with public car parks and rest areas. Lorries and cars park, drive and steer. Pedestrians suddenly appear behind vehicles or quickly cross the road and often the field of view is limited. Reliable, long-life lighting can help minimising such danger sources. TRILUX luminaires feature perfectly matched photometrical characteristics and comply with the very latest technological standards. Equipped with Multi-Lens-Technology (MLT), the Lumega 700 LED (page 184) guides light via computer-optimised single lenses efficiently onto the surface to be illuminated to reduce the danger of accidents.



OUTDOOR

PEDESTRIAN ZONES

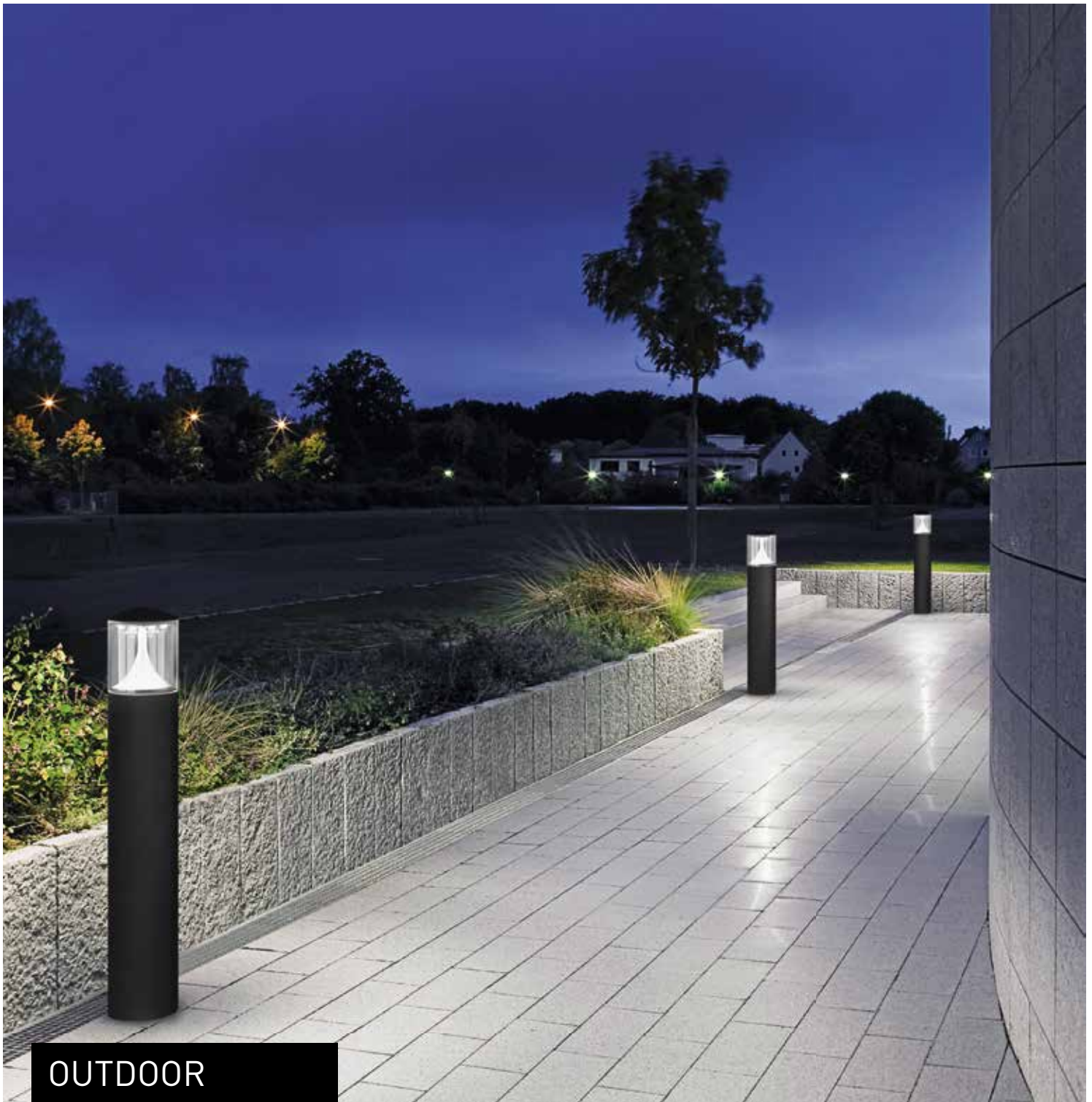
Attractively designed pedestrian zones and urban areas promote economic life, create atmosphere and thus lead to image gains for inner-city environments. With light you can design urban spaces in fascinating ways and actively contribute to preventing crime. Whether by day or at night: TRILUX LED luminaires for urban areas attract welcome guests, and at the same time scare off those that are not welcome.



OUTDOOR

PEDESTRIAN CROSSINGS

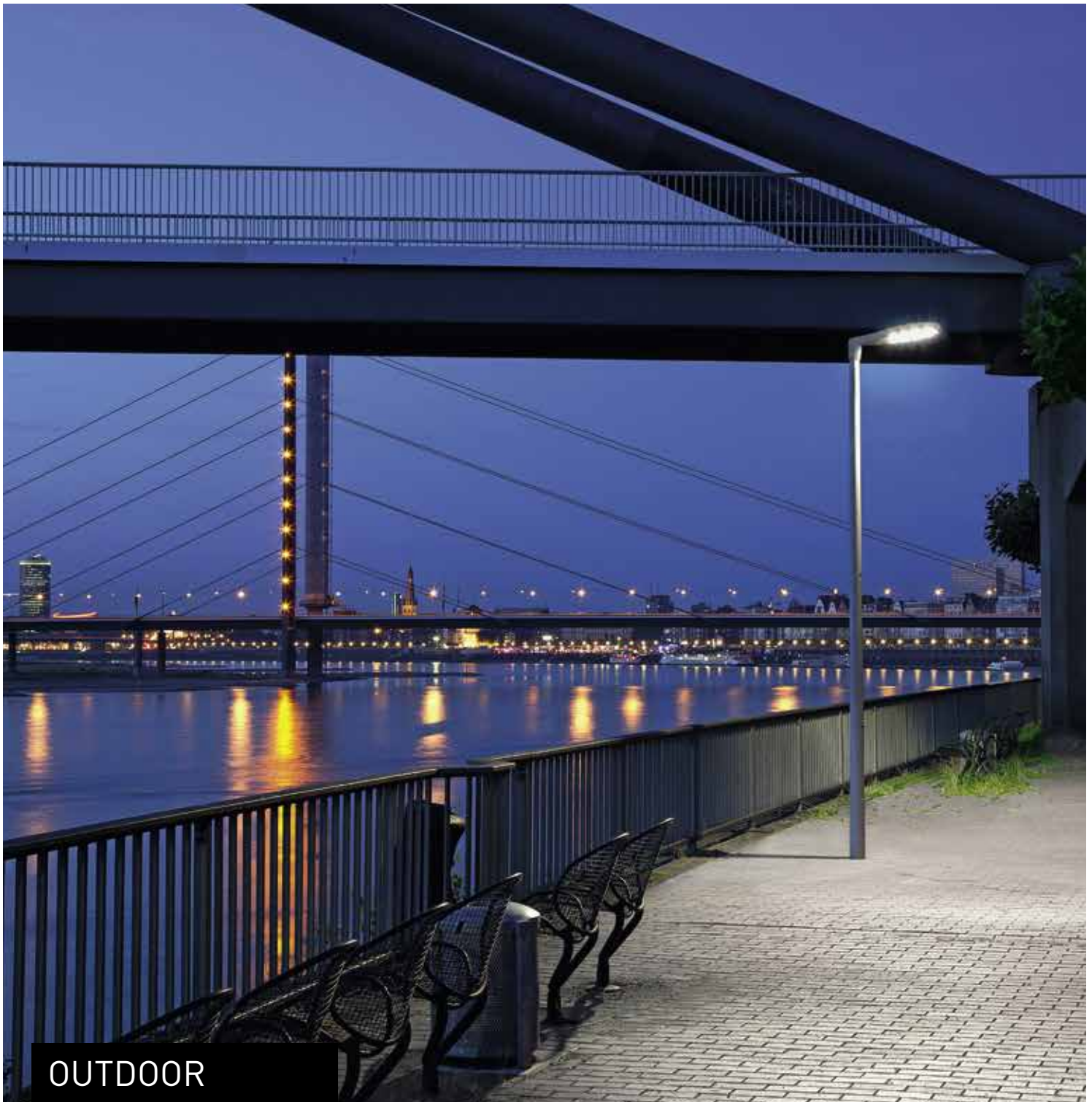
Conflict zones such as pedestrian crossings require greater attention from traffic participants and therefore need better lighting than traffic zones without the danger of collisions. Pedestrians on crossings and waiting on the roadside must be clearly recognisable from both directions, even in darkness and with wet roads. The Viatana LED with special optics guarantees standard-compliant illumination for pedestrian crossings (page 176).



OUTDOOR

RESIDENTIAL ESTATES

Do paths in building complexes still have to be illuminated with inefficient light sources? And shouldn't we forbid children to shoot a football onto the luminaires or to climb on the lanterns? We can't do anything about that, but we still have a solution. The 8841 LED bollard luminaires (page 190) not only look good, but are bright enough to ensure safety and also economy of operation. And on top of that, also very tough to defy wind, weather and children at play.



OUTDOOR

CYCLE PATHS

The bicycle is becoming ever more popular – and this means that cycle paths are also gaining importance. In urban areas with many bicycles, the requirements of cycle paths are as demanding as with roads for vehicles. Homogeneous lighting, sufficient lighting levels and glare reduction are photometrically obligatory, and of course maximum cost effectiveness. The TRILUX Convia LED is exemplary with such characteristics, see page 172.



SHOPPING CENTRES AND BUSINESS PARKS

Light as an individual business card: shopping villages, hospitals, office complexes, heritage buildings and hotels and restaurants benefit from an extensive portfolio of individual and customised lighting solutions. Thanks to the variable lighting concepts, functional buildings can be specifically presented, for example with the Altigo luminaire range that not only sets accents in the ground but also on walls and ceilings and as bollard luminaires. See pages 186, 194, 196, 200.





OUTDOOR

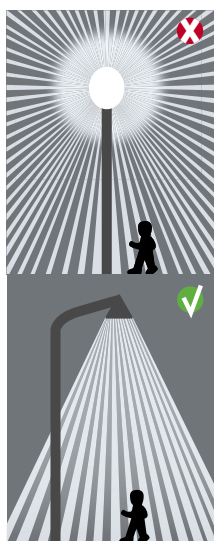
FACADE LIGHTING

Outdoor lighting that not only illuminates but also highlights. Whether it's about accenting architectural details or highlighting complete buildings and objects – TRILUX LED luminaires set architecture in the light it deserves. Highlighting objects, surfaces and buildings – with Faciella LED the path to perfect light was never that simple (page 208).



OUTDOOR

ENERGY EFFICIENCY



Efficient light guidance – dark sky and bright roads

While fluorescent lamps emit light uniformly and radially to all sides of the space, LEDs according to construction type radiate the light at an angle of around 80° to 140°. Intelligent optical systems for light guidance designed for LEDs allow for the construction of high efficiency luminaires that serve the targeted illumination of roads and streets for example.

Reduction of light emission

LED luminaires offer targeted light distribution characteristics on lanes and pavements by means of optics or reflectors.



Energy efficiency

A practical example: With the replacement of 30 conventional luminaires with the same quantity of Cuvia outdoor luminaires, not only costs were significantly cut but lighting quality was improved.

Efficiency calculation for street lighting	Obsolete system	Cuvia 40/AB1L 1350-740
Lamp type	HME (HQL)	LED
Number of lamps per luminaire	1	1
Number of luminaires	30	30
Ballast	LLCG	ET
Connected load of luminaire	138 W	16 W
Luminaire luminous flux	4900 lm	1350 lm
Specific connected loads	0.738 W/m ²	0.086 W/m ²
Total connected load of lighting system	4,140 W	480 W
Yearly energy consumption	16,623 kWh/a	1,927 kWh/a
Energy costs p.a.	2,992 €/a	347 €/a
Savings potential		88 %
Savings potential in kilowatt hours p.a.		14,696 kWh/a
Costs savings p. a.		2,645 €/a
CO ₂ savings p.a.		8.82 t/a

Calculation basis for energy savings is the conventional nominal value of 18 cent per kWh



OUTDOOR

PROJECT: UNIVERSITY LIGHTING, PADERBORN

Basic facts

Luminaire: ConStela/LED 4000 ww ET, colour: DB 703

Luminaire: 8841 bollard luminaire AB/LED 700 ww, colour: DB 703

Luminaire: 8841 bollard luminaire RB/LED 550 ww, colour: DB 703

Implementation period: October/November 2013

Investment: Costs of approx. 54,000 euros

Building owner: Paderborn University

Planner: Minati Planning Offices

Location: Paderborn University

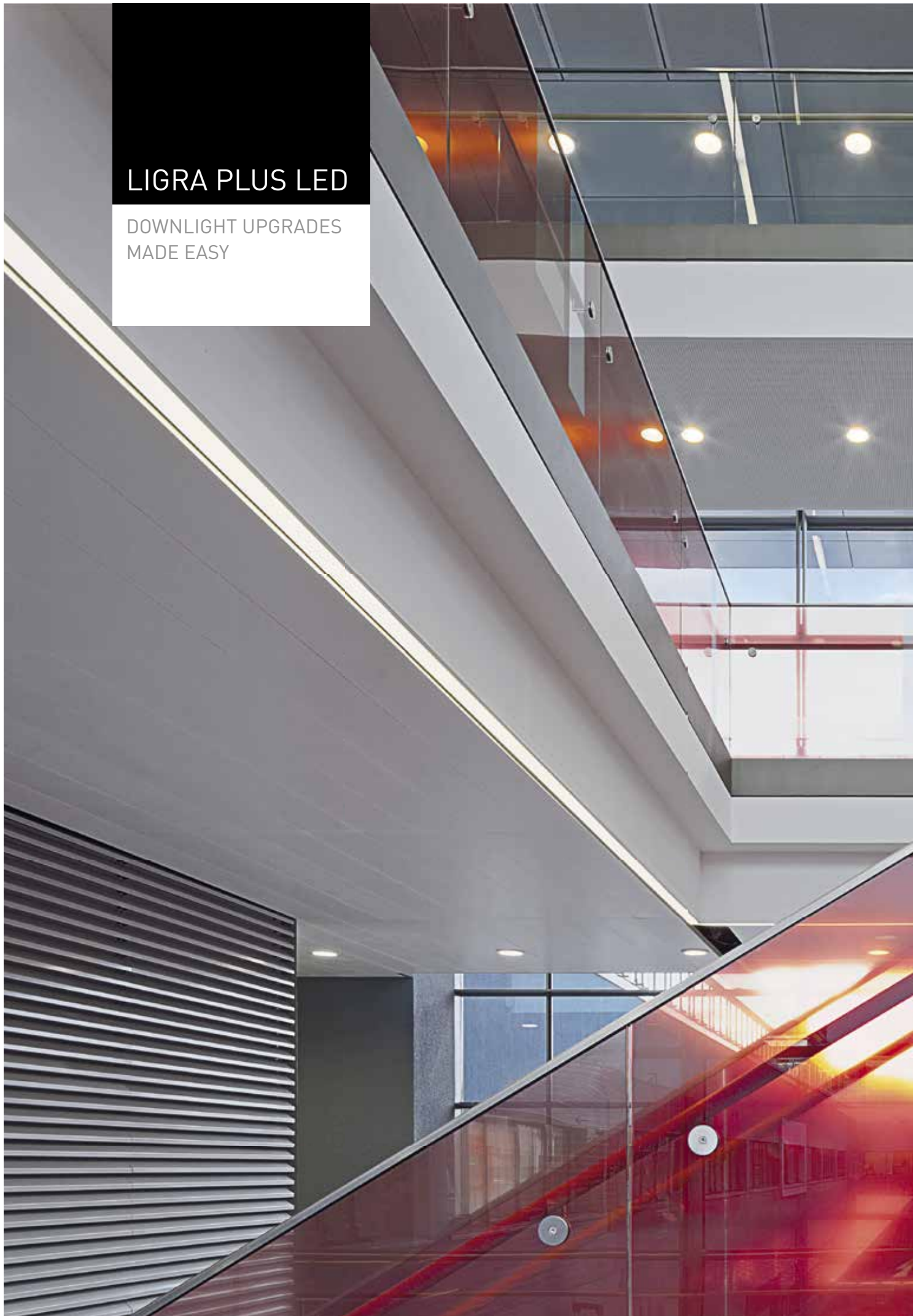


A purist design inspires the University of Paderborn

The domain for light columns until now was in the decorative area. Lighting solutions that complied with standards were difficult to implement. TRILUX with its ConStela LED has now managed to combine a purist, join-free design with sophisticated photometrics. This combination also has convinced within a lighting project for Paderborn University in Germany. 11 ConStela and 23 LED bollard luminaires provide safe and standard-compliant illumination of the university's main entrance area. The TRILUX lighting solutions also confidently highlight the architecturally designed stairway and corresponding access paths, all thanks to the optical system featuring Multi-Lens-Technology. Highly efficient, UV and temperature-resistant lens systems emit homogeneous light. The architecture and lighting have transformed the university entrance area into a stylish and representative zone. And the university is highly pleased because the new LED systems also consume 40 % less energy than conventional luminaires and have very long service lives, thus supporting the sustainability philosophy of the university.

LIGRA PLUS LED

DOWNLIGHT UPGRADES
MADE EASY



Upgrading was never as simple as it is with the easy-to-install and flexible Ligra Plus LED. With the restoration covers, the luminaire fits into nearly all existing ceiling cut-outs and if required can be connected via mains through-wiring from luminaire to luminaire to save time. The Ligra Plus LED is available with different luminous flux packages and light distribution characteristics for the perfect illumination of a wide variety of rooms. All versions fulfil maximum demands for visual comfort and energy efficiency. And thanks to the diverse design versions, the Ligra Plus LED always blends harmoniously into the interior design.

Upgrading. In next to no time.

For the rapid and simple upgrading of obsolete systems, the luminaires can be installed into existing ceiling cut-outs that would normally be too large with the help of special restoration covers. And because of mains through-wiring, installing junction boxes is not needed.

One downlight system. Many versions.

With differing light distribution characteristics, three luminous flux packages and various designs, the Ligra Plus LED is perfectly suitable for lighting requirements in nearly all office surroundings. High IP54 protection rating with resistance to dust and splash water also expands the application spectrum.

Glare-free lighting. Increased work comfort.

A wide distribution optic, limited luminances and high glare reduction ensure a pleasant sense of light and maximum visual comfort for office work.



Design: MiD Möller and Demmer

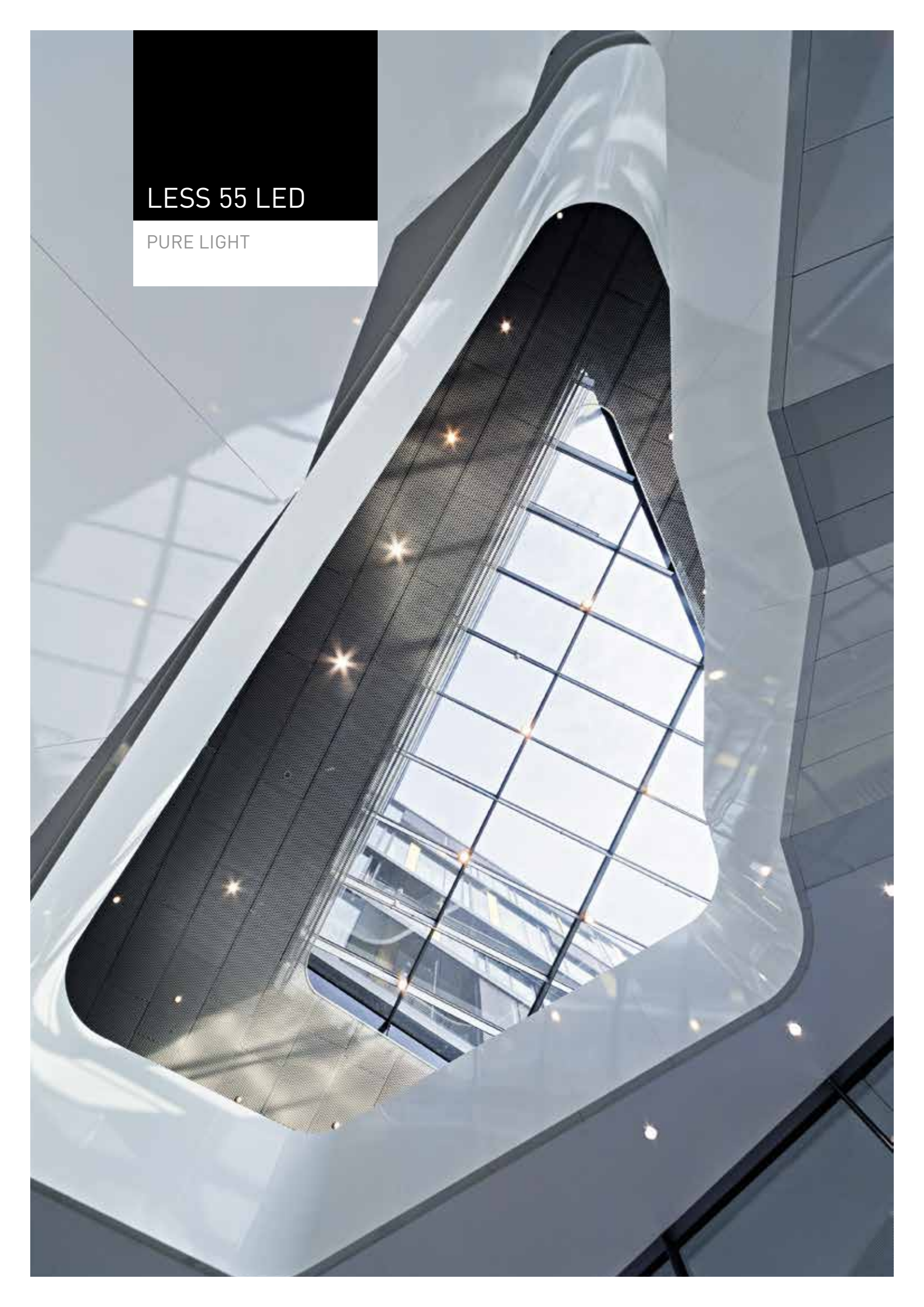
Technical features:

- Luminaire luminous flux: 1000 lm, 1800 lm, 2700 lm
- Connected load/efficiency: 11 W, 18 W, 29 W/90 to 100 lm/W
- Service life: 50,000 h L80/B10 at tq 25° C
- Colour rendering/temperature: 830, 840
- Electrical version: ET, ETDD
- Dimensions/recessing dimensions: Ø 140 x 100 mm deep, 140 x 140 x 100 mm deep
- Protection rating/impact resistance: IP20, IP54 and IP54 on room side incl. accessory IK02
- Light distribution: direct, wide light distribution/UGR19, 22, 25

Versions of this range are prepared for biological lighting and are marked with the affix "Active".

With the help of refurbishment plates the luminaire can be installed in almost all bigger ceiling cut-outs in next to no time.





LESS 55 LED

PURE LIGHT

The product range is now available in its well-known design but with highly efficient LED technology. The technologically advanced premium product LESS is designed without unnecessary details or superfluous changes in material. The wide product range with its various wattages solves every task and enhances all architectural environments.

Three versions. Three sizes.

LESS LED is available as recessed luminaire with and without edge cover. Both options can be ordered with a ceiling-flush, frosted cover on demand. Different types like a surface-mounted version, a version with wall-washer optics and a spot version complete the wide range of the product family. LESS LED is available in three construction sizes and light colours, as well as with white or highly specular reflector. The housing colour can be chosen individually.



Technical features:

- Colour temperature: 2700 K, 3000 K, 4000 K
- Luminaire luminous flux: 300 lm to 578 lm (depending on light colour and electrical current)
- Connected load: 4 W (350 mA)/6 W (500 mA)/8.7 W (700 mA) (depending on light colour and electrical current)
- Colour rendering: Ra > 80
- Electrical version:
Control gears for 350/500/700 mA are separately available
- Reflector: white /highly-specular
- Optic: with/without glass optic, frosted
- Recess version: flush/with edge
- Recessing dimensions: recess depths 73 mm to 96 mm, ceiling cut-out 65 mm to 81 mm
- Service life: 50,000 h
- Protection rating/safety class: IP20/III
- Light distribution: 13°/36°/86°/WW/RS

Recessing depths and ceiling cut-outs vary depending on the version and should not be understood as generally valid width. Information on connected load, luminaire luminous flux and/or light distribution mirror the entire spectrum of possible LESS LED variants. A detailed overview can be found in the main catalogue or on the respective data sheets of the luminaires.

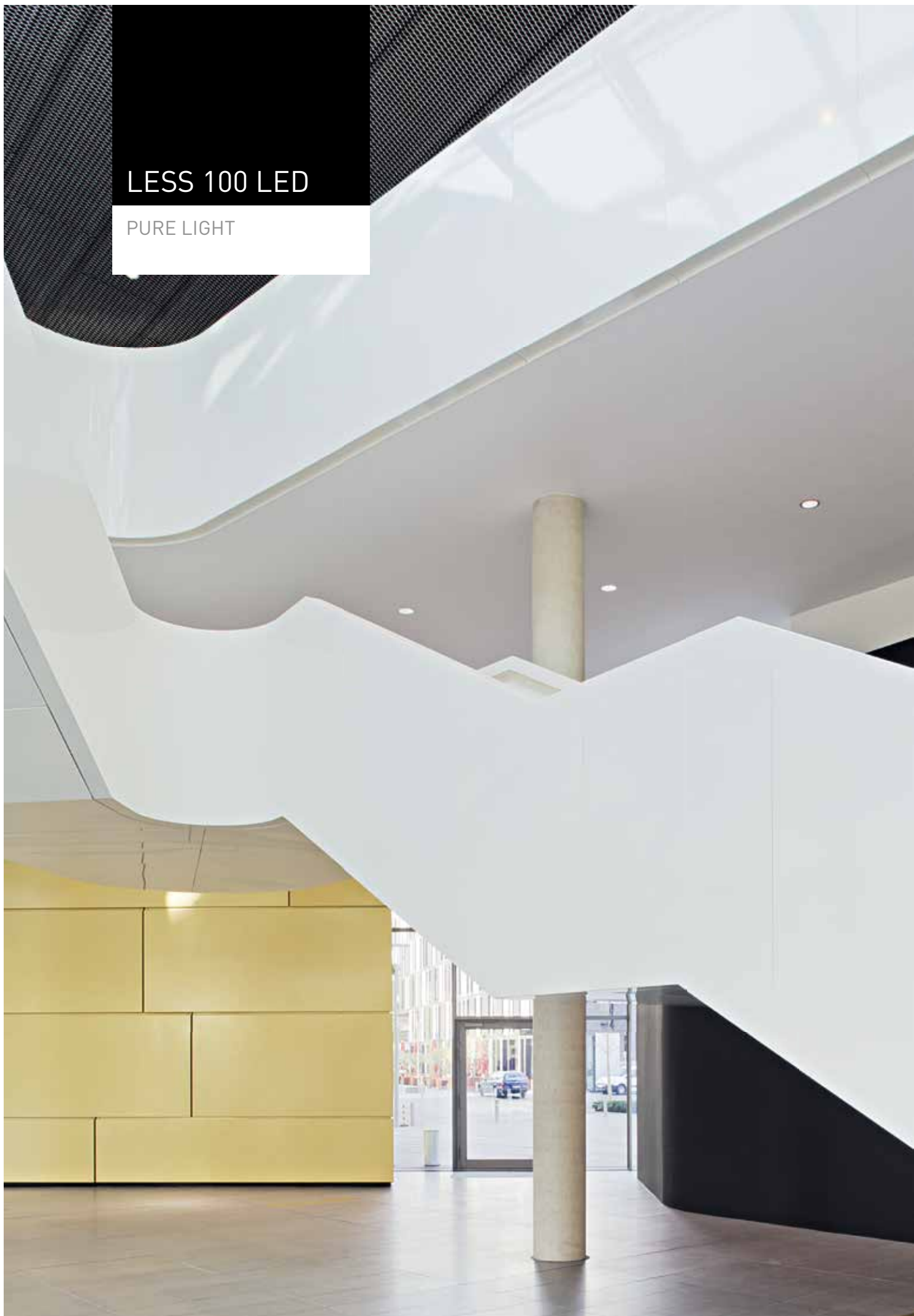
The design of the LESS 55 convinces with its clear shape and minimal changes in material.

For the LESS 55, a white and a highly-specular reflector is available. The version with glass features a white reflector as standard.



LESS 100 LED

PURE LIGHT



The product range is now available in its well-known design but with highly efficient LED technology. The technologically advanced premium product LESS is designed without unnecessary details or superfluous changes in material. The wide product range with its various wattages solves every task and enhances all architectural environments.

Three versions. Three sizes.

LESS LED is available as recessed luminaire with and without edge cover. Both options can be ordered with a ceiling-flush, frosted cover on demand. Different types like a surface-mounted version, a version with wall-washer optics and a spot version complete the wide range of the product family. LESS LED is available in three construction sizes and light colours, as well as with white or highly specular reflector. The housing colour can be chosen individually.



Technical features:

- Colour temperature: 2700 K, 3000 K, 4000 K
- Luminaire luminous flux: 2000 lm
- Connected load: 16.5 W/19 W/18 W
- Colour rendering: Ra > 80
- Electrical version: DALI
- Reflector: white/highly-specular
- Optic: with/without glass optic, frosted
- Recess version: flush/with edge
- Recessing dimensions: recess depths 138 mm to 168 mm, ceiling cut-out 110 mm to 116 mm
- Service life: 50,000 h
- Protection rating/safety class: IP20/III
- Light distribution: 12°/30°/45°/WW/RS

Recessing depths and ceiling cut-outs vary depending on the version and should not be understood as generally valid width. Information on connected load, luminaire luminous flux and/or light distribution mirror the entire spectrum of possible LESS LED variants. A detailed overview can be found in the main catalogue or on the respective data sheets of the luminaires.

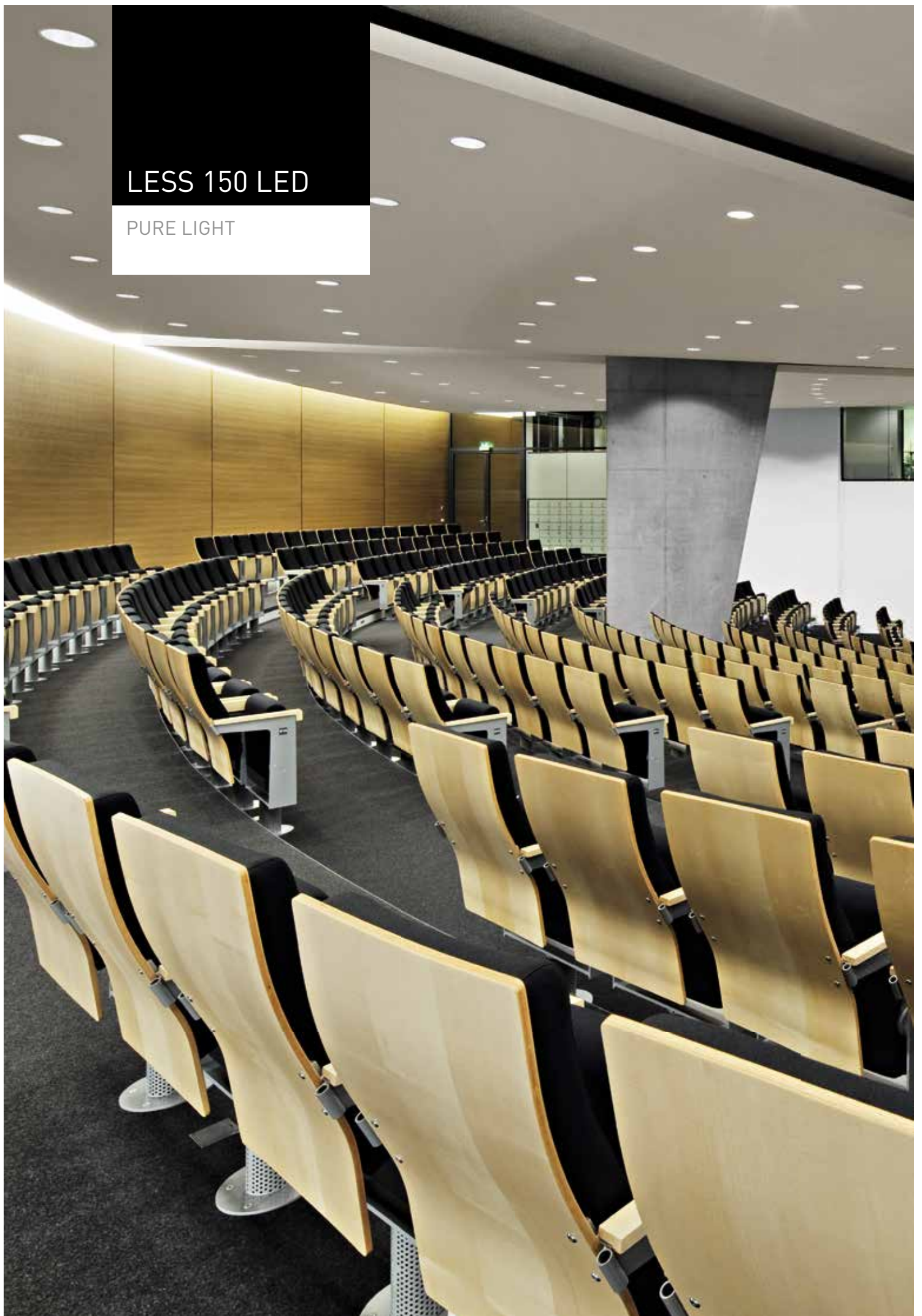
The spotlight head of the LESS 100 can be adjusted in 30° angles and allows for a flexible use.

For the LESS 100, a white and a highly-specular reflector is available. The version with glass features a white reflector as standard.



LESS 150 LED

PURE LIGHT



The product range is now available in its well-known design but with highly efficient LED technology. The technologically advanced premium product LESS is designed without unnecessary details or superfluous changes in material. The wide product range with its various wattages solves every task and enhances all architectural environments.

Three versions. Three sizes.

LESS LED is available as recessed luminaire with and without edge cover. Both options can be ordered with a ceiling-flush, frosted cover on demand. Different types like a surface-mounted version, a version with wall-washer optics and a spot version complete the wide range of the product family. LESS LED is available in three construction sizes and light colours, as well as with white or highly specular reflector. The housing colour can be chosen individually.



Technical features:

- Colour temperature: 2700 K, 3000 K, 4000 K
- Luminaire luminous flux: 2000 lm/3000 lm
- Connected load: 16.5 W/19 W/18 W
- Colour rendering: Ra > 80
- Electrical version: DALI
- Reflector: white/highly-specular
- Optic: with/without glass optic, frosted
- Recess version: flush/with edge
- Recessing dimensions: recess depths 168 mm to 198 mm, ceiling cut-out 162 mm to 166 mm
- Service life: 50,000 h
- Protection rating/safety class: IP20/III
- Light distribution: 10°/30°/45°/WW/RS

Recessing depths and ceiling cut-outs vary depending on the version and should not be understood as generally valid width. Information on connected load, luminaire luminous flux and/or light distribution mirror the entire spectrum of possible LESS LED variants. A detailed overview can be found in the main catalogue or on the respective data sheets of the luminaires.

The reflector technology of the LESS 150 allows for a light angle of 10°, 30° and 45° and ensures a homogeneous light distribution.

For the LESS 150, a white and a highly-specular reflector is available. The version with glass features a white reflector as standard.



QUAD

HIGH PERFORMANCE IN
A COMPACT DESIGN



New technology with an attractive design: the QUAD recessed pivotable spotlight. With its pivotable and tiltable luminaire head and low recess depth it combines the advantages of both a surface-mounted and recessed luminaire. It can be used as a downlight or directional spot, and is flexible enough to easily illuminate highly placed goods. The design of the QUAD is based on the high quality elements of the ceramic cooling ribs and the strikingly modern luminaire design.

Low recess depth. Wide action radius.

With a recess depth of max. 120 mm, the QUAD adapts to nearly all ceiling designs. The luminaire head can be rotated through 355° and pivoted through 90° to specifically highlight goods up to the ceiling height.

Clean-cut spot. Simple adaptation.

QUAD generates a clean, narrow distribution spot. The desired beam angle is defined by two tool-free replaceable diffuser discs, optionally a narrow beam with 12° or more diffuse with 24° for a softer light distribution.

Purist design. Attractive elements.

The slender luminaire blends well into shop concepts thanks to its functional design. At the same time, design elements such as the translucent ceramic cooling ribs set striking and modern accents.

Intelligently combined innovations.

Quad features especially high-performance, passive ceramic cooling and an innovative collimating optic for maximum performance in a very compact design.



Technical features:

- Luminaire luminous flux: 3600 lm
- Connected load/efficiency: 44 W/73 lm/W
- Service life: 5 years at L80/F10
- Colour rendering/temperature: 3000 K, 3500 K, 4000 K (CRI >80)
- Electrical version: dimmable on request
- Recessing dimensions: Ø 155 mm, D: 120 mm
- Protection rating/impact resistance: IP20
- Beam angle/light distribution: 12°, 24°

QUAD surface-mounted spot



QUAD.T00 surface-mounted spot



QUIRA

THE LUMINAIRE
WITH DISCRETION



Surface-mounted luminaires

Professional retail lighting solutions must fulfil many tasks, ranging from inviting general lighting to effective and atmospheric lighting for displaying specific goods. Flexibility here is imperative because the selection and structure of goods changes from one day to the next. All of these lighting tasks are solved confidently by the QUIRA recessed spotlight.

Wide action radius. Let's do the twist.

The luminaire head can be pivoted outwards by 70° and inwards by 15° and can be additionally rotated through 350°. The pivoted-out spot can accentuate high positioned decoration until below the ceiling. When pivoted in, the luminaire can specifically illuminate while staying flush with the ceiling.

The art of adaptation. Tool-free reflector replacement.

From wide distribution for general lighting to narrow distribution for displaying specific goods: QUIRA is available with three different interchangeable reflectors: flood, medium flood and spot. New shop fittings require new lighting scenes? No problem: The reflector units can be replaced on-site without tools.

Freedom of choice. Four light colours.

QUIRA is available with four different light colours from 2700 to 4000 kelvin for custom light effects.

See everything. Hear nothing.

Compact, highly efficient and with passive cooling. Thanks to passive cooling the QUIRA operates completely without noise and with high efficiency. With 3000 lumens, the QUIRA very effectively illuminates goods despite its compact size.



Technical features:

- Luminaire luminous flux: 3000 lm
- Connected load/efficiency: 33 W/84 lm/W
- Service life: 5 years at L80/F10
- Colour rendering/temperature: 2700 K, 3000 K, 3500 K, 4000 K/ (CRI >80)
- Electrical version: dimmable on request
- Recessing dimensions: Ø 130 mm, D: 150 mm
- Protection rating/impact resistance: IP20
- Beam angle/light distribution: SP, MF, FL

When 70° pivoted out the spot also can illuminate high positioned decorative elements.

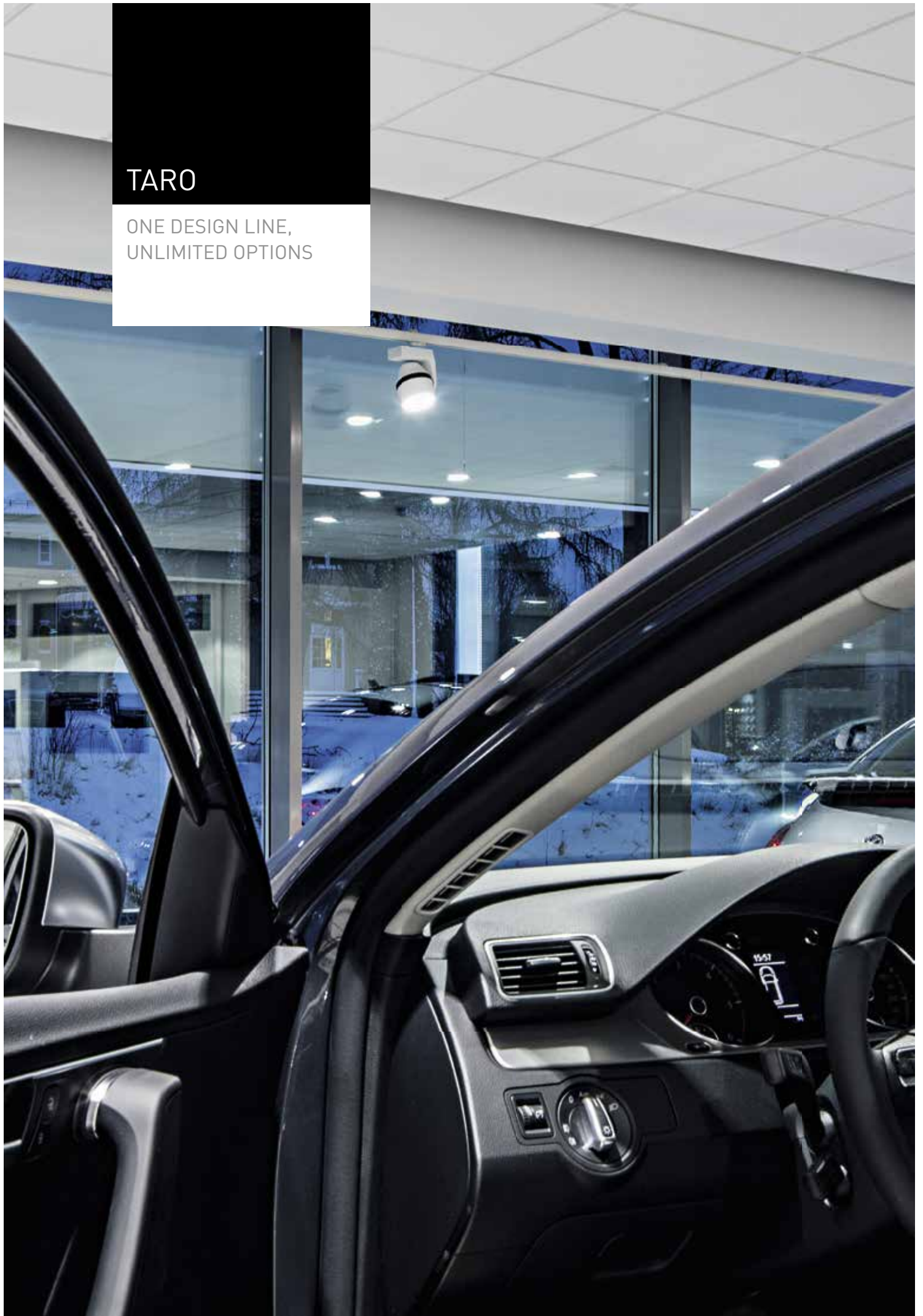


When 15° pivoted inwards the spot is flush to the ceiling.



TARO

ONE DESIGN LINE,
UNLIMITED OPTIONS



Surface-mounted luminaires

Professional retail lighting with suitable solutions, quickly installed – and with a uniform and modern design: The TARO product range provides lighting designers with a wide-ranging portfolio of luminaires. In that way even large retail areas with a wide range of goods can be illuminated customised, in a modern and flexible way. Narrow distribution spots ensure targeted purchasing impulses and individual groups of goods are attractively accentuated. Thus, all types of goods from fashion to food receive exactly the right light for perfect displays.

A large family. And a wide selection.

Five different luminaires are available from semi-recessed spots to surface-mounted spots and suspended luminaires. Various luminous flux packages, distribution characteristics, light colours and other options for individualisation mean easier adaptation. The TARO range also features three different special light spectra for an especially appealing display of fresh goods.

Sophisticated architecture? Handled with ease.

Whether open or closed, high or low ceilings: TARO enables lighting concepts to be flexibly implemented. Even the large, high-performance TARO recessed spots have a recess depth of only 100 mm. If lateral light is needed the TARO Mini surface-mounted spot is ideal – it can be optionally installed to vertical tracks, which represents an intelligent benefit for example in sophisticated shop window design. And a further advantage: All TARO luminaires feature a wide swivel range, making them suitable for illuminating high positioned decorative elements.

One shop. One design.

One uniform luminaire design over a complete retail area has many benefits: it visually unites various goods areas and light scenes, it has a high recognition factor and simplifies harmonious retail design. All of this is provided by the TARO family with its dual-colour design and family-typical design elements.



Technical features:

Suspended luminaire TARO:

- Luminaire luminous flux: 1900 lm to 4220 lm
- Connected load/efficiency: 33 W/74 to 83 lm/W
- Service life: 5 years at L80/F10
- Colour rendering/temperature: Light colour white 2700 K, 3000 K, 3500 K, 4000 K (CRI >80, >90), special light Food B+V+C, MF, M
- Electrical version: dimmable on request
- Dimensions: Ø 140 mm, H: 146 mm
- Protection rating/impact resistance: IP20
- Beam angle/light distribution: SP, MF, FL

Surface-mounted spot TARO MINI:

- Luminaire luminous flux: 3000 lm
- Connected load/efficiency: 33 W/75 to 83 lm/W
- Service life: 5 years at L80/F10
- Colour rendering/temperature: light colour white 2700 K, 3000 K, 3500 K, 4000 K (CRI 80, 90)
- Electrical version: dimmable on request
- Dimensions: Ø 105 mm, 164 x 38 mm (L x W)
- Protection rating/impact resistance: IP20
- Beam angle/light distribution: SP, MF, FL

TARO suspended luminaire



TARO MINI surface-mounted spot



TARO

ONE DESIGN LINE,
UNLIMITED OPTIONS



Recessed luminaires

Professional retail lighting with suitable solutions, quickly installed – and with a uniform and modern design: The TARO product range provides lighting designers with a wide-ranging portfolio of luminaires. In that way even large retail areas with a wide range of goods can be illuminated customised, in a modern and flexible way. Narrow distribution spots ensure targeted purchasing impulses and individual groups of goods are attractively accentuated. Thus, all types of goods from fashion to food receive exactly the right light for perfect displays.

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Five different luminaires are available from semi-recessed spots to surface-mounted spots and suspended luminaires. Various luminous flux packages, distribution characteristics, light colours and other options for individualisation mean easier adaptation. The TARO range also features three different special light spectra for an especially appealing display of fresh goods.

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One shop. One design.

One uniform luminaire design over a complete retail area has many benefits: it visually unites various goods areas and light scenes, it has a high recognition factor and simplifies harmonious retail design. All of this is provided by the TARO family with its dual-colour design and family-typical design elements.



Technical features:

Recessed spot TARO MINI:

- Luminaire luminous flux: 3000 lm
- Connected load/efficiency: 33 W/83 lm/W
- Service life: 5 years at L80/F10
- Colour rendering/temperature: light colour white 2700 K, 3000 K, 3500 K, 4000 K (CRI 80, 90)
- Electrical version: dimmable on request
- Recessing dimensions: Ø 130 mm, D: 100 mm
- Protection rating/impact resistance: IP20
- Beam angle/light distribution: SP, MF, FL

Recessed spot TARO

- Luminaire luminous flux: 1500 lm to 4000 lm
- Connected load/efficiency: 27 W, 31 W, 39 W, 41 W/ 44 to 99 lm/W
- Service life: 5 years at L80/F10
- Colour rendering/temperature: light colour white 2700 K, 3000 K, 3500 K, 4000 K (CRI >80), special light Food B+V+C, MF, M
- Electrical version: dimmable on request
- Recessing dimensions: Ø 175 mm, D: 100 mm
- Protection rating/impact resistance: IP20
- Beam angle/light distribution: SP, MF, FL

TARO MINI recessed spot



TARO recessed spot



B.LEE

PURE FUNCTIONALITY



The adaptable surface-mounted pivotable spotlight, available in two sizes and with various decorative rings in the colours white, black or silver is perfectly suitable for wide-area and accent lighting. B.LEE enables uniform retail lighting designs to be achieved with an especially interesting price-performance ratio.

Purist design. Maximum functionality.

Simply unmistakable: the linear design of the cooling element with visible cooling ribs gives the B.LEE a technical-functional character. Due to this special feature it is especially impressive in the retail sector. Optional decorative rings in white, black or chrome make the B.LEE a unique eyecatcher.

Customised light. Highly flexible.

The B.LEE surface-mounted pivotable spot is particularly flexible: various light colours, light distribution characteristics and luminous flux packages enable a customised illumination of retail areas. In addition, three special light spectra are available for the natural illumination of fresh goods.

One range. Many options.

Wherever less light emission is needed and less space is available, the smaller version of this range, the B.LEE MINI, is ideally suitable. Especially practical: the luminaire heads of both spots is mobile enough to even specifically illuminate high positioned decorative elements.



Technical features:

- Luminaire luminous flux: 2000 lm to 4000 lm
- Connected load/efficiency: 31 W, 39 W, 41 W / 43 to 99 lm/W
- Service life: 5 years at L80/F10
- Colour rendering/temperature: light colour white 2700 K, 3000 K, 3500 K, 4000 K (CRI 80, 90), special light Food B+V+C, M, MF
- Electrical version: dimmable on request
- Dimensions: Ø 126 mm, H: 188 mm, W: 145 mm
- Protection rating/impact resistance: IP20
- Beam angle/light distribution: SP, MF, FL

Black with decorative ring in chrome.



White with decorative ring in white.



STRATUS VARIO 175

AN ALL-ROUNDER WITH
A CLASSIC DESIGN



Uniform or accentuating light distribution – with its pivotable and tiltable luminaire head and various LED versions, the STRATUS VARIO 175 adapts flexibly to all spatial situations and lighting tasks. The recessed directional spot copes even with challenging lighting tasks thanks to high lumen packages.

Light in all directions.

The luminaire head can be rotated through 355° and pivoted via steps to 50° to specifically highlight goods up to the ceiling height.

Easy mounting. Done.

With its pre-assembled components the recessed directional spotlight can be assembled without tools. The optics can also be replaced tool-free at any time.

Functional concept. Classic design.

The functional-classic design blends harmoniously into shop concepts.

Customised light. For perfect displays.

Three different beam angles, different light colours and luminous flux packages up to 5000 lumens mean perfect light all the time.



Technical features:

- Luminaire luminous flux: 1500 lm to 5000 lm
- Connected load/efficiency: 27 W, 31 W, 39 W, 41 W, 60 W/ 43 to 99 lm/W
- Service life: 5 years at L80/F10
- Colour rendering/temperature: light colour white 2700 K, 3000 K, 3500 K, 4000 K (CRI 80, 90)
- Special light Food B+V+C, MF, M
- Electrical version: dimmable on request
- Recessing dimensions: Ø 175 mm, D: 200 mm
- Protection rating/impact resistance: IP20
- Beam angle/light distribution: SP, MF, FL

Gradually pivotable for accurate alignment.



With segment reflector for maximum efficiency.



NIMBUS VARIO PLUS

THE FLEXIBLE WALLWASHER
FOR PERFECT MERCHANDISE
ILLUMINATION



The NIMBUS Vario Plus recessed wallwasher with its uniform light distribution is ideally suitable for the display of goods in the retail sector. With its pivotable luminaire head, areas can be specifically illuminated up to the ceiling edge. The discrete design of the wallwasher in three different colours blends harmoniously into the shop design. Mounting is easy and without tools using pre-assembled components that are simply fitted together.

Ceiling-flush installation. Ceiling-flush light.

Goods can be illuminated up to the ceiling edge thanks to the ceiling-flush light emission and pivotable head.

Pivotable. By 45° in nine steps.

The luminaire head can be swivelled across nine lockable steps up to a 45° angle.

Simple installation. Tool-free.

With its pre-assembled components the recessed wallwasher is mounted without tools.

A discrete design. Colour diversity.

The luminaire is available as standard in three colours: white, black and silver, and with its discreet design blends well into all shop concepts.

Customised light. Perfect displays.

The wallwasher is available with various light colours and luminous flux packages between 2,000 and 4,000 lumens. The luminaire can therefore be flexibly modified to different lighting tasks for goods display.



Technical features:

- Luminaire luminous flux: 2000 lm to 4000 lm
- Connected load/efficiency: 31 W, 39 W, 41 W
41 to 95 lm/W
- Service life: 5 years at L80/F10
- Colour rendering/temperature: light colour white 2700 K, 3000 K, 3500 K, 4000 K (CRI 80, 90), special light Food B+V+C, MF, M
- Electrical version: dimmable on request
- Recessing dimensions: 135 x 270 mm, D: 125 mm
- Protection rating/impact resistance: IP20
- Beam angle/light distribution: WFL

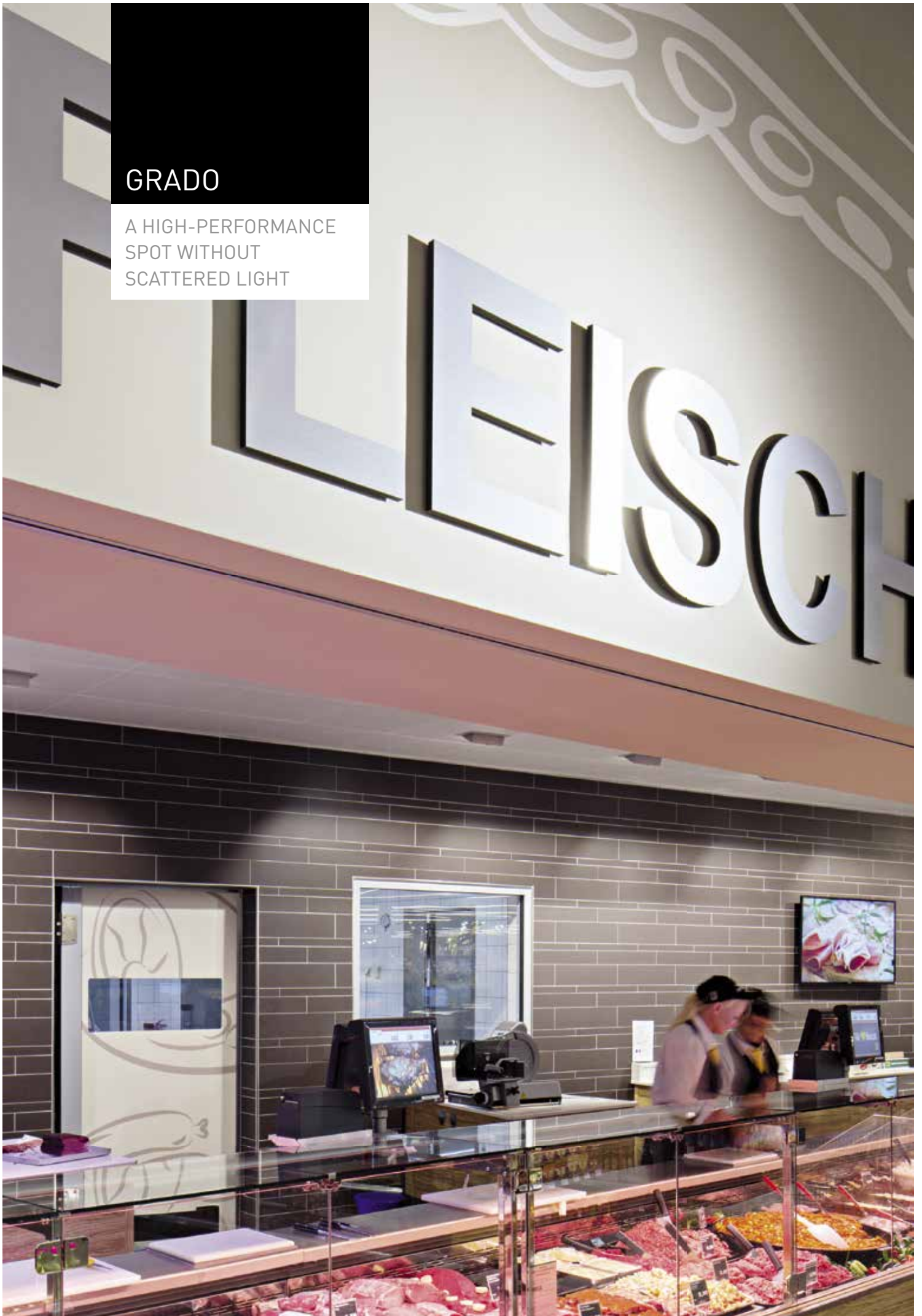
Nine adjustable steps for accurate illumination.

With diffuser reflector for homogeneous light distribution.



GRADO

A HIGH-PERFORMANCE
SPOT WITHOUT
SCATTERED LIGHT



Maximum illumination on the target surface: GRADO spotlight generates a precisely defined light cone with sharp borders. This is ideal for illuminating logos, displays and image elements above product carriers.

Precise light cone. Concise borders.

GRADO spotlight illuminates areas of 3 x 1 metres with a spot distance of 1.80 metres, without light spill and with optimal glare reduction.

Moveable. Adaptable.

Thanks to its 20° pivot angle upwards, GRADO can illuminate graphics which are high positioned.

Flat. Flexible.

With its flat construction and discreet design, GRADO can also be used with low ceiling heights and adapts to all shop concepts.

Simple installation. Easy alignment.

GRADO can quickly and tool-free be mounted to 3-circuit tracks and can be aligned in next to no time.



Technical features:

- Luminaire luminous flux: 4000 lm
- Connected load/efficiency: 39 W/91 lm/W
- Service life: 5 years at L80/F10
- Colour rendering/temperature: light colour white 2700 K, 3000 K, 3500 K, 4000 K/(CRI 80, 90)
- Electrical version: dimmable on request
- Dimensions: 227 x 233 x 109 mm (L x W x D)
- Protection rating/impact resistance: IP 20
- Beam angle/light distribution: WFL

Diffuser reflector for accurate light cone.

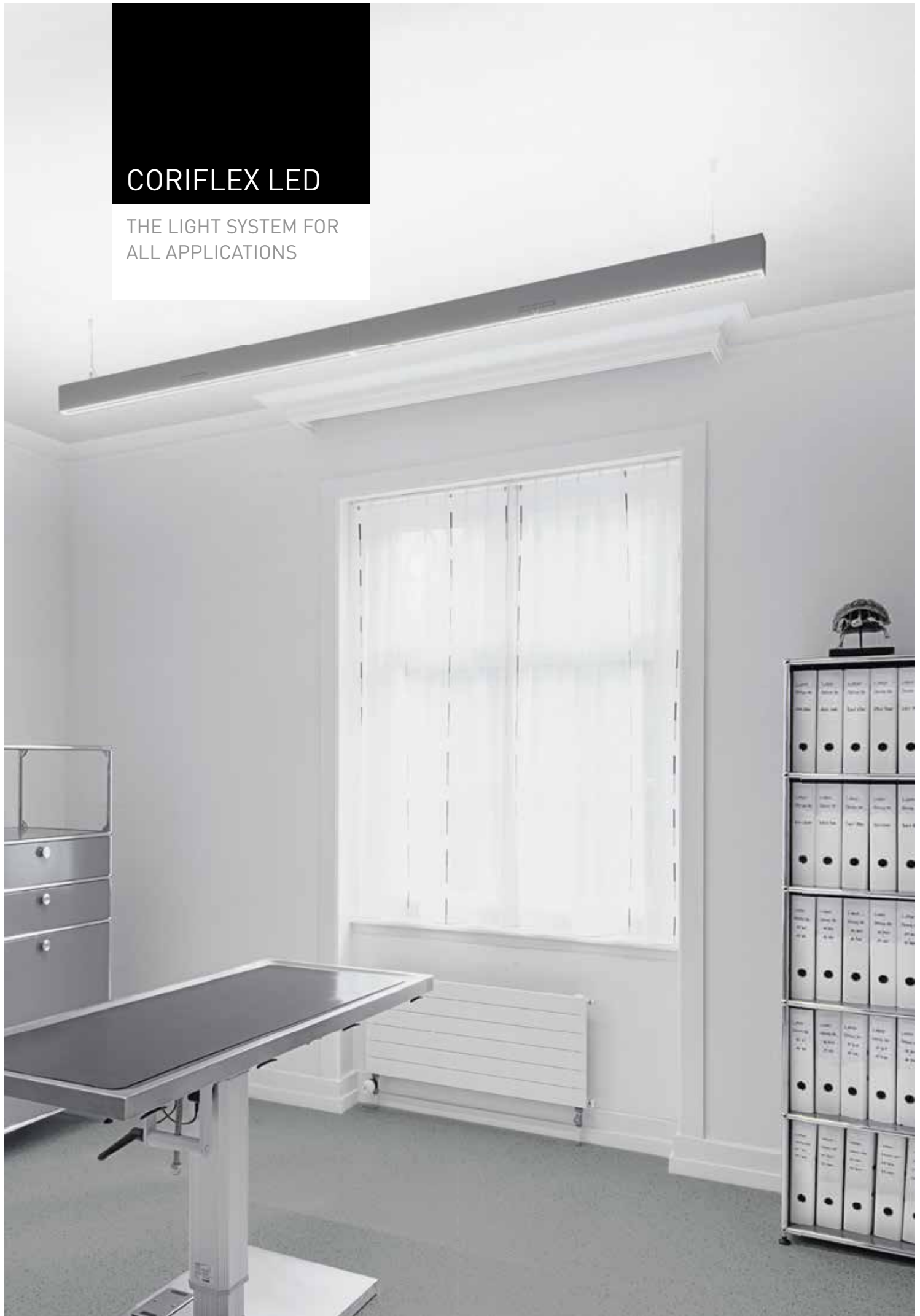


Flat construction, discreet design.



CORIFLEX LED

THE LIGHT SYSTEM FOR
ALL APPLICATIONS



The market requires custom-designed light for different application areas. The Coriflex LED family makes this possible with flexible luminaire modules, corner connectors, sensor versions, tracks for spots and glare-free elements with direct/indirect or purely direct light. This also means the luminaire is suitable for the standard-compliant lighting of offices and educational facilities.

One system. Many applications.

The highly flexible, modular kit system with corner connection modules, tracks, sensor modules and either direct/indirect or purely direct light adapts individually to customer requirements and applications.

One component. Double the mounting speed.

Only one component needs to be installed because of integration of the track, gear tray and optic into the luminaire. This reduces assembly time by 50 %.

Clever. A continuous line in next to no time.

With the help of the Plug & Play click system, Coriflex LED is rapidly and reliably connected to a continuous line. The compact 1-metre elements ensure more flexibility with planning and also simplify handling.

Complete glare elimination. With TRILUX technology.

Thanks to new TRILUX technology (MRX, Micro-Reflector-Technology) the direct light is completely glare-free, and with the further developed UGR19 optic it is also suitable for especially challenging lighting situations for example in offices or the educational sector.



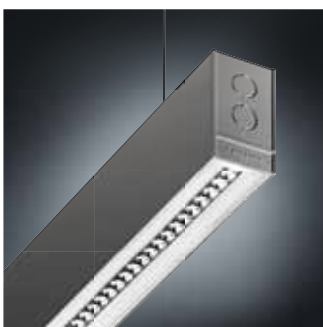
Design: Billings Jackson Design

Technical features:

- Luminaire luminous flux: 3500 lm, 4000 lm, 5500 lm
- Connected load/efficiency: 37 W, 42 W, 58 W/up to 100 lm/W
- Service life: 50,000 h L80/B10 at tq 35° C
- Colour rendering/temperature: 840, 830
- Electrical version: ET, ETDD
- Dimensions: 1130 x 50 x 88 mm (L x W x H)
- Protection rating/impact resistance: IP40/IK07, 2 Joule
- Light distribution: VDU-compliant (MRX), wide light distribution (B), narrow-wide light distribution (TB), narrow light distribution (T), double asymmetric light distribution (DA), asymmetric light distribution (A)

The TRILUX specific Micro-Reflector-Technology (MRX) for LED luminaires has been especially configured for direct distributing optics. The single, highly-efficient reflector chambers ensure optimal glare-reduction and guarantee high efficiency and energy savings.

Thanks to the Coriflex corner modules the light system can follow and emphasise the building's geometry, e.g. with a 90° curve in corridors.



www.trilux.com/coriflex-led/



SYSTEM 190

PERFECT DISPLAY
OF GOODS, DIVERSE
CEILING LOOKS



Custom-designed retail light is given a suitable frame: The SYSTEM 190 enables flexible and accentuating goods displays and also supports the interior design. The smooth, closed underside of the luminaire blends elegantly into the ceiling appearance, and various module lengths and corner connectors enable harmonious adaptation to all room settings. Also square shapes are achieved without effort as well, for example for limited shop-in-shop areas. Mounting is especially simple: The modules only need to be connected and the luminaires are aligned quickly thanks to cardanic pivoting.

Attractive ceiling looks. Harmonious overall impression.

The smooth underside of the luminaire achieves a calm and closed ceiling appearance.

One modular system. All possible forms.

Thanks to different module lengths and corner connectors, the system adapts well to all room settings. Even closed forms are possible.

Flexible light. Optimal lighting.

Various light colours, beam angles and luminous flux packages enable individual goods illumination.

Lay in, install, done.

The luminaires are laid into the modules opened from above. The equipped modules can easily be connected and mounted without tools, wiring is not needed.

Align and replace. Child's play.

The luminaires are cardanically pivotable. This simplifies alignment, transportation and tool-free replacement of the luminaire.



Technical features:

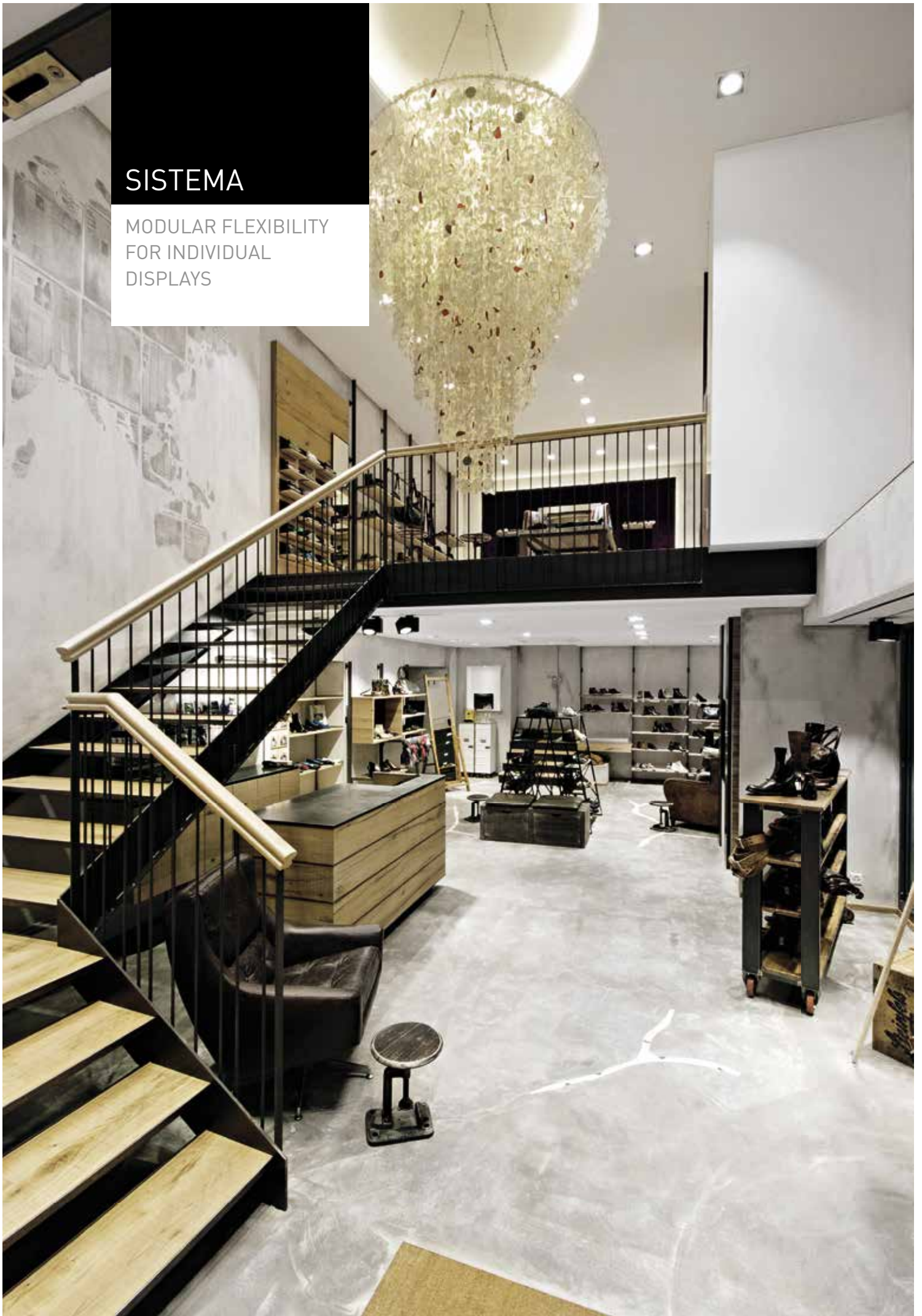
- Luminaire luminous flux: 1500 lm to 4000 lm
- Connected load/efficiency: 27 W, 31 W, 39 W, 41 W/ 44 to 99 lm/W
- Service life: 5 years at L80/F10
- Colour rendering/temperature: light colour white 2700 K, 3000 K, 3500 K, 4000 K (CRI 80, 90)
- Special light Food B+V+C, MF, M
- Electrical version: dimmable on request
- Dimensions:
single-cell: length 1000/1250/1500/2000/2500 mm
double-cell: length 1000/1250/1500/2000/2500 mm
- Protection rating/impact resistance: IP20
- Beam angle/light distribution: SP, MF, FL

Variable design – linear, rectangular or closed forms.



SISTEMA

MODULAR FLEXIBILITY
FOR INDIVIDUAL
DISPLAYS



SISTEMA enables custom-designed general and accent lighting in the retail sector very easily. The modular light system is available with different frames and can be rapidly fitted without tools. The luminaire is also photometrically diverse – it can be equipped with various luminaire modules according to application. Replacing the modules later is done with a few clicks of the wrist.

More options. Customised light.

The luminaire can be equipped with LED and HIT modules. Various light colours, beam angles and luminous flux packages enable individual goods illumination.

Modular construction. Maximum flexibility.

Sistema is available with either a single, double or triple-cell frame that can be equipped according to needs with luminaire modules, blank panels or spotlight elements.

Less energy. Better light quality.

The new LED segment reflectors and optimised passive cooling make SISTEMA especially energy-efficient and ensure concise illumination.

Mounting, adjustment and maintenance. All without tools.

Mounting is completely without tools from the installation frame to the luminaire heads. Just as simple is changing to other SISTEMA modules at a later time – even from HIT to LED. Thanks to cardanic pivoting, luminaire modules are simply and precisely adjusted.



Technical features:

- Luminaire luminous flux: 1500 lm to 4000 lm
- Connected load/efficiency: 27 W, 31 W, 39 W, 41 W/ 44 to 99 lm/W
- Service life: 5 years at L80/F10
- Colour rendering/temperature: 2700 K, 3000 K, 3500 K, 4000 K (CRI 80, 90), special light Food B+V+C, M, MF
- Electrical version: dimmable on request
- Recessing dimensions:
 - single-cell: 205 x 205 mm, D: 200 mm
 - double-cell: 205 x 370 mm, D: 200 mm
 - triple-cell: 205 x 545 mm, D: 200 mm
- Protection rating/impact resistance: IP20
- Beam angle/light distribution: SP, MF, FL

SISTEMA single-cell frame

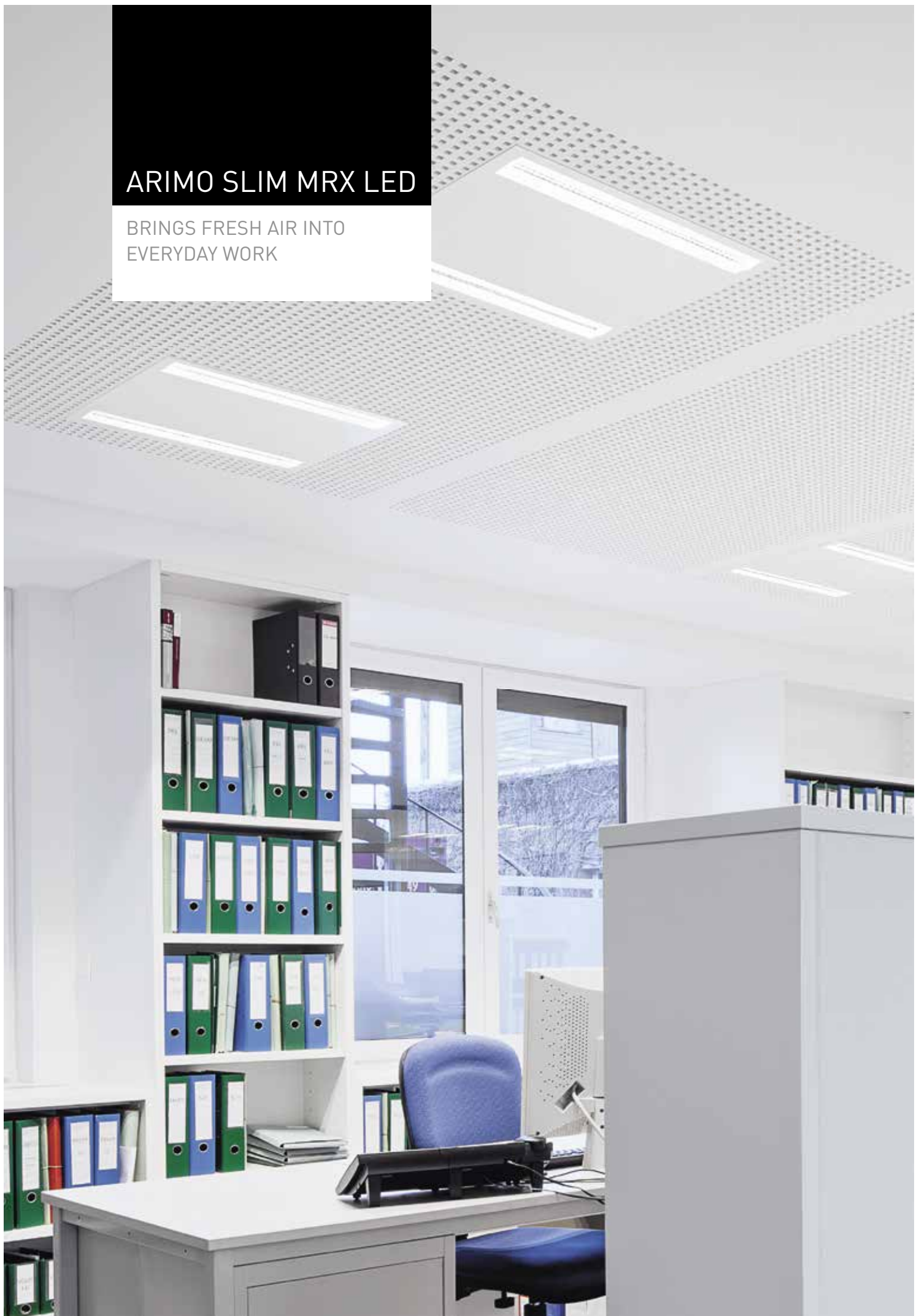


SISTEMA double-cell frame



ARIMO SLIM MRX LED

BRINGS FRESH AIR INTO
EVERYDAY WORK



The Arimo Slim MRX LED sets standards in terms of light quality and design: with Micro-Reflector-Technology (MRX) the light itself is pleasant and glare-free even with high luminous flux packages. The extraordinary luminaire concept with direct distributing LEDs provides attractive accents in modern working environments. The light is also highly energy-efficient, so that investment costs are amortised in a very short period of time.

New technology. Convincing light.

The innovative micro reflector framed by wide-area light elements sets accents and emits glare-free light ($UGR_{19} < 1,500 \text{ cd/m}^2$). This specifically developed technology provides maximum visual comfort even with high luminous flux levels.

More efficiency. For new and obsolete systems.

With above-average energy efficiency and especially simple mounting, Arimo Slim MRX LED scores points already with purchase and is therefore perfectly suitable for new installations and upgrading.

One room package. Several benefits.

Simply practical: Four Arimo Slim MRX LED luminaires share one mains connection. This makes installation faster by almost 50 %. Wiring included in the scope of supply also saves costs.

Compact construction. For more freedom of space.

The compact construction of the Arimo Slim MRX LED provides sufficient mounting space even in tight ceiling conditions, but is still designed to integrate light management or emergency light components.



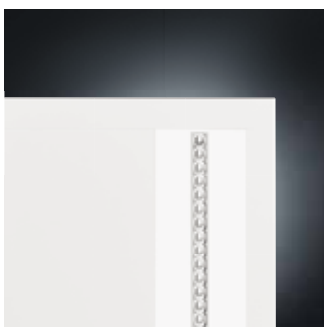
Design: MID Möller and Demmer

Technical features:

- Luminaire luminous flux: 3000 lm, 4000 lm
- Connected load/efficiency: up to 110 lm/W
- Service life: 50,000 h L80/B10
- Colour rendering/temperature: 830, 840
- Electrical version: ET, ETDD
- Dimensions/recessing dimensions: M73 (600 x 600 mm), M84 (625 x 625 mm), height 35 mm
- Protection rating/impact resistance: IP20/IK02
- Light distribution: VDU-compliant according to EN 12464-1 ($UGR_{19} < 1,500 \text{ cd/m}^2$)

The TRILUX specific Micro-Reflector-Technology (MRX) for LED luminaires has been especially configured for direct distributing optics. The single, highly-efficient reflector chambers ensure optimal glare-reduction and guarantee high efficiency and energy savings.

The innovative optic with visual light edge ensures a modern look and sets additional accents.



www.trilux.com/arimo-slim-led-mrx/



ARIMO SLIM CDP LED

THE ULTRA-FLAT
UPGRADING SOLUTION
FOR WIDE-AREA LIGHT



Only 20 mm high but very energy-efficient. The luminaire can be laid into existing ceiling grids with just a few twists of the wrist, and via Plug & Play connected to the control unit. Once installed, the Arimo Slim CDP LED ensures outstanding work atmospheres. The light is homogeneous, wide-area and has no glare or shadows. Other top benefits for upgrading: The Arimo Slim CDP LED with its slender construction can be stored space-saving and transported easily, which reduces costs.

Homogeneous light. An efficient working day.

Guaranteed concentration thanks to high visual comfort: The homogeneous, wide-area light of the Arimo Slim CDP LED is especially pleasant and glare-free according to UGR19, compliant to standards.

Simple concept. Rapid upgrading.

To achieve rapid and simple upgrading, the control unit can be connected to the mains cable beforehand and can flexibly be positioned. Plug & Play then ensures simple connection to the luminaire afterwards.

Efficient lighting and compact dimensions.

The high luminaire efficiency ensures rapid amortisation of investment costs and is also very sustainable.

One room package. Several benefits.

Simply practical: Four Arimo Slim CDP LED luminaires share one mains connection. This makes installation faster by almost 50 %. Wiring included in the scope of supply also saves costs.

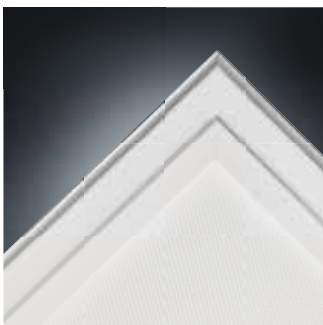


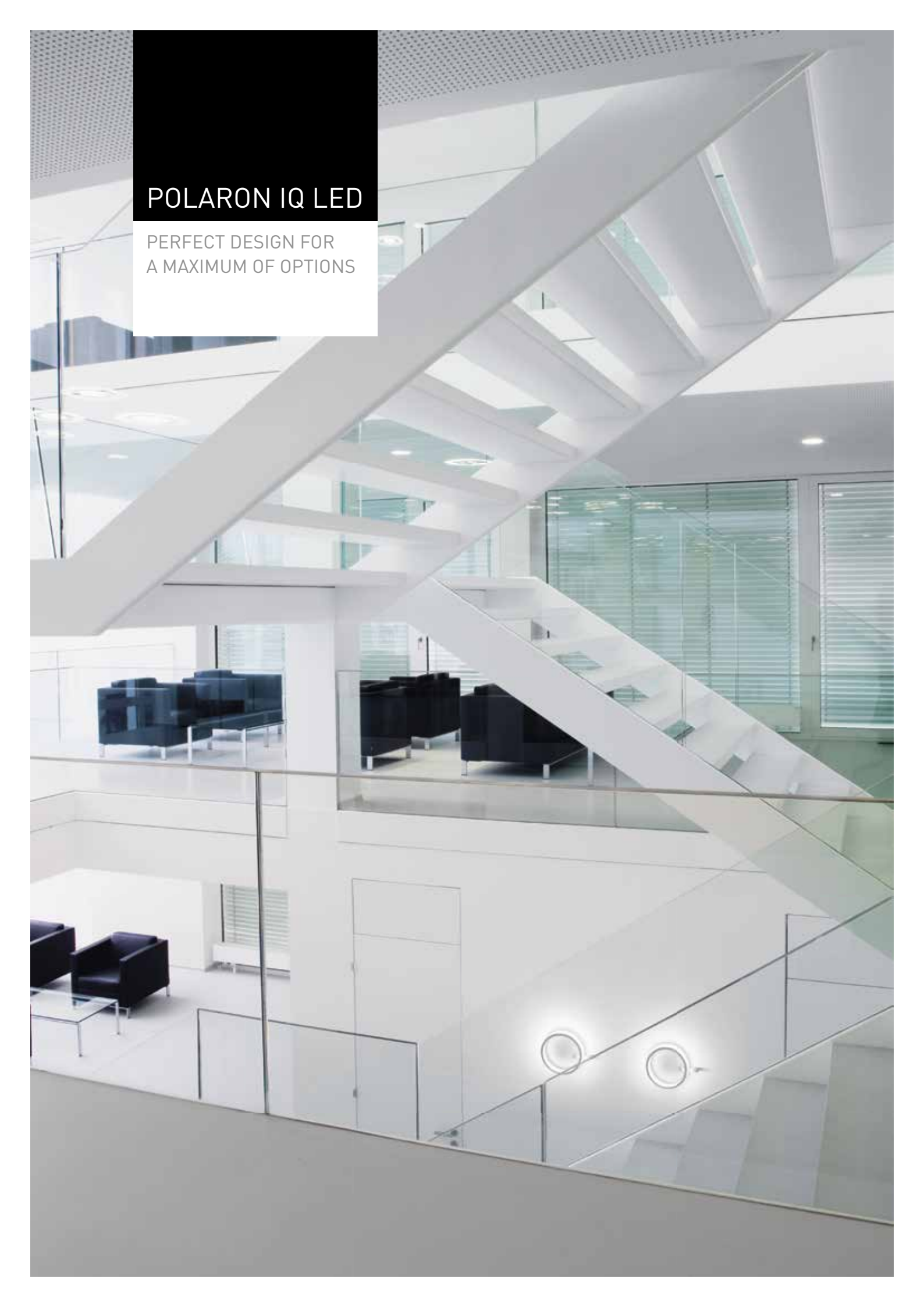
Technical features:

- Luminaire luminous flux: 3000 lm, 4000 lm
- Efficiency: up to 100 lm/W
- Service life: 50,000 h L80/B10
- Colour rendering/temperature: 830, 840
- Electrical version: ET, ETDD
- Dimensions: M73 (600 x 600 mm), M84 (625 x 625 mm)
- M84 version in combination with accessory also suitable for cut-out ceilings
- Protection rating/impact resistance: IP20/IK02
- Luminance: VDU-compliant according to EN 12464-1

The homogenous illumination and glare-reduction according to UGR19 ensure a pleasant and standard-compliant lighting.

The lateral light feeding of the LEDs enables a luminaire body heights of only 20 mm. Due to the separate control gear the Arimo Slim CDP LED can even be used in tight spaces.



A photograph of a modern office interior featuring a large, white, multi-level staircase with glass railings. The space is bright and airy, with large windows in the background. The text is overlaid on the top left of the image.

POLARON IQ LED

PERFECT DESIGN FOR
A MAXIMUM OF OPTIONS

The basic element of the Polaron IQ LED family is a filigree, round light profile allowing for maximum planning flexibility: its diversity enables countless combinations within the series – meaning that light and luminaire design can be perfectly adapted to the application. The custom-designed luminaire is quickly and simply configured using a practical online tool, and just as easily installed thanks to an intelligent mounting concept.

Perfect proportions. A timeless design.

The purist design of the Polaron IQ LED is noticeable and yet timeless. The filigree, perfectly proportioned ring blends harmoniously into the interior design.

Maximum flexibility. Tailored results.

The modular product family supplies maximum design flexibility, for example thanks to two different ring sizes and light emissions, as well as the option of emitting direct and laterally distributed light according to requirements. The luminaire is available optionally as a recessed, semi-recessed, surface-mounted or suspended luminaire, or with only indirect light emission and can be installed as wall or ceiling luminaire.

A wide selection. And a clever configurator.

Thanks to an intelligent online configurator, the complete diversity of the Polaron IQ LED can be quickly applied to design the perfect luminaire.

Simple mounting. Simple maintenance.

The luminaire can be mounted in next to no time by only one person. Also very simple – the control unit and ring can be replaced subsequently.



Design: Sieger Design

Technical features:

- Luminaire luminous flux: 800/1000 lm, 1800/2000 lm, 2800/3000 lm
- Connected load/efficiency: 95 lm/W
- Service life: 50,000 h L80/B10
- Colour rendering/temperature: 840, 830
- Electrical version: ET, ETDD
- Dimensions/recessing dimensions: Ø 260 mm, Ø 400 mm
- Protection rating: IP20
- Light distribution: direct and lateral light distribution, lateral light distribution

The ring as the perfect shape: The purist design of the Polaron IQ LED blends into interiors with a timelessly simple elegance.

Available as a recessed, semi-recessed, surface-mounted or suspended luminaire, the Polaron IQ LED adapts perfectly to any application.



SANESCA LED

LIGHT AND EASE FOR
THE CARE SECTOR



Attractive designs are becoming more important in the health sector as well. Both appealing and purist, the looks of the Sanesca LED blend harmoniously into patient rooms. And thanks to its high flexibility, a uniform lighting concept can be implemented over different areas. The luminaire combines indirect room light with direct, glare-free reading light to support progressive and efficient patient care.

Simply configured. Flexibly used.

The Sanesca LED can be installed as a pure wall luminaire or used above the patient bed with a function module. The modular design enables the integration of sockets, data modules, simple nurse call and other functions.

Install once. Benefit steadily.

A long service life, long maintenance cycles and high reliability mean the Sanesca LED is the ideal, energy-efficient and cost-efficient lighting solution for the moderate care sector.

Simple cleaning. Simple maintenance.

Hardly any visible screws or gap dimensions that could collect dirt: the Sanesca LED is particularly easy to clean. Also, 20 minutes is all it takes to carry out all maintenance work, such as replacing the LED unit or control unit.



Design: Deck 5

Technical features:

- Luminaire luminous flux: 2000 lm, 4800 lm, 5000 lm
- Service life: 50,000 h L80/B10
- Colour rendering/temperature: 840, 830
- Electrical version: ET, ETDD
- Dimensions: 700 x 190 mm (W x D), fixing (height) 95 mm
- Protection rating/impact resistance: IP20
- Light distribution: direct-indirect light distribution
- Versions of this range are prepared for biological lighting and are named with the affix "Active".

Both appealing and purist, the looks of the Sanesca LED blend harmoniously into patient rooms. And thanks to high flexibility, a uniform lighting concept can be implemented over different areas.

The Sanesca LED supplies indirect room light for attractive general lighting and a direct, glare-free reading light that can be expanded to examination light using a further switching option.



LATERALO PLUS LED

INNOVATIVE OPTICS FOR
COMPELLING OFFICE LIGHT



Even when switched off, the extremely flat suspended luminaire with a transparent cover blends stylishly into all interiors. But the Lateralo Plus LED's real strength is in operation: it supplies maximum visual comfort and almost shadow-free, wide-area light. The innovative light control with an especially wide distributing indirect light component makes this possible. It also simplifies lighting and interior design because the uniformly wide light distribution enables variable distances to the ceiling.

Wide-area light. No glare, no shadows.

With the intelligent combination of direct and indirect light components, Lateralo Plus represents unique light quality. This is proven by the innovative BLG system. Arranged in two levels and in double quantity, prismatic points bring together the LED light to emit a new strength of light.

Variable ceiling distance. Planning flexibility.

The especially wide distributing indirect light component guarantees outstanding quality of light even at small distances to the ceiling.

Ultra-flat. And transparent.

The Lateralo Plus LED is ultra-flat and appears to float in the room thanks to its transparent panel. This impression is underlined by the absence of a separate mains cable – the Lateralo Plus LED is instead supplied with power via the thin wire suspensions.

Double light. Double efficiency.

Thanks to the wide light distribution in combination with high luminous flux packages, twindesk workplaces can optimally be illuminated.



Design: Hartmut S. Engel

Technical features:

- Luminaire luminous flux: 6000 lm, 7500 lm, 9000 lm
- Connected load/efficiency: 58 W, 75 W, 90 W/> 100 lm/W
- Service life: 50,000 h L80/B10 at tq 25° C
- Colour rendering/temperature: 840
- Electrical version: ETDD
- Dimensions/recessing dimensions: 1455 x 338 x 16 mm, 1175 x 338 x 16 mm
- Protection rating/impact resistance: IP20/IK02
- Light distribution: direct-indirect, very wide light distribution/UGR19

As the control gear and connection components are located on or rather in the ceiling, there is no mains cable needed. The power supply is realized via filigree wire suspensions.

In autumn 2014 the Lateralo product range will be rounded-off by the Lateralo Ring.

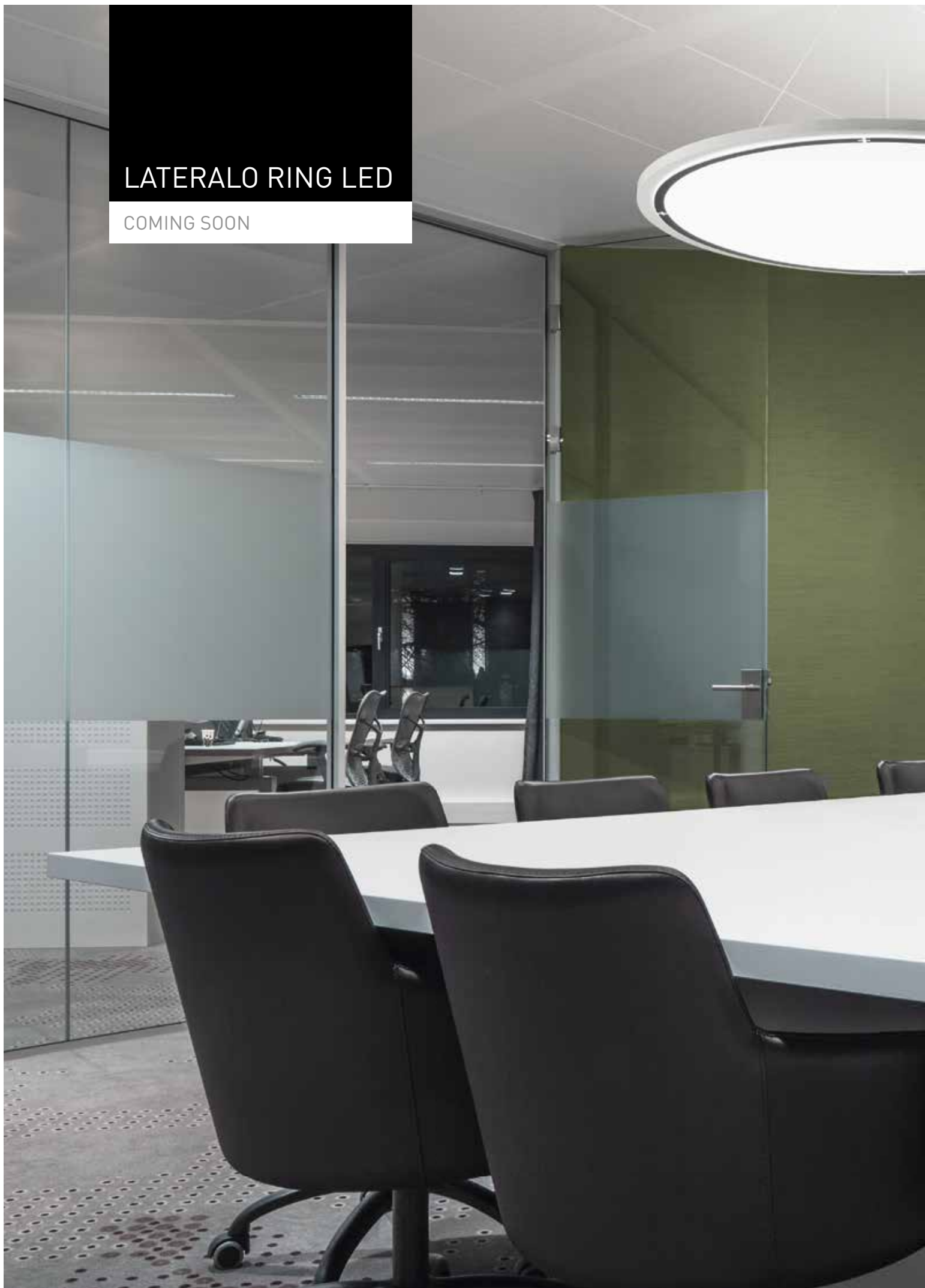


[www.trilux.com/
lateralo-plus/](http://www.trilux.com/lateralo-plus/)



LATERALO RING LED

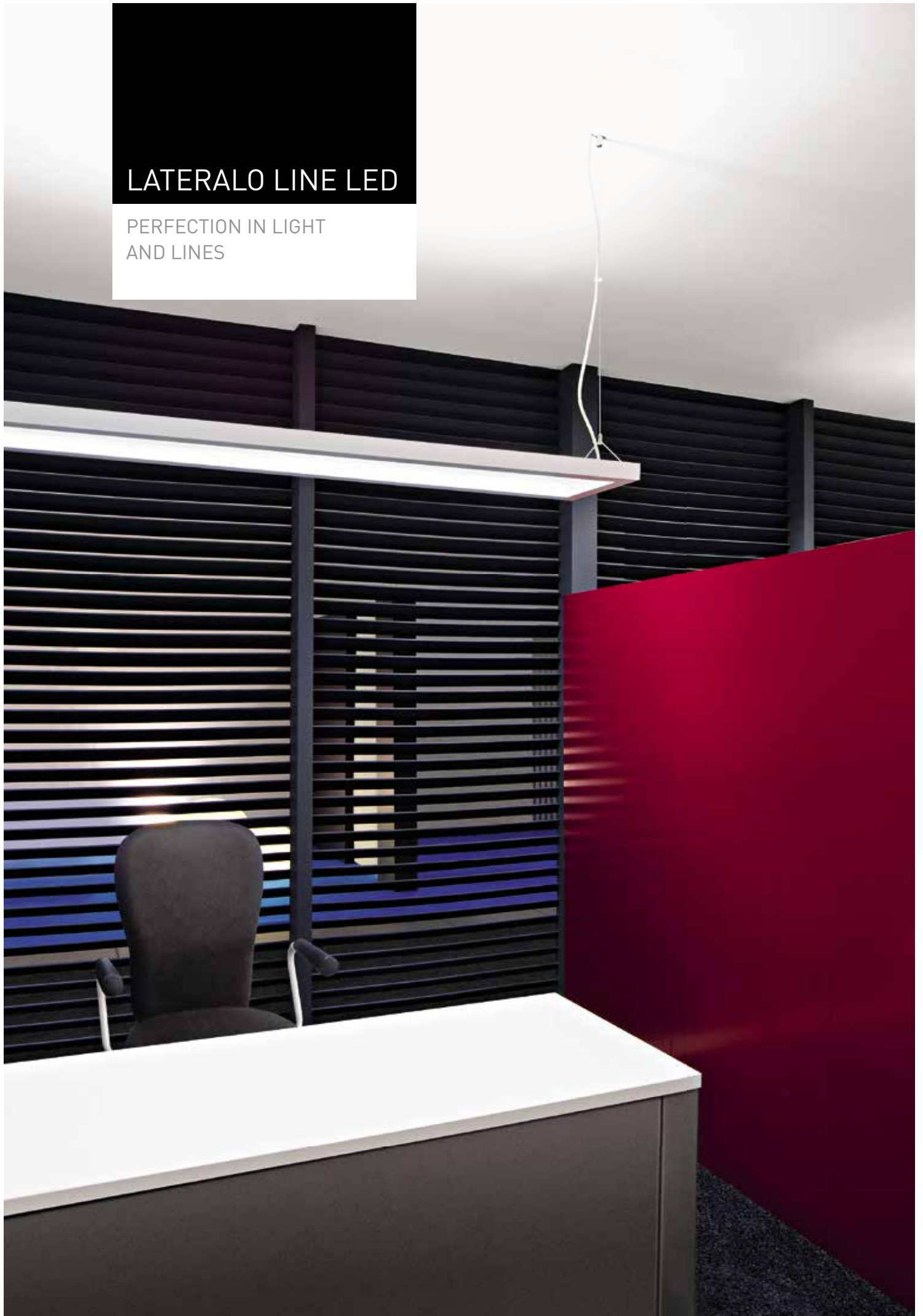
COMING SOON





LATERALO LINE LED

PERFECTION IN LIGHT
AND LINES



Strict lines paired with a transparent lightness and high quality of light. The linear, flat construction with central embedded transparent panel blends discreetly and harmoniously into the room. Besides that the purist form language makes the Lateralo Line design timeless and very adaptable. The generous transparency enables the luminaire to melt into the architecture.

Wide-area light. High visual comfort.

With the innovative Light Guide System (LGS), a special optic of transparent panel and direct light entry, the luminaire provides very pleasant and almost shadow-free light.

Light management. Economic and efficient.

If required, the Lateralo Line LED is available with an integrated light management system, making the luminaire especially economic and providing light according to needs.

It convinces. As a single luminaire and continuous line.

In addition to the single luminaire for workstation lighting, the continuous line version, with its consistent alignment, is rapidly configured to create lighting solutions for different architectural styles.

Free planning. Flexible mounting.

With perfectly matched direct and indirect components, Lateralo Line guarantees outstandingly homogeneous, wide light distribution independent of the mounting height – from this also benefits the continuous line.



Design: Hartmut S. Engel

Technical features:

- Luminaire luminous flux: 4200 lm
- Connected load/efficiency: approx. 50 W/approx. 84 lm/W
- Service life: 50,000 h L80/B10
- Colour rendering/temperature: 840
- Electrical version: ET, ETDD
- Dimensions/recessing dimensions:
approx. 1176 x 280 x 27 mm (L x W x H)
- Protection rating/impact resistance: IP20/IK02
- Light distribution: direct-indirect, very wide light distribution

Interplay between transparency and wide-area light.



LUCEO LED

INNOVATIVE
TECHNOLOGY IN A
TIMELESS DESIGN



The new Luceo LED unites timeless luminaire design with all of the advantages of a highly efficient LED lighting solution. The classically appealing design of the suspended luminaire features outstanding quality of light and high flexibility for office applications. The lighting solution is available with two different luminous flux packages and can be installed both as a single luminaire and as continuous lines. A further advantage of the Luceo LED is that it is ideally suited for upgrading existing Luceo T5 lighting systems because existing suspension points and continuous line connectors can be used.

Economic and efficient.

Luceo LED quickly pays off due to its high efficiency of 100 lm/W. The low investment costs are paid back in a short time because of the significantly lower operating costs compared to a standard lighting solution, e.g. in terms of energy and maintenance.

Diverse and flexible.

The Luceo LED can be installed both as a single luminaire and as continuous lines, and with two different luminous flux packages (4000 lm/ 6300 lm), it adapts flexibly to a wide range of framework conditions. The luminaire emits either direct, indirect or direct/indirect light according to specified version.

Homogeneous and pleasant.

With its uniform, glare-free distribution of light, the Luceo LED suspended luminaire ensures outstanding quality of light and high visual comfort. Light intensity can be dimmed via DALI.

Environmentally and climate-friendly.

Low energy consumption is not only commercially attractive, but also cuts down on greenhouse gas emissions occurring with conventional energy generation. As such, Luceo LED contributes protecting the environment and climate.



Technical features:

- Luminaire luminous flux: 3800/4000 lm, 6000/6300 lm
- Connected load/efficiency: 100 lm/W
- Service life: 50,000 h L80/B10
- Colour rendering/temperature: 830, 840
- Electrical version: ET, ETDD
- Dimensions: 1286 x 220 x 42 mm (L x W x H), (as of 6000 lm 1586 mm long)
- Protection rating/impact resistance: IP20/IK02
- Light distribution: direct-indirect, VDU-compliant according to EN 12464-1

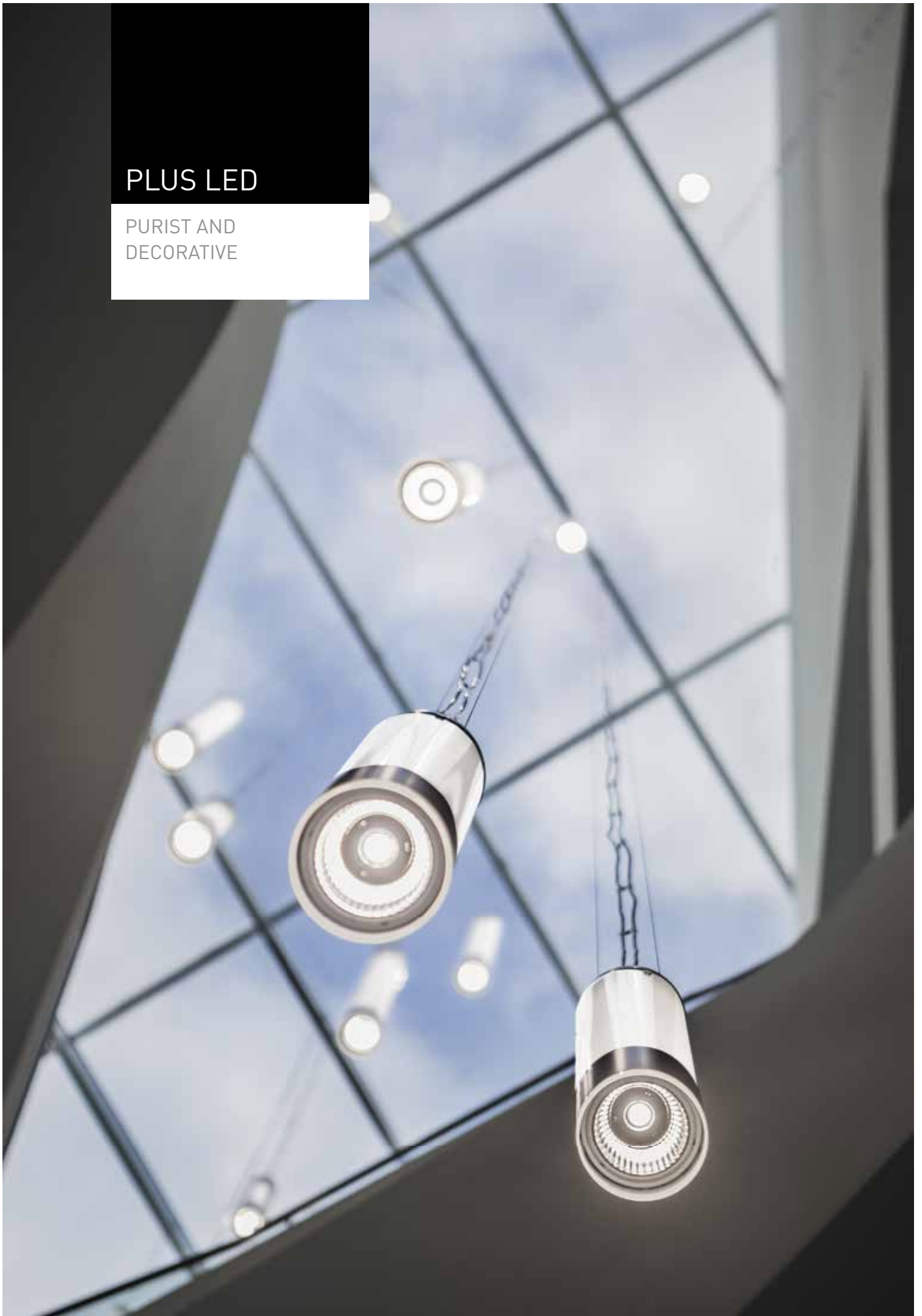
Perfect preconditions for upgrading an existing Luceo T5 luminaire with the new Luceo LED solution: already existing suspension point and continuous line connectors remain the same. Existing systems can thus be upgraded quickly and simply.

Luceo LED can be used as a single luminaire or as a continuous line and, with its two luminous flux packages (4000 lm/6300 lm), is optionally suitable for illuminating a single work place or can be used as general lighting.



PLUS LED

PURIST AND
DECORATIVE



The cylindrical form of the PLUS LED is perfectly suitable for the illumination of architectural rooms. Due to its purist design the PLUS LED sets illuminated objects individually in scene without pushing to the fore.

The perfect combination.

While the integrated downlight with faceted specular reflector sets effective accents, the uniformly illuminated frosted cylinder lights up the surrounding.

Two construction sizes – versatile possibilities

The PLUS LED, available in two construction sizes, can realize numerous projects. The small construction size offers with 550 lm a more subtle indirect lighting than the bigger version with 1655 lm.

Other lengths are available on request.



Technical features:

- Colour temperature: 4000 K direct, 5000 K indirect
- Luminaire luminous flux: 2000 lm direct, 550 lm/1655 lm indirect
- Connected load:
25 W direct, 14 W indirect/
25 W direct, 39 W indirect
- Colour rendering: Ra > 80 direct, Ra ~78 indirect
- Electrical version: ETDD
- Mounting version: suspended luminaire
- Optic:
direct: faceted specular reflector,
symmetrically narrow-wide light distribution
indirect: opal acrylic, wide light distribution
- Dimensions: 645 x 150 mm/1500 x 150 mm
- Service life: 50,000 h
- Protection rating/safety class: IP20/III
- Light distribution: direct-indirect light distribution

Technic & details

A four-axle continuous line with white or coloured LEDs illuminates the frosted cylinder homogeneously. The thermal management of the LED downlight, which provides direct light, is hidden behind the banderole. Below the silver banderole an intensely illuminated light crown is formed. The banderole can be varnished in diverse colours.

Design

The purist, decorative LED luminaire finishes with an integrated, slim canopy, which matches perfectly to the semi-specular acrylic cylinder in terms of colour. The light crown is highlighted by using a discreet banderole in the respective colouring.



LED LINE

FLOATING GLAS WITH
HIGHEST QUALITY



Whether compact or longish – the LED Line, available in two construction sizes, is the ideal luminaire for offices, living spaces and architecture. The perfectly shaped combination of metal and glass ensures a unique design.

Small luminaire – plenty of light

The LED Line is equipped with 18 or 24 1.4 W LEDs and enables a high luminous efficiency despite its low construction size.

Glare free optic.

The optical system consisting of prismatic disk and glass cover gives the luminaire a homogeneous and glare free light distribution.



Technical features:

- Colour temperature: 3000 K
- Luminaire luminous flux: 1450 lm/1930 lm
- Connected load: 30 W/40 W
- Colour rendering: Ra > 80
- Electrical version: switchable
- Mounting version: suspended luminaire
- Optic: prismatic glass
- Dimensions: 300 x 140 mm/1300 x 90 mm
- Service life: 50,000 h
- Protection rating/safety class: IP20/III
- Light distribution: wide light distribution

Design

The milled, low iron oxid stepped glass with a material thickness of 15 mm with all-round polished edges gives the LED Line a very high quality rating. The invisible connection with the housing and the overlapping edge of the glass block create the illusion of a floating area.

Technic

With the small version the control gears are integrated in the ceiling canopy; power supply is via the wire suspension. A prismatic cover above the massive glass block distributes the light of the LED. Thanks to the integral prismatic cover the technic is invisible when looking into the transparent glass. Only the LED points arranged in lines on the circuit board become slightly visible.

Details

The grinded stainless steel used on the long side represents a contrast to the end caps made of chrome. From the bottom view these are hidden by the overlapping stepped glass, which is only laid on two milled edges.



LESIMA LED

PERFECT GOODS
PRESENTATION,
INDIVIDUAL DESIGN



Double effect: Seen from afar, the LESIMA suspended luminaire sets decorative accents. The luminaire shades are available in different designs, sizes and materials and with their specific decorative elements and translucent light patterns give orientation during shopping. Besides an attractive design, LESIMA also features a targeted and powerful presentation of goods.

Light and luminaire. Perfectly adapted.

The LESIMA is optionally available as a conical or cylindrical luminaire each in two sizes. With various luminous flux packages, light distribution characteristics and light colours – including three special light spectra for food – it adapts perfectly to specific room concepts.

Six shades. More orientation.

The shade is available in six different materials and colours. The design can be selected individually to suit specific goods. In this way various areas can be illuminated with a uniform basic design to provide additional orientation.

Simple mounting. Simple replacement.

The LESIMA is installed quickly and without tools. Reflector units and shades can also be subsequently replaced without tools.



Technical features:

- Luminaire luminous flux: 2000 lm to 4000 lm
- Connected load/efficiency: 31 W, 39 W, 41 W (44 to 99 lm/W)
- Service life: 5 years at L80/F10
- Colour rendering/temperature: light colour white 2700 K, 3000 K, 3500 K, 4000 K (CRI >80, >90), special light Food B+V+C, MF, M
- Electrical version: dimmable on request
- Diverse ceiling fixings
- Protection rating/impact resistance: IP20
- Beam angle/light distribution: SP, MF, FL

LESIMA cylindrical

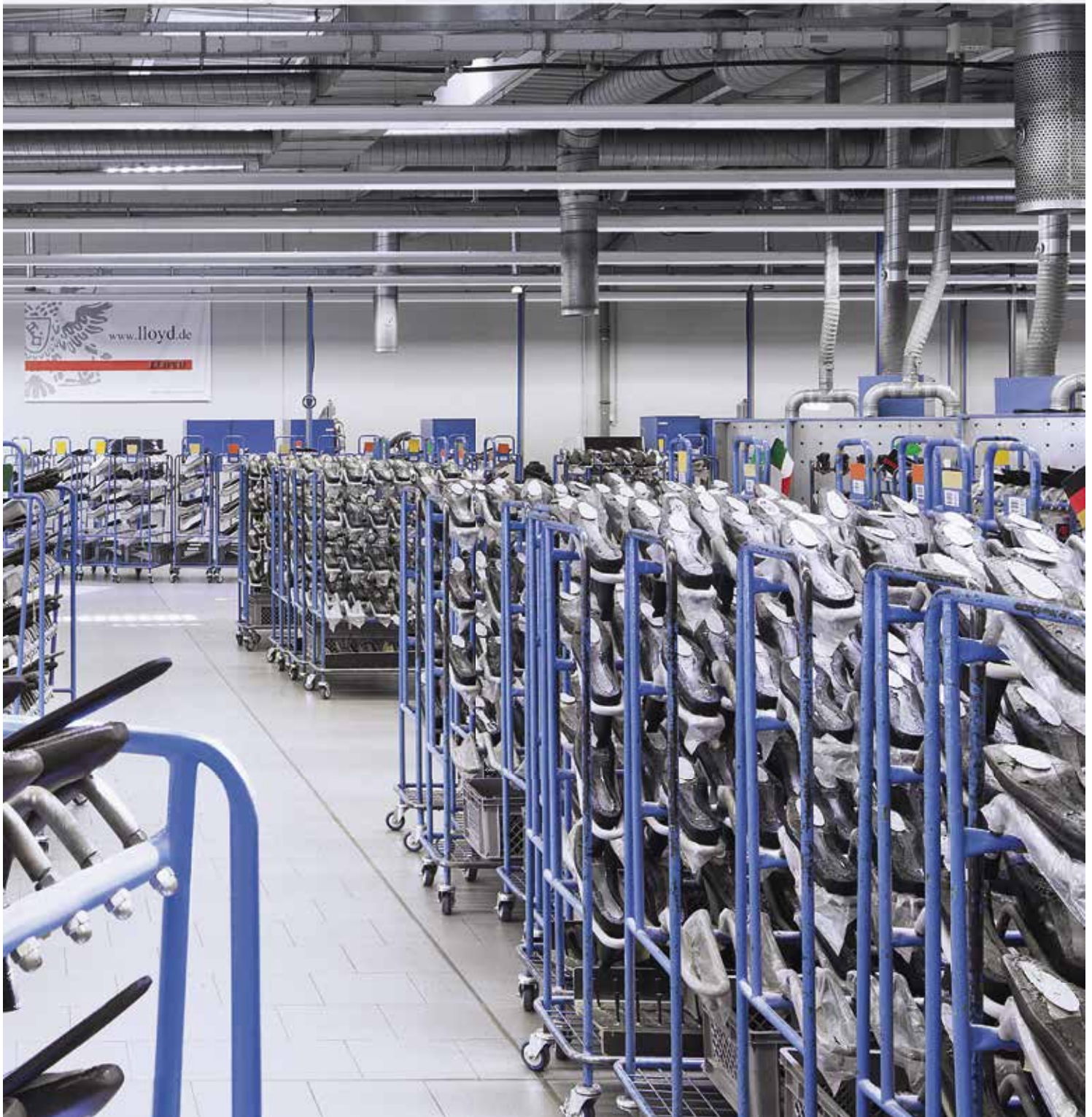


LESIMA conical



E-LINE LED

FROM OLD TO NEW IN
44 SECONDS



Industrial lighting installations often have significant improvement potential with energy efficiency and light quality. Upgrading obsolete systems would certainly pay off but often fails in practice due to uncertainty, doubts and planning problems. To eliminate such factors, TRILUX developed the E-Line LED: with this system, existing T5/T8 lighting installations can be upgraded tool-free in only 44 seconds to high efficiency LED technology. The luminaire can be installed very rapidly due to many intelligent and practical features. Further strong features are the quality and flexibility of the E-Line LED. That's why the system adapts individually to lighting requirements with various luminous flux packages and modular components, e.g. for spotlights.

Upgrading. Breathtakingly simple.

44 seconds and no more to mount the E-Line LED into existing TRILUX trunking rails (T5/T8) – without tools.

Rapid amortisation. Efficiency pays off.

E-Line LED features a perfect price-performance ratio: the higher energy efficiency of up to 134 lm/W cuts operating costs significantly, meaning that investments are rapidly amortised.

Smooth optic. Smooth maintenance.

Very practical: the smooth optic simplifies and accelerates any cleaning work and thus reduces maintenance costs while guaranteeing consistently high quality of light.

Perfectly adapted. High luminous flux packages and a high protection rating.

E-Line LED is available with either 13,000 lm or 20,000 lm. The two new versions with IP54 protection rating also feature protection from dust and humidity. This means applications in difficult surroundings are no problem.



Technical features:

E-Line LED IP54 lens optic

- Luminaire luminous flux: 7500 lm
- Connected load/efficiency: 64 W
- Service life: 50,000 h L80/B10 at tq 40° C
- Colour rendering/temperature: 840
- Electrical version: ET, ETDD
- Dimensions: 1475 mm long (for upgrading obsolete T8 systems an additional blanking cover is needed)
- Protection rating/impact resistance: IP54 within the lamp housing, IP50 to the trunking
- Light distribution: narrow-wide light distribution (TB), narrow light distribution (T)



Technical features:

E-Line LED IP54 prismatic diffuser

- Luminaire luminous flux: 7500 lm
- Connected load/efficiency: 85 W
- Service life: 50,000 h L80/B50 at tq 25° C
- Colour rendering/temperature: 840
- Electrical version: ET, ETDD
- Dimensions: 1475 mm long (for upgrading obsolete T8 systems an additional blanking cover is needed)
- Protection rating/impact resistance: IP54 within the lamp housing, IP50 to the trunking
- Light distribution: symmetrically wide light distribution (B)



E-LINE LED

FROM OLD TO NEW IN
44 SECONDS



Industrial lighting installations often have significant improvement potential with energy efficiency and light quality. Upgrading obsolete systems would certainly pay off but often fails in practice due to uncertainty, doubts and planning problems. To eliminate such factors, TRILUX developed the E-Line LED: with this system, existing T5/T8 lighting installations can be upgraded tool-free in only 44 seconds to high efficiency LED technology. The luminaire can be installed very rapidly due to many intelligent and practical features. Further strong features are the quality and flexibility of the E-Line LED. That's why the system adapts individually to lighting requirements with various luminous flux packages and modular components, e.g. for spotlights.

Upgrading. Breathtakingly simple.

44 seconds and no more to mount the E-Line LED into existing TRILUX trunking rails (T5/T8) – without tools.

Rapid amortisation. Efficiency pays off.

E-Line LED features a perfect price-performance ratio: the higher energy efficiency of up to 134 lm/W cuts operating costs significantly, meaning that investments are rapidly amortised.

Smooth optic. Smooth maintenance.

Very practical: the smooth optic simplifies and accelerates any cleaning work and thus reduces maintenance costs while guaranteeing consistently high quality of light.

Perfectly adapted. High luminous flux packages and a high protection rating.

E-Line LED is available with either 13,000 lm or 20,000 lm. The two new versions with IP54 protection rating also feature protection from dust and humidity. This means applications in difficult surroundings are no problem.



Technical features:

E-Line LED 13,000 lm version

- Luminaire luminous flux: 13,000 lm
- Connected load/efficiency: 108 W
- Service life: 50,000 h L80/B10 at tq 35° C
- Colour rendering/temperature: 840, 830
- Electrical version: ET, ETDD
- Dimensions: 1475 mm long (for upgrading obsolete T8 systems an additional blanking cover is needed)
- Protection rating/impact resistance: IP20
- Light distribution: wide light distribution (B), narrow-wide light distribution (TB), narrow light distribution (T), double asymmetric light distribution (DA)



Technical features:

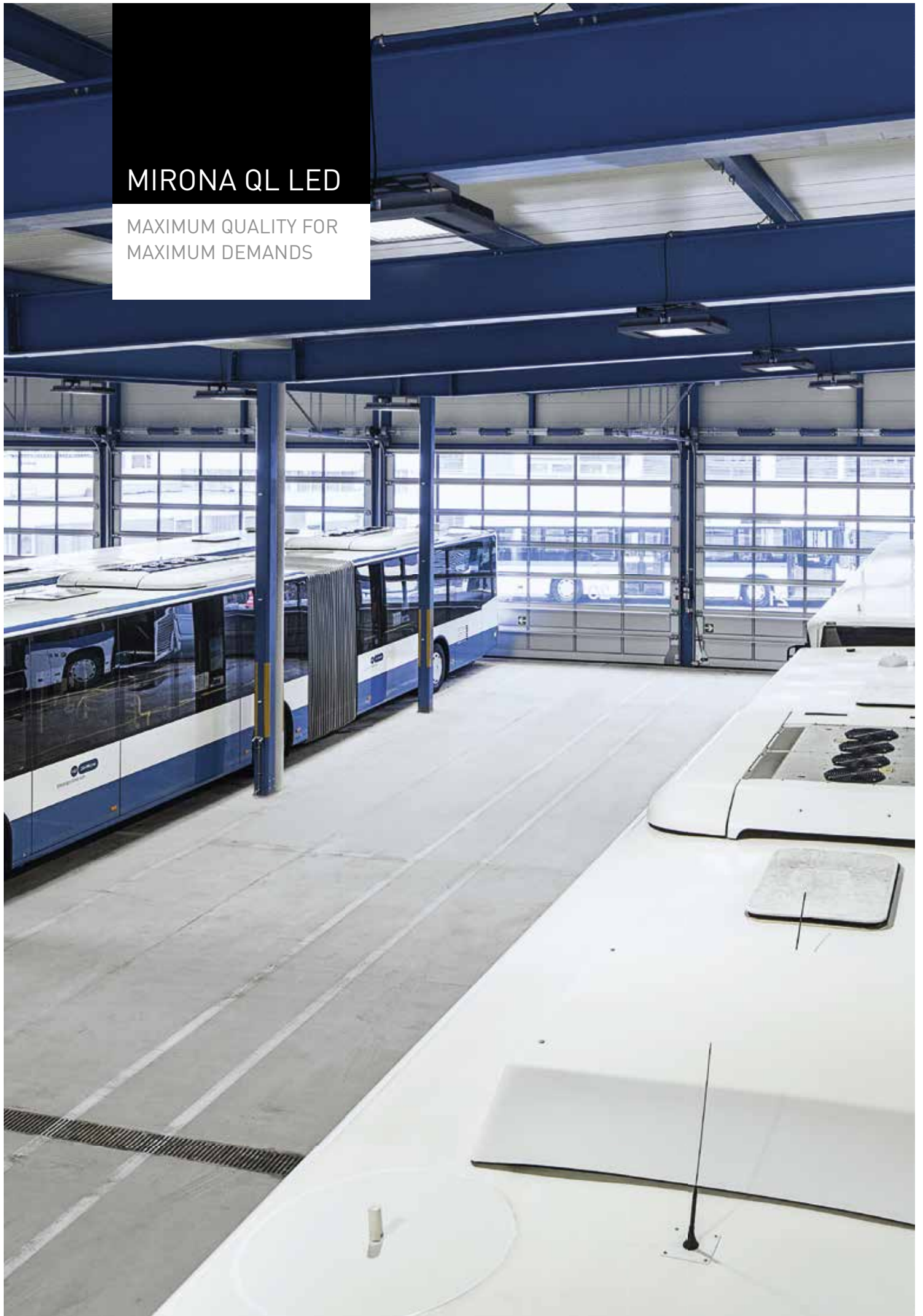
E-Line LED 20,000 lm version

- Luminaire luminous flux: 20,000 lm
- Connected load/efficiency: 162 W
- Service life: 50,000 h L80/B10 at tq 35° C
- Colour rendering/temperature: 840, 830
- Electrical version: ET, ETDD
- Dimensions: 1475 mm long (for upgrading obsolete T8 systems an additional blanking cover is needed)
- Protection rating/impact resistance: IP20
- Light distribution: narrow-wide light distribution (TB), narrow light distribution (T)



MIRONA QL LED

MAXIMUM QUALITY FOR
MAXIMUM DEMANDS



Heard, understood and implemented: the demand is increasing for a new generation of high-performance, energy-efficient and reliable highbay luminaires for ceiling heights of more than 13 metres. Even in frequently extreme temperatures in hot production lines or cold warehouses, the luminaires must operate durably and reliably and emit uniform, glare-free light. All of this has been achieved with the Mirona QL LED: According to "fit & forget", the luminaire provides best light for 100,000 operating hours at maximum heights, and is also easy to install.

100,000 operating hours.

Not one second spent worrying about the Mirona QL LED.

No costly operating interruptions or maintenance work: the Mirona QL LED provides reliably optimal light for 100,000 hours. This means that expensive idle times in running production processes now belong to the past.

Simply clever. 50 % less energy consumption.

The intelligent photometric concept achieves energy savings of 50 % compared to standard lighting solutions.

Reduced glare. Precise, rapid and safe work.

Glancing safely up to the hall ceiling without being glared despite 24,000 lumens – the innovative optic with high glare reduction contributes to greater work safety and helps avoiding accidents.

Quickly and simply mounted. Costs saved.

A clever mounting system with rapid-mounting plate and Wieland rapid connection system cuts installation times and costs.



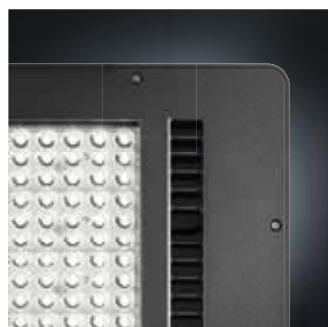
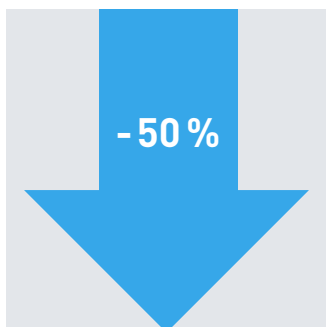
Design: MID Möller and Demmer

Technical features:

- Luminaire luminous flux: 10,500 lm, 12,000 lm, 21,000 lm, 24,000 lm
- Connected load/efficiency: 109 W, 230 W/up to 110 lm/W
- Service life: 100,000 h L80/B10 at tq 25 °C, 50,000 h L80/B10 at tq 45 °C
- Colour rendering/temperature: 840
- Electrical version: ETDD
- Dimensions: 678 x 589 x 80 mm (L x W x H)
- Protection rating/impact resistance: IP66/IK08, 6 Joule
- Light distribution: narrow light distribution, narrow-wide light distribution, highbay racking optic
- With impact-resistant PC cover: IFS/BRC certified

Compared to conventional systems, the new Mirona QL LED saves up to 50 % energy costs thanks to its luminous efficiency of up to 110 lm/W. Additional economic advantages are the high reliability and extremely long service life of 100,000 hours (L80/B10 at an average ambient temperature of +25 °C). Available with two luminous flux packages of optionally 12,000 lm and 24,000 lm, the luminaire is also suitable for standard-compliant lighting of halls with a ceiling height of more than 13 meters.

Thanks to its extremely robust, flat construction made of high quality materials, the Mirona QL LED is especially resistant and persistent. Even at a higher average ambient temperature of +45 °C, the Mirona QL LED achieves a service life of 50,000 hours.



www.trilux.com/mirona-ql/



MIRONA QXS LED

STRONG PERFORMANCE
IN A COMPACT DESIGN

WALDRICH COBURG



Compact, tough and simply strong: the highbay luminaire Mirona QXS LED combines many benefits in a limited construction space. The luminaire can be installed in halls with low mounting heights thanks to its very small construction size, and even confidently copes with extremely challenging application conditions such as damp rooms or outdoor areas. As typical for the Mirona range the light offers maximum visual comfort: glare-free, highly homogeneous and particularly energy-efficient. The Mirona QXS LED thus enormously simplifies lighting design as it is suitable for nearly all applications, and especially where high quality and efficiency are needed simultaneously.

Energy efficiency and long service life. A combination that pays off.

Costs for the Mirona QXS LED are amortised within a very short period of time due to low energy consumption and its long service life.

Perfect light. Perfect visibility.

Mirona QXS LED optics feature high glare limitation and various light distribution characteristics. The light is uniform and pleasant and creates optimal visual conditions for safe, efficient work.

Simply installed. Instantly off the mind.

The luminaire features rapid installation thanks to Plug & Play. And its outstanding thermal management guarantees a maintenance-free service life of 50,000 hours.

Small dimensions. Big advantage.

The small construction size gives planners more flexibility. At the same time the compact dimensions simplify handling in all applications.



Technical features:

- Luminaire luminous flux: 10,000 lm/11,000 lm (depending on the optic)
- Connected load/efficiency: 100 W/up to 110 lm/W
- Colour rendering/temperature: 840
- Electrical version: ET/ETDD
- Dimensions: 325 x 325 x 151 mm (L x W x H)
- Service life: 50,000 h L80/B10 at tq 30 °C
- Protection rating/impact resistance: IP66/IK08, 6 Joule
- Light distribution: narrow/narrow-wide light distribution
- With impact-resistant PC cover: IFS/BRC certified

Due to the low energy consumption (110 lm/W) and the long service life (50,000 h) the Mirona QXS LED is amortised within a very short period of time.



THE ROBUST WEATHER-
PROOF LUMINAIRE FOR
EXTREME SITUATIONS

THE ROBUST WEATHER-
PROOF LUMINAIRE FOR
EXTREME SITUATIONS

Ice cold or boiling hot, damp or dusty – the Nextrema LED with its robust die-cast aluminium body performs in cold stores, washing facilities and car parks at temperatures ranging from -30 °C to +35 °C from day to day. With PC diffuser it is also suitable for production facilities in the food industry. The inner values and intelligent installation concept are also beneficial: its light is pleasantly homogeneous, without glare and especially energy-efficient. Mounting and handling are also particularly simple and time-saving due to many clever functions.

Small construction. High performance.

The Nextrema LED is compact and very powerful: with a length of only one metre it achieves the same lumen output as standard 1.5 metre weather-proof luminaires. This simplifies the illumination of rooms with limited mounting space.

Sophisticated sensor technology.

Intelligent light management system.

Optional presence detection and daylight sensors enable configurations according to needs and reliable lighting management. In car parks for example a "accompanying" light can be implemented that "accompanies" pedestrians and car drivers through the building and gives a feeling of safety.

Robust shell. Long-life core.

With its tough die-cast aluminium body and impact-resistant design, Nextrema LED withstands humidity, dirt and even extreme temperatures of -30 °C to +35 °C. It guarantees reliable operation over the complete 50,000 hours service life.

Rapid, compact installation.

Thanks to its compact 1-metre size, Wieland rapid connection system, mounting clips and mounting template, the Nextrema LED is installed quickly, simply, space-savingly and with protection against polarity reversal.



Technical features:

- Luminaire luminous flux: 4300 lm (PC), 4500 lm (PMMA), 5900 lm (PC), 6200 lm (PMMA)
- Connected load/efficiency: 45 W, 60 W/up to 103 lm/W
- Service life: 50,000 h L80/B10 at tq 35° C
- Colour rendering/temperature: 840
- Electrical version: ET, ETDD
- Dimensions: 1045 x 92 x 85 mm
- Protection rating/impact resistance: IP66/IK08, 6 Joule (PC), IK04, 0,5 Joule (PMMA)
- Light distribution: Bat-wing
- IFS/BRC certified

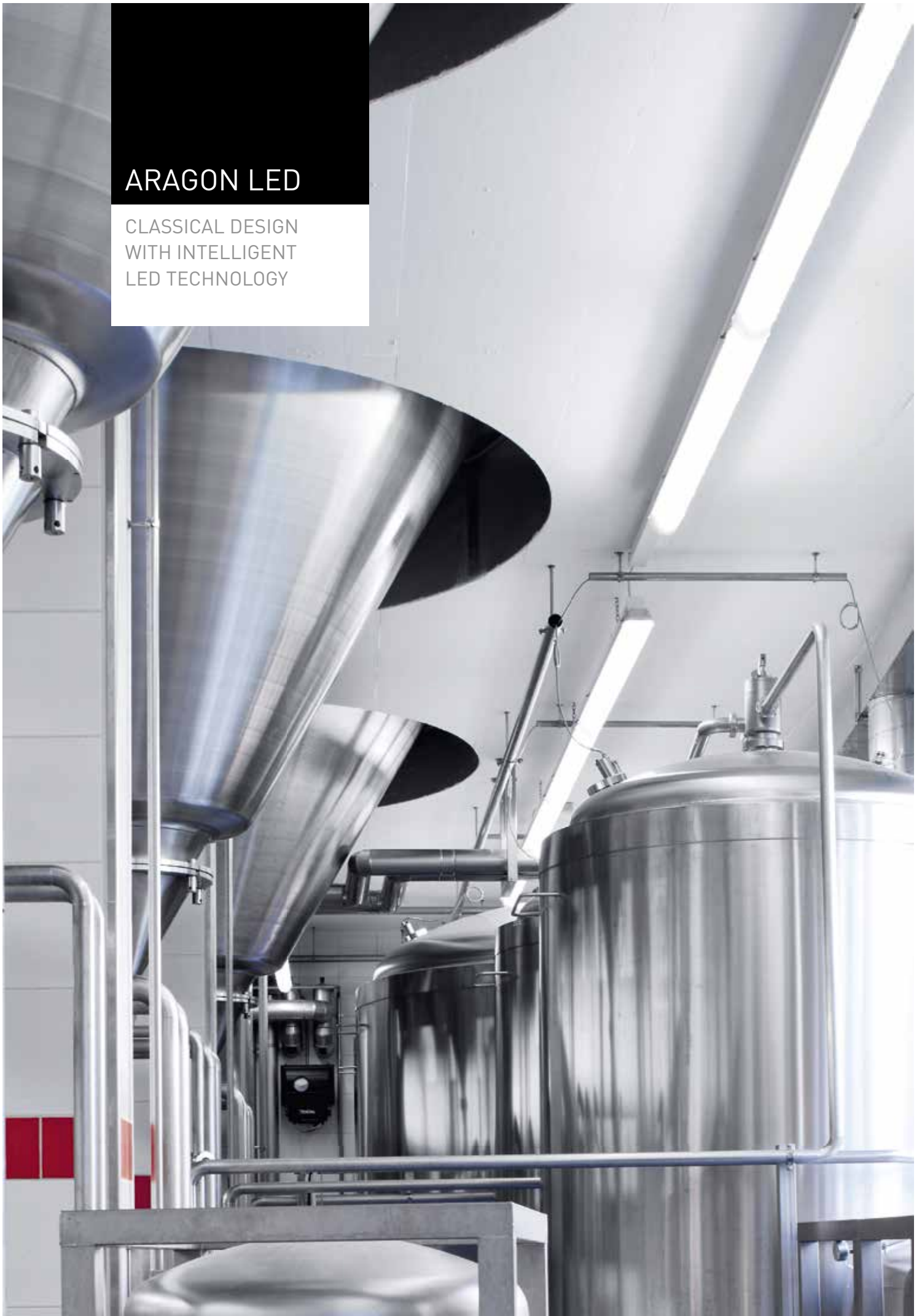
The Nextrema LED 2, with a luminaire luminous flux of 6000 lumen, can replace a conventional 2 x 58 watt luminaire and is especially economic: the luminous efficiency of up to 103 lm/W has been increased by approx. 40 % compared to its predecessor.

The Nextrema LED 2 is optionally available with an integrated daylight and motion sensor. The luminaire switches on depending on motion when daylight is poor. When no motion is recognised the Nextrema LED 2 dims down to a pre-set level or switches off. This enables an especially energy-efficient illumination of differently frequented areas.



ARAGON LED

CLASSICAL DESIGN
WITH INTELLIGENT
LED TECHNOLOGY



The Aragon LED is the ideal partner for efficient upgrading. Replacement of conventional luminaires to LED in obsolete systems is child's play due to equal construction sizes. Using state-of-the-art LED technology featuring a service life of 50,000 hours and an efficiency of 100 lm/W reduces operating costs by more than 50 %. But that's not all, the weather-proof luminaire is also intelligent. An optionally integrated presence detection and daylight sensor enables further energy savings. Additionally, the robust luminaire body of the Aragon LED even withstands humidity, variations in temperature as well as dirt and dust.

Upgrading in next to no time.

Rapid and simple mounting due to fixing points and dimensions identical to the conventional version.

Intelligent and economic.

Sensor versions additionally save energy costs, as these only emit light in the required intensity and according to needs.

Universally applicable.

Four lumen packages, the robust polycarbonate luminaire body and the high protection rating allow for a wide application area – ranging from car parks and cold stores to production sites in the food industry.



Technical features:

- Luminaire luminous flux: 2300 lm, 4000 lm, 3500 lm, 5600 lm
- Connected load/efficiency : 23 W, 40 W, 35 W, 56 W/100 lm/W
- Service life: 50,000 h L80/B10 at tq 35° C
- Colour rendering/temperature: 840
- Electrical version: ET, ETDD
- Dimensions: 1270 x 113 x 106 mm, 1570 x 113 x 106 mm (L x W x H)
- Protection rating/impact resistance: IP66/IK08, 6 Joule
- Light distribution: Bat-wing
- IFS/BRC certified

Reduction of energy costs thanks to the use of state-of-the-art LED technology. Rapid, cost-saving mounting – the perfect luminaire for upgrading due to identical dimensions and fixing points.



FIDESCA-PM LED

MAXIMUM EFFICIENCY
FOR CLEANROOMS



Whether in operating theatres, in the food or pharmaceutical industry or with the production of microchips – in cleanrooms the technical equipment must comply with particularly stringent requirements to guarantee problem-free running of the highly sensitive processes. This also applies of course to the lighting. It is for this reason that TRILUX has expanded the reliable Fidesca series with the Fidesca-PM LED that not only complies with maximum demands in terms of cleanliness but also emits especially bright, pleasant and energy-efficient light. The luminaire thus contributes to the long-term performance of cleanrooms.

An outstanding solution for cleanrooms

Fidesca-PM LED has been certified by the Fraunhofer Institute as being suitable for applications in cleanrooms. Due to its bacteria resistance and the extremely tough laminated safety glass cover with an IP65 protection rating, the luminaire is optimal for applications in critical production and laboratory surroundings.

Complete reliability

With a service life of at least 50,000 operating hours, the Fidesca-PM LED requires extremely low levels of maintenance. State-of-the-art LED technology also makes the luminaire completely reliable. Failure times that adversely affect production processes and medical operations with possibly serious results are a thing of the past with the Fidesca-PM LED.

Very robust

Resilient and impact-resistant: The covers of the complete Fidesca series are made of laminated safety glass, giving them an especially high level of resistance to knocks and splintering. The glass can also be easily cleaned and is not attacked by cleaning agents and disinfectants.

The very best light for strong performance

Optimal lighting and visual conditions are the absolute prerequisites for production and operating environments: high luminous intensity, intelligent light distribution and excellent colour rendering (RA > 90) enable fatigue-free, concentrated work.



Technical features:

- Luminaire luminous flux: 6800 lm, 8500 lm, 10.300 lm, 12.400 lm
- Connected load/efficiency: 100 W, 128 W, 150 W, 177 W
- Service life: 50,000 h L80/B10
- Colour rendering/temperature: 940
- Electrical version: ETDD
- Dimensions: 296 x 1248 mm, 296 x 1548 mm, 412 x 1248 mm, 412 x 1548 mm
- Protection rating: IP65
- Light distribution: direct light distribution

The Fidesca-PM LED is available with luminous flux packages of between 6,800 and 12,400 lumens – ideal preconditions for illuminating any cleanroom according to requirements.

The cover consists of high quality, non-splintering laminated safety glass with an IP65 protection rating. This renders the Fidesca-PM LED especially resistant to mechanical destruction, dirt and dust as well as humidity.



KUBION LED

A SYSTEM THAT SIMPLY
MAKES EVERYTHING
POSSIBLE



Wall supply unit Kubion LED

Much has to be considered when equipping a patient room. Medical and care functionality has primary importance for the personnel. Patients on the other hand want a very homely atmosphere. And economy has maximum priority from the operator's point of view. TRILUX combines all of these factors in one system – the modular Kubion LED wall supply unit. The solution is very flexible particularly with functionality: in addition to standard-compliant and glare-free direct and indirect light, it offers a wide spectrum of medical, communication and electrical components as part of the modular kit. The linear design of the basic module can be individually and stylishly adapted with a wide selection of decorative elements in different colours and versions. This means an attractive and custom-designed wall supply unit is created very quickly which makes everyday care much easier thanks to many intelligent details.

Large modular kit. Custom-made equipment.

In addition to standard electrical components such as switches, sockets and connections for potential equalisation cables, many other components can be integrated, ranging from medical gas connections and nurse call to telephone and data sockets.

Simple cleaning. Maximum hygiene.

Due to the flush installation of the components and the straight, cubic design, the complete system can be quickly and simply cleaned and corresponds to maximum hygiene requirements.

Efficient light. Pleasant and glare-free.

The supply unit combines pleasant, indirect general lighting with a direct light component emitting targeted light without glare for reading. Kubion LED is also attractive economical thanks to energy-efficient LED technology, a long service life and low maintenance effort.

High quality design. Individually configured.

Unique supply units are created by combining the rectangular basic profile and an individual decorative module. A selection can be made from different high quality decorative elements, versatile profile diameters as well as a wide colour selection.

The electronically slidable reading light can be adapted to the bed position, the direct and indirect components are dimmable. An integral push-button combines the direct and indirect lighting for examination purposes. Everyday nursing is made easier with an optical display for assigning nurse calls, as well as ambient lighting integrated into the reading light module for use during the night.



Technical features:

- Luminaire body made of extruded aluminium
- Profile length up to 6.9 m made of one piece for 1 to 3 bed places
- Profile cross-section square 150 x 150 mm or rectangular 150 x 95 mm
- Profile cross-section optionally with 10° inclined surface upwards or downwards
- Decorative covers 1200 x 20 x 210 mm in wooden optic, optionally available with translucent illuminated stripes on the upper or lower side for ambient lighting with LED
- Slidable decorative covers for covering gas outlets
- Indirect LED lighting: luminaire luminous flux 7200 lm, colour temperature 4000 K
- Direct LED lighting: luminaire luminous flux 700 lm, colour temperature 4000 K
- Recess frame for separated feeding of electric power and gas
- Expandable via system-specific accessory like infusion fixture and shelves



AURINIO L30

MOST EASY HANDLING
FOR OPTIMUM
EXAMINATION LIGHT



Aurinio L30 LED examination luminaire

The Aurinio L30 LED impresses in every aspect. On the one hand it supports examinations with its intuitive usability and many practical functions. The luminaire head is located on a flexible arm with a wide action radius so that the desired position can simply be fixed. In addition to rail mounting on a supply unit, the Aurinio L30 LED can also be used as a mobile version. High illuminance levels and very good colour rendering ensure outstanding visual conditions. Furthermore, the Aurinio L30 LED represents an economically attractive investment. With its long service life, high energy efficiency, reliability and long maintenance intervals, the luminaire is amortised within a short time period.

Brilliant light. Precise colours.

The 30,000 lux of the Aurinio L30 LED can be steplessly dimmed down to 20 %. In combination with very good colour rendering (Ra = 95) – also applicable to red colours – the high-performance light ensures optimal visual conditions. The colour temperature can also be adapted to the specific application in three steps – 3800 K, 4300 K and 4800 K. The LED light is also especially tissue-protective due to the lack of an infrared component.

Wide action radius. Simple handling.

The light can be simply fixed with universal clips to horizontal standard rails. During examinations, the light head can be precisely aligned and steadily positioned due to the flexible arm with a wide action radius.

Very economic.

50,000 hours of light, high energy efficiency, low maintenance costs – the Aurinio L30 LED has a high level of cost-efficiency.



Technical features:

- Illuminance in a distance of 0.5 m: 30,000 lx
- Dimmable: 20 % to 100 %
- Colour temperature: 3800 K, 4300 K, 4800 K
- Colour rendering index: Ra 95
- Light field diameter: 160 mm
- Protection rating: IP40
- Luminaire head can be adjusted in height: 1300 mm
- Diameter luminaire head: 130 mm
- Cable length: 1.5 m
- Ergonomic handling due to integral switching elements in the handle

Examination luminaire with convincing price-performance ratio, 50,000 hours light output, long service life and freedom of maintenance.

A flexible arm ensures high stability and enlarges the action radius of the doctor considerably. The Aurinio® L30 is the perfect luminaire for intensive care, normal care and medical practices.



AURINIO L50

BRILLIANT LIGHT
FOR PRACTICES AND
HOSPITALS



Aurinio L50 LED examination luminaire

The correct diagnosis is also a question of lighting: with its brilliant light and high colour rendering, the Aurinio L50 LED supplies perfect visual conditions for reliable examinations. The light can be optionally mounted as a ceiling or wall luminaire or can be used as a mobile luminaire for all locations needing best, flexible light. Both versions of the Aurinio L50 LED feature enormous moveability and ergonomics, enabling rapid and precise illumination. With its cardanic suspended light head, the Aurinio L50 LED reaches every area without effort. And when the light gets closer to patients for more precise examinations, the tissue is maximally protected by the LED light. Minimum energy consumption, maximum reliability and a long service life make the Aurinio L50 LED the perfect light solution for the health sector.

Brilliant light. Precise colour rendering.

The Aurinio L50 LED with 55,000 lux and a colour rendering index of $R_a > 94$ ensures optimal visual conditions. The light is dimmed in three steps and protects the tissue of patients due to the lack of an infrared component.

Maximum economy. From the beginning.

Despite high illuminance levels, the Aurinio L50 LED has a very low energy consumption. Combined with its long service life and low maintenance costs, the light is amortised very quickly.

Intelligent concept. Premium version.

The light head of the premium version has an all-round circular railing. The mobile version is also equipped with automatic cable rewind.



Technical features:

- Illuminance in a distance of 1 m: 55,000 lx
- Colour temperature: 4000 K
- Colour rendering index: $R_a > 94$
- Light field diameter: 160 mm
- Illumination depth: 1400 mm
- Integrated 3 step dimmer from 25,000 to 55,000 lx
- Service life of LEDs: $> 20,000$ h
- Size of luminaire body: $\varnothing 240$ mm without all-round railing
- Luminaire head can be adjusted in height: 1,300 mm

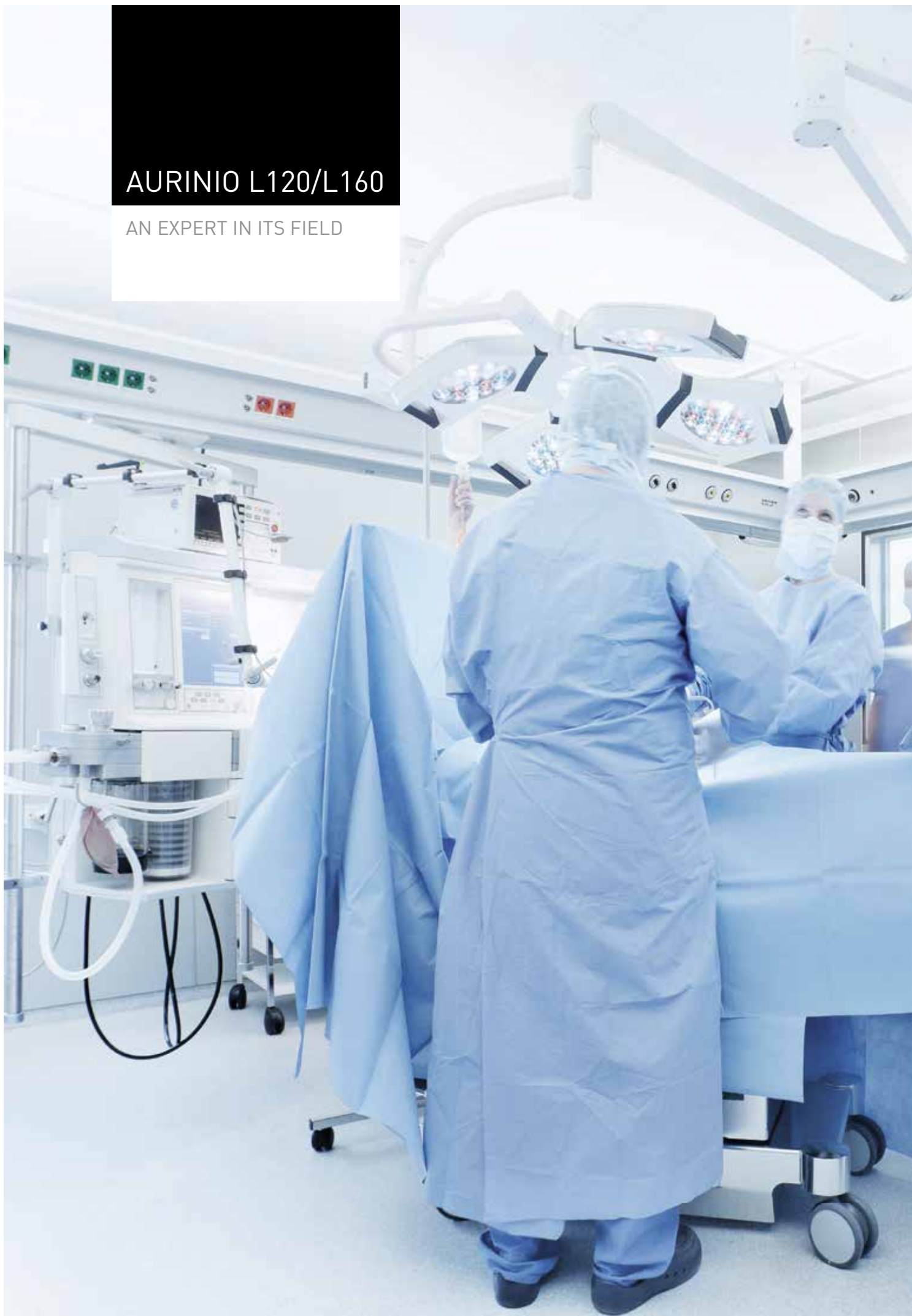
It is slim and flexible everywhere, where high visibility is needed. A special advantage: its rapid applicability, its enormous flexibility and its high rotatability.

The mobile version is optionally available with battery back-up system. Autarkic operation up to 3 hours.



AURINIO L120/L160

AN EXPERT IN ITS FIELD



Aurinio LED OT luminaires

With operations, everything has to be right to the last detail – and this was the guiding principle when developing the Aurinio LED OT luminaire. It not only features outstanding light quality for shadow-free and colour-true illumination of the operating area. All important parameters such as illuminance, light field diameter and colour temperature can also be customized to the various interventions and operation steps. The result is optimal visual conditions for various applications. And because operating theatres have to be ready as soon as possible after operation, the Aurinio LED OT luminaire is simply and quickly wipe-disinfected.

Flexible light. Perfect results.

Operating theatres often need high illuminance levels and as far as possible without heat development. The Aurinio LED OT luminaire is steplessly dimmable between 160,000 and 22,000 lux. Neither tissue nor room is heated up because the LED light has no infrared components. Across all dimming levels, the white light has a high general colour rendering index ($R_a = 96$), as well as a high colour rendering index for red ($R_9 = 95$).

Right colour temperature. Optimum contrast.

For contrast-rich illumination of different tissue types, colour temperature can be modified in three levels: 3800K, 4300K and 4800K.

Simple disinfection. Quickly ready for operation again.

The OT luminaire can be wiped-disinfected and can be equipped on request with a sterilisable handle or disposable handle.

Intelligent. Efficient.

The specifically developed lens combination with primary and secondary optic focuses the light very efficiently. Combined with dimmable high-performance LEDs with maximum colour rendering and variable colour temperature, the Aurinio LED OT luminaire sets standards in terms of flexibility and quality.

High-detail recordings

The optional integration of HD or SD cameras onto the Aurinio LED OT handle makes even the smallest details in the OT field visible and can be combined with various monitors.



Technical features:

- Illuminance in a distance of 1 m: 160,000 lx
- Dimmable: 20 % to 100 %
- Illumination depth: 960 mm
- Colour temperature: 3800 K, 4300 K, 4800 K
- Colour rendering index: R_a 96, Colour rendering index R_9 (red) 95
- Protection rating: IP54
- High shadow reduction
- Combination of lenses with primary and secondary optic to focus the light
- Resistant to wipe-disinfection
- Sterilisable handle or disposable handle
- Air-current optimised luminaire body for Laminar Air Flow supply air ceilings
- Low intensity of turbulences due to low surface temperature with approx. 27 °C at 80,000 lux

The endoscopy modus increases the contrast effect with imaging methods for the surgeon. With endoscopic surgeries reflexions on the monitor are reduced. Furthermore, it provides an unobtrusive background lighting for the orientation of the entire OT team.



PUBLISCA LED

THE PUBLIC'S
FAVOURITE WITH TRUSTED
TECHNOLOGY



If there is a trend-setter in outdoor lighting, it is definitely the Publisca LED. During the day it blends perfectly into its surroundings thanks to its timeless elegant design, whether in historic old towns or as part of avant-garde architecture. At night it emits customised and especially energy-efficient light.

Flexibility for planning and design. Optimal lighting.

For perfect light on paths, residential streets, squares and in urban zones – the light colour, mounting height, luminaire luminous flux, light distribution characteristics and design line can all be varied. Its modular design enables all photometric parameters to be precisely adapted to the application area.

A double advantage for storing and logistics.

The Publisca LED with its pivotable luminaire head can be stored to save space and can be transported simply, efficiently and environmentally friendly.

Intelligent details. Reduced mounting costs.

It's as quick as this: details such as the freely accessible connection module cut mounting times, because the luminaire head does not have to be opened for installation.



Technical features:

- Luminaire luminous flux: 1500 lm to 4400 lm
- Connected load/efficiency: 20 W to 59 W/up to 80 lm/W
- Service life: 50,000 (h) L80/B10
- Colour rendering/temperature: 730, 740
- Electrical version: LR, LRA, ETDD, optional: LMS
- Dimensions: Ø 380 x 571 mm (diameter x H)
- Protection rating/safety class/impact resistance: IP66/II/IK08
- Light distribution: asymmetrical wide light distribution (AB)/rotationally symmetrical wide light distribution (RB)

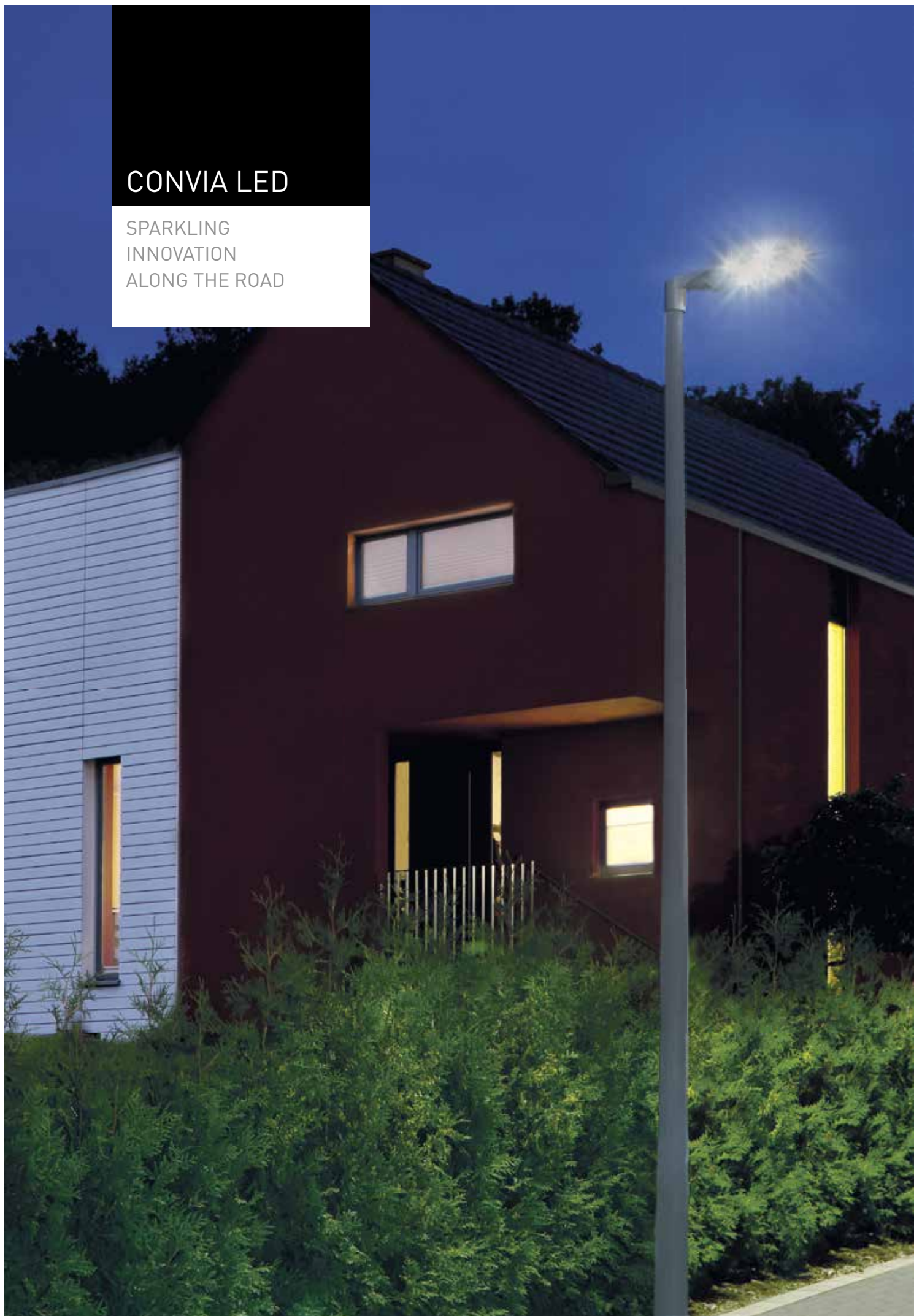
Optics with MLT (Multi-Lens-Technology) specifically developed for the Publisca enable a wide diversity of applications for many lighting requirements thanks to optimal light control. The computer-optimised, UV and temperature-resistant lens systems with asymmetric wide (AB) or rotationally symmetric wide (RB) light distribution guarantee high levels of efficiency.

Electrical connection is made significantly easier with the connection module and aids rapid, simple and low-cost installation. With a safety class II rating, the connection module is freely accessible and does not require the luminaire to be opened.



CONVIA LED

SPARKLING
INNOVATION
ALONG THE ROAD



Illuminating streets especially well, highly efficient and stylish at the same time is child's play with the Convia. The LED technology is not only especially energy-efficient, durable and environmentally friendly. It also allows for the Convia's small, flat design which blends perfectly into any urban environment. The optical system with computer-optimised reflectors also guarantees customised light distribution that achieves high levels of safety and visual comfort.

Elegant: The discreet yet open form communicates a high design quality in nearly all surroundings.

Safe light: Excellent illumination along the complete road length with variable installation arrangements lessens the danger of accidents.

Energy-saving: Savings potential via power reduction with each luminaire.

Simple and quick: Intelligently developed luminaire construction, luminaire fixing with only one fixing point.

Highly simple: Very simple electrical connection due to a connection module that can be removed without tools. Opening the luminaire is not necessary.

Long-life: Maximum manufacturing quality and technology combined with die-cast aluminium ensure a permanent quality.



Technical features:

- Luminaire luminous flux: 1800 lm, 3300 lm
- Connected load/efficiency: 23 W, 45 W/up to 80 lm/W
- Service life: 100,000 (h) L80/B10, 50,000 (h) L80/B10
- Colour rendering/temperature: 740
- Electrical version: LR, LRA, ET, ETDD, optional: LMS
- Dimensions: 662 x 380 x 60 mm (L x W x H)
- Protection rating/safety class/impact resistance: IP66/II/IK07
- Light distribution: asymmetrical wide light distribution (AB)/very wide light distribution (R)

Purist design and discreet flat construction. The outstanding design has been awarded the reddot and iF product design award.

Optical system consisting of 10 metallised plastic reflectors, frosted. With minimalised, computer-optimised reflector contour for creating an application-oriented, asymmetric wide light distribution.

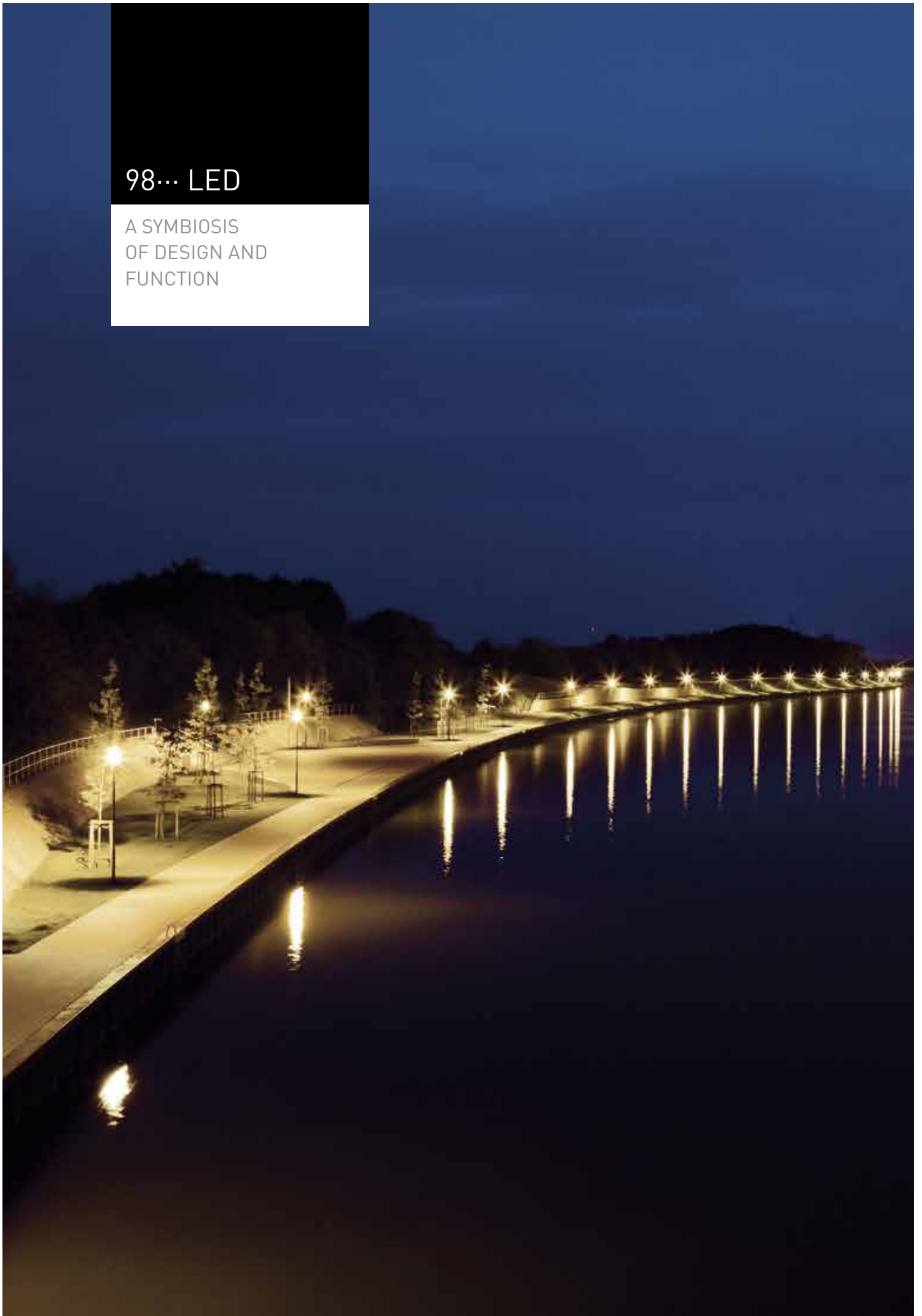


www.trilux.com/convia/



98... LED

A SYMBIOSIS
OF DESIGN AND
FUNCTION



Because of the flexibility of the 98 series, achieving a customised luminaire becomes even simpler. Six different versions are available, all with the same aim: to bring efficiency and elegance into towns and cities. To achieve this, the 98... series unites a proven, classic design with state-of-the-art LED technology.

Simple and timeless: Unadorned basic geometric forms with self-confident, visible functionality.

Safe light: Homogeneous, glare-free lighting of the complete road, guaranteeing high levels of safety.

Photometrically variable: Variants for the systematic illumination of squares and for targeted lighting of roads.

Efficient: Rapid, simple mounting, a long service life and longer maintenance cycles with minimal maintenance effort.

Large selection: The luminaire range has diverse selection possibilities with a uniform design language.

Simple handling: The electrical block as the functional unit contains the electrical components, LED module and primary optic. Practical: This can be inserted and replaced without tools.



Technical features:

- Luminaire luminous flux: 1100 lm to 1900 lm
- Connected load/efficiency: 23 W, 35 W/up to 55 lm/W
- Service life: 50,000 (h) L80/B10
- Colour rendering/temperature: 840
- Electrical version: LR, ET, ETDD
- Protection rating/safety class/impact resistance: IP65/II/IK07
- Light distribution: asymmetrical wide light distribution with secondary optic (IA) / rotationally symmetrical wide light distribution with secondary optic (IS)

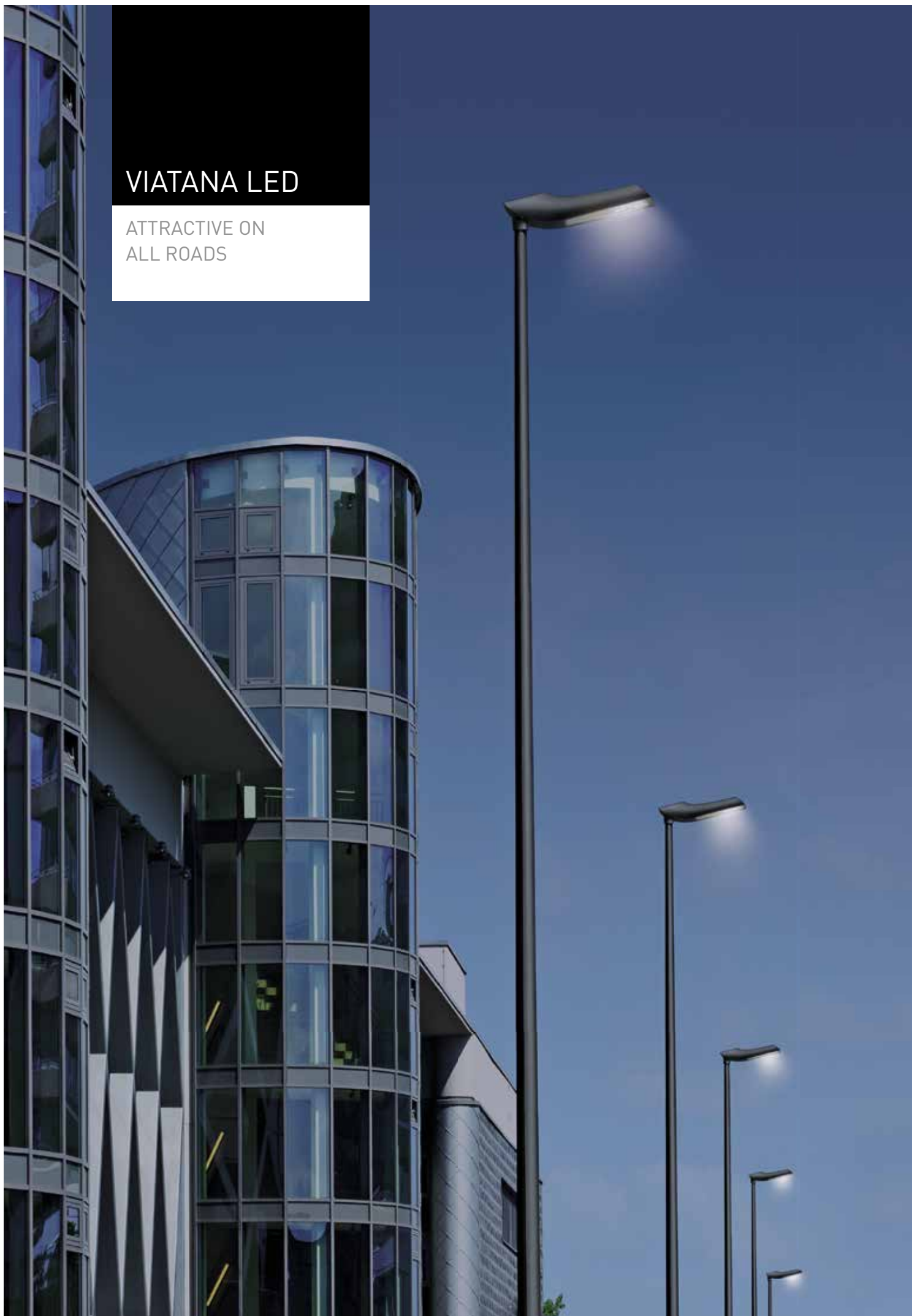
The symmetric secondary reflector optic enables large post distances with constantly brilliant light effect.

98er luminaires with IA optic are predestined for efficient lighting of residential streets.



VIATANA LED

ATTRACTIVE ON
ALL ROADS



It's the sum of innovative technology, an attractive design and simple handling that makes the Viatana LED as special as it is. Thanks to state-of-the-art LED and unique reflector technology, it illuminates the road area highly efficient, reliably and according to targets. Further energy savings are possible via switching concepts for power reduction. The modular luminaire design and use of LED modules complying to the Zhaga specification enable any future changes to be carried out easily. Viatana combines all this with a modern, appealing design and many practical details such as simple and quick mounting and maintenance.

Simply future-safe. Certified.

Viatana is the first Zhaga-certified outdoor luminaire in the world. This means upgrading to future LED generations is possible.

Maximum efficiency. More options.

The Viatana combines state-of-the-art LED technology and free-form reflector technology to achieve maximum luminous efficacy and energy efficiency. Programmable control units enable power-reducing switching concepts and also cut energy costs. Optional light management systems offer additional savings potential.

A timeless design. With verve.

The Viatana with its elegant looks and timeless design blends harmoniously into all surroundings.

Simplest installation. Simplest replacements.

The luminaire is mounted in a flash thanks to only one fixing point. The electrical components are accommodated on an electrical block that is removable without tools. This simplifies and accelerates the mounting process.

High-performance. Highly adaptable.

The Viatana is available with luminaire luminous flux options between 2,000 and 9,000 lumens to enable the optimal illumination of various traffic zones such as parking lots, residential areas and main roads.



Technical features:

- Luminaire luminous flux: 2000 lm to 9000 lm
- Connected load/efficiency: 23 W to 107 W/up to 96 lm/W
- Service life: > 80,000 (h) L80/B10
- Colour rendering/temperature: 740
- Electrical version: LR, LRA, ETDD, optional: LMS
- Dimensions: 835 x 230 x 91 mm (L x W x H)
- Protection rating/safety class/impact resistance: IP66/II/IK08
- Light distribution: asymmetrical wide light distribution (AB)/pedestrian crossing

The unique Viatana reflector technology enables a wide application spectrum, and thanks to optimal light control is ideal for various lighting needs. The computer-optimised, vaporised 3D freeform matt reflector guarantees high efficiency and a high level of visual comfort by distributing the light onto the road section with a high level of luminous efficiency, and specifically targeted. A special optic is available for the illumination of pedestrian crossings.

The technical concept of the Viatana has been consistently focused on outdoor luminaires in compliance with the Zhaga specification for standardised LED modules. Thanks to sophisticated thermal management and the patented mounting system, the Viatana represents a high quality product with long service life and simple exchangeability.



Zhaga



www.trilux.com/viatana/

**COMING SOON:
LUMEGA IQ LED**

FLEXIBLE OUTDOOR
LIGHTING WITH
INTELLIGENT FEATURES



When it gets dark outside, Lumega IQ enters the scene. And thanks to its flexibility it is not limited to specific applications but illuminates streets and parking areas just as efficiently and reliably as industrial facilities – adapting perfectly to specific applications due to various optics and LED systems. Installation and adjustment is also child's play due to the functional luminaire design with patented features. Double advantageous: the already outstanding energy efficiency can be further improved with intelligent light management systems and switching concepts.

Mounting. Simple and quick.

Many practical and intelligent details such as tool-free replacement of components (E-block) simplify mounting and maintenance considerably.

Adjusting and converting. The patent for simplicity.

Flexible, practical and patented: With only a single externally accessible screw the inclination angle of the Lumega IQ LED is adjusted and the luminaire is converted from a post-top to a bracket-mounted luminaire.

Maximum safety. Reliable lighting.

Newly developed optical systems guarantee outstanding light distribution. The innovative optics ensure outstanding illumination and maximum safety, disturbance-free and continuously.

Efficiency. A matter of technology.

The energy efficiency of the Lumega IQ LED can be further increased via high-performance light management systems and application-oriented, intelligent switching concepts.



Technical features:

- Luminaire luminous flux:
Lumega IQ 70: 3000 lm to 11,000 lm
Lumega IQ 90: 12,000 lm to 22,000 lm
- Connected load/efficiency:
IQ 70: 23 W to 108 W/up to 129 lm/W
IQ 90: 110 W to 227 W/up to 110 lm/W
- Service life: > 80,000 (h) L80/B10
- Colour rendering/temperature: 730, 740
- Electrical version: LR, LRA, ETDD, optional: LMS
- Dimensions:
Lumega IQ 70: 760 x 325 x 98 mm (L x W x H)
Lumega IQ 90: 960 x 325 x 98 mm (L x W x H)
- Protection rating/safety class/impact resistance: IP66/II/IK08
- Light distribution: asymmetrical wide light distribution (AB)/pedestrian crossing

Lumega IQ LED is available either as post-top or bracket mounted luminaire. Simple and rapid converted: the outer adjustment as well as the adjustment of the luminaire inclination angle in 5 °C steps is done via only one screw.

Lumega IQ LED – the luminaire range in two construction sizes. Different optical systems in Multi-Lens-Technology (MLT) and numerous luminous flux packages guarantee efficiency and flexibility in planning.



Lumega IQ 70



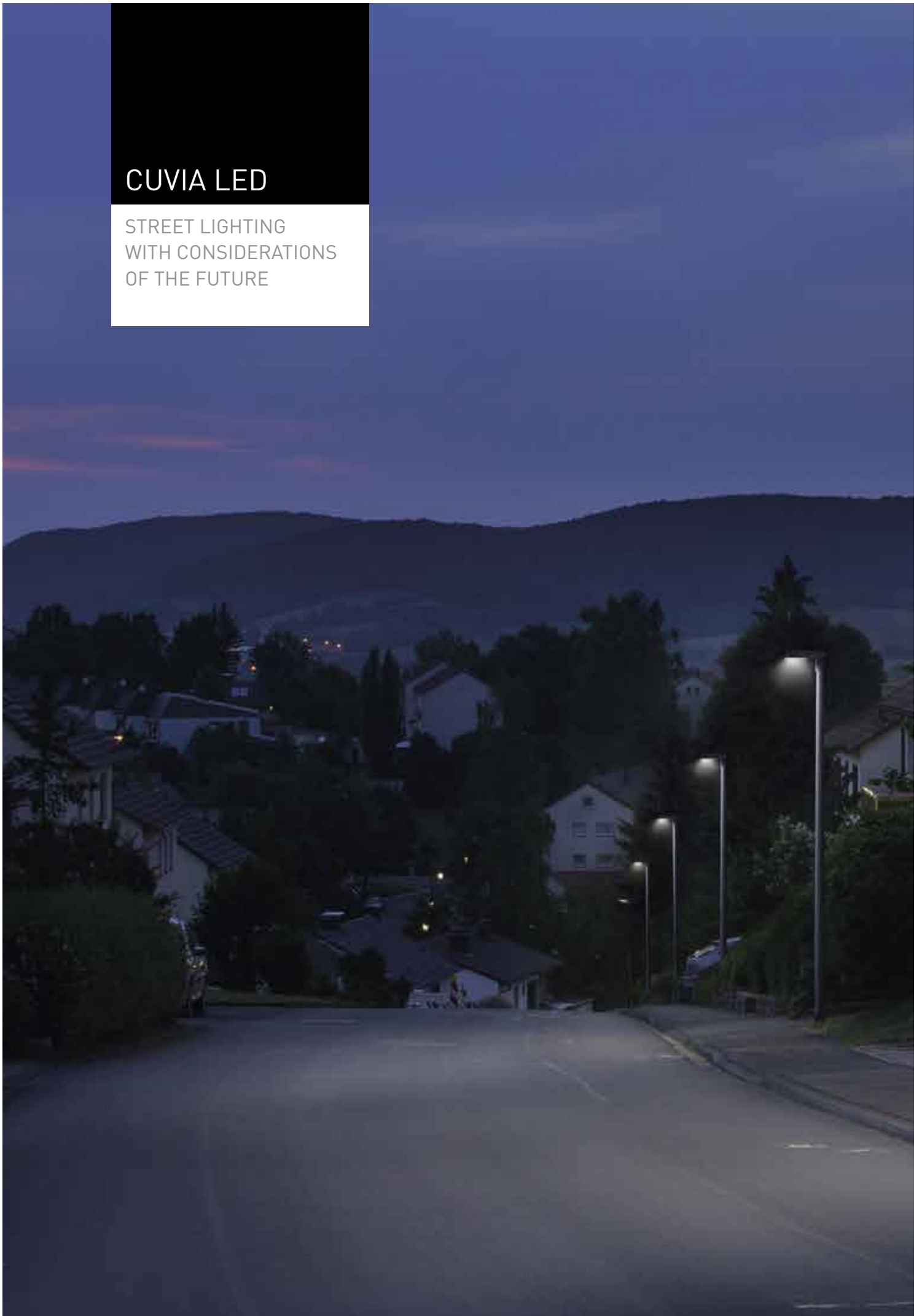
Lumega IQ 90



www.trilux.com/lumega-iq-70/
www.trilux.com/lumega-iq-90/

CUVIA LED

STREET LIGHTING
WITH CONSIDERATIONS
OF THE FUTURE



One luminaire and many options: the TRILUX Cuvia LED. The modular design of the luminaire allows for many variants with regard to luminous flux packages and optical systems. The result is always customised light on streets, paths and squares. The light head can be simply replaced if photometric requirements are changed or at the end of the service life. This means future upgrades are achieved with minimum effort in terms of time and costs. In short: The Cuvia is an energy-efficient and future-safe investment with an appealing design.

The family with a future. Designed with upgrades in mind.

The modular design enables maximum flexibility with luminous flux packages and optical systems, making upgrades in the future very simple.

Economic. Over its complete service life.

Efficiency is what counts in the complete life cycle of a luminaire. The low-maintenance and energy-efficient Cuvia range features total cost efficiency: with purchasing, operating costs and maintenance.

Maintenance and installation. Rapid and safe.

Only one screw needs to be released to connect the E-block. The luminaire head can even be replaced without tools and the luminaire is adjusted between 0-10 degrees without effort. This makes installation and alignment especially simple.

A system with style. In a timeless design.

High-grade materials and the noticeably attractive Cuvia design ensure a high recognition factor, with optimal photometric results.

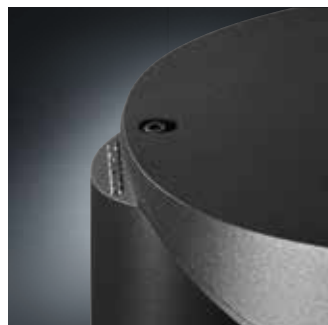


Technical features:

- Luminaire luminous flux: 900 lm to 6800 lm
- Connected load/efficiency: 10 W to 78 W/up to 105 lm/W
- Service life: 50,000 (h) L80/B10 at tq 35°
- Colour rendering/temperature: 740
- Electrical version: LR, LRA, ET
- Dimensions:
 - Cuvia 40: 417 x 309 x 71 mm (L x W x H),
 - Cuvia 60: 547 x 309 x 71 mm (L x W x H)
- Protection rating/safety class: IP66/II
- Light distribution: asymmetrical wide light distribution

The luminaire is delivered as post top luminaire. A simple and quick conversion to a bracket-mounted luminaire is possible.

The luminaire consists of two modules. The light module is separated from the basis module with a screw. The customer can easily carry out the electrical connection.



Cuvia 40



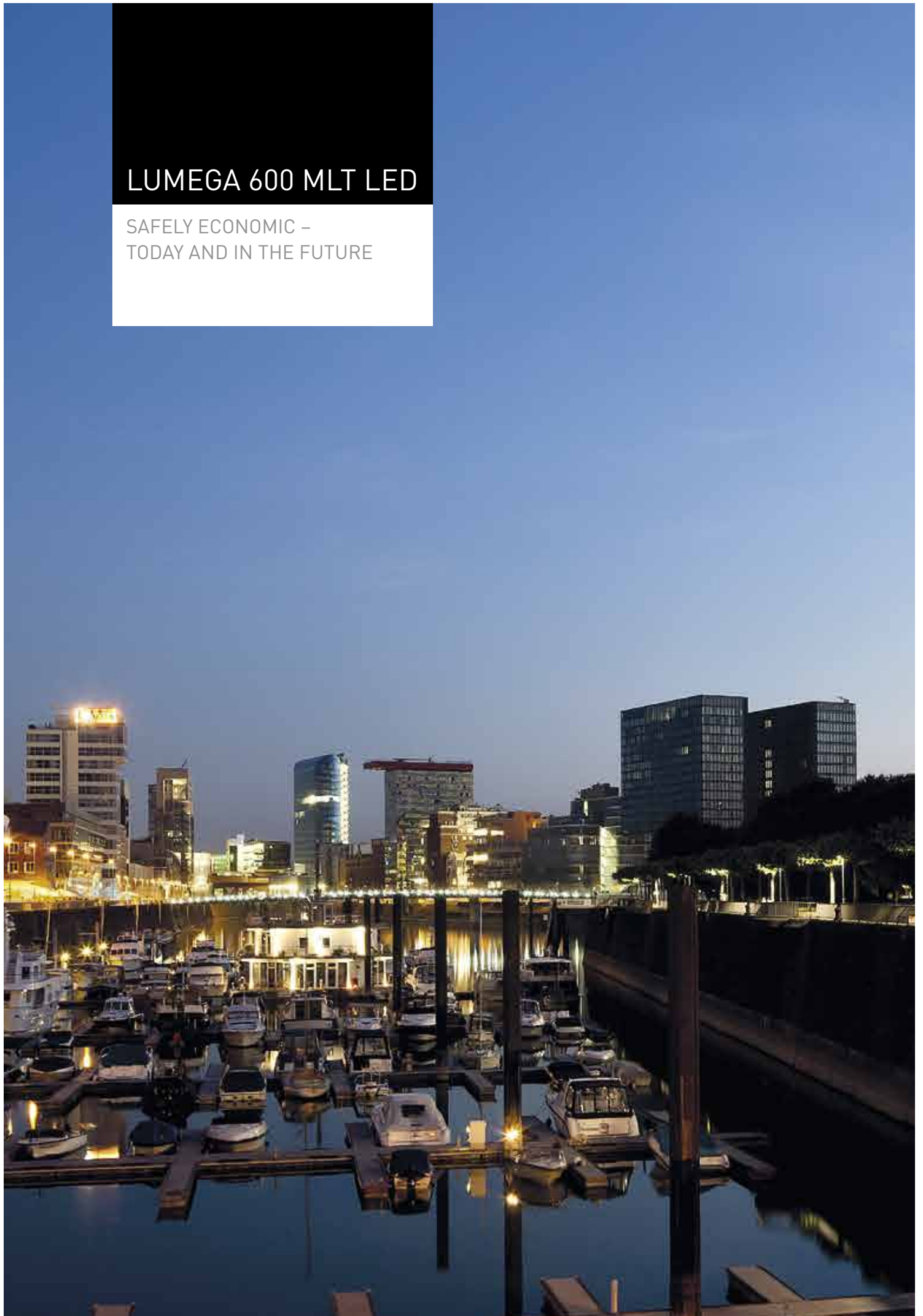
Cuvia 60



www.trilux.com/cuvia-40/
www.trilux.com/cuvia-60/

LUMEGA 600 MLT LED

SAFELY ECONOMIC –
TODAY AND IN THE FUTURE



Thanks to computer-optimised single lenses, Lumega 600 MLT (Multi-Lens-Technology) allows targeted distribution of light over the complete road section. With differing variants it achieves a luminaire luminous flux of between 2,000 lm and 4,500 lm and thus ensures efficiency in a wide application range. Because of the intelligent luminaire design featuring many clever and practical details, mounting, maintenance and all future updates are carried out particularly simply and quickly.

Versatile: An optimal light control thanks to computer-optimised single lenses and divers luminaire luminous flux levels allow for a wide application spectrum.

Future-safe: The modular design means upgrading to later, more efficient LED generations is easy.

Simplicity itself: The intelligent and proven luminaire construction of the Lumega 600 MLT means mounting and maintenance is child's play.

Long-life: The high IP66 protection rating and high quality materials ensure a long service life.

Safe: Homogeneous illumination of the complete road section helps to lessen the danger of accidents.



Technical features:

- Luminaire luminous flux: 2000 lm to 4500 lm
- Connected load/efficiency: 22 W to 53 W/up to 92 lm/W
- Service life: > 80,000 (h) L80/B10
- Colour rendering/temperature: 730, 740
- Electrical version: LR, LRA, ET, optional: LMS
- Dimensions: 628 x 254 x 173 mm (L x W x H)
- Protection rating/safety class/impact resistance: IP66/II/IK08
- Light distribution: asymmetrical wide light distribution (AB)

The two corrosion-resistant catches of the Lumega enable a tool-free access to the IP66 connection block of the luminaire. The blanking cover is lockable and protected against falling down. The tool-free removable E-block contains the required electrical components. Electrical plug-in connection and mechanical adjustment facilitate the use.



LUMEGA 700 MLT LED

SAFELY ECONOMIC –
TODAY AND IN THE FUTURE



The Lumega 700 MLT ensures economically and effectively illuminated streets and pavements. Equipped with "Multi-Lens-Technology" (MLT), the light is efficiently guided onto the surface to be illuminated via computer-optimised single lenses. A total of 48 lens systems achieve luminaire luminous flux levels of between 5000 and 9700 lm. The high flexibility and modular luminaire design simplify adaptation to the application according to needs.

Simplicity itself: Installation, maintenance and upgrading of the luminaire is child's play thanks to intelligent construction.

Future-safe: The modular luminaire design means upgrading to later, more efficient LED generations is very simple.

Safe: Excellent illumination along the complete road section with variable installation locations including pavements lessens the danger of accidents.

Robust: High quality materials and high IP66 protection rating mean a long service life.

Versatile: An optimal light control and various luminaire luminous flux levels allow for a wide application spectrum.



Technical features:

- Luminaire luminous flux: 5000 lm to 9700 lm
- Connected load/efficiency: 49 W to 110 W/up to 102 lm/W
- Service life: > 80,000 (h) L80/B10
- Colour rendering/temperature: 740
- Electrical version: LR, LRA, ET, optional: LMS
- Dimensions: 720 x 290 x 210 mm (L x W x H)
- Protection rating/safety class/impact resistance: IP66/II/IK08
- Light distribution: asymmetrical wide light distribution (AB)

The replaceable LED module combines different functions. The housing made of die-cast aluminium ensures an optimal thermal management and thus a long service life of the LEDs. The 48 high-power LEDs are equipped each with a lens system, which caters for an optimal light distribution. The sealed, flat cover not only avoids light being emitted in the sky, but also ensures the high protection rating of IP66.



www.trilux.com/lumega-700-mlt/

ALTIGO LED

VERSATILE SIGNPOSTS
TOWARDS THE FUTURE



Altigo 50---/Altigo 80---

In evening hours the bollard luminaires of the Altigo luminaire family invite people to stay awhile with their pleasant light. During daytime they are an eye-catcher and emphasise the design of outdoor areas. They also create the ideal precondition for a harmonious interplay of building and landscape architecture. It is only consistent that they are also highly energy-efficient and that installation is rapid and simple.

Long-life: Maximum manufacturing quality and use of long-life materials ensure permanent value.

Efficient: The luminaires are outstandingly economic due to the low power consumption of the LEDs.

Simple, quick and secure: The luminaire can be fixed without tools into the bollard housing.

Elegant: The concise, minimal language of form, the bollard housing and luminaire module form a common element of design.

Accentuating: An eye-catcher during the day, creates atmosphere at night: the bollard luminaires emphasise modern landscape architecture.



Technical features:

- Luminaire luminous flux: 20 lm, 40 lm
- Connected load/efficiency: 4,5 W, 7 W/up to 6 lm/W
- Service life: 50,000 (h) L80/B10
- Colour rendering/temperature: 830
- Electrical version: ET
- Dimensions:
 - Altigo 50: 110 x 70 x 500 mm (L x W x H)
 - Altigo 80: 110 x 70 x 800 mm (L x W x H)
- Protection rating/safety class: IP67/I
- Light distribution: diffuse light distribution

Single-sided light emission, no diffuse light to the rear. Can be used as a decorative light object. The underground support is perfectly matched to the mounting surface of the bollard. A concise, purist design with a sharp-edged, cubic profile.



www.trilux.com/altigo/

SKEO-P LED

LIGHT, DESIGN
AND EFFICIENCY:
THE THREE SIDES
OF PERFECTION



Prismatic bollard luminaire

Combining the appeal of simple geometry with maximum photometric efficiency: the Skeo-P prismatic bollard luminaire with its triangular basic form sets attractive accents for architecturally sophisticated outdoor design. High-grade, long-life materials and a high protection rating enable long-term use even in adverse weather conditions. The luminaire also scores with many practical details such as the well thought-out fixing options and electrical connections enabling especially quick and simple mounting.

Noticeable: The triangle as basic section of the bollard is an unmistakable component for the architecture outside.

Robust: With its clearly defined triangular profile and the precisely machined sections and cover components, the luminaire is suitable for long-term use in outdoor applications.

Rapid: Mounting time of the luminaires is reduced to a minimum via the functional design of the mounting and the electrical connection.

Economic: With energy consumption, Skeo is very modest and still, thanks to optimised optics, it supplies uniform light on all paths.



Technical features:

- Luminaire luminous flux: 700 lm
- Connected load/efficiency: 15 W/up to 47 lm/W
- Service life: 50,000 (h) L80/B10
- Colour rendering/temperature: 830
- Electrical version: ET
- Dimensions: 174 x 200 x 1000 mm (L x W x H)
- Protection rating/safety class: IP67/II
- Light distribution: rotationally symmetrical medium-wide light distribution (RM), rotationally symmetrical narrow light distribution (RT), rotationally symmetrical wide light distribution (RB)

The triangle as basis for the prismatic luminaire form gives the luminaire a unique character.

A concise, no-fuss luminaire geometry, open sides for light emission and flush die-cast components are the fundamentals of the functional design.



8841... LED

HIGH PERFORMANCE
WITH STYLE



Constructional architecture does not end with the outer facade but continues with the building surroundings. During daytime, the 8841 LED bollard luminaire emphasises the looks of outdoor facilities, while in twilight and evening hours it illuminates paths attractively, efficiently and safely with best lighting technology. Available with different wide light distribution characteristics, the luminaire perfectly adapts to its surroundings and can also be used as a bollard, short bollard or wall luminaire. The 8841 LED is certainly fit for the future: Subsequent modifications are carried out quickly due to the simply replaceable luminaire head.

Timeless elegance. Design flexibility.

The timeless, classic design of the 8841 LED gives it an unmistakable character and blends aesthetically into either sophisticated or decorative architectural surroundings.

Flexible family. Customised light.

The 8841 LED is available as a bollard, short bollard or wall luminaire, and can optionally be configured with asymmetric or rotationally symmetric wide light distribution as well as various luminaire luminous flux packages. Additional vandalism protection is provided by an optional supporting column with continuous underground support.

High-performance lighting technology.

The innovative lighting technology guarantees optimal light effects with minimum energy costs.



Technical features:

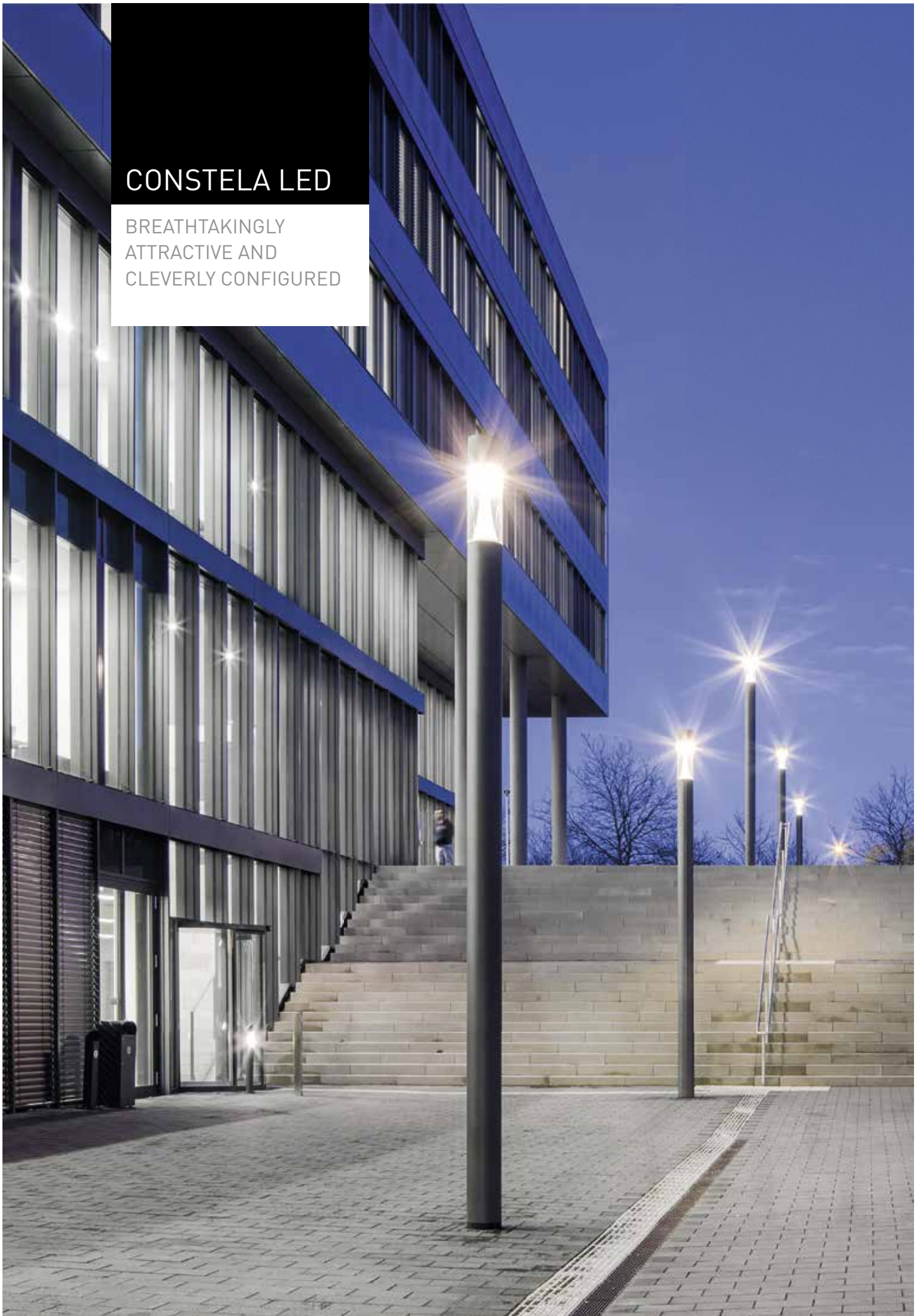
- Luminaire luminous flux: 550 lm, 700 lm
- Connected load/efficiency: 16 W, 11 W/up to 64 lm/W
- Service life: 50,000 (h) L80/B10
- Colour rendering/temperature: 730, 740
- Electrical version: ET
- Dimensions:
short bollard: Ø 170 x 660 mm (Ø x H)
bollard: Ø 170 x 1060 mm (Ø x H)
- Protection rating/safety class: IP65/II
- Light distribution: rotationally symmetrical wide light distribution (RB), asymmetrical wide light distribution (AB)

Two different distribution characteristics – asymmetric wide light distribution and rotationally symmetrical wide light distribution – are available to fulfill lighting tasks.



CONSTELA LED

BREATH TAKINGLY
ATTRACTIVE AND
CLEVERLY CONFIGURED



The ConStela LED brings individuality and aesthetics to urban outdoor lighting. Planners and architects can rapidly and simply assemble the column with modular design using the TRILUX configurator. Selection can be made from various luminaire heads, spots as intermediate elements and supporting columns of various heights. The result is a custom-designed column for individual lighting solutions. Various light modules also mean the ConStela LED is very flexible – it can illuminate squares as well as emphasise individual objects. With all its diversity and flexibility, ConStela LED with its purist look represents an attractive and sophisticated design that upgrades urban environments both day and night with design and light effects.

Modular construction. Complete flexibility.

The modular system is the key: Supporting columns with various heights, various luminaire heads and the option of using flexibly adjustable spots create unique light columns. On request, TRILUX also offers further options for individualisation.

The TRILUX configurator.

The simplest way to achieve custom-designed light.

With the TRILUX configurator, individual modules are quickly combined to custom-designed columns.

No tools. No trouble.

It's quicker without tools: The spot elements are easily adjusted without tools.

Concise forms. Timeless design.

Its unique and purist look makes the ConStela LED's design timeless. It is the ideal solution for sophisticated outdoor settings.



Technical features:

- Luminaire luminous flux: 3200 lm, 4200 lm
- Connected load/efficiency: 49 W/up to 86 lm/W
- Service life: 50,000 (h) L80/B10
- Colour rendering/temperature: 730, 740
- Electrical version: ET, optional: LMS
- Dimensions: Ø 230 mm
- Protection rating/safety class/impact resistance: IP65/II
- Light distribution: rotationally symmetrical wide light distribution (RB)/asymmetrical wide light distribution (AB)

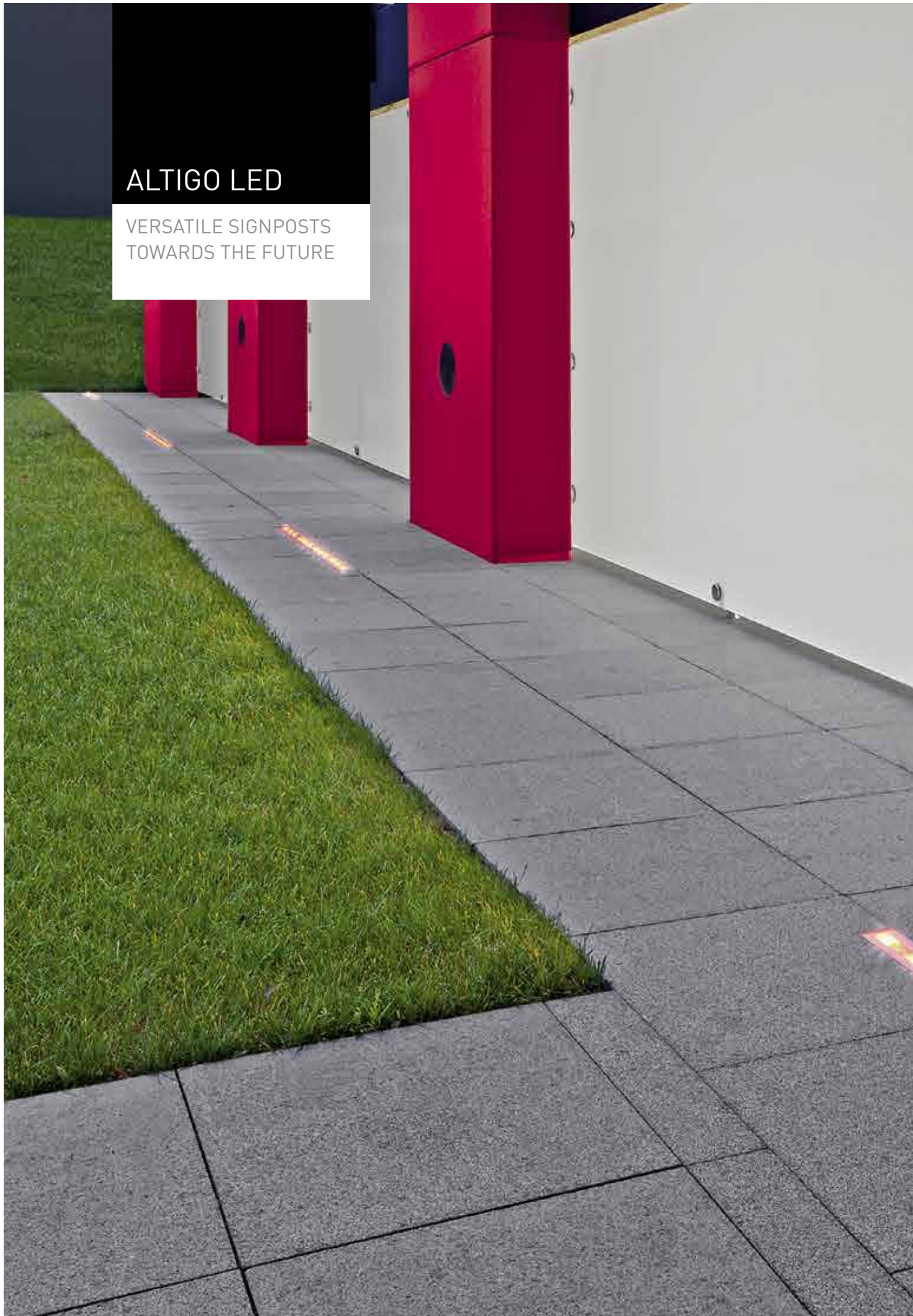
The basic luminaire head is variable in height (500 mm and 800 mm). The integration of a spot module between the stand profile and luminaire head enables additionally the illumination of objects out of the light column.

By combining the 8841 LED bollard luminaire with the ConStela Empor-luminaire head, a coherent and harmonious light concept can be created.



ALTIGO LED

VERSATILE SIGNPOSTS
TOWARDS THE FUTURE



Accent luminaires

The luminaires of the attractive Altigo family are slender and appealing and are installed flush into the ground, walls or ceilings. In such situations they set elegant accents with light. They have the flexibility to optimally integrate into their architectural surroundings and to fulfil a wide range of lighting tasks. They are optionally available with symmetric or asymmetric spot optics and are thus ideal for emphasising facades or objects. In terms of light colour as well the luminaires fulfil almost any need.

Flexible: Optional use in the ground, on walls or ceilings offers wide flexibility for design.

Tailor-made: The luminaires are optionally available with symmetric or asymmetric light distribution characteristic and white or coloured light.

Long-life: Maximum manufacturing quality and use of long-life materials ensure permanent value.

Simple and practical: The luminaire is fixed without tools into the mounting enclosure. Each module has the requisite disassembly key for easy removal.

Elegant: The luminaire appeals without flourishes, visible catches and covers.



Technical features:

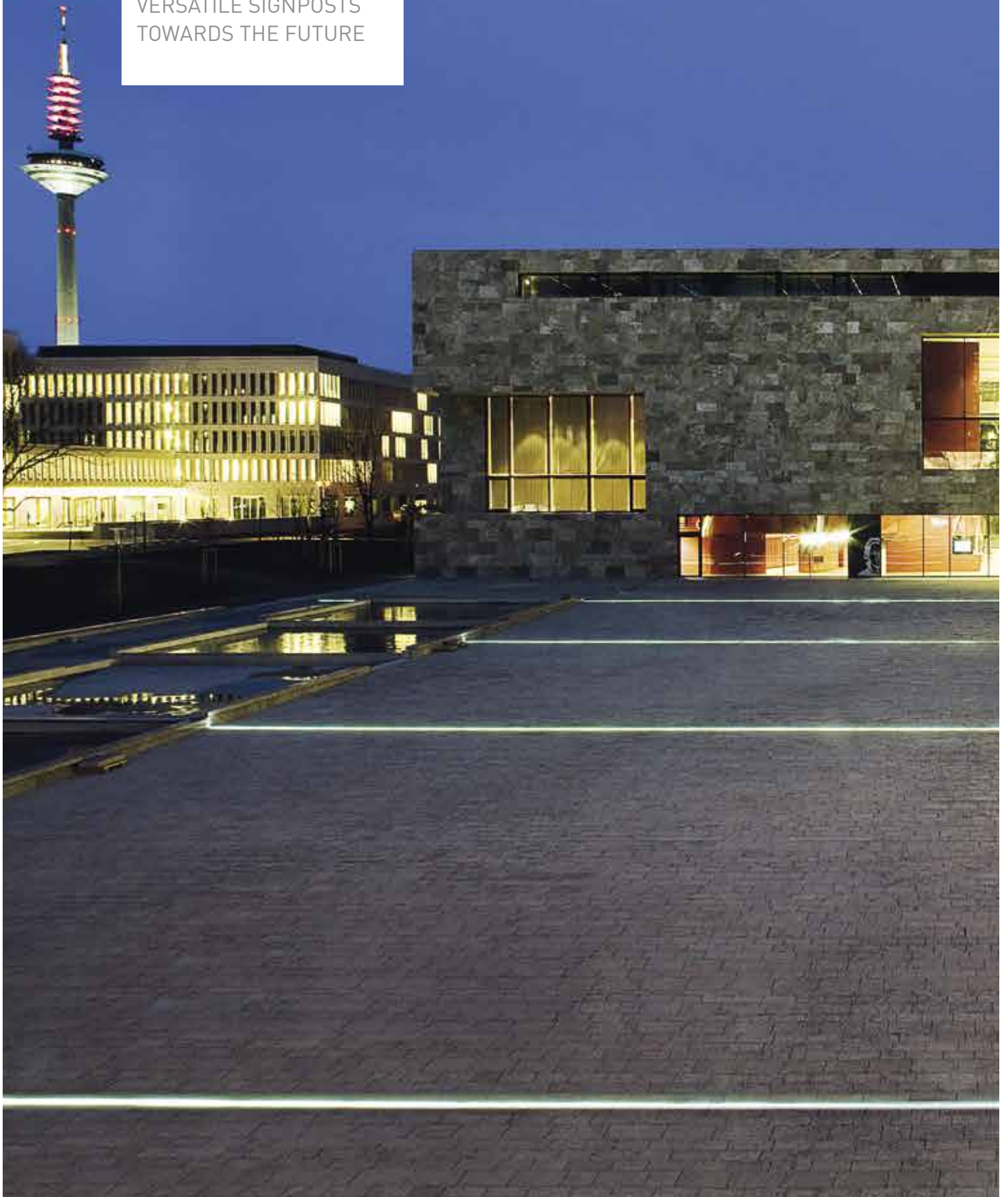
- Luminaire luminous flux: 20 lm to 1200 lm
- Connected load/efficiency: 4,5 W, 43 W/up to 30 lm/W
- Service life: 50,000 (h) L80/B10
- Colour rendering/temperature: 830
- Electrical version: ET, RGB
- Dimensions:
 - 300 x 64 x 100 mm (L x W x H)
 - 600 x 64 x 100 mm (L x W x H)
 - 1200 x 64 x 100 mm (L x W x H)
- Protection rating/safety class: IP67/III
- Light distribution: rotationally symmetrical wide light distribution (RB), asymmetrical wide light distribution (AB)

Flush recessing in the ground, walls or facades. Optionally symmetric or asymmetric light distribution characteristics and white or coloured light. Mounting enclosure with knockouts for drainage and connection purposes. Tool-free recessing of luminaire into housing with protection against simple removal. Disassembly is only possible with the help of the supplied tool.



ALTIGO LED

VERSATILE SIGNPOSTS
TOWARDS THE FUTURE



Light lines

The aesthetically appealing Altigo luminaire family sets elegant linear accents not only at ground level but also in walls. The diffuse distribution modules create a continuous light line, either in white or with RGB colours. Thanks to the high quality of design, the luminaires can be quickly and simply integrated into the architectural surroundings. Many practical features make installation easier.

Long-life: Maximum manufacturing quality and use of long-life materials ensure permanent value.

Simple, quick and secure: The luminaire is fixed without tools into a surface-mounted enclosure for facades, walls and ceilings.

One hand movement: The mounting enclosure has practical knockouts for drainage and connection purposes.

Elegant: The luminaire appeals without flourishes, visible catches and covers.

Continuous lines: When recessed in the ground, the optical impression of a continuous light line is created.



Technical features:

- Luminaire luminous flux: 20 lm to 1200 lm
- Connected load/efficiency: 4,5 W, 43 W/up to 30 lm/W
- Service life: 50,000 (h) L80/B10
- Colour rendering/temperature: 830
- Electrical version: ET, RGB
- Dimensions:
 - 300 x 64 x 100 mm (L x W x H)
 - 600 x 64 x 100 mm (L x W x H)
 - 1200 x 64 x 100 mm (L x W x H)
- Protection rating/safety class: IP67/III
- Light distribution: rotationally symmetrical wide light distribution (RB), asymmetrical wide light distribution (AB)

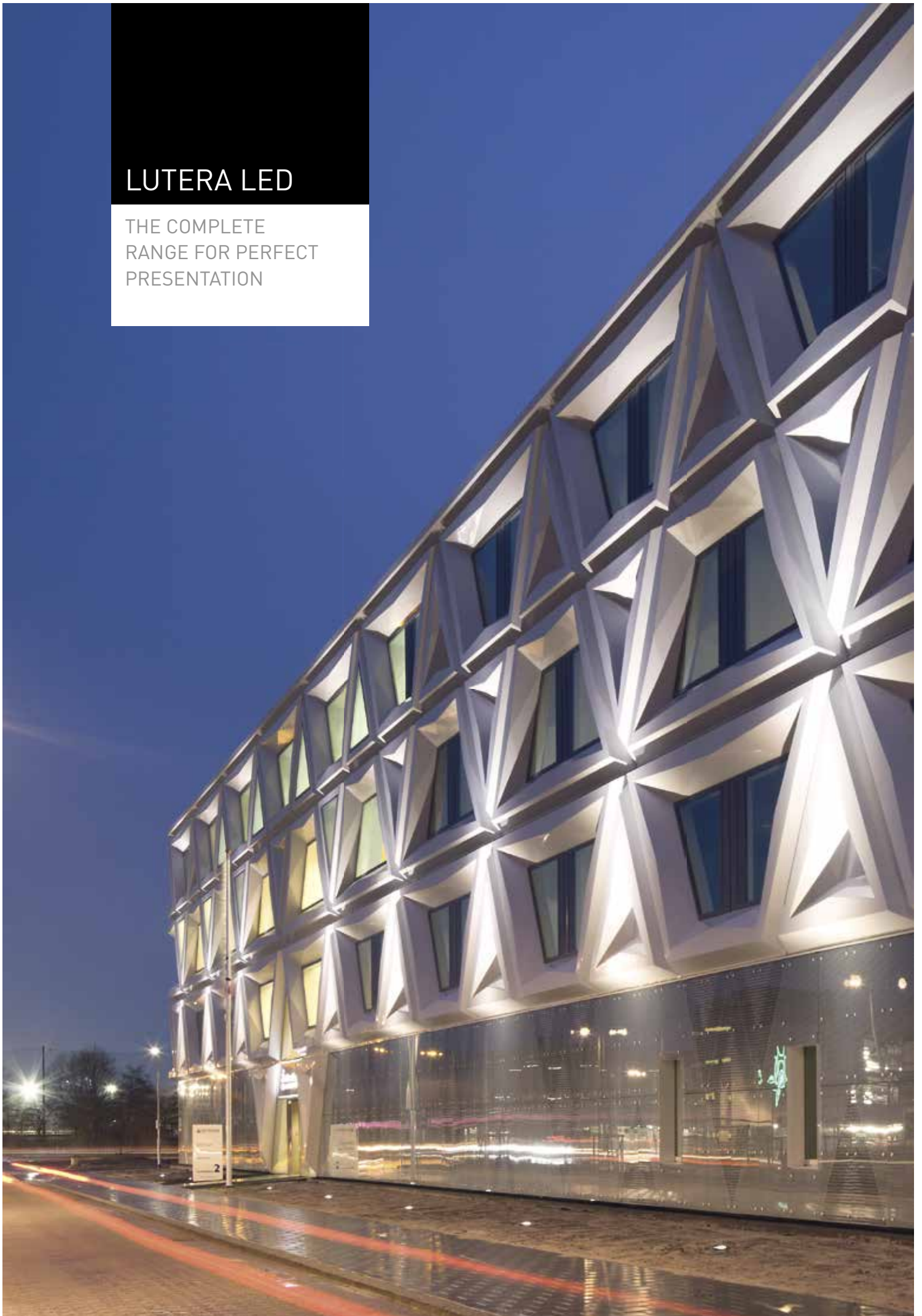
Flush recessing in the ground, walls or facades. Diffuse distribution. White or coloured light.

Mounting enclosure with knock-outs for drainage and connection purposes. Tool-free recessing of luminaire into housing with protection against simple removal. Disassembly is only possible with the help of the supplied tool.



LUTERA LED

THE COMPLETE
RANGE FOR PERFECT
PRESENTATION



Setting targeted light accents, illuminating surfaces and even excitingly displaying buildings – with the expanded Lutera LED portfolio the options range from very small to very large with the ground-recessed luminaires. The Lutera LED is available in three construction sizes with various light source options to create a very wide application range: new for example are the especially high-performance LED solutions that also attractively illuminate larger buildings and give lighting planners more design flexibility. With installation, all luminaires in the range are quite simple: the low recess depth predestines them for new applications both indoors and outdoors.

Perfect light. Well-grounded.

Three construction sizes, various light source options and new high-performance luminous flux packages enable wide planning flexibility for both indoors and outdoors.

The design. Functional aesthetics.

The Lutera LED represents functional and attractive light design for buildings and objects.

Long operating time. In extreme conditions.

The intelligent sealing concept guarantees long-term, disturbance-free operation even after long operating hours in extreme conditions.



Technical features:

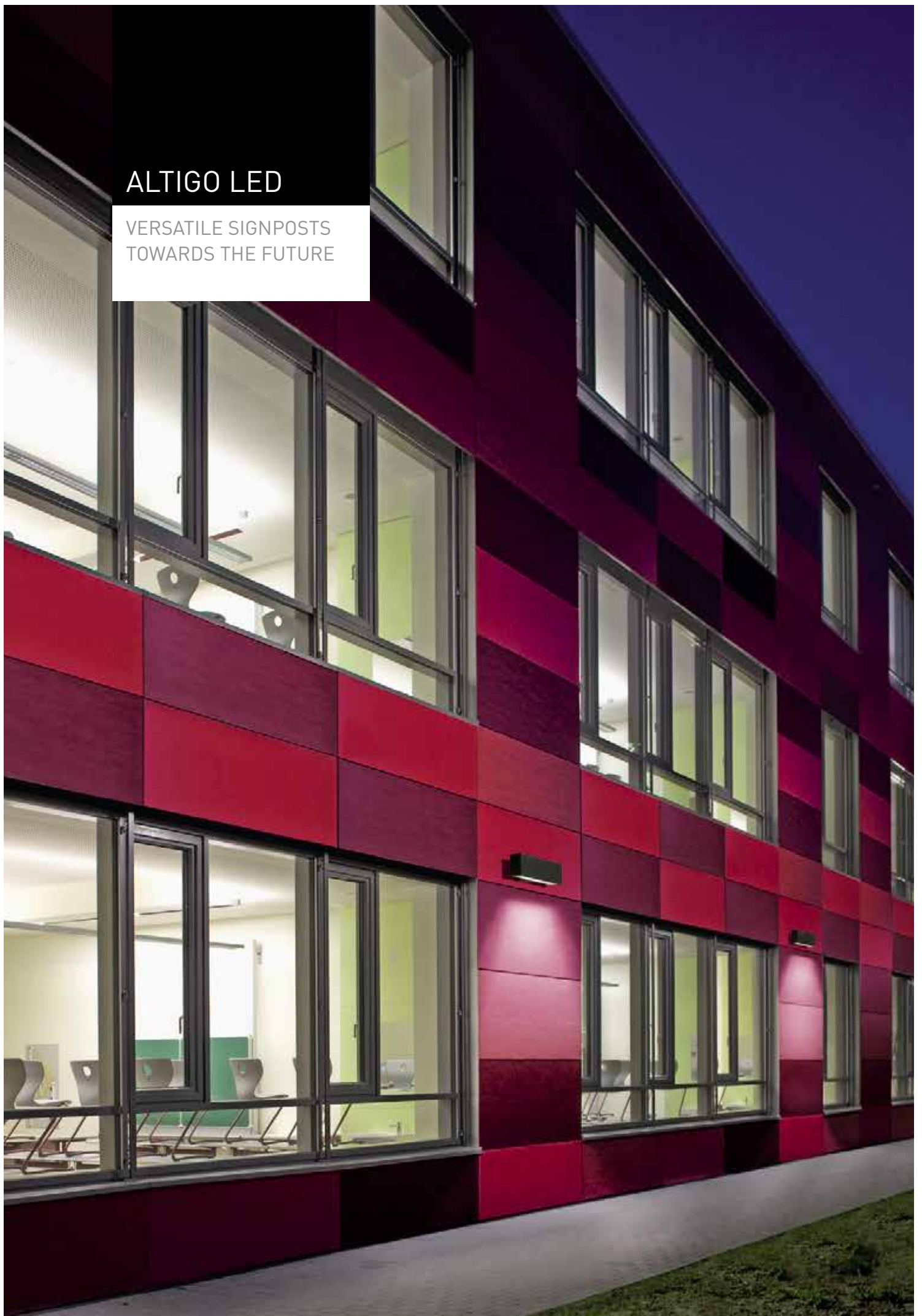
- Luminaire luminous flux: 200 lm, 300 lm, 600 lm, 900 lm, 1800 lm
- Connected load/efficiency: 4 W, 5 W, 12 W, 16 W, 17 W/ up to 75 lm/W
- Service life: 50,000 (h) L80/B10
- Colour rendering/temperature: 830, 840
- Electrical version: ET
- Dimensions: 95 x 95 x 88 mm (L x W x H)
- Protection rating/safety class: IP68/I
- Light distribution: rotationally symmetrical narrow light distribution (RE), rotationally symmetrical wide light distribution (RB)

Hermetically sealed junction box avoids humidity from getting into the luminaire. The LEDs reduce maintenance effort to a minimum. Lockable pivoting range of the light source for secure fixing of the adjustment. Stainless steel screws and stainless steel inserts in the cast part enable problem-free usage for decades.



ALTIGO LED

VERSATILE SIGNPOSTS
TOWARDS THE FUTURE



Wall and ceiling luminaires

Large, flexible and with a concise and attractive design: the linear Altigo luminaire family sets elegant accents not only at ground level but also on walls and ceilings. With their classic, purist design they blend optimally into their architectural surroundings. They also adapt outstandingly to a wide variety of applications due to their high optical flexibility. The targeted light control of the symmetric and asymmetric optics ensures efficient path and facade lighting. For effect lighting, either warm white LED or colour-definable RGB LED modules are available. This diversity of form and functionality within a unified design supplies architects and planners with wide design flexibility and also simplifies the harmonious implementation of larger lighting projects.

Flexible: Choice of use on wall, facade or ceiling ensures a wide application range.

Simple, quick and secure: The luminaire is fixed without tools into a surface-mounted enclosure for facades, walls and ceilings.

Long-life: Maximum manufacturing quality and use of long-life materials ensure permanent value.

Elegant: The luminaire appeals without flourishes, visible catches and covers. The concise, purist design with a sharp-edged, cubic profile typifies the luminaire.



Technical features:

- Luminaire luminous flux: 20 lm to 1200 lm
- Connected load/efficiency: 4,5 W, 43 W/up to 30 lm/W
- Service life: 50,000 (h) L80/B10
- Colour rendering/temperature: 830
- Electrical version: ET
- Dimensions:
 - ceiling: 340 (640, 1240) x 70 x 115 mm (L x W x H)
 - wall: 340 x 90 x 110 mm (L x W x H)
 - wall: 360 x 90 x 110 mm (L x W x H)
- Protection rating/safety class: IP67/I
- Light distribution: rotationally symmetrical wide light distribution (RB), asymmetrical wide light distribution (AB)

A clear, reduced design language with a sharp-edged, cubic profile. Simple wall fixing via die-cast wall brackets. The luminaire can be inserted into the housing without tools and is protected against simple removal. Disassembly is only possible with the help of the provided tool. Altigo WT will be delivered with asymmetric optics, optionally for illuminating sign posts or paths in front of it.



SKEO-C LED

TIMELESS CHARM
WITH AN EFFICIENT
CHARACTER



Cylindrical wall luminaire

Finding the right form for attractive and efficient facade lighting is simple: the Skeo-C cylindrical wall luminaire unites timeless design with state-of-the-art LED technology. The result is highly noticeable facade lighting with high efficiency and a unique character: A large selection of light distribution characteristics means wide flexibility for the wall luminaire. Mounting is very quick thanks to Plug & Play.

Simplicity itself: Mounting the luminaire is simple and safe via electrical connection on the wall plate.

Economic: With energy consumption, the cylinder wall luminaire is very modest and supplies appealing light around the building with optimised optics.

Long-life: With its harmonious aluminium profile and the precisely machined cover components, the luminaire is suitable for long-term use in outdoor applications.

Accentuating: The soft light contour at the end of the tube is an attractive eye-catcher and also makes the cylinder recognisable as a luminaire.

Adaptable: The wall luminaire can be flexibly used for supporting the architectural concept thanks to a wide selection of light distribution characteristics.



Technical features:

- Luminaire luminous flux: 800 lm to 1700 lm
- Connected load/efficiency: 15 W, 30 W/up to 57 lm/W
- Service life: 50,000 (h) L80/B10
- Colour rendering/temperature: 830
- Electrical version: ET
- Dimensions: 270 x 270 x 423 mm (L x W x H)
- Protection rating/safety class: IP67/I
- Light distribution: direct light distribution (D), direct-indirect light distribution (DI)

Plug & Play: Simple mounting via connection terminal on the mounting plate and wireless blade contacts between mounting plate and luminaire body.

The laterally frosted light emission surfaces generate a soft light contour.



SKEO-P LED

LIGHT, DESIGN AND
EFFICIENCY:
THE THREE SIDES OF
PERFECTION



Prismatic wall luminaire

For representative facade illumination outdoors, the Skeo-P prismatic wall luminaire is the perfect choice. In terms of cross-section it has the classic discreet design of an equilateral triangle. With many specification options for light distribution characteristics, light emission and inclination angle to the facade, it provides high design flexibility for stylishly illuminating facades. An optical highlight is the discreet light contour in the form of an equilateral triangle at the luminaire end. Installation is simple and quick thanks to Plug & Play.

Simple: Electrical connections are located on the wall plate. This makes mounting very quick, simple and safe.

Accentuating: The soft light contour at the light emission of the prism is an unmistakable component of the luminaire and additionally supports the effect on the facade.

Versatile: The wall luminaire can be flexibly used for supporting the architectural concept thanks to a wide selection of light distribution characteristics.

Highly resistant: With its dominating triangular profile and the precisely machined cover components, the luminaire is suitable for long-term use in outdoor applications.

Economic: With energy consumption, Skeo is very modest and supplies attractive light onto the building with optimised optics.



Technical features:

- Luminaire luminous flux: 800 lm to 1700 lm
- Connected load/efficiency: 15 W, 30 W/up to 57 lm/W
- Service life: 50,000 (h) L80/B10
- Colour rendering/temperature: 830
- Electrical version: ET
- Dimensions: 234 x 200 x 423 mm (L x W x H)
- Protection rating/safety class: IP67/I
- Light distribution: direct light distribution (D), direct-indirect light distribution (DI)

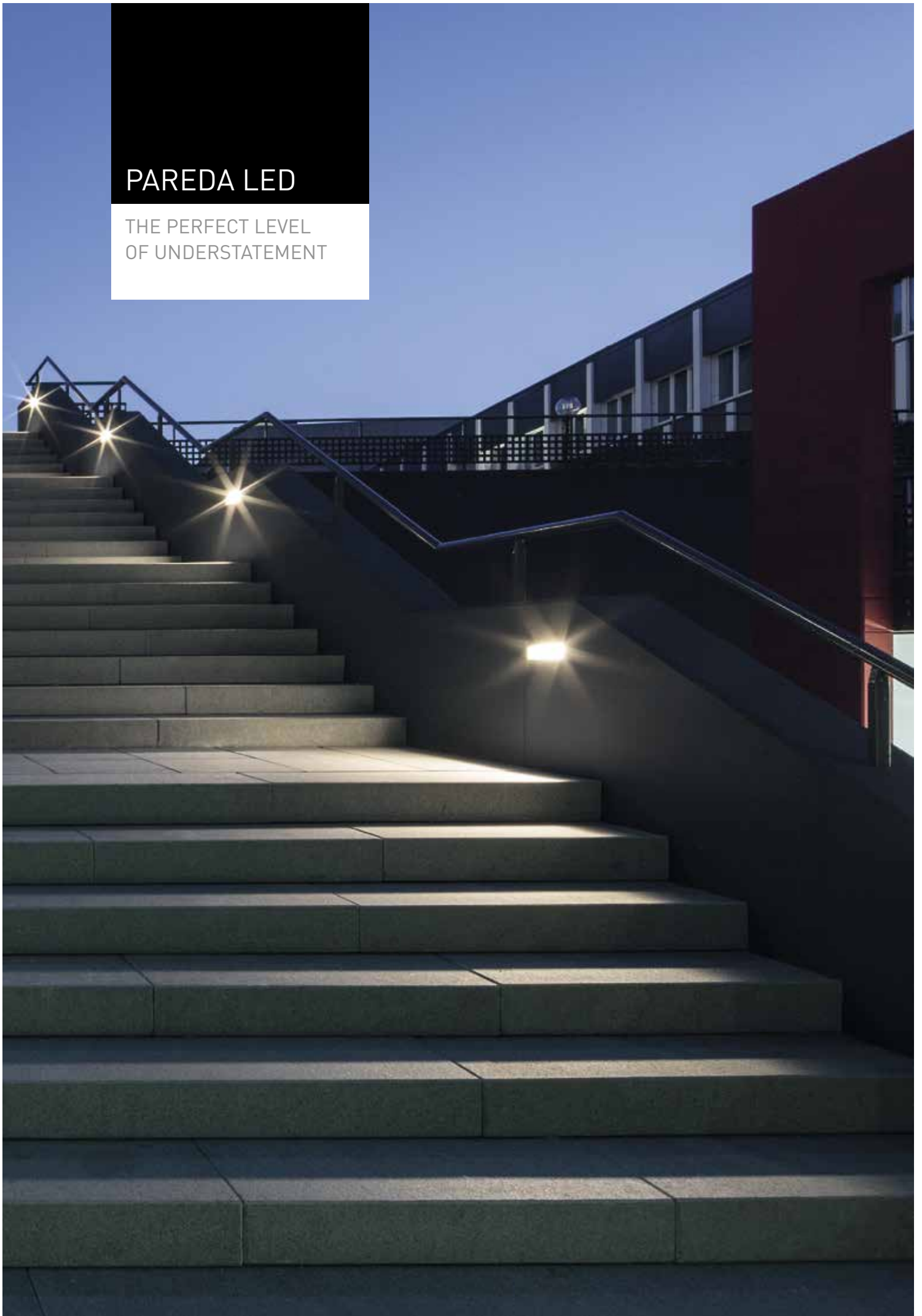
Plug & Play: Simple mounting via connection terminal on the mounting plate and wireless blade contacts between mounting plate and luminaire body.

The laterally frosted light emission surfaces create a soft and attractive light contour.



PAREDA LED

THE PERFECT LEVEL
OF UNDERSTATEMENT



The Pareda recessed wall luminaire with its classic, timeless design is suitable for architecturally sophisticated lighting of entrance areas, steps and ramps both indoors and outdoors. It can be mounted either flush to the wall or with raised frame, and is available in various sizes for flexible adaptation to a wide range of lighting tasks. With its high protection rating and very durable materials, the Pareda LED is ideal for continuous use in tough weather conditions.

Universal: With two different construction sizes and various recessing versions, the luminaire offers a wide spectrum of applications for flexible design arrangements according to specific lighting tasks.

Practical: The matching system of mounting enclosure and recessed luminaire provides flexibility in all construction phases.

Classic: The well-balanced housing design has a timeless appearance.

Trouble-free: Maximum manufacturing quality, the use of long-life materials and almost complete freedom of maintenance ensure permanent value.



Technical features:

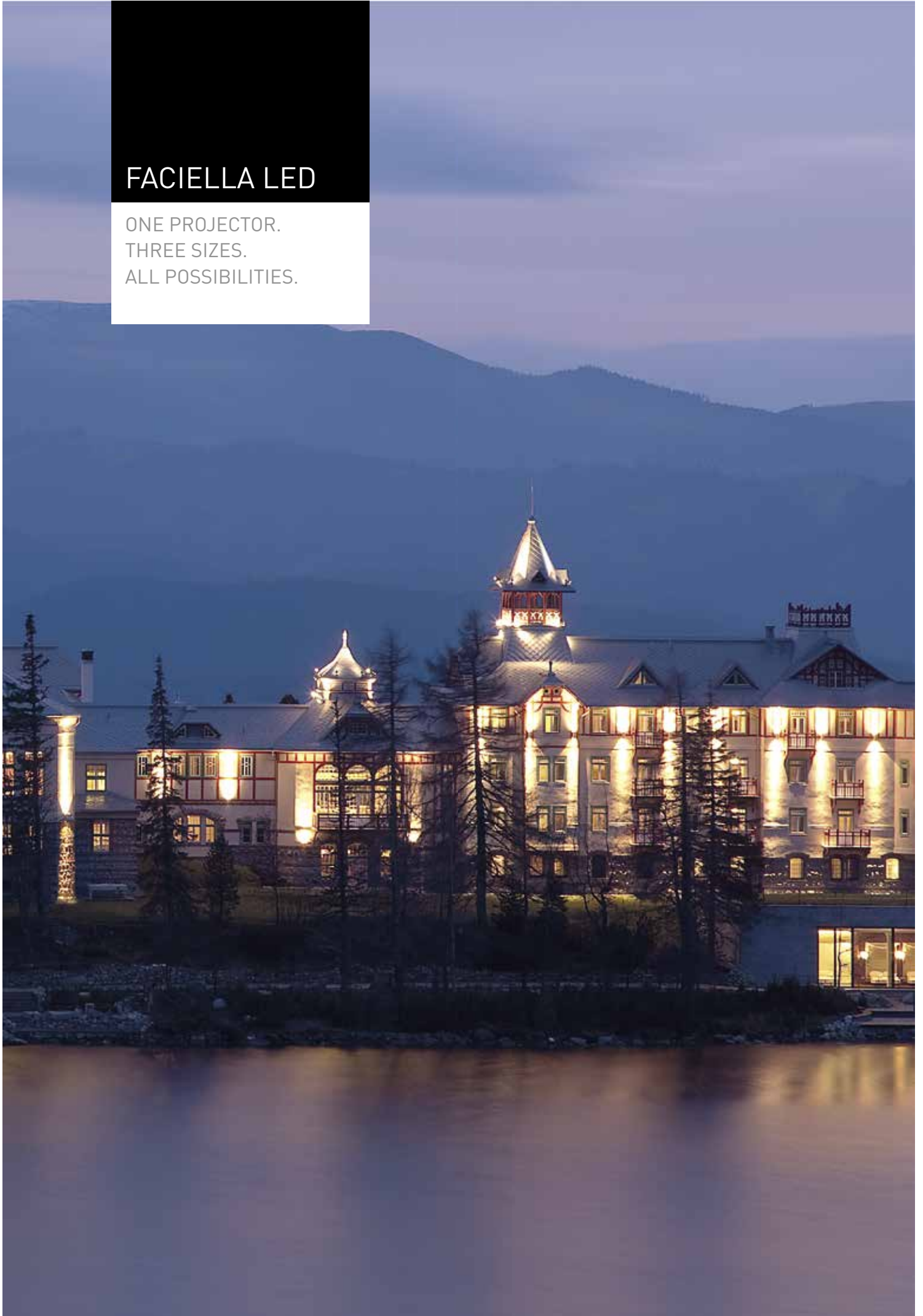
- Luminaire luminous flux: 30 lm, 100 lm
- Connected load/efficiency: 3 W, 6 W/up to 16 lm/W
- Service life: 50,000 (h) L80/B10
- Colour rendering/temperature: 830
- Electrical version: ET
- Dimensions:
 - Pareda R: 250 x 136 x 105 mm (L x W x H)
 - Pareda S: 105 x 116 x 105 mm (L x W x H)
- Protection rating/safety class: IP65/I
- Light distribution: direct light distribution (D)

The Pareda LED can be installed flush into the wall to achieve a smooth appearance. Alternatively a version with raised frame is available that is perfectly suitable especially for rough wall surfaces.



FACIELLA LED

ONE PROJECTOR.
THREE SIZES.
ALL POSSIBILITIES.



Highlighting objects, surfaces and buildings – with Faciella LED the path to perfect light is easier than ever before. Completely different lighting tasks can be solved with a uniform design. The high-performance and energy-efficient projector is available in several construction sizes and with various luminous flux packages and beam angles for flexible use. The manually adjustable inclination angle simplifies precise targeting of the projector.

Three construction sizes. A single design.

The Faciella LED projector is available in three construction sizes to effortlessly illuminate objects, surfaces and buildings of various types and sizes.

Customised light.

Various luminous flux packages and beam angles enable solving different lighting tasks to emphasise the most attractive features of architecture.

Simple mounting. Minimum effort.

The Faciella LED is supplied with a ready-to-connect luminaire cable so there is no need to open the luminaire while mounting it. This simplifies and accelerates the installation process.



Technical features:

- Luminaire luminous flux: 220 lm, 650 lm, 2600 lm, 3800 lm
- Connected load/efficiency: 7 W, 12 W, 42 W, 45 W/up to 84 lm/W
- Service life: 50,000 (h) L80/B10
- Colour rendering/temperature: 830, 840
- Electrical version: E, ET, RGB
- Dimensions:
 - Faciella 08: 165 x 66 x 80 mm (L x W x H),
 - Faciella 15: 236 x 147 x 147 mm (L x W x H),
 - Faciella 20: 300 x 200 x 200 mm (L x W x H)
- Protection rating/safety class: IP65/II
- Light distribution: rotationally symmetrical very narrow light distribution (RT), rotationally symmetrical narrow light distribution (RE), rotationally symmetrical medium-wide light distribution (RM), rotationally symmetrical wide light distribution (RB)

Movable inclination angle is adjustable via only one screw.

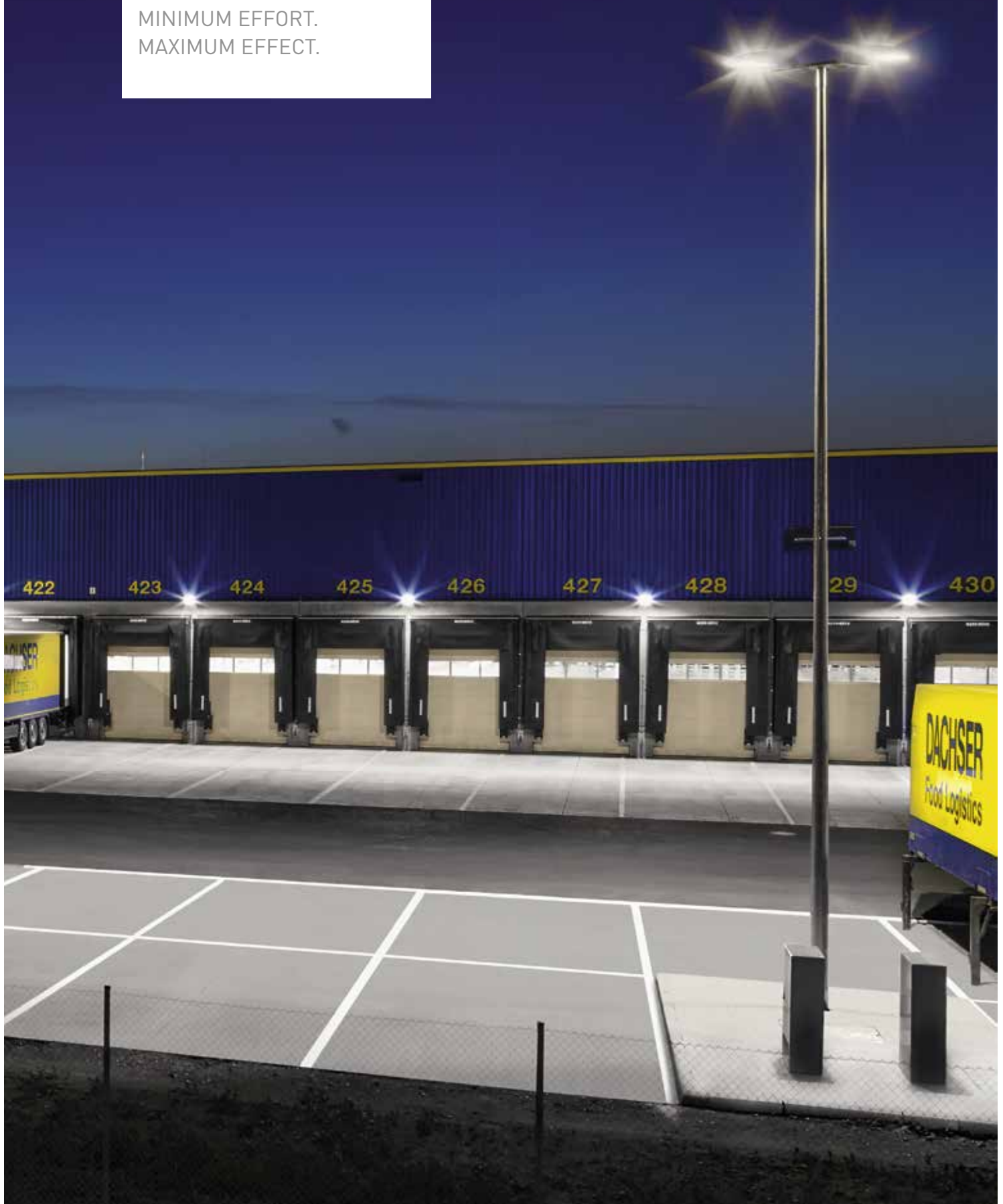


Low installation effort – the luminaire is directly delivered with cable connection.



LUMENA STAR LED

MINIMUM EFFORT.
MAXIMUM EFFECT.



Ranging from open space to facade illumination: The Lumena Star LED adapts perfectly to its specific application area. Also existing, inefficient spotlight systems can be rapidly and simply replaced with the Lumena Star LED as existing posts and connections can be used 1:1, meaning that upgrading has minimum effort in terms of time and costs. Thanks to high energy savings of up to 40 %, long service life and low maintenance effort, the Lumena Star LED is amortised in a very short time period. The light quality is very high thanks to innovative specular optics with a pleasant, glare-free light.

One spotlight. Many options.

The Lumena Star LED adapts to its specific application due to various power levels and luminous flux packages of 12,000 to 24,000 lm, ranging from open spaces to facade illumination.

Simple upgrading. Rapid savings.

Compared to a standard lighting system, the Lumena Star LED enables significant energy savings of up to 40 %. To make upgrading even easier, existing connections and posts can be used without problems.

Maximum efficiency. For low operating costs.

The Lumena Star LED combines high energy efficiency with a long service life and low maintenance effort. Optional features such as power reduction and light management systems provide further energy-saving potential.

Innovative technology. Outstanding light quality.

Pleasant, glare-free and without disturbing light spill: With its innovative specular optic the Lumena Star guarantees excellent light quality.



Technical features:

- Luminaire luminous flux: 12,000 lm to 24,000 lm
- Connected load/efficiency: 125 W, 265 W/up to 90 lm/W
- Service life: 50,000 (h) L80/B10 at tq 35°
- Colour rendering/temperature: 740, 650
- Electrical version: LR, LRA, ET, optional: LMS
- Dimensions: 670 x 448 x 160 mm (L x W x H)
- Protection rating/safety class: IP66/I
- Light distribution: asymmetrical medium-wide light distribution (AM)





LIGHT MANAGEMENT

ENERGY SAVING
HUMAN CENTRIC LIGHTING

Because light management can simply do more

Light management is often associated with high-effort installations and complex electronic controls. This is an erroneous assumption since modern light management systems are not only easy to operate but also maximise light comfort and minimise energy costs.

Energy savings

Both spatial conditions as well as personal requirements are relevant for lighting. In the end though, various factors define individually suitable light management systems. Dimming, daylight-dependent control, simple maintenance as well as presence- or time-depending switching provide a wide spectrum of saving options. Intelligent luminaires equipped with sensors not only simplify installation but are also immediately ready for operation. In addition, light management systems can be integrated into existing building controls. In larger building complexes they enable completely new lighting options. If daylight and presence detection sensors are used, light management systems reduce operating costs by up to 85 % starting from installation.

Human Centric Lighting

In addition to the demand for higher energy efficiency, the stimulating effect of daylight is also focused on. Medical findings show that the biorhythm and therefore further life functions of humans can significantly be influenced by light. It therefore makes sense to adopt daylight as an example for the artificial lighting of our modern living environments. In particular, the blue component of light, i.e. the colour of the sky has proved to be our synchroniser. Modern light management systems use these findings and specifically control the various light components of lighting to noticeably achieve more attention and well-being.

Using light management systems not only pays off financially. The human well-being can also be increased with specific forms of lighting. Large, poorly illuminated areas such as car parks or open-plan offices are both safety risks and fear zones. Intelligent lighting prevents unnecessary dark zones and provides safety in a preventative way. This is only one possibility to increase the well-being of customers and employees. Light management systems are also suitable for accenting and displaying. They create appealing atmospheres in sales outlets that influence customers emotionally and therefore also have a sales-promoting effect.

TRILUX Services

TRILUX provides simple, room-related solutions with the applications Office, Education, Industry, Shop & Retail and Health & Care and also offers complete solutions for central monitoring and control in outdoor applications. These systems, often directly integrated in luminaires, are simply and effortlessly installed for immediate operation. Optional networking of the systems simply increases comfort as well as the feeling of safety. Integration into existing building control systems is also easily carried out. TRILUX gladly provides you with wide-ranging support, from consultation and project planning to commissioning.



OFFICE

LIGHT MANAGEMENT

In addition to the increasing requirement for an atmosphere of well-being in offices, light quality is of course also focused on, and connected with this, energy consumption as well. We provide not only maximum lighting efficiency with our innovative light solutions but due to the use of light management systems also minimum energy consumption. In addition, intelligent networking of the systems avoids dark zones and light islands especially in open-plan offices, so that the well-being of employees is not only improved but safety is increased as well.

Offices

- Energy savings via daylight-dependent control and presence detection
- Simple mounting as the system is integrated in the luminaires ready for connection
- Simple operation via push button or remote control
- Networking of several systems for the common control of larger areas
- No dark zones or light islands due to homogeneous basic lighting in non-occupied work areas
- Simple integration into higher-level building management systems



EDUCATION

LIGHT MANAGEMENT

To be receptive to information, people need to concentrate. And a sense of well-being is needed for concentration. Well-being requires pleasant surroundings and lighting as well. Today though, lighting systems in schools not only have to ensure a pleasant atmosphere but must also be energy-efficient.

Light comfort can be increased by using modern light management systems, which in turn reduce energy consumption. The consequence is lower operating costs.

Classrooms

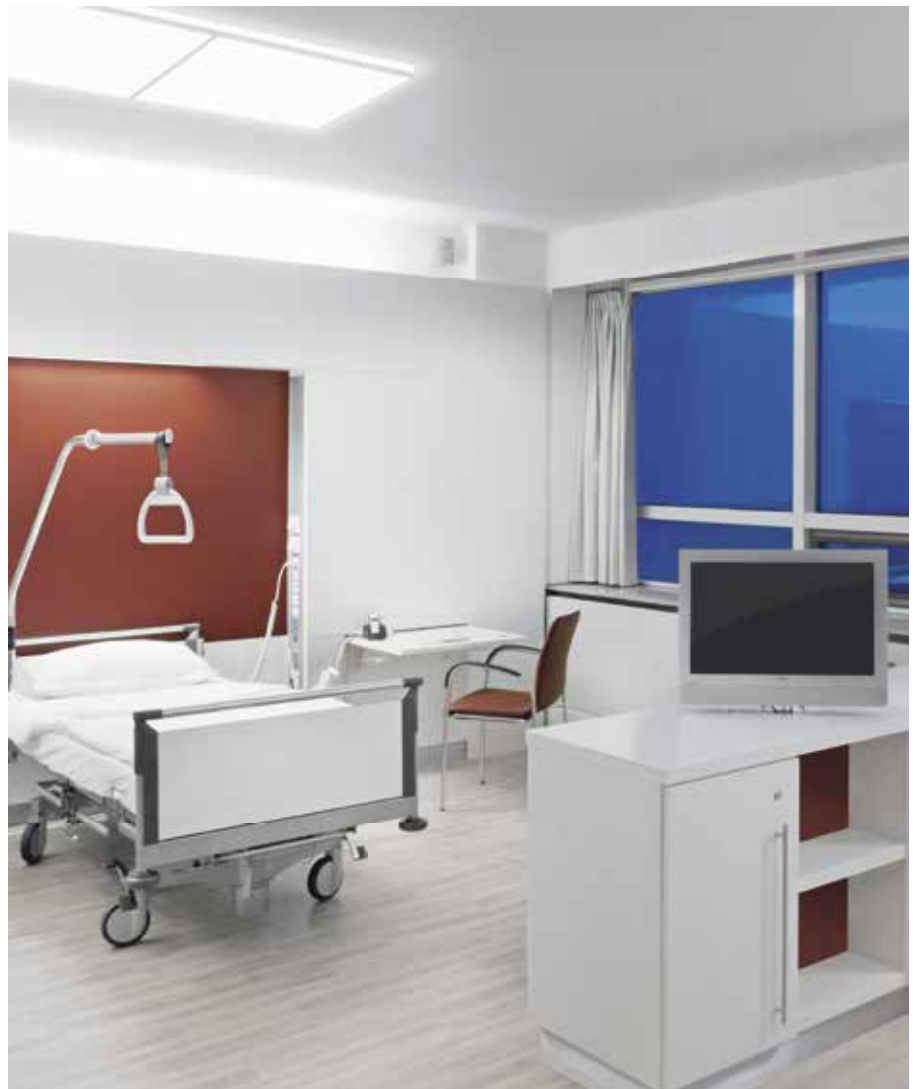
- Energy savings via daylight-dependent control and presence detection
- Simple mounting as the system is integrated in the luminaires ready for connection
- Separate control of room and blackboard lighting via push-button
- Optional automatic (via motion) or manual activation of room lighting when a classroom is entered.
- Automatic deactivation of the complete lighting system as well as room and blackboard lighting with absence
- Simple integration into higher-level building management systems



Suitable, individual lighting concepts have very high importance especially in the health sector. These help personnel in their daily work, patients with recovery and also the clinic in sustainably improving efficiency. A part of this is biologically effective lighting that dynamically adapts its light intensity and light colour according to daylight. This increases not only comfort but also the sense of well-being and promotes the healing process. Thus, it creates optimal surroundings for patients and hospital personnel. This can be optionally combined with RGB ambience lighting, individually adjustable by patients according to their personal desires and sensibilities.

Patient rooms

- Individual and health-promoting light control for patients and personnel
- Biologically effective lighting that adapts light intensity and light colour automatically to the natural day-night rhythm via an integrated controller
- Emergency button (for examinations or emergencies) interrupts the daytime sequence and makes full lighting available



Intensive care rooms

- Individual and health-promoting light control for patients and personnel
- White/white control with light intensity and light colour that can be set individually according to patients' needs
- Central switching of lighting scenes for examination light, indirect room light and RGB ambience light



Energy efficiency is an essential topic in the industrial sector. In factories, the power consumption of lighting accounts for an average of around 15 % of total energy requirements, in warehouses, consumptions are even up to 80 %. By combining energy-efficient luminaires with light management systems, not only comfort is increased but real money is saved.

Production halls and warehouses

- Energy savings via daylight-dependent control and presence detection
- Ready-to-connect integration of the system in sensor modules for flexible positioning and simple installation
- Installation heights up to 15 m
- Networking of several modules for the common control of larger areas
- No dark zones due to adjustable basic lighting with absence
- Simple integration into higher-level building management systems



Car parks

- Energy savings via presence-dependent switching of lighting
- Additional savings due to adjustable threshold values
- Ready-to-connect integration of the system in the luminaire
- Installation heights up to 10 m
- Networking of several systems for the common monitoring of larger areas
- Increased safety due to adjustable basic lighting with absence



OUTDOOR

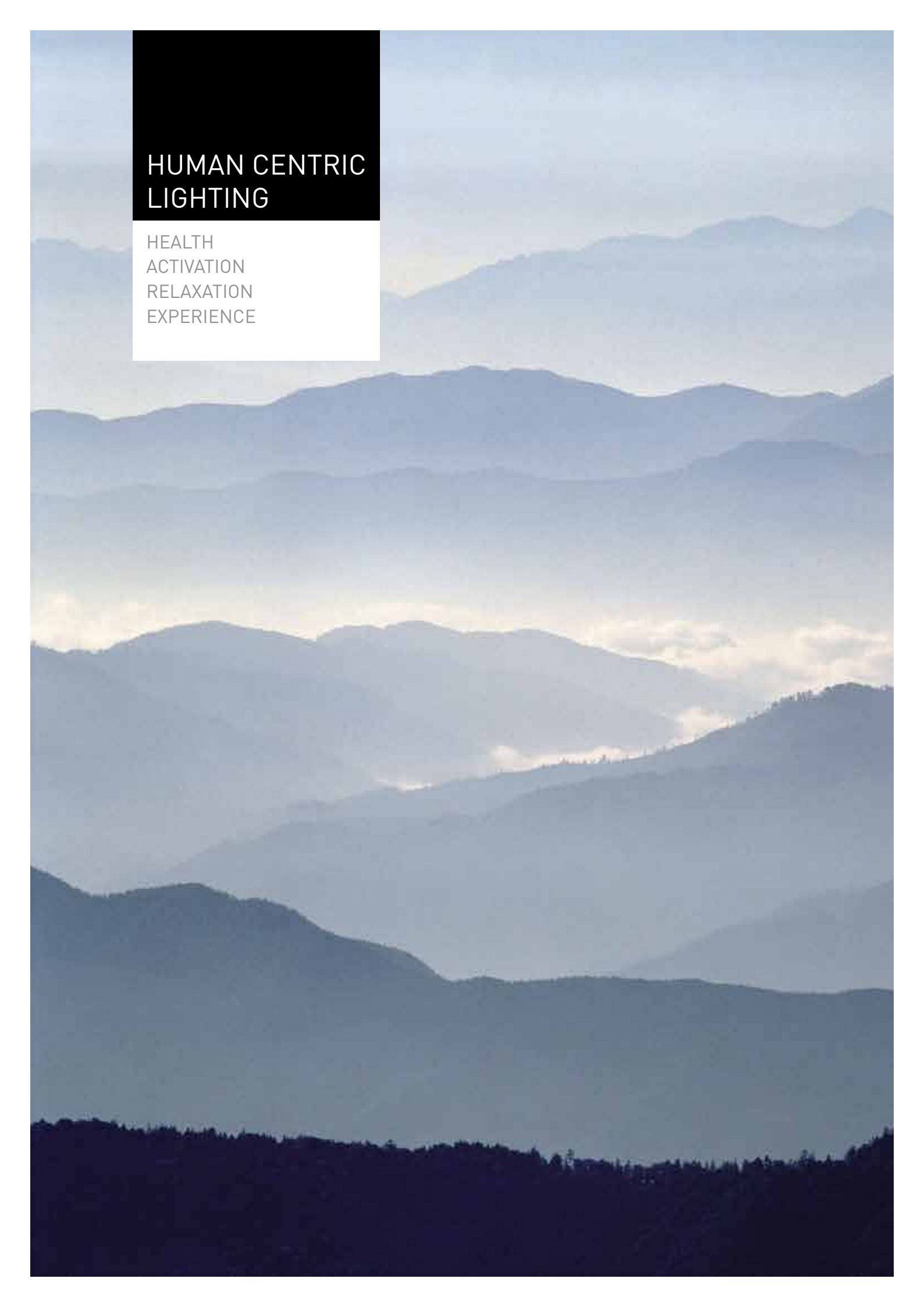
LIGHT MANAGEMENT

Application possibilities for intelligent light management systems outdoors are highly diverse, increasing not only comfort and safety but also simultaneously reducing energy consumption. Controlling the lighting is always possible via remote access. The rapid, simple response to unpredicted events is possible. Luminaire-integrated brightness and motion sensors also enable the flexible modification of lighting and significantly increase safety. A wide variety of operating parameters can be remotely monitored. Maintaining the lighting system can optimally be planned, thus reducing costs.

Car parks

- Energy saving due to flexible adaptation of the lighting system via brightness and motion sensors as well as centrally saved dimming scenes
- Operation and monitoring of single luminaires or luminaire groups via radio (PC or tablet)
- Display of operating parameters and energy consumption
- Clear display of luminaires according to geographical data



The background of the entire page is a photograph of a vast mountain range. The mountains are layered, creating a sense of depth. The sky is a pale, hazy blue, and there are some wispy clouds. The overall color palette is cool and muted, with various shades of blue and grey. In the foreground, the dark silhouette of a forested ridge is visible.

HUMAN CENTRIC LIGHTING

HEALTH
ACTIVATION
RELAXATION
EXPERIENCE

Simply getting the biological rhythm going

TRILUX is analysing the effect of light on people as defined by the term Human Centric Lighting. According to a current survey by ZVEI and A.T. Kearney, Human Centric Lighting is one of the future-relevant topics for the European lighting sector. The approach goes beyond standard system design focusing only on lighting and energy efficiency criteria. It's mainly about the effect of light on human well-being and health, and biologically effective light is a part of this.

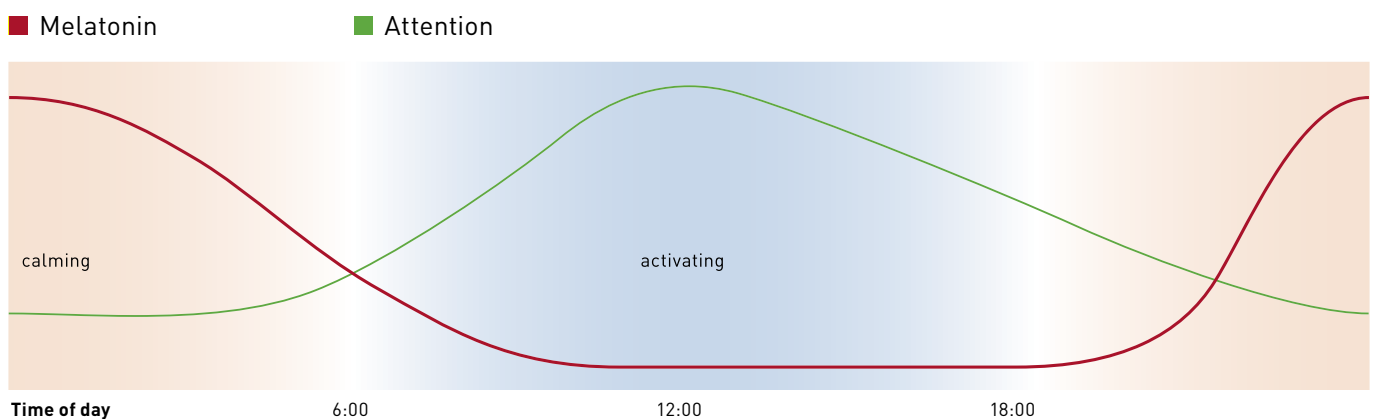
The inner clock of humans has always been characterised by natural light that regulates the daily course of all living organisms. Daylight increases the level of human activity which then reduces during darkness. Afterwards the body changes over to a relaxed sleeping phase. Biologically effective lighting simulates this natural process. Modern LED lighting systems, individually programmed or preset, take on this task. With various dynamic spectral components and illuminance levels, they imitate the course of the day and stimulate body responses.

The positive influence of light

Light with a high spectral blue component activates and increases the capability for performance and concentration. If this blue component in light decreases, the body relaxes and changes over to a calm phase. White/white control offers further positive effects on the human biological rhythm. It is able to improve motivation, the ability to concentrate and therefore productivity as well, and provides ideal support with intellectual tasks.

The right light at the right time

The use of Human Centric Lighting is not only suitable for the medical-therapeutic sector, but also for office and industrial areas. It is however only competent lighting design that enables the optimal utilisation of these intelligent lighting solutions. TRILUX provides this service, and in addition to the spatial conditions also takes into account the type of use. It is then decided which lighting is actually needed and what the light must achieve. This guarantees individual lighting solutions that are able to adapt according to human requirements and supply the right light at the right time.



Required artificial light is mixed of warm white (3,000 K) and daylight white (6,500 K) light sources according to the time of day.

HUMAN CENTRIC LIGHTING

HEALTH
ACTIVATION
RELAXATION
EXPERIENCE



Left: 6500 K, right: 3000 K

TRILUX Active luminaires

With Active luminaires, TRILUX bridges across to the future topic of “Human Centric Lighting” to bring biologically effective light into a wide range of sectors (e.g. Health & Care, Office or Education). For example: recessed and surface-mounted luminaires with wide-area light for patient rooms, offices and classrooms, or surface-mounted luminaires and downlights for traffic zones and social areas.

TRILUX Active luminaires are equipped both with warm white (3000 K) and cool white (6500 K) LEDs. This design enables the individual selection of desired colour mixes in combination with white/white controls as well as the use of controls for biologically effective lighting that automatically simulates the daytime sequence using light intensity and light colour.



Belviso Active



Liventy Active



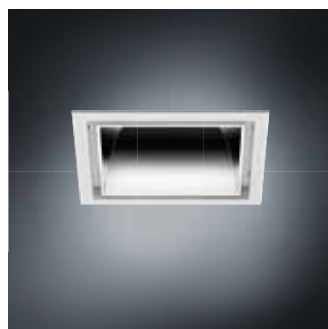
Acuro Active



Sanesca Active



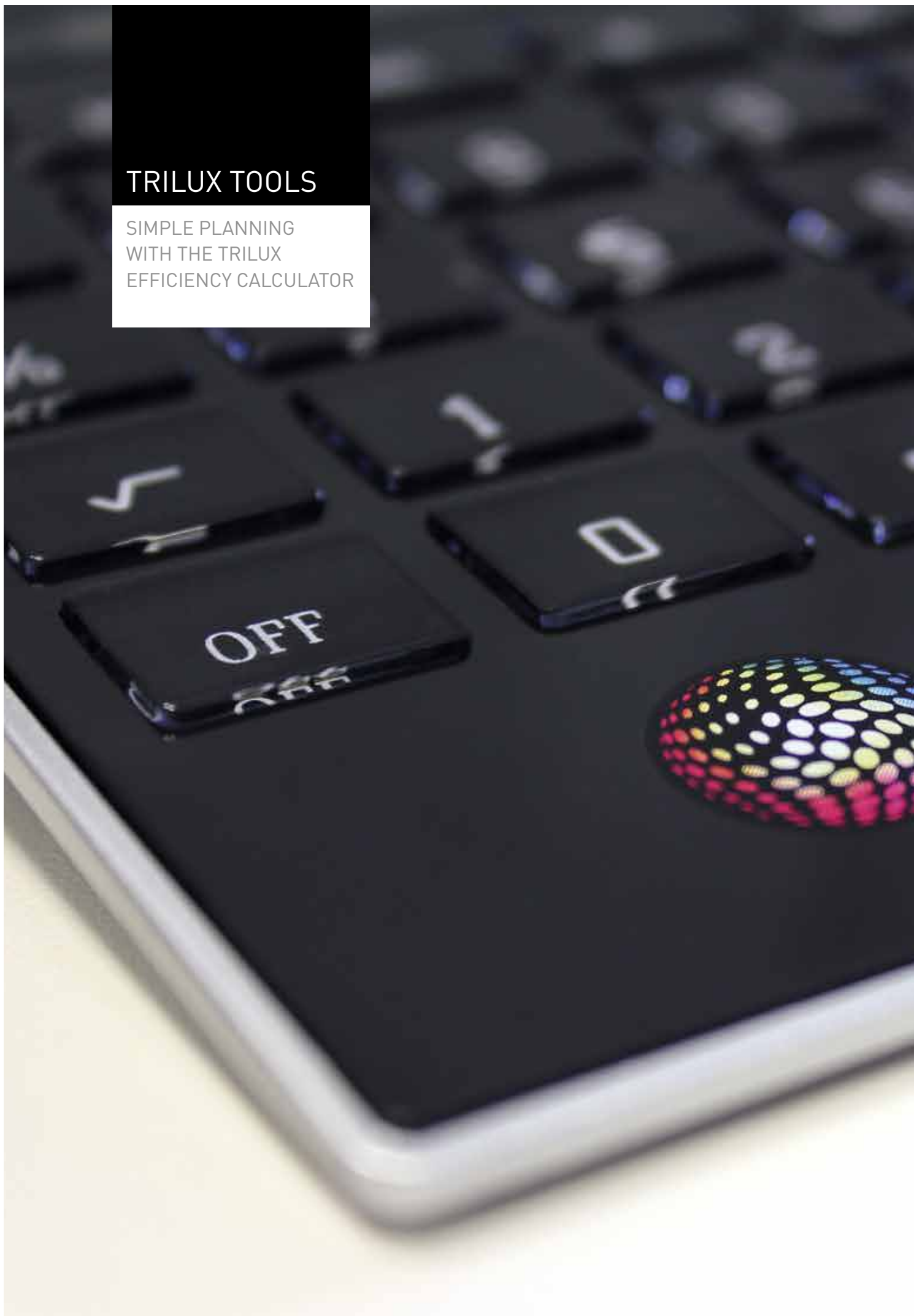
Inperla Ligra Plus Active



Athenik Ligra Plus Active

TRILUX TOOLS

SIMPLE PLANNING
WITH THE TRILUX
EFFICIENCY CALCULATOR



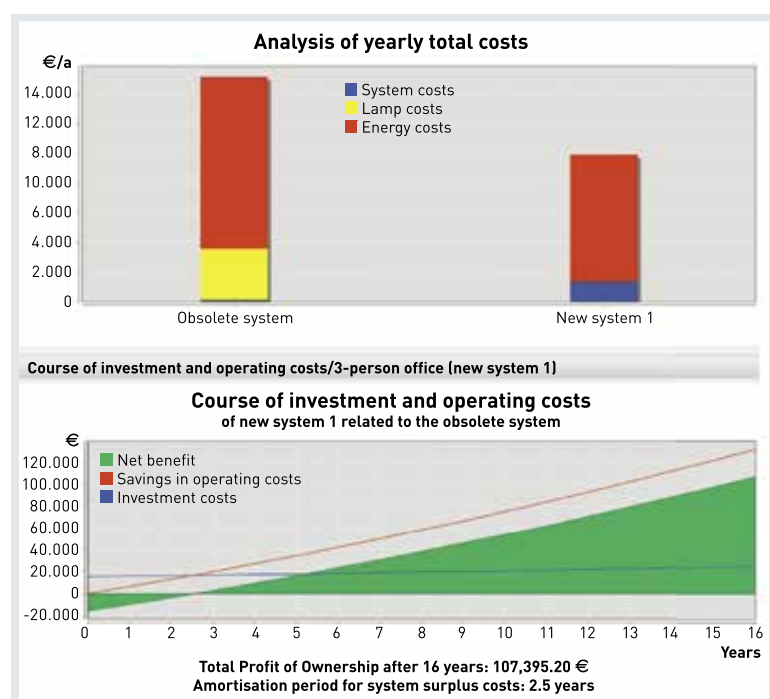
With the efficiency calculator, TRILUX provides a tool to compare the economy of up to five lighting systems. The savings potential of new systems can be determined and documented most easily. For example, the efficiency calculator calculates the amortisation period of a new system with LED lighting. Also the profit achieved via savings higher than the investment during the complete system service life can be calculated.

Analysis and graphic processing

For calculation purposes, all economically relevant parameters are entered into a clear input screen. Luminaire, system and utilisation data are taken into account as well as system, lamp, maintenance and energy costs. Connection to the TRILUX online catalogue ensures that product data is always up-to-date. Clear graphics of the results, e.g. the analysis of yearly total costs or the development of investment and operating costs make it understandable at first glance.

Easy use of data

Calculation results are summarised in easily understandable tables to provide customer-specific decision support. These include statements concerning energy efficiency, reduction of carbon dioxide, costs as well as amortisation periods for relevant planning fundamentals. Individually created projects can of course be saved on a local PC, archived, and then processed later. Creating a project report is also useful. This includes all project data, evaluations, diagrams as well as data sheets of the products used.



www.trilux.com/efficiencycalculator or
www.trilux.co.uk/efficiencycalculator

1. THE LED REVOLUTION

With the establishment of LED lighting, the lighting industry is currently experiencing a revolutionary and deep transition in technology that can be compared with the discovery of the incandescent lamp, or with the changeover to fluorescent lamps. The adaptation of standards and norms can hardly keep up with such a wide-ranging and rapid transition. In those times as this there are usually no uniform terms of language, meaning that with LED until now, communication has differed concerning quality criteria and data. The verification of products and their compatibility in such cases is hardly possible, and this causes uncertainty in the market. The aim of the LED Guide is therefore to achieve a uniform understanding concerning LED lighting, in addition to supplying fundamental LED information.

The incandescent lamp – a thermal radiator

The incandescent lamp is a classic thermal radiation source. The filament, a multiple-twisted tungsten wire of 1 m length and 0.02 mm thickness, is heated with a current flow. The radiation emitted depends on the temperature of the filament: if the wire is warm it emits infrared waves. With increasing temperature the wavelength of the emitted radiation becomes shorter, until with a glowing wire it achieves the range of 380 nm (violet) to 780 nm (red) that is visible for the human eye. The ratio of radiation emitted as light is relatively low here though. Only 7 % of electrical energy is emitted in the form of light, and the majority of the input energy is lost as heat via IR rays.

The LED – a luminescence radiator

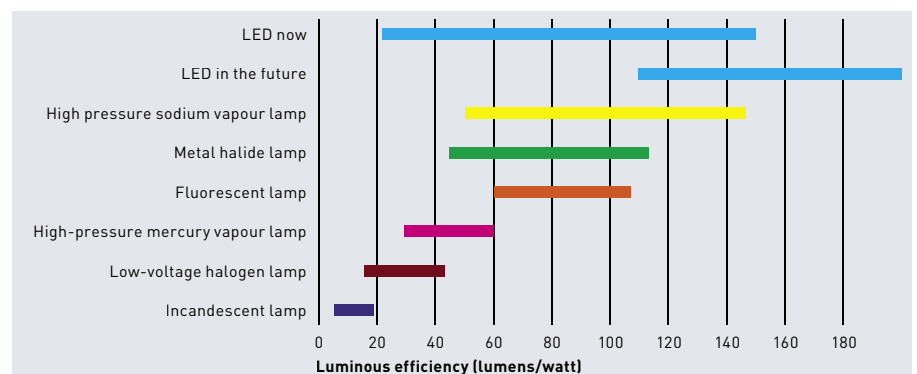
An LED is completely different. The light emitted from a diode is not the by-product of a thermal process as with incandescent lamps but is generated as part of an electrical reaction within the diode, with recombination of positive and negative charge carriers in the junction area of the semiconductor. The energy released is emitted as electromagnetic radiation in the visible range, meaning in the form of light. The luminous efficiency of LEDs exceeds that of an incandescent lamp many times over. With new modules, around 50 % of input electrical energy is transformed by LEDs into light.

Fluorescent lamps are also luminescence radiators

In a similar way to LEDs, the light in a fluorescent lamp is not generated via a thermal process but via an electrical or chemical process. The functionality of fluorescent lamps equates to low pressure mercury vapour discharge lamps. Here an evacuated glass tube coated on the inner side with a phosphor is filled with low quantities of mercury. If a sufficiently high voltage is applied, the mercury vapour is exposed to free electrons and begins to emit ultraviolet radiation at a wavelength of between 185 and 254 nm. This highly energetic light is briefly absorbed by the phosphor on the inner surface of the glass tube. When the phosphor returns to its basic state it releases the energy in form of light in the visible range.

Fluorescent lamps feature good energy efficiency of approx. 100 lm/W and are characterised by a service life of around 20,000 hours.

Comparison of light sources



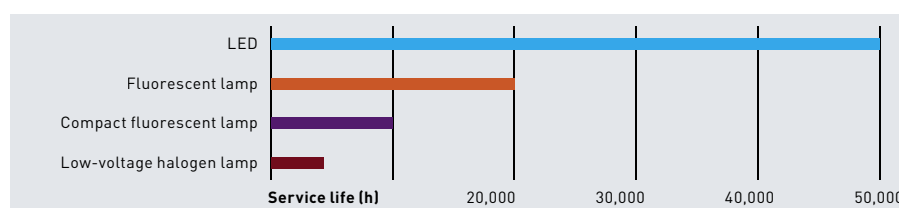
The LED is one of the most efficient light sources. It has high potential.

2. MEASUREMENT FACTORS AND SERVICE LIFE OF LED LUMINAIRES

With a service life of approximately 50,000 operating hours – often much more with outdoor luminaires – the LED is far superior to most other light sources. This corresponds to 5.7 years of continuous operation or 2,083 days, 24 hours per day. The service life of an LED is influenced for example by temperature, electric current and voltage, humidity, chemicals, radiation and mechanical forces. The sensitivity of an LED to mechanical factors is however relatively low compared to other lamps due to a lack of movable or breakable parts and its compact construction size.

Improved ease of maintenance

Around 50,000 hours service life means that relamping is no longer necessary.



LED luminaires significantly cut maintenance and repair costs. The specified service life in hours though says nothing about the quality of an LED product. Further key factors are needed for this purpose, such as connected load and luminous flux emitted from an LED luminaire. LED luminaires though can still not be evaluated just with these parameters, because the service life of LED luminaires is primarily limited by falling below a pre-defined minimum luminous flux (i.e. degradation). In addition, the total failure of all LEDs or LED modules in luminaires and the corresponding electronics also plays a role. When planning with traditional lamps, failure of the electronics was not considered up until now, and this is the reason why this is currently not applicable for observing the service life of LED products. It becomes clear that these observations can be used for photometric planning but not for guarantee evaluations. For comparison purposes of various LED luminaires and when defining the service life, the listed key parameters are mainly applicable, and these should also be specified in the technical information of LED luminaires:

Rated input power of luminaires P (in watts):

The rated input power P in watts (W) of a luminaire defines a quantity value that is applicable for the complete manufacturing spectrum of this luminaire type, including tolerance-related deviations of all assembled components in the new state. The rated input power of an LED luminaire is documented on the type plate, in the applicable data sheet and in the electronic data. This value is also used for further observations and calculation purposes.

The input power of any luminaire from production is the effective power in watts, including all internal consumers. This parameter is measured at the power input terminals or at the mains plug at a predefined ambient temperature, and must not exceed the specified rated input power by more than 10 % under consideration of unavoidable tolerances of the components used.

With dimmable luminaires, dimming levels are currently not considered so that determination of rated input power is at 100 % luminous flux emission (defined work point). For luminaires with constant luminous flux technology, the rated power at the time of the rated service life must also be specified.

2. MEASUREMENT FACTORS AND SERVICE LIFE OF LED LUMINAIRES

Rated luminous flux of luminaires
 Φ_v (in lm):

The rated luminous flux Φ_v in lumens (lm) for a luminaire defines a quantity for the new value of the complete luminous flux for this luminaire that is emitted according to pre-specified operating conditions in the visible range and in all directions, and that applies to the complete production spectrum of this luminaire type, including tolerance-related deviations. The rated luminous flux is documented in the data sheet and the electronic data. If no other ambient temperatures are specified in the data, then 25 °C applies. The specified rated luminous flux is then used for further observations and calculations.

The measured initial value for luminous flux of any luminaire of this luminaire type from production must not fall below the rated luminous flux of the reference luminaire by more than 10 %.

Luminous efficiency of LED luminaires η_v
(in lm/W)

The luminous efficiency is the ratio of rated luminous flux to the rated input power of the same LED luminaire.

$$\eta_v = \frac{\Phi_v \text{ of the luminaire in lumens}}{P \text{ of the luminaire in watts}}$$

Using the luminaire luminous efficiency as the sole criterion for comparison purposes or for evaluating energy efficiency is only possible with comparable luminaires and with similar luminous intensity distribution. In other cases, a calculation of the complete lighting installation is needed.

Rated ambient temperature of luminaires,
thermal management

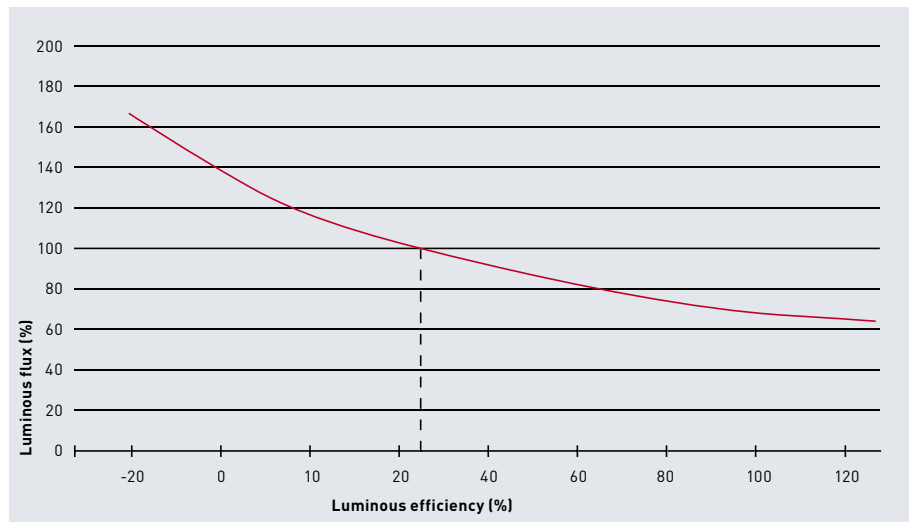
One of the most important factors for the performance and service life of an LED is the temperature in the junction area, the Junction Temperature T_j . The luminous efficiency and service life of LEDs decrease with increasing temperature. This is why thermal management of the luminaire is highly important.

The influence on operational behaviour of an LED luminaire due to ambient temperature must be taken into account as well.

The maximum rated ambient temperature t_a specifies the value at which the luminaire is permitted to be operated in compliance with all safety-relevant parameters. This value in operation may only be exceeded for a short period of time by a maximum of 10 Kelvins.

The temperature specification t_q (quality) has now been added. This designates the maximum rated ambient temperature applying to the specified key factors such as service life and photometric characteristics. t_q can be equal to t_a , but it is also possible for various rated ambient temperatures to specify the corresponding operating data in each case.

With values of $t_a = 25\text{ °C}$ or $t_q = 25\text{ °C}$, specifying the temperature on the luminaire is not required because this value is a standard value.



The brightness of LEDs decreases with increasing temperature.

TRILUX-TIP

Measurements with real systems instead of under laboratory conditions

Often the service life of an LED is determined under laboratory conditions. Here several values such as temperature and air currents can strongly deviate from real, practice-related conditions. This is why TRILUX tests its LED systems under real conditions. Since 2004, the temperature in the junction area (t_j) is being determined for various products as part of long-term analysis (up to 50,000 hours). In these cases the measured values correlate very well with the previously calculated values.

Efficient thermal management as a performance-critical factor

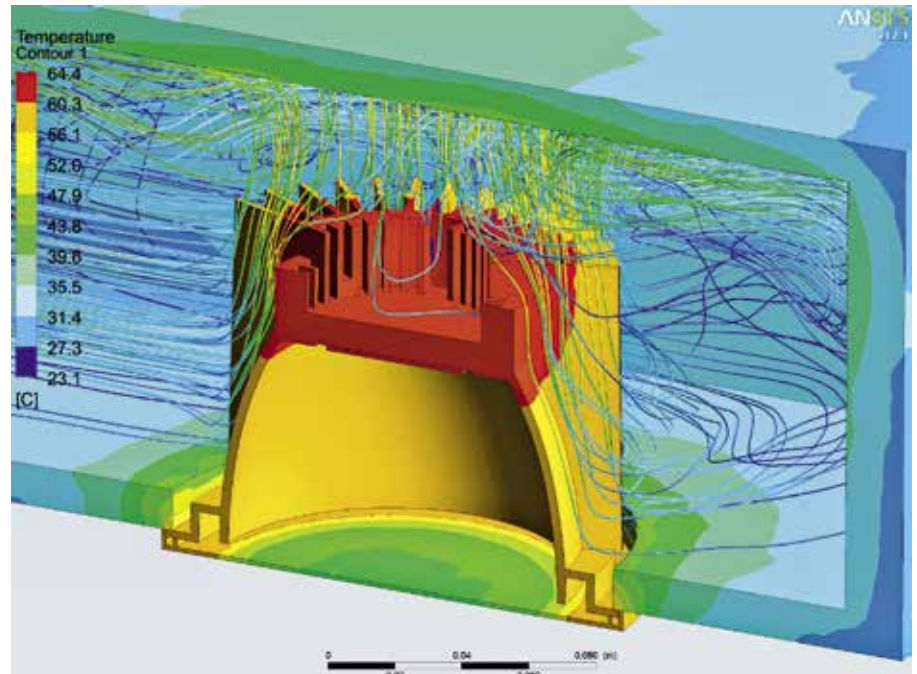
Although light emitted from an LED contains no infrared components and is thus "cold", high temperatures are created during recombination in the semiconductor crystal. This almost punctiform heat load has to be dissipated via a sophisticated cooling system and uniformly distributed. In principle the LED cooling system is similar to a computer processor: the PCB on which the LED is mounted is pressed with a heat sink to ensure optimal heat transition. The form and construction of the heat sink depend among other factors on the luminaire geometry, the installation location and the material used.



2. MEASUREMENT FACTORS AND SERVICE LIFE OF LED LUMINAIRES

TRILUX-TIP

Industry-leading thermal and electric management



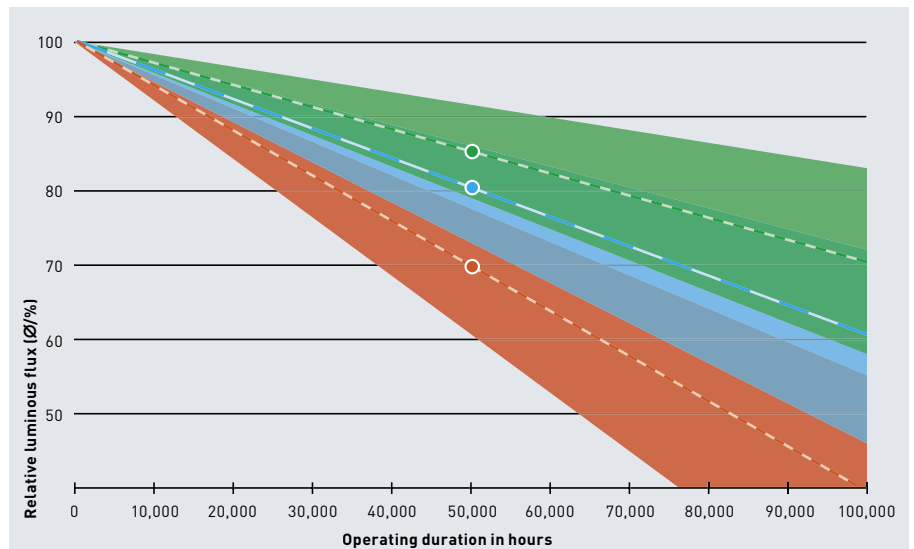
In order for LEDs to fully leverage on their advantages in terms of service life and luminous efficiency they must be operated at the optimal operating point. For this, excellent thermal and electrical management is mandatory. TRILUX optimises the thermal chain of its luminaires via detailed simulations and constructions on the real system. Factors considered include the total power consumption of the luminaire, the ambient temperature in the application, the air flow around the luminaire, the required luminous efficiency of the LED and the targeted service life.

Rated service life L_x (in h):

The rated service life L_x is the time at which the existing luminous flux of the LED luminaire is referred to a percentage value x of the original luminous flux. L_{80} or L_{70} for example describes the specified service life referred to the time at which 80 % or 70 % of the new luminous flux value is still achieved. When comparing different LED luminaires, not only the actual service life in hours is of interest but in particular the specification of the value x from L_x that can differ between manufacturers and also between products. With various luminaires with identical rated service life (e.g. 50,000 h), this means that the luminaires with the higher x value (L_{80}) achieve higher luminous flux levels than the luminaires with lower x values (L_{70}). As a consequence, in a specified lighting system a larger quantity of luminaires with lower x values, or alternatively, luminaires with higher luminous flux levels must be installed, and this usually means higher connected loads.

Gradual failure B_y :

The B_y percentage ratio of failures due to gradual reduction of luminous flux specifies the ratio of LED luminaires that fall below the targeted luminous flux of x percent (see L_x) at the defined end of service life. For example, $L_{80} B_{10} 50,000$ h means that only 10 % of still functioning LED luminaires fall below 80 % of the initial value for luminaire luminous flux after 50,000 h. With $L_{80} B_{50} 50,000$ h, 50 % of luminaires already fall below 80 % of the new value for luminaire luminous flux. If no value for B_y is specified in LED luminaire data, then data apply for the classification B_{50} . The type of failures for individual LEDs or LED modules in a luminaire may differ when seen from a planning point of view.



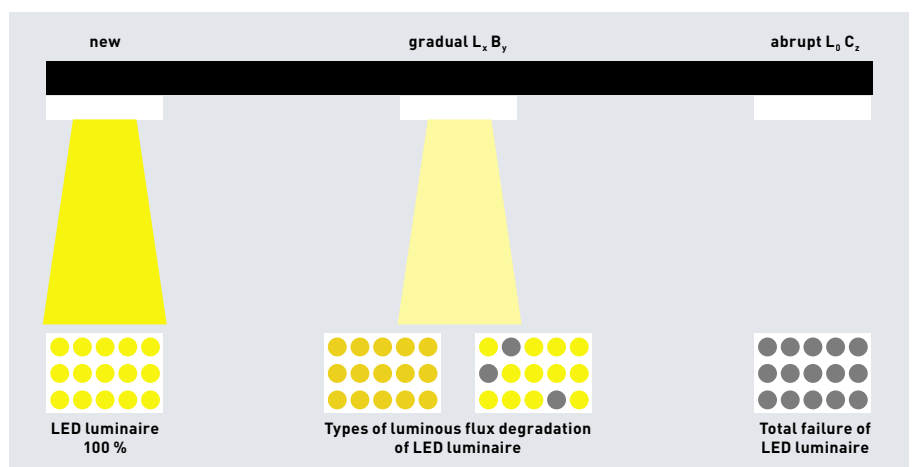
Gradual luminous flux reduction, exemplary for products with the designations $L_{80} B_{10} - 50,000$ h (green), $L_{80} B_{50} - 50,000$ h (blue) and $L_{70} B_{50} - 50,000$ h (red) each with corresponding mean values for the sequence of luminous flux

Abrupt failure C_z :

The percentage ratio of total failures C_z is the ratio of LED luminaires that has completely failed by the time a specified service life has been reached, i.e. no longer emits light. Unfortunately, a uniform consensus concerning the application for LED luminaires could not be achieved until now. As a result, the market has two different evaluation methods:

- C_z can be specified for the service life L_x (e.g. as the combination $L_{80} B_{10} C_0 - 50,000$ h with $C_z = C_0$: no total failure of an LED luminaire)
- For a particular z value, in addition to the rated service life L_x and the percentage ratio B_y , a separate service life L_0 is specified (e.g. as $L_{80} B_{10} - 50,000$ h, $L_0 C_5 - 150,000$ h with $C_z = C_5$: 5 % of luminaires have totally failed after 150,000 h).

For lighting planners it makes sense to use the first version, because it usually should be known how many products have actually totally failed until the considered service life.



Possible conditions or error situations for an LED luminaire (new state, degradation and total failure; source: TRILUX Akademie)

2. MEASUREMENT FACTORS AND SERVICE LIFE OF LED LUMINAIRES

Comparison of rated service life

It is only possible to compare LED luminaires with regard to service life by specifying the rated service life L_r , the gradual failure B_r , and the total failure C_r . The quantity of total failures until the rated service life of quality-manufactured LED luminaires is usually low. Attention should be paid to total failure when selecting the products, but this plays no role when considering luminaire classifications. Products become comparable by categorizing LED luminaires into corresponding luminaire classifications (e.g. $L_{80}, B_{10} - 50,000$ h).

Luminaire classification of LED luminaire	Conversion into other luminaire classifications		
	$L_{80} B_{10}$	$L_{80} B_{50}$	$L_{70} B_{50}$
$L_{80} B_{10} - 50,000$ h	50,000 h	67,500 h	100,000 h
$L_{80} B_{50} - 50,000$ h	37,500 h	50,000 h	75,000 h
$L_{70} B_{50} - 50,000$ h	25,000 h	33,500 h	50,000 h

Exemplary figure: The left column contains the luminaire classifications of the actual LED luminaires. The three columns on the right show the corresponding rated service life with conversion into other luminaire classifications.

3. CONSTRUCTION OF AN LED – THE COMPONENTS

Construction of an LED assembly

At first sight an LED assembly consists of a series of simple components. The central element is the actual LED (light emitting diode), a specially doped semiconductor that transforms the electrical energy into visible light. This process takes place in a very narrow area in the centre of the semiconductor, the so-called junction area or junction. The LED itself features two electrical connections and can be fixed onto a thermally conducting carrier material to dissipate the heat occurring during operation. These components are protected by a robust housing that is covered above, i.e. in the radiation direction, by a primary optical system (usually a small lens).

TRILUX TIP

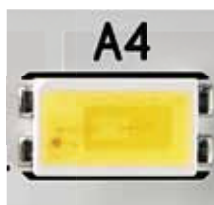
LED ≠ LED – there are large differences in quality of the components

The service life of an LED, uniform and homogeneous brightness and colour values of the light and the safety of an LED luminaire all depend on the quality of the components used. This is why TRILUX only uses first-class components in its LED luminaires sourced from certified and quality-tested suppliers.

Simple LEDs to 1 watt

LED types of lower power ratings have in past years made a large quality leap and can in the meantime be used very well for general lighting purposes. The largest progress with mid-power packages has been achieved with thermal resistance, and by introducing the so-called slug, as previously done with high-power packages. Here the thermal energy is not only dissipated via the electrical contacts (anode and cathode) but also via a direct thermal path (slug) on the PCB.

In this way, maximum efficiency levels in the luminaires can be achieved. This type of LED is particularly suitable for generating wide-area light, both for trans-illuminating optical systems as well as for edge light entry.



High performance LED – increasing output requires a heat sink

It is not only the luminous flux that increases with increasing wattage but also the temperature on the junction area. The LED heat sink by itself is not enough though, and the luminaire manufacturer has to also ensure that the heat is effectively dissipated.



3. CONSTRUCTION OF AN LED – THE COMPONENTS

SMD LED – wireless LED assembly

SMD LED (surface mounted devices) need no wires. Instead, the SMD LED has small bumps on the underside that fit precisely into the slightly recessed, laterally reversed connection contacts (footprints) on the PCB so that they can be directly mounted onto the circuit board without drilling. SMD LEDs are the industrial standard and the type of construction most often used in practice. They cover an extremely wide application spectrum ranging from low-power LEDs with a power consumption of a few milliwatts to high-power LEDs with a wattage of up to 20 watts.

COB LED – the "naked" Chip on Board

With the SMD LED the chip is installed into a so-called package, but with COB LEDs the naked LED chip is assembled directly onto the circuit board (Chip on Board). Subsequently the chip gets an epoxy lens with defined beam angle. COB LEDs are suitable for especially high performance and tightly configured LED modules.

Flip chips without a package

Flip chips are already known from the high-power LED sector. Progress in the areas of efficiency and continuous cost pressure now cause leading manufacturers to offer these flip chips without a package. With corresponding assembly systems, these chips can be attached to the PCB exactly as LED packages are. The advantage compared to chip-on-board technology is that the failure-sensitive wire bond is not required.

OLED – ultra-thin, flexible LED film

The semiconductor in an OLED – an organic LED – when compared to a normal LED does not consist of inorganic crystal but an ultra-thin, organic layer with semiconductor properties. Analogue to inorganic LEDs, the light in OLEDs is created via the recombination of electrons and holes. In the junction they form an exciton, a quasiparticle, that when returning to a lower energy state either emits light itself or excites a pigment in the junction to light emission.

One of the most important benefits of OLED is its low thickness: this can be less than 2 mm on a glass substrate. Although OLEDs are already used commercially, in terms of service life they do not yet meet the TRILUX quality criteria. With white light OLEDs, L_{70} is currently around 10,000 to 20,000 hours (at up to 5000 cd/m²).

LED module – a unit ready for use

One or several LED chips are fixed to a PCB and are assembled to a unit ready for use with all required optical, electrical and thermal elements. The module can be controlled via standardised connections, and according to construction can be operated directly or can be used to design a luminaire. Fundamentally a differentiation is made between linear, flexible and flat LED modules, LED chains and LEDs with sockets (e.g. retrofit lamps).



4. FUNCTIONALITY OF AN LED

LED light engine

In addition, a so-called light engine also contains the control gear.

TRILUX TIP**TRILUX – from module to luminaire**

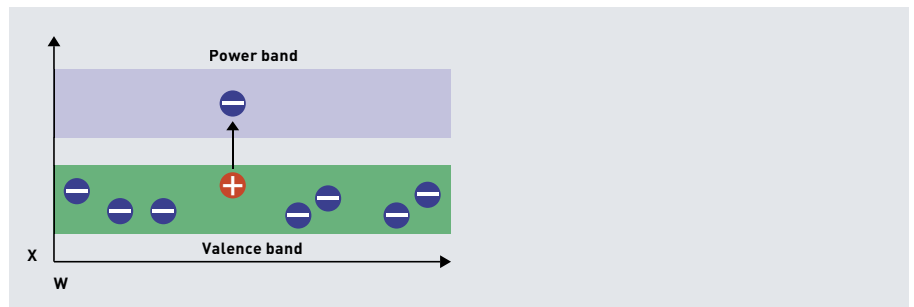
The construction of our LED luminaires is a highly complex and individual adaptation process. Which LED chips and LEDs are assembled onto which PCBs with which optics? How can thermal management, operating and control units as well as luminous intensity and light colour be adapted to individual application conditions? Which light distribution is optimal? And of course: How can all of these requirements be combined to become an attractive, durable and efficient lighting solution with a future-fit design? Our answers to these questions are found on the product pages of this LED Guide.

Semiconductors

Semiconductors are crystalline solids with a strongly temperature-dependent conductivity. At absolute zero (-273,15 °C) they function as an isolator, but at room temperature they have a measurable conductivity that rises with increasing temperature.

The band model

This phenomenon can be explained with the quantum band model. This states that the electrons in a semiconductor can move only on specific energy bands with a specific energy level. At absolute zero the highest occupied energy band, the valence band, is completely filled with electrons and is separated from the next higher empty energy band, the conduction band, by a band gap. If temperature increases then single electrons can overcome the band gap and move freely on the conduction band so that conductivity increases. This leaves a positively charged gap on the valence band, a so-called defect electron or "hole".

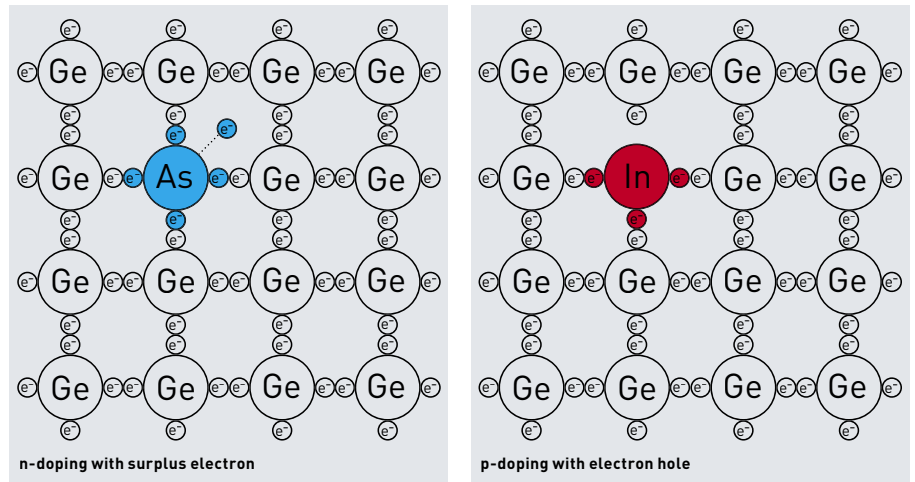
Semiconductors**Recombination and light emission**

If a freely movable electron on the conduction band meets a defect electron in the valence band then the electron and hole can recombine. The energy thus released can be emitted as light, as is the case with LEDs. The wavelength of the emitted light depends on the size of the band gap and can be influenced by the selection of semiconductor materials.

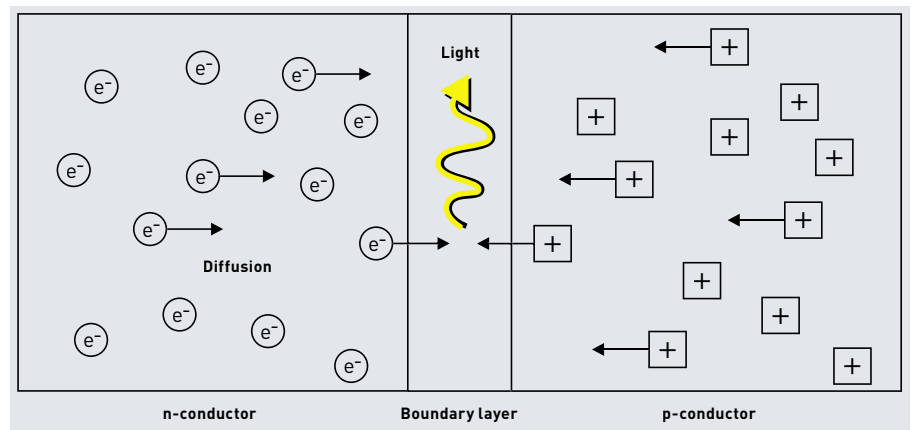
Doping, P-doping, N-doping

Doping specifically increases the conductivity of a semiconductor. Discontinuities in the crystal lattice are integrated by atoms with a lower or higher quantity of valence electrons. If a series of arsenic atoms with five valence electrons for example are integrated into a crystal lattice of germanium atoms (four valence electrons), then the fifth atom is not required for combination. It flows freely through the lattice and is available for conduction of the electrical current. A semiconductor doped with foreign atoms of a higher value is called an n-conductor. If an atom is integrated into the germanium lattice with only three valence electrons, e.g. indium, then a freely wandering electron hole is generated in the lattice. A semiconductor doped in this way is a p-conductor.

4. FUNCTIONALITY OF AN LED

Doping, p-doping, n-doping
Continuation

The pn junction

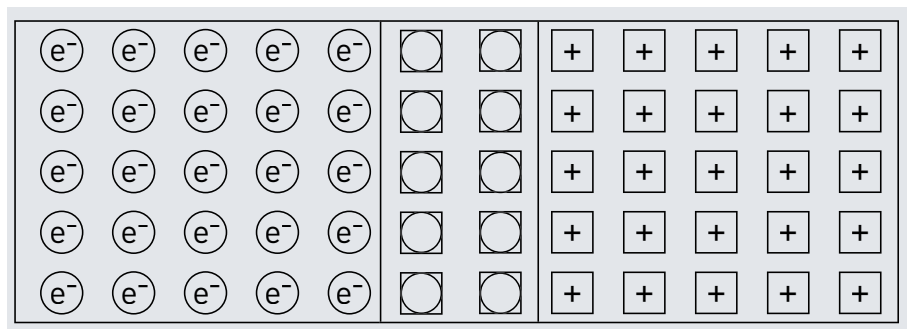


If an n- and a p-conductor are combined, electrons diffuse on the boundary layer from the n-conductor into the p-conductor and holes from the p-conductor into the n-conductor. When a hole is recombined with an electron the charge in the boundary layer disappears. Here the pn semiconductor remains electrically neutral but tension is generated by the disappearing of an electron from the n-conductor and a hole from the p-conductor. The n-conductor becomes increasingly positively charged in the boundary layer and the p-conductor negatively charged. The surplus electrons in the n-conductor are still attracted by the holes in the p-conductor, but are simultaneously repulsed by the increasing negative charge in the p-conductor, until a state of equilibrium is attained and electron migration stops.

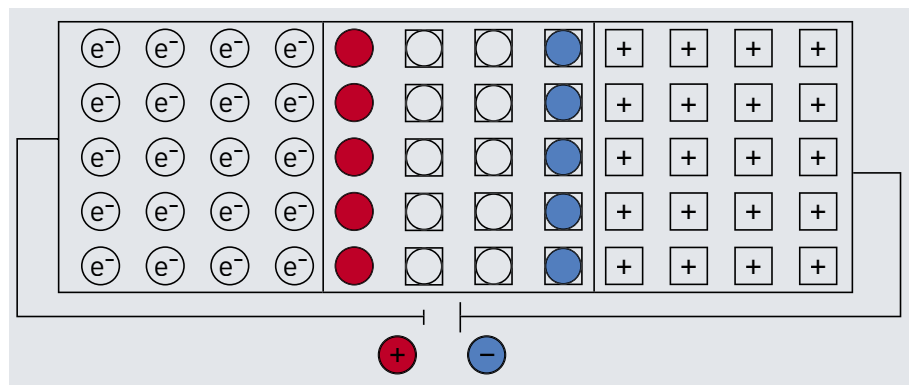
Forward direction and reverse direction

With application of voltage to the pn junction, the size of the junction area can be influenced. Here polarity is decisive. If the n-conductor (electron donor) is combined with the negatively charged cathode, then electrons push in from the n side in the direction of the junction area to the anode. At the same time holes migrate from the p side (connected with the positively charged anode) towards the junction area or cathode. The junction area becomes smaller with increasing voltage until the forward voltage is achieved and the diode conducts current. If though the n-conductor is combined with the positively charged anode, electrons are attracted by the anode so that the junction area increases and no current can flow.

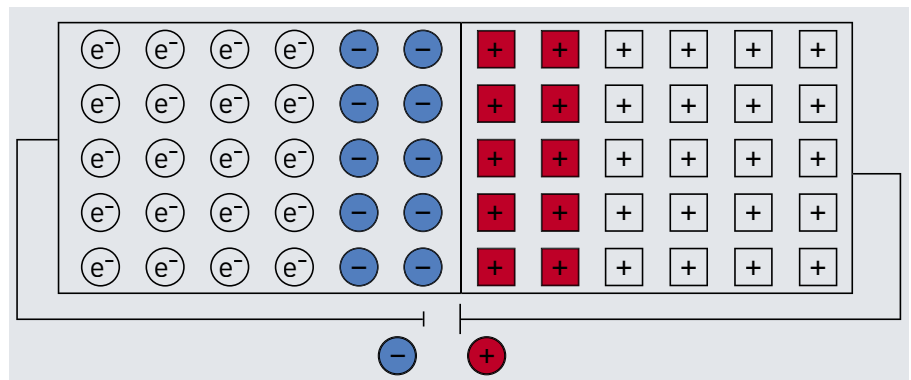
Currentless situation



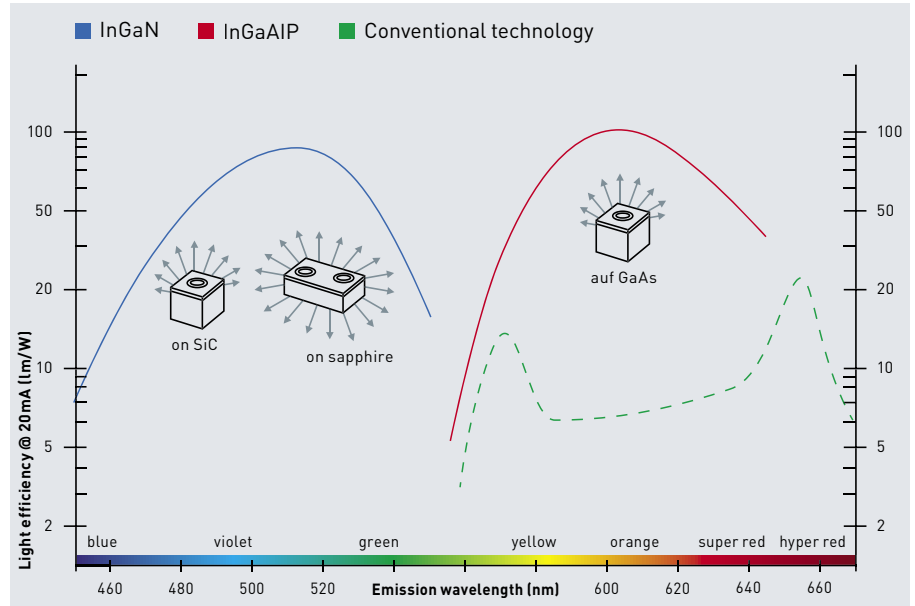
Diode in reverse direction



Diode in forward direction



Monochromatic light with recombination at the junction area

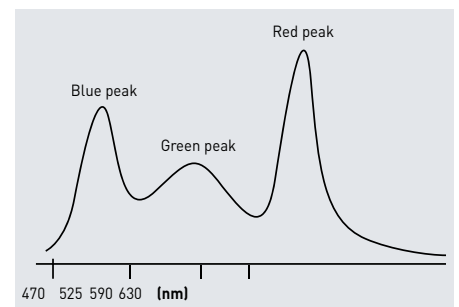
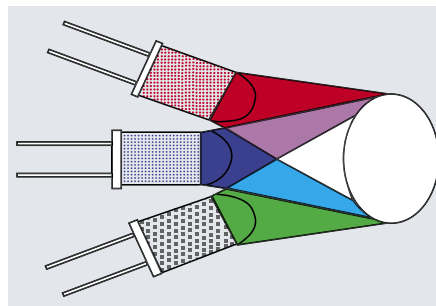


If an electron and a hole recombine, light emission is generated. Because with the return of the electron from the conduction to the valence band the same quantity of energy is always released, the emitted light is monochromatic. By selection of suitable semiconductor materials, the size of the band gap can be specified to generate all spectral colours, i.e. red, orange, yellow, green, blue and violet. Because efficiency of the green LED is significantly lower than the other spectral colours, further research is being carried out here for suitable semiconductor materials.

White light – trichromatic via RGB LED

White light is generated with the additive colour mixing of the spectral colours red, green and blue. This fact is utilised by RGB LEDs: a red, green and blue LED chip are combined to an LED unit. With specific control of the single LED chips the mixing ratio of the primary colours and thus the colour of the emitted light can be dynamically and infinitely modified. But because red, green and blue LEDs differ in terms of brightness, service life and operating conditions, RGB LED has high demands with construction and control technology. The LED industry has now worked out solutions to reduce these disadvantages though. As a consequence, green and other coloured LEDs are now available that do not directly emit the specific wavelength but use a blue LED chip as the basis. The corresponding colours are generated using phosphor, as with white light. Another advantage for general lighting is that these coloured LEDs do not generate such narrow-band light.

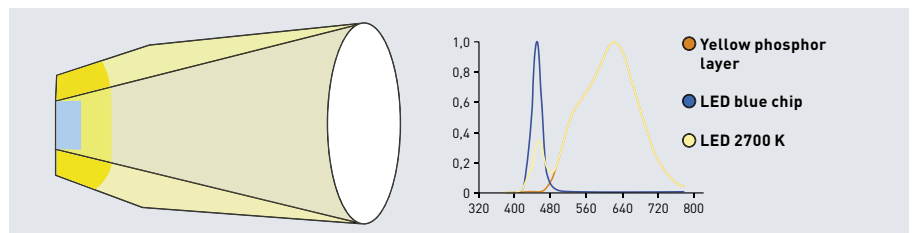
RGB-LED



White light – bichromatic via blue LED and yellow phosphor

If a blue LED is combined with a luminescence colorant, e.g. yellow phosphor, then the energy-rich blue light is partly absorbed by the yellow phosphor and is emitted as longer wavelength yellow light. With additive mixing of the non-absorbed blue light component with the yellow light, white light is generated. The colour tone of the white light LED can be influenced here by type and concentration of the luminescence colorant. Compared to RGB LED, the light emitted by such luminescence conversion LEDs has a relatively wide and uniform spectral distribution and thus better colour rendering.

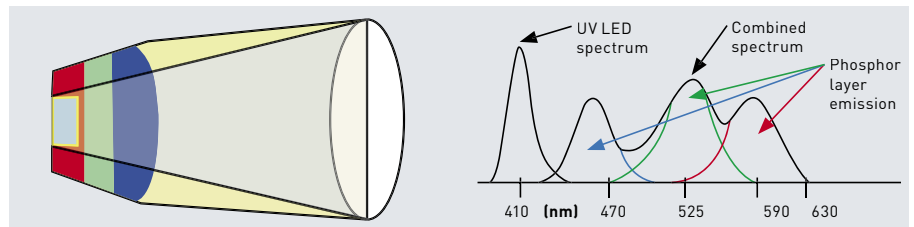
Blue LED + yellow phosphor layers



White light – via UV LED and RGB phosphor layers

White light can also be generated via a combination of UV LED and RGB phosphor layers. The UV LED emits highly energetic, invisible radiation that is absorbed by several luminescence colorants and is transformed to lower energy wavelengths that can be perceived by the human eye. In total, white light is generated, and with the addition of various other wavelengths it can be modulated with the help of the RGB LED so that a wide spectrum of colour tones and colour temperatures can be achieved.

UV LED + RGB phosphor layers



TRILUX-TIP

White light – which LED technology is the best?

Depending on the application area and demands, various LED technologies are suitable for generating white light. RGB LEDs are most often used for accent lighting. Their strengths are with the flexible, dynamic controllability of the light colour. Compared to bichromatic luminescence conversion LEDs though they are more expensive and less efficient in terms of colour rendering. Both technologies are part of the TRILUX LED program and are used in many different lighting solutions and luminaires. UV LED with RGB phosphor have a high potential for the future, but are technologically not yet mature enough to satisfy TRILUX quality standards.

White light, warm light, cool light?

If the spectral composition of the light from various light sources is compared then major differences are seen. Candlelight for example contains an above average red component and is perceived as warm light, whereas the light from a fluorescent tube has a higher blue component and appears cooler. As most natural light sources emit a wide spectrum of various wavelengths, specification of a single wavelength is not suitable for characterising white light. More decisive is the ratio of the various spectral components. These specify the colour temperature with white light or the colour of coloured light.

5. LIGHT AND COLOUR

Colour temperature – black body

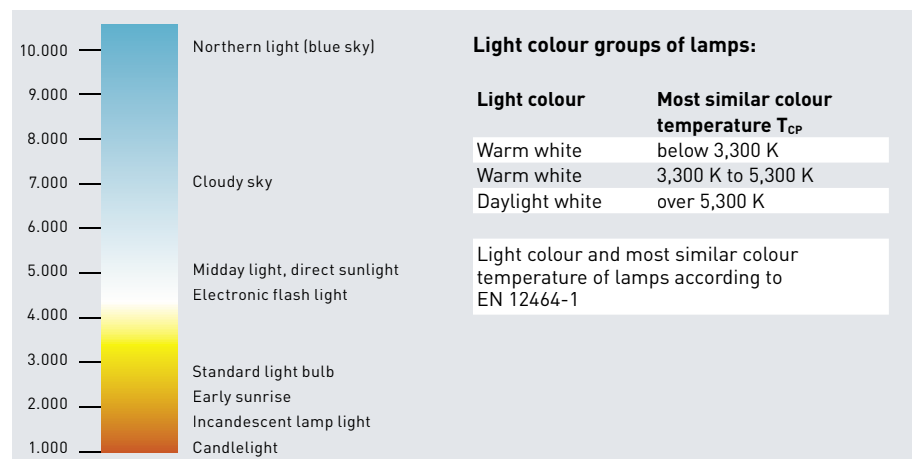
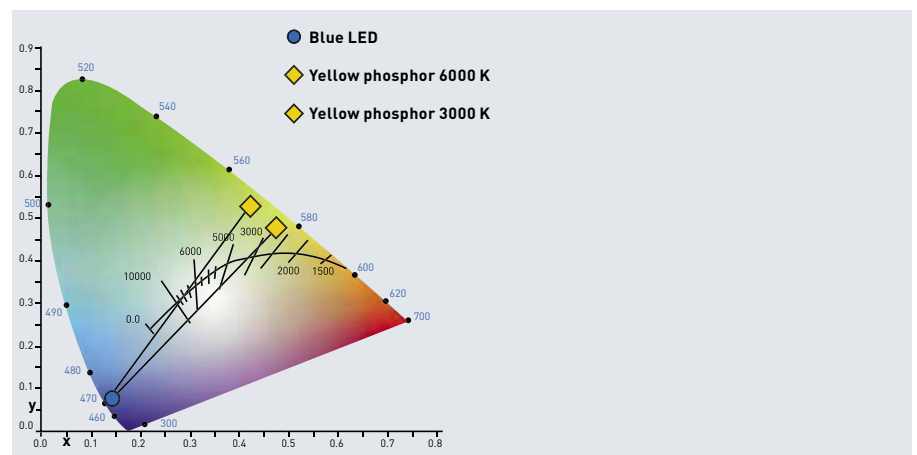
If a black metal body is heated (a so-called black body) it begins to emit electromagnetic rays. These are initially heat radiations in the infrared range, but then with increasing heat they achieve the spectrum of visible light. At a specific temperature the metal begins to glow red, then yellow, then white and finally blue. Here the ratio of the various wavelengths changes: the hotter the metal becomes, the less red components and the more blue components the emitted light has.

Colour temperature – light in accordance with the black body

If the spectrum emitted from the metal is compared to a natural light source it can be seen that: Each light source can be specified by the light of the glowing metal at a specific temperature. With a temperature of 1,500 Kelvin (approx. 1,773 °C) the metal emits the same light spectrum as candlelight. At 4,000 K (approx. 4,273 °C) the light corresponds to a neutral white (nw) fluorescent lamp usually used in Germany, and at around 6,500 K (approx. 6,773 °C) the colour temperature is that of daylight.

Colour temperature specification

The "light colour" of a lamp refers to the colour appearance (colour type) of the radiated light. This is quantified by its most similar colour temperature (T_{CP}). The light colour of daylight changes through the day. The light colour of artificial light can also be specified as in the table.

**Generation of white light with phosphor**

CRI – the colour rendering index

In practice the question is often asked how "natural" light is, meaning how natural colours appear with this light. This value is measured with the aid of the colour rendering index. This specifies how natural the light from a source is perceived or how natural the colours of an object are rendered in this light. Sunlight has a colour rendering index (Ra value) of 100, and the higher the Ra value of a light source, the more natural is its colour rendering.

Colour rendering of specific lamps

Lamp	Index R
Quality of colour homogeneity in the ellipse	to 100
Fluorescent lamp, white de Luxe	85...100
Fluorescent lamp, white	70...84
LED, white	65...97
Fluorescent lamp	50...90
Metal halide lamp	60...95
High pressure sodium vapour lamp, warm white	80...85
High pressure mercury vapour lamp	45
High pressure sodium vapour lamp, standard	18...30
High pressure sodium vapour lamp, colour- improving	60

Binning – sorting for consistent light quality

With the production of LEDs, deviations of colour and intensity of the light as well as forward voltage may occur due to the production process. To ensure uniform configuration of the luminaire, binning is carried out, meaning the LEDs are inspected after production and grouped into various classes or groups. Binning is realised according to the following criteria:

Colour binning

LEDs are sorted according to their colour coordinates in the CIE standard colorimetric system. Here white LEDs are differentiated according to colour temperature and colour locus. For coloured LEDs, binning is implemented with the aid of the colour locus and the peak or dominant wavelength. With the help of the MacAdam ellipses it can be demonstrated how fine the bin has been set by the manufacturer. The following applies: The smaller the bin, the less colour differences are visible. If a bin is as large or smaller than the MacAdam ellipse at the corresponding colour locus, then the human eye can no longer recognise colour differences.

Flux binning

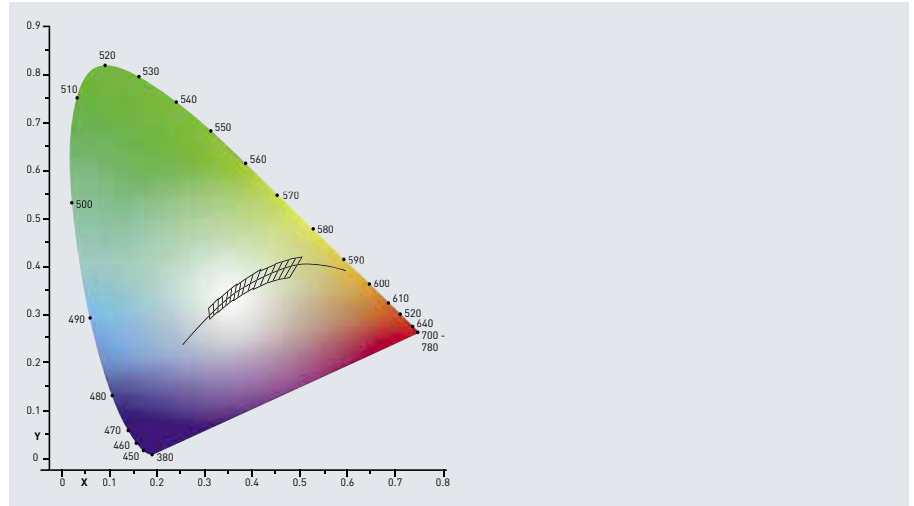
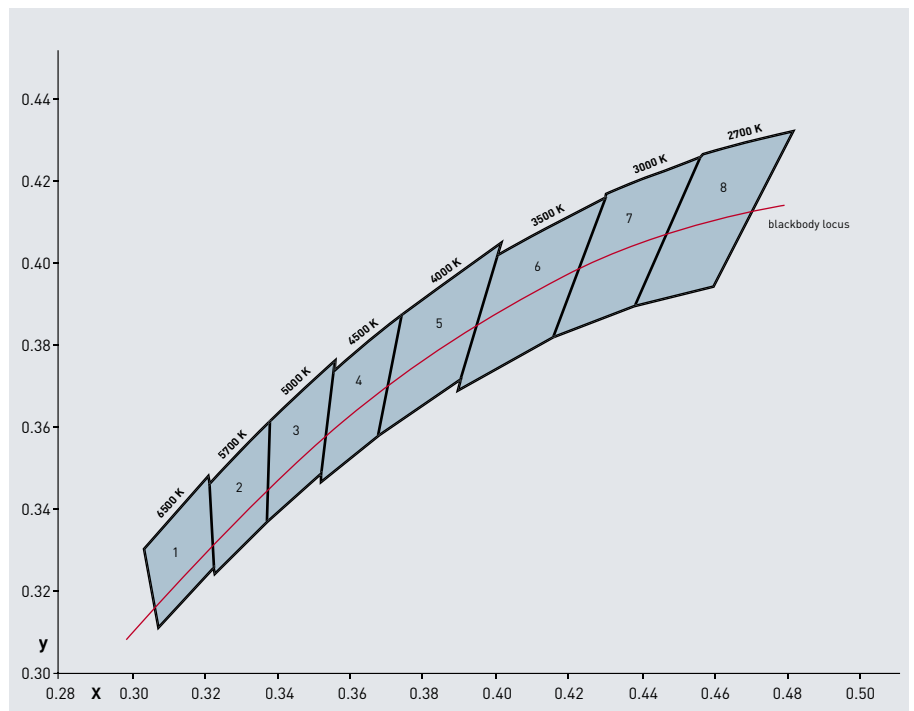
Sorting is carried out according to the luminous flux of the LEDs, measured in lumens. This ensures a uniform luminous flux. For LEDs with integral optics, instead of luminous flux a specification of luminous intensity in candelas can be made.

Voltage binning

LEDs are sorted according to forward voltage.

The CIE standard colorimetric system

A colour can be objectively described with the CIE standard colorimetric system, and this is a fundamental requirement for useful clustering and binning. With specification of a colour with the CIE standard colorimetric system, the RGB colour values are transferred via mathematical conversion to an XY coordinate system. The result is a horseshoe-shaped spectral locus. On the outside are the colour tones with the highest saturation level and towards the centre the secondary colours increase. In the achromatic or white point, red, green and blue are mixed to equal ratios so that the light is white.

CIE standard colorimetric system**Binning of white LEDs**

The colour space shown as white in the CIE system contains a wide spectrum of colour temperatures. Warm white for example is at 2,670 K and cool white is at 6,500 K. In addition to colour temperature, binning considers the "colour tone", i.e. the colour component with which the LED deviates from the ideal spectrum of a black body.

White LEDs in full distribution

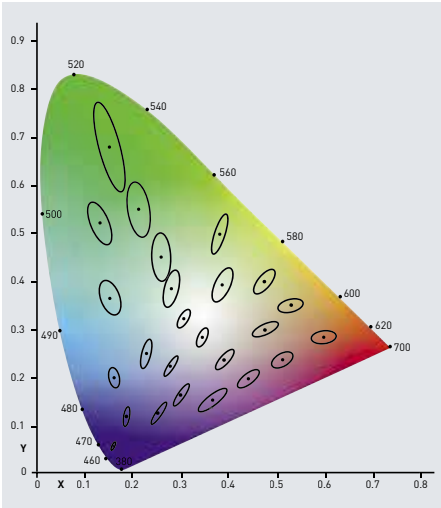


With a full distribution solution, the LEDs jointly integrated into a luminaire are not binned and the emitted light has visible colour differences.

Binning of LEDs – what the eye sees...

To sort LEDs it would theoretically be a good idea to define a desired colour value in the CIE system and to assign this a circular tolerance radius. Testing in practice though shows that the human eye perceives different colour deviations to different extents. While it perceives relatively small differences in the blue-violet range, perception in the green range for example is poorer.

Note:
The figure shows no 1-SDCM MacAdam ellipses but enlargements to more clearly explain the principal.



LED binning – MacAdam ellipses

This phenomenon is taken into account by MacAdam ellipses. According to the definition, a MacAdam ellipse is the extent around a colour tone in which the observer has the impression that all comparative colours have the same distance from the reference colour tone. The dimensions in which the MacAdam ellipses are specified are SDCM (Standard Deviation of Color Matching) or threshold value units. If the ellipse is small enough, e.g. SDCM = 1, the colours within the ellipse are perceived to be equal.

Dimensions of the MacAdam ellipses in SDCM

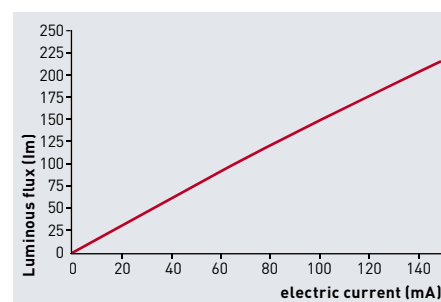
Size of MacAdam ellipse	1 SDCM / MacAdam step	2-3 SDCM / MacAdam step	> 4 SDCM / MacAdam step
Quality of colour homogeneity in the ellipse	No visible colour deviation	Hardly any visible colour deviation	Visible colour deviation

6. LIGHT MANAGEMENT – BRIGHTNESS AND COLOUR

The brightness and colour of an LED system can be dynamically controlled to the finest levels with intelligent control and operating devices. Standardised digital interfaces such as DALI or DMX can be used as well as the analogue 1-10 V process. One of the strengths of LED systems is the high bandwidth of dimming. While fluorescent tubes can only be dimmed to around 3 % of their total output, LEDs can be infinitely dimmed down to 0.1 %.

Dimming via current intensity

One of the possibilities of dimming LEDs is controlling the current intensity, because in a particular range the quantity of light from an LED depends linearly on the level of electrical current flow. A major benefit with current dimming is the fact that LEDs become more efficient with low current feed. Problematic though here is the lightly varying voltage curves of the individual LEDs. If the LED is dimmed to below 30 % it can happen that individual LEDs still illuminate while others are already inactive. In addition, with current dimming it has to be considered that the colour locus of the LED shifts slightly so that colour differences may become visible.



Luminous flux subject to electric current of a typical mid-power LED.

Dimming with pulse width modulation

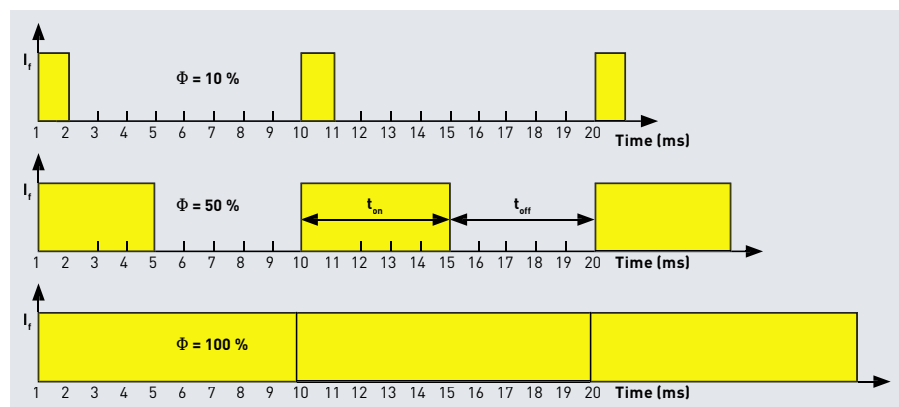
If an LED module is operated with constant extra low voltage, e.g. 10, 12 or 24 V, then dimming must be implemented via pulse width modulation. But PWM can also be used for dimming in other conditions. LEDs here are always operated with nominal current. Dimming is by switching the LED on or off for only a specific percentage of time. The human eye cannot resolve the single pulses occurring at high switching frequency in the millisecond range. It only perceives that the time-averaged luminous intensity decreases.

TRILUX-TIP

The body sees more than the eye

If LEDs are dimmed via pulse width modulation, the frequency must not fall below a certain value, because even when the eye only sees reduced luminous flux, the human body responds to the hardly perceivable flickering caused by the high frequency on and off switching. To examine these conditions, TRILUX cooperates with the Bartenbach light laboratory. It was determined among other facts that insufficient switching frequency may lead to tiring.

A tip: High-quality luminaires should have a minimum PWM frequency of 500 Hz.

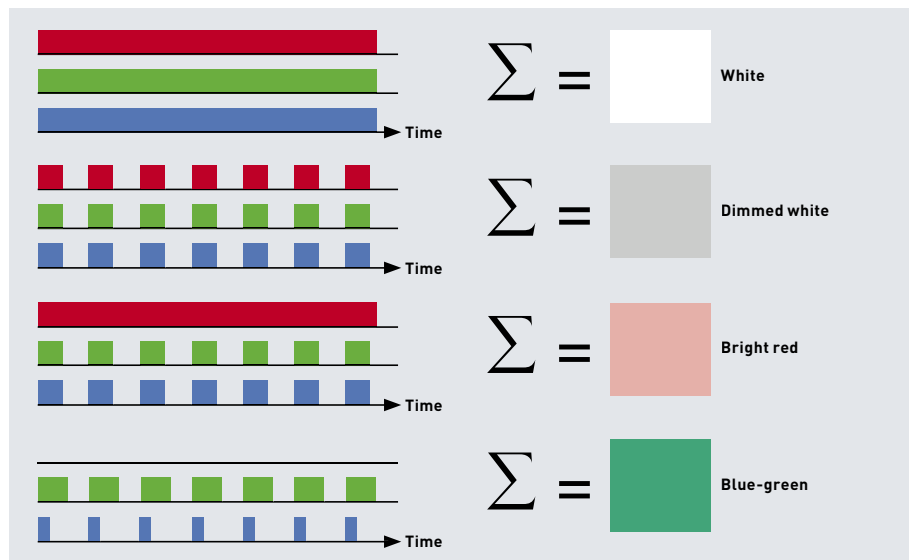


LEDs are always operated with nominal current with pulse width modulation – or not at all.

Colour transitions with pulse width modulation

Not only the brightness but also the colour can be varied with pulse width modulation. Up to 16.7 million different colours can be generated by the selective control of the RGB chips within an RGB LED, ranging from blue, cyan, green, yellow, orange to deep red. Depending on the control method, variation can also be made between saturated and weakly saturated colours up to white.

Dimming and colouring with pulse width modulation

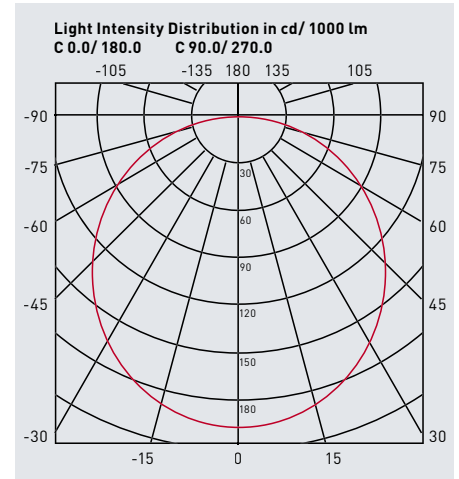


7. LIGHT DISTRIBUTION

An LED is a point-shaped light source that emits light at a narrow angle of 0° to 150° (Full Width Half Maximum). With use of various primary, secondary or tertiary optics (e.g. lenses, diffusers or reflectors) the light distribution can be specifically adapted to the application to construct narrow- or wide-angle, asymmetric or symmetric light solutions.

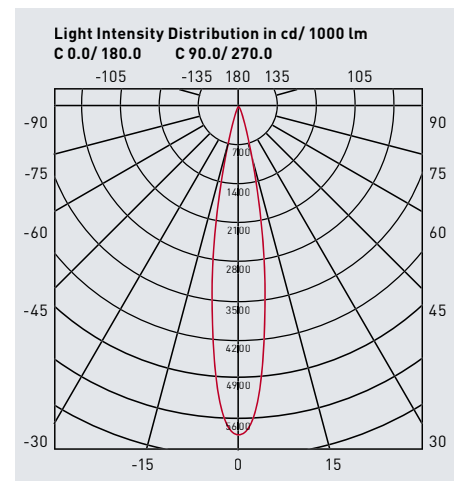
Luminous intensity distribution curve (without secondary optic)

The luminous intensity distribution curve of an LED "without secondary optic" corresponds in many cases to that of a Lambertian source.



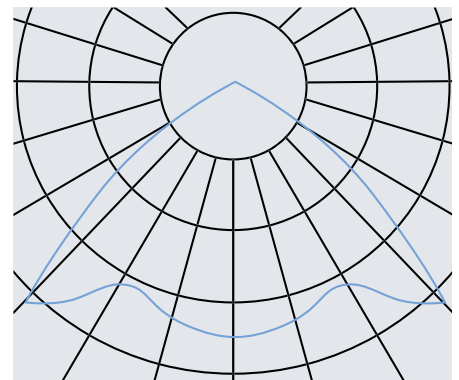
Luminous intensity distribution curve (with secondary optic)

A supplementary optic focuses the LED light "with secondary optic". The result is a narrow-angle light spot.



Luminous intensity distribution curve (LDC)

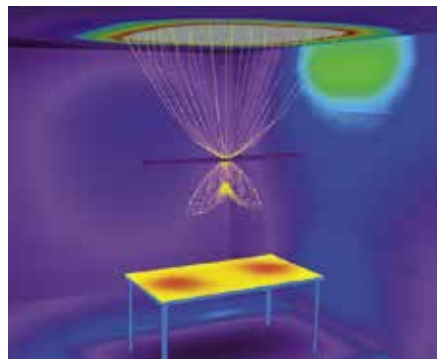
The luminous intensity distribution body specifies precisely how the light of an LED is distributed. Here luminous intensities in the room are displayed as polar coordinates and combined to form a curve. The figure on the right shows a luminous intensity distribution curve that represents excerpts from individual levels of the luminous intensity distribution body.



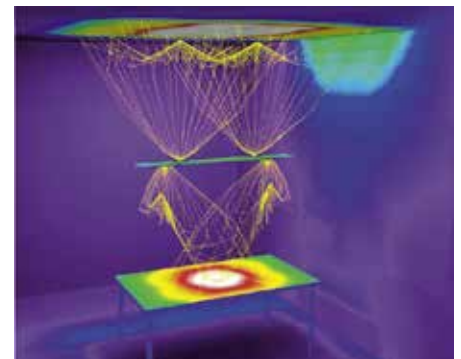
Complex light distributions calculated with ULD

If several LEDs are installed in a luminaire then a central LDC does not give reliable results as the calculations assume that light was emitted from a point-shaped light source in the luminaire centre or uniformly over the complete luminaire surface. Here though the situation in some cases does not reflect the practice. A correct representation is achieved when the luminous intensities of the individual LEDs are integrated into the calculation as ULD data (Unified Luminaire Data) where several LDCs serve as the basis for correct calculation.

Complex light distribution



Lighting planning with a total light distribution leads to erroneous illuminances.



Correct is the use of four individual luminous intensity distribution characteristics in so-called ULD data (Unified Luminaire Data).

8. FOUR CRITERIA FOR A GOOD LED LUMINAIRE

Premium components

The source of LEDs is particularly decisive for quality and service life of the light.

Perfect light control

Only with precise light control the advantage of LEDs can be fully used.

Optimal use of energy

LEDs have low-cost power consumption, but they do not operate efficiently in terms of energy in all cases. The luminous efficiency of the complete system is decisive.

Light stability and light colour

During planning, light colour and light stability over the service life should definitely be taken into account.

TRILUX TIP

LED and design – complete flexibility with form and colour



LEDs with a diameter of 0.5 mm, flexible LED modules that can be integrated as bands, chains or surfaces into luminaires and 16.7 million colours – never before have luminaire designers had such flexibility with forms and colour design. TRILUX uses this creative freedom mainly for one thing: to construct luminaires that are both. So innovative and attractive that they deserve design awards and so powerful and energy-efficient that they inspire in practice.

Design-awarded LED luminaires



ConStela LED



Coriflex LED



Lateralo Plus LED

9. NEW OPTICAL SYSTEMS FOR LED LUMINAIRES

LED has become a standard technology and we have now already converted the major part of the TRILUX portfolio to LED. The luminous efficiency of today's LEDs has mainly left all traditional lamps far behind. However, the combination of LED and its optical system is decisive for luminous efficiency. A further evaluation factor is light comfort (light quality), and in 2012 TRILUX as a consequence developed LCL (low contrast light) technology, a system that guarantees pleasant light comfort with maximum efficiency even with high lumen packages, as currently successfully implemented in the Coriflex range.

We have continued this approach to develop innovative solution concepts for other product categories and applications as well. TRILUX expertise in the sector of optical systems has developed over decades, and as a result, we now offer new, innovative standards where the blending of optics and LED technology can be experienced more intensively than ever before. Previously it was the classic louvre systems, today it's miniaturized lenses or reflectors or wide-area concepts with lateral light feeding. The results though still target best possible efficiency (costs) as well as optimal light comfort (UGR + visual impression), with a significant increase of options due to LED technology. Even the smallest details during development processes can be highly decisive, and the results are certainly impressive.

Specifically for directed lighting tasks (sectional) OFFICE

MRX (Micro-Reflector-Technology)
for VDU-compliant visual tasks with maximum efficiency

Micro-Reflector-Technology (MRX) specifically developed by TRILUX for LED luminaires is specially designed for direct distribution optics. The single highly efficient reflector chambers made of plastic ensure optimum glare reduction, and with highly reflective aluminium vaporising guarantee maximum efficiency and energy savings (<1500 or 3000 cd/m²; UGR19).

Product examples: Arimo Slim MRX and Coriflex MRX



Specifically for wide-area lighting (homogeneous) OFFICE, HEALTH & CARE, SHOP & RETAIL

CDP prismatics (Conical-Deglaring-Prism)
for VDU-compliant, flexible lighting concepts with visible light

The innovative CDP (Conical-Deglaring-Prism) optic is used for both direct and direct/indirect distribution luminaire systems. The fine prismatic structure ensures highly homogeneous distribution of light and uniformity with optimum glare reduction (<3000 cd/m²; UGR19). And when combined with LED maximum efficiency as well, and not only for office applications.

Product example: Arimo Slim CDP



**Specifically for wide-area lighting with direct and indirect light component (homogeneous)
OFFICE**

BLGS (Binary Light Guide System)

for VDU-compliant, flexible lighting concepts with perceivable light and maximum visual comfort

The innovative planar optic (Binary Light Guide System, BLGS) specifically developed for direct/indirect distribution LED luminaires intelligently combines very wide-angle direct and indirect light components. The light is laterally fed into a dual panel system and a specific prism structure emits the light almost three-dimensionally. This guarantees maximum visual comfort on the one hand, and makes the light perceivable in a new strength, virtually free of shadows and glare. The concept also offers new benefits for planning and upgrading obsolete concepts. Because of the extremely wide distribution, using low-suspended luminaires is also possible with low ceiling heights, and a high lighting quality is ensured ($<3000 \text{ cd/m}^2$; UGR19).

Product example: Lateralo Plus



LGS (Light Guide System)

for flexible lighting concepts with perceivable light and high visual comfort

The innovative planar optic (Light Guide System, LGS) specifically developed for direct/indirect distribution LED luminaires intelligently combines very wide-angle direct and indirect light components. The light is laterally fed into a single panel system and a specific prism structure emits the light. This guarantees a high level of visual comfort and almost shadow-free light. The concept also offers new benefits for planning and upgrading obsolete concepts. Because of the extremely wide distribution, using low-suspended luminaires is also possible with low ceiling heights, and a high lighting quality is ensured (UGR19).

Product example: Lateralo Line



10. PHOTOMETRIC PLANNING INFORMATION FOR SOLUTIONS WITH LED LUMINAIRES

When planning an energy-efficient lighting system, determining the maintenance factor is the essential driver because levels of illuminance or luminance of lighting systems reduce during the course of the service life. The reasons for this are ageing and failure of the light sources, soiling of the luminaires, and with indoor lighting a reduction in the reflectance value of the ceilings and walls (room soiling). The soiling of illuminated surfaces should also be taken into account with outdoor lighting.

The higher the maintenance factor for a lighting system can be set, the lower is its energy consumption. Despite this, a cost/effort analysis should be carried out to achieve practical maintenance cycles. The previously specified definitions with regard to service life criteria here play an important role. Planners must be able to determine and document the maintenance factor and recommend suitable maintenance activities.

The maintenance factor is dependent on the type of lamps and luminaires and the sensitivity of the room to dust and soiling, as well as the maintenance method and maintenance interval. Because with LED applications the actual LED and the luminaire are increasingly becoming one unit, observance of luminous flux reduction and the survival factor of the LEDs as the light source (lamps) is applied to LED luminaires in order to still be able to use the maintenance factor process for conventional lamps.

The maintenance factor MF is determined by:

- LLMF:** Lamp lumen maintenance factor – specifies the reduction of LED luminaire luminous flux during the service life
- LSF:** Lamp survival factor – specifies LED luminaire failure during the service life
- LMF:** Luminaire maintenance factor – specifies the influence of soiling of the optical system of luminaires between two cleaning operations
- RMF:** Room maintenance factor – specifies deterioration of the system light output ratio due to deterioration of the reflectance values of the ceiling, walls and floor for indoor lighting
- SMF:** Surface maintenance factor – specifies deterioration of the system light output ratio due to deterioration of the reflectance values of the illuminated surface in outdoor applications. Only used where practical.

The maintenance factor MF is the product of the single sub-maintenance factors of the lighting system:

Indoor lighting:	$MF = (LLMF \times LSF) \times LMF \times RMF$
Outdoor lighting:	$MF = (LLMF \times LSF) \times LMF \times (SMF)$

For conventional lamps, corresponding information about the lamp lumen maintenance factor (LLMF) and the lamp survival factor (LSF) exists in the relevant documentation, but until now this was not the case for LED light sources. For this reason, a handy maintenance factor table for LED luminaires has been drawn up. Specific luminaire classifications for LED luminaires are determined using the two factors L_x and B_y , whereby with L_x the value for rated service life is also specified in hours. The value for the lamp survival factor (LSF) is determined directly from the value z of total failure C_z . Typical values are seen in the maintenance factor table.

$$LSF = 1 - \frac{z[C_z]}{100}$$

Rated service life Characteristic values L _x B _y	Service life in 1000 h																					
	1	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	
L80 B10 – 50,000 h	LLMF	1.00	0.99	0.97	0.96	0.94	0.93	0.91	0.90	0.88	0.87	0.85	0.84	0.82	0.81	0.79	0.78	0.76	0.75	0.73	0.72	0.70
	LSF	1	1	1	1	1	1	1	1	1	1	1	1	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	
L80 B10 – 100,000 h	LLMF	1.00	0.99	0.99	0.98	0.97	0.96	0.96	0.95	0.94	0.93	0.93	0.92	0.91	0.90	0.90	0.89	0.88	0.87	0.87	0.86	0.85
	LSF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
L80 B50 – 50,000 h	LLMF	1.00	0.98	0.96	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.78	0.76	0.74	0.72	0.70	0.68	0.66	0.64	0.62	0.60
	LSF	1	1	1	1	1	1	1	1	1	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.98	0.98	
L80 B50 – 100,000 h	LLMF	1.00	0.99	0.98	0.97	0.96	0.95	0.94	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.86	0.85	0.84	0.83	0.82	0.81	0.80
	LSF	1	1	1	1	1	1	1	1	1	1	1	1	1	0.99	0.99	0.99	0.99	0.99	0.99	0.99	
L70 B10 – 50,000 h	LLMF	0.99	0.97	0.95	0.92	0.90	0.87	0.84	0.82	0.79	0.77	0.74	0.71	0.69	0.66	0.64	0.61	0.58	0.56	0.53	0.51	0.48
	LSF	1	1	1	1	1	1	1	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.98	0.98	
L70 B10 – 100,000 h	LLMF	1.00	0.99	0.97	0.96	0.95	0.94	0.92	0.91	0.90	0.88	0.87	0.86	0.84	0.83	0.82	0.81	0.79	0.78	0.77	0.75	0.74
	LSF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.99	0.99	0.99	0.99	
L70 B50 – 50,000 h	LLMF	0.99	0.97	0.94	0.91	0.88	0.85	0.82	0.79	0.76	0.73	0.70	0.67	0.64	0.61	0.58	0.55	0.52	0.49	0.46	0.43	0.40
	LSF	1	1	1	1	1	1	1	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.98	0.98	0.98	
L70 B50 – 100,000 h	LLMF	1.00	0.99	0.97	0.96	0.94	0.93	0.91	0.90	0.88	0.87	0.85	0.84	0.82	0.81	0.79	0.78	0.76	0.75	0.73	0.72	0.70
	LSF	1	1	1	1	1	1	1	1	1	1	1	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	
L70 B50 – 35,000 h [e.g. retrofit]	LLMF	0.99	0.96	0.91	0.87	0.83	0.79	0.74	0.70	0.66	0.61	0.57	0.53	0.49	0.44	0.40	0.36	0.31	0.27	0.23	0.19	0.14
	LSF	1	1	1	0.99	0.98	0.97	0.96	0.94	0.9	0.86	0.82	0.77	0.72	0.67	0.62	0.57	0.52	0.47	0.42	0.37	0.30
L50 B50 – 50,000 h	LLMF	0.99	0.95	0.90	0.85	0.80	0.75	0.70	0.65	0.60	0.55	0.50	0.45	0.40	0.35	0.30	0.25	0.20	0.15	0.10	0.05	0.00
	LSF	1	1	1	0.99	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.98	0.97	0.95	0.90	0.80	0.60	0.40	0.20	0.00
L50 B50 – 100,000 h	LLMF	1.00	0.98	0.95	0.93	0.90	0.88	0.85	0.83	0.80	0.78	0.75	0.73	0.70	0.68	0.65	0.63	0.60	0.58	0.55	0.53	0.50
	LSF	1	1	1	1	1	1	1	0.99	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.98	0.97	0.97	0.97	0.97
L50 B50 – 35,000 h [e.g. retrofit]	LLMF	0.99	0.93	0.86	0.79	0.71	0.64	0.57	0.50	0.43	0.36	0.29	0.21	0.14	0.07	0.00						
	LSF	1	1	1	0.99	0.98	0.97	0.96	0.90	0.80	0.70	0.60	0.50	0.35	0.20	0.00						

Table: Maintenance factor table for LED luminaires with selected LxBy classifications (source: TRILUX Akademie). The reduction in luminous flux (LLMF) and total failure (LSF) of LED luminaires are shown. These specifications help with the photometric planning of lighting installations. The maintenance factor table is also available online: www.trilux.com/maintenance_factor_table

Example of luminaire classification and maintenance factor:

If the luminaire classification L₈₀ B₁₀ C₀ 50,000 h has been specified for an LED luminaire, then the maintenance factor value for luminous flux reduction (LLMF) after 50,000 hours is 0.85. The survival factor (LSF) value is 1, because up to this time no LED luminaire completely failed. In comparison, LED luminaires with the evaluation class L₈₀ B₅₀ C₁ 50,000 h achieve values of 0.8 for LLMF and 0.99 for LSF, and luminaires with the evaluation class L₇₀ B₅₀ C₁ 50,000 h achieve values of 0.70 for LLMF and 0.99 for LSF. This clarifies the potential for energy saving by selecting a product with a higher luminaire classification.

If on the other hand an LED luminaire with luminaire classification L₈₀ B₁₀ C₀ 50,000 h is designed for an operating period of only 25,000 h, then a value of 0.93 can be used as maintenance factor for luminous flux reduction LLMF. Accordingly, an evaluation class of L₉₃ B₅₀ 25,000 h could also be specified for such a luminaire. If on the other hand longer use of e.g. 70,000 h is intended, then the value 0.79 should be used in planning.

To show the potential with investment costs and energy saving, the table directly compares luminaires with different luminaire classifications available on the market.

Luminaire classification of LED luminaire	Lamp lumen maintenance factor LLMF	Initial value factor (planning factor)	Percentage-based comparison
L ₈₀ B ₁₀ – 50,000 h	0,85	1,17	100 %
L ₈₀ B ₅₀ – 50,000 h	0,80	1,25	107 %
L ₇₀ B ₅₀ – 50,000 h	0,70	1,43	122 %

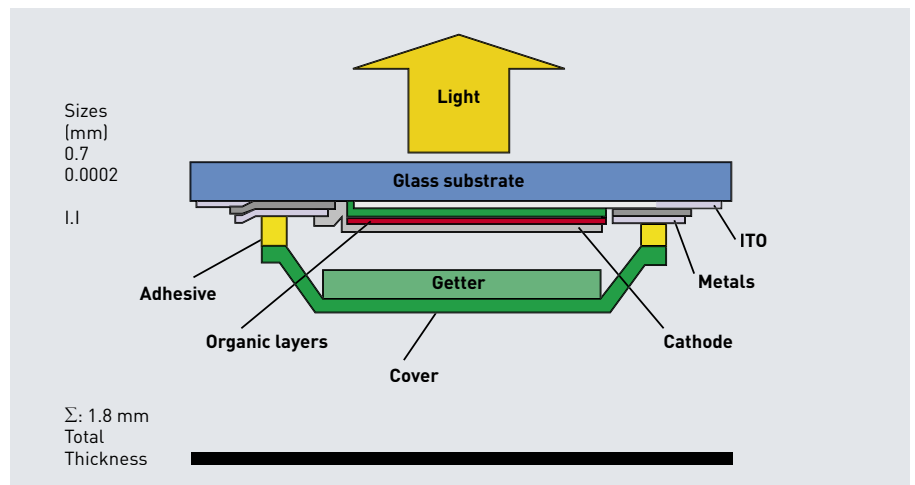
Table: Display of lamp lumen maintenance factors and the corresponding initial value factor (1/LLMF) for differing luminaire classifications. With the assumption of comparable rated input power values and rated luminous flux of the luminaires, it becomes clear that when using luminaires from lower luminaire classifications a higher quantity and a higher connected load is needed.

In addition, photometric planning must also take into account the time-related soiling of luminaires and rooms. For these factors, characteristic values apply with regard to different types of luminaires and, with indoor lighting, different room sizes.

11. WHAT IS AN OLED?

OLED is short for organic light emitting diode. OLEDs consist of several different material layers, and each of these layers has a specific task. Beginning with the carrier material, today usually glass but in some cases metal, and finishing with the encapsulating cover glass, 10 different layers are not unusual. Among these are in some cases transparent electrode materials, electron transporting materials and the actual organic emitter materials. Light generation takes place within these organic emitter materials. The materials are applied in very thin layers (sometimes consisting of just a few nanometres) in planar fashion onto the carrier materials to create a homogeneous, luminous sequence of layers.

General construction of an OLED



OLEDs emit light only in the visible range. Depending on the specific combination of individual layers, they emit monochromatic (single-colour) light or white light. Warm white and cool white colour tones are possible. The light is emitted diffusely, homogeneously and almost Lambertian, in one direction (with non-transparent OLEDs) or two directions (with transparent OLEDs).

The functional principle is similar to that of LEDs. Electrons and holes recombine with each other with OLEDs as well to generate energy in the form of light. As with LEDs, band structures exist in whose transition areas the recombination processes take place.

The production of OLEDs is under cleanroom conditions and is implemented by vaporization under high vacuum. This is a very elaborate and expensive complex process, and even the smallest of impurities can damage the organic materials. The layer construction must therefore be optimally protected from external influences such as oxygen, water vapour and other particles by very good encapsulation with a cover glass.

The current state of development and -future outlook

OLED technology is in general experiencing a very positive development. Currently OLED glass tiles are available in sizes up to 15 cm x 15 cm that emit light in one direction, and OLED efficiency levels range from 30 to 60 lm/W. These efficiencies will increase soon. In the same time period it will also be possible to reduce costs and further develop unique properties such as transparency and flexibility.

Major manufacturers are investing many millions in production plants and new business models. Large-scale installations with OLED are being aimed at and are one of the approaches in helping OLED to achieve greater market acceptance.

Although OLEDs are currently still expensive, quantity is used to impress. Several OLED producers as well as luminaire manufacturers link their installations with supplementary features (e.g. sequential control, interaction or kinetics). In the near future OLED will be strongly customer-oriented and will find applications in projects/project luminaires. The manufacturers are "pushing" the technology and hope for the "pull" of the lighting industry.

What's happening in the organic LED sector

The current positioning of the TRILUX Group with regard to OLED already today covers possible focus areas of future developments. The technology is being actively pushed by the manufacturers. However, without the support, the pull of the lighting industry, a "chicken and egg problem" will remain. With increasing demand the producers could reduce the prices, and luminaire manufacturers could integrate more OLEDs should the price be low enough.

Arguments concerning added value and customer benefits must be continuously updated and rethought due to LED developments. Because LED technology will continue its dynamic development though, OLEDs will find it hard to make their way in most application sectors. For luminaire manufacturers it is enormously important to precisely observe possible changes in value creation components in connection with OLED, to be able to respond as early as possible. Participating in research projects helps in this regard, and for this reason TRILUX is contributing to the cooperative OLYMP research project.

Olymp

The aim of OLYMP is to lead OLED technology to market maturity for the general lighting mass market. The technological advance gained by the cooperation partners in the organic LED sector should be maintained, therefore enabling OLED materials and series products from Germany. A high level of innovation is needed to defend this peak position with the technological core topics of higher energy efficiency and costs that are simultaneously suitable for the lighting market. Following successful market launching, it will be increasingly necessary to introduce initial small series for increasing the acceptance of this new wide-area light technology to help achieve wide market penetration. As part of the research project, TRILUX will present the results in the form of luminaire demonstrators.

In a similar way to LED development, much momentum can be taken over from the display industry with the OLED sector. The costs for materials will decrease, and acceptance for this technology will significantly increase in the sector.



The first luminaire demonstrator of the cooperative OLYMP research project

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Simply managing projects

Product data featured in the online catalogue, your configurations or important website content – all that can be saved in the TRILUX portal. You can create project folders and even work with others in a team simultaneously. The integrated timeline with comment function always provides a complete overview of the current project status.

Simply calculating prices

Never lose sight of costs again. The portal directly displays gross prices for individual products (may vary depending on the country version). And that's not all – if several products are assigned to a project the total sum is automatically calculated.

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