"You can’t live on fears.” ERCO founder Arnold Reininghaus lived by these words, and today, they still characterise our family business. Founded in 1934, ERCO began to explore architectural lighting in the sixties and became instrumental in establishing this new field in Europe. Barely 50 years later, the company has emerged as the first traditional luminaire manufacturer to migrate to a product range based completely on LED technology. The dauntless determination to confront new issues and technologies early on while adopting a consistent approach was the backbone that today has established ERCO as a leading specialist in architectural lighting with premium digital lighting tools.

This mindset also explains our clear and consistent approach to the application of architectural lighting: We consider the immaterial material known as light a design tool to create ambience by modelling and dividing up space and objects using subtle or striking illumination for scenic effect. It follows that light must be understood as the fourth dimension of architecture. With this in mind, ERCO develops lighting tools as a modular toolbox system designed to achieve user-based and perception-orientated lighting concepts. In times of dwindling natural resources, we are also responsible, as a luminaire manufacturer, for upgrading our products consistently, ensuring maximum efficiency in use and maintenance.

As a logical consequence, ERCO is devoted to perfecting LED technology by focusing on our expertise in optoelectronics. We have reconsidered architectural lighting with LED in every possible aspect, from light generation and light guidance through to light control, ensuring now and in the future that we only supply highly efficient and economical light for any spatial setting. This approach is summarised precisely in our current leitmotif – “light digital.”

Please allow us to give you some insight into our development work, outlining the unique strengths and features of our LED technology, to demonstrate the true added value of ERCO lighting solutions.
ERCO develops, designs and produces all the digital lighting tools at its Lüdenscheid base on the southern edge of the Rhine-Ruhr metropolitan area, in an award-winning facility including laboratories, production and offices, that has been recognised for its architectural merits. It was here that ERCO made the strategic decision in 2006 to focus consistently on LED technology – and to draw on its expertise in optoelectronics. This timely decision has taken the ERCO LED lighting technology to an unparalleled level of excellence that combines with an intelligent system design to offer sophisticated solutions for many and diverse applications in architectural lighting.

Genuine passion for innovative technology and state-of-the-art architecture was, is, and remains a key component of the ERCO brand. The synthesis of our perfectionist approach to technical detail and our strategic insight into sustainable, sophisticated and user-oriented architectural lighting permeates every aspect of our work. It is defined by a holistic mindset that centres on close interdisciplinary collaboration with lighting technicians, design and production engineers, and designers. This dynamic dialogue between the ERCO experts manifests itself in highly efficient and agile product development and enables us to drive innovations, regularly launching premium products at a fast pace.

Research and development
As a cosmopolitan company with a global brand, ERCO keeps its finger on the pulse of the international lighting and architecture scene, allowing us to translate major trends in technology and design into sophisticated lighting tools. Considering that the quality of the lens system has a huge impact on the characteristics, performance and efficiency of an LED luminaire, ERCO sees a focus of its development work on optoelectronics as the interface between optical systems, electronics and information technology. All products are tested in our in-house laboratory to ensure that they meet the highest standards of performance, light quality and longevity. This holistic approach of considering light as a single unit, from the specification of high-power LEDs to the development of lens systems and control gear through to the creative challenges of a targeted design concept for each project, enables us to guarantee a consistently high quality of our products based on state-of-the-art LED technology.

Product design
From the corporate architecture of our factory through to the clear style of our lighting tools and our meticulous corporate image – design has always been at the heart of ERCO’s process. Strong concepts and creativity form the backbone of a design team focused on the creation of a distinct design language for our LED product range on the principles of functional minimalism. At the same time, our team is permanently engaged with advancing our archetypal, modular system principles, whereby aesthetic aspects of spatial design are given the same attention as functional parameters such as efficient thermal management and glare control. Available in several sizes and with different mounting options, the luminaires in the ERCO range offer an appropriate solution for a wide variety of applications as well as spatial settings and dimensions.

Production and assembly
All processes at the Lüdenscheid facility, from electronics and tool manufacturing all the way to polymer production and metal-working, are closely monitored by ERCO experts and consistently optimised to guarantee efficiency and superior quality. Our electronics production is ESD-secure and the controlled reflow process is continuously monitored, for optimised assembly based on a meticulously researched time and temperature profile. The result is products that ensure long life and remarkably low failure rates. The same attention to detail carries through to the in-house production of ERCO track, providing designers and fitters with the best possible infrastructure to support the installation of lighting systems. Our suppliers are just as carefully selected for lasting partnerships built on trust. Working closely as a team, with short distances between development and production, ensures that ERCO customers can rely on our products 100%.

Engineering excellence for the light of the future
Global concepts, created in Germany
ERCO is a global player with independent sales organisations and partners in 55 countries worldwide. In addition to these locations, ERCO showrooms and offices can be found all around the globe, where our teams of highly qualified and specially trained staff are available as professional consultants. This worldwide network ensures reliable service and competent, on-site support especially on international and multinational projects.

ERCO consultants
Our local ERCO consultants see their role in the building process as “consultant to the consultant”, providing professional expertise to designers in all aspects related to lighting technology throughout each project phase. In addition to advisory services in the planning stage, this role also supports tendering, sample supply and project design all the way through to supply logistics including customer service and training. With case-related specialist information and customised product documentation our experts work as partners in the background supporting the various facets of project design.

ERCO showrooms
Our showrooms and offices provide spacious facilities for productive work meetings. Each showroom has a mock-up section designed to test the visual effects of lighting tools and present new products as well as to demonstrate precisely the advantages of perception-oriented lighting design. Some of our showrooms also have examples of ERCO’s lighting skills in the outdoor area, whilst others reflect ERCO’s approach to modern office lighting with recently upgraded workplaces.

Events and workshops
ERCO has a passionate belief in sharing its expertise in LED technology with designers in the context of workshops and seminars. Events held in our showrooms are a forum for exchange between creative and technical designers, whilst at the same time showcasing ERCO’s passion for “light digital” as the current leitmotif.

www.erco.com/service
ERCO is dedicated to optimising the use and character of indoor and outdoor architecture with light. Our lighting tools are developed in close collaboration with architects, lighting designers and electrical consultants, whereby we harness the full potential of LED technology to develop products on the basis of efficient visual comfort. Emphasis in our approach is given to the principles of qualitative lighting design for optimum structuring and effective illumination of space combining superior glare control with energy efficiency and longevity based on state-of-the-art LED technology. ERCO develops lighting tools used primarily for applications in the following fields: Work, Shop, Culture, Community, Hospitality, Living, Public and Contemplation. The following pages demonstrate that our LED technology adds real value to any application.

**Work**

International law firm Pinsent Masons in Belfast uses ERCO’s efficient LED luminaires throughout its building, using downlights with LED technology as the core of the firm’s lighting concept adding structure to the ceiling whilst offering an architecturally pleasing alternative to linear fluorescent luminaires.

Qualitative lighting design for offices geared towards efficient visual comfort with precise zoning to meet the relevant standards while responding to human perception and ensuring an economic use of the luminaires. In addition, ERCO LED luminaires set standards in office lighting with excellent efficiency and low maintenance requirements.

**Shop**

Light in fashion stores, car dealerships, supermarkets and shopping malls must offer the flexibility required to reconstitute the luminaires to periodically changing product presentation. In the outlet of Berlin based eyewear manufacturer Mykita, ERCO LED light illuminates the high-quality materials and stylish outlines of the eyewear models with utmost effect using neutral white light, rendering the values accuracy in brilliant light.

**Culture**

ERCO is well known for fulfilling the challenging demands of museum lighting with superior solutions, leading to an extensive range of projects worldwide. The Fränkische Galerie in Kronach opted for ERCO LED light to illuminate its artefacts in superbly natural colours without causing damage as a result of UV or infrared exposure. LED light stages exhibition concepts and architecture with absolute precision, exceptional uniformity and remarkable brilliance for an optimised visual experience.

**Community**

Architectural lighting in educational and administration buildings, as illustrated here in the centre of the ICE Saclay Science Centre, must meet the demands of large and much frequented rooms with maximum efficiency. LED technology offers an ideal solution combining exceptional energy performance with high levels of luminous flux and low maintenance requirements.
LED light in practical applications

Living

RGBW luminaires in Hamburg’s Villa Linari transform the atmosphere with changing colours. Lighting in the home can create an individual ambience whilst meeting a wide range of requirements in a relatively small space – from the illumination of dinner tables and reading chairs through to workplace illumination for the kitchen and desk. Digital lighting tools generate a wide spectrum of light distributions ensuring maximum precision in adjusting the light to suit individual contexts, whilst at the same time providing highly uniform light of a pleasant colour temperature with excellent colour rendering properties and maximised energy efficiency.

The Brasileiro restaurant in Prague uses warm white light for an appetising presentation of its hearty dishes. Lighting in restaurants, bars and hotels should create an ambience that reflects the relevant gastronomic concept. LED lighting tools offer excellent colour rendering properties to enhance the fresh look of meals whilst highly precise beams of uniform light segregate the dining area, bar and lounge using appropriate lighting designs.

Public

The remarkable results of using LED light to illuminate historic monuments or public squares are indisputable. The relighting of the Imperial Forums in Rome are the perfect example, using either warm white or neutral white light, with precise light distributions, to emphasise façades and ornamentation that reflect the symbolic character of this site. LED lighting tools are ideal for outdoor applications, offering high visual comfort, a robust design and minimum maintenance.

Contemplation

LED lighting tools support an ambience that belies the dignity of sacred buildings whilst enhancing the symbolic nature of light in religion. As well as strengthening the tranquil atmosphere in an interior with meticulously defined, uniform illumination, digital luminaires accentuate liturgical elements such as altars with precise light distributions, emphasizing ornamental details and wall paintings whilst enhancing the character of domes and other roofs. In the Siegerland motorway church, for example, LED light lends weight to the building’s modern and sturdy silhouette and underlines the warm and protective feel of the wooden structure inside.
Lighting tools in the indoor area

Whether the project involves modern author-architecture, a large factory loft or the pragmatic concrete structure of the 1960s, an open-plan office, a concept store or a museum: ERCO lighting tools offer a comprehensive toolbox of modular lighting solutions for a wide spectrum of indoor and outdoor applications. Our broad variety of versatile luminaires supports architects, lighting designers and electrical consultants in implementing their lighting concepts with meticulous care to suit any spatial setting and mounting situation. Based on the intended purpose, their light enhances space with pinpoint accuracy, provides security and orientation with uniform levels of ambient lighting or produces a wide and spacious impression of the room using wallwashing. Their understated, functional design reflects the requirements of LED technology and lends ERCO lighting tools legitimacy as aesthetic architectural elements in their own right.

Transforming high rooms: Ceiling washlights
The light of ceiling washlights projected into the room enhances the protective character of ceilings whilst creating a sense of height and width, above all in rooms with low ceilings.

Directing attention: Spotlights, floodlights, wallwashers
Whether as accent light focused on a sculpture or wallwashing for a shop display – spotlights, floodlights and wallwashers allow highly flexible deployment thanks to adaptions for track systems, adjustable luminaire heads and a wide spectrum of light distributions.

Uniform and unobtrusive: Recessed luminaires
Recessed luminaires are deliberately toned down in favour of their lighting effect. Wide-beam distribution options as well as high visual comfort enable highly uniform illumination with large luminaire spacing.

The right scale: Surface-mounted and pendant luminaires
Pendant luminaires are designed for flexible height adjustment in relation to the architecture and its use, providing economical ambient lighting with excellent glare control. As succinct architectural elements they are often used to highlight particular areas in the room.

Productive working: Workplace lighting
Flexible positioning, glare-free and dimmable – workplace lighting needs to meet individual requirements. ERCO workplace lighting brings this flexibility to any situation.
Lighting tools in the outdoor area

ERCO’s range of robust spotlights offers the broadest possible scope for design with a diversity of light distributions, lumen categories and mounting options for any outdoor application.

Facilitating orientation:
Bollard luminaires
Bollard luminaires contribute to safety by illuminating pathways, stairs and other open spaces. Dark Sky technology protects pedestrians from glare, while at the same time preventing spill light above the horizontal plane.

Structuring space:
Façade luminaires
Thanks to uniform wash-lighting of the ground and ceiling, façade luminaires ensure safety on pathways whilst defining spatial borders without spill light disturbing the environment around them.

Directive and decorative light: In-ground luminaires
In-ground luminaires are used as directive lighting and highlight entrances, trees or walls. Their distinctive upward light direction, with efficient glare control as a mandatory criterion, immediately attracts attention adding a further decorative element to the lighting concept.

Robust ambient lighting: Recessed luminaires
Downlights, directional luminaires and wallwashers enable designers to extend perception-oriented lighting design with excellent visual comfort to the outdoor area.

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In 2014, the Nobel Prize in Physics was awarded to a trio of scientists who invented the first blue light emitting diode in 1995. The blue LED was the final step towards creating white light, making it the “rough diamond” for the sophisticated digital technology that ERCO has perfected in its pioneering approach in architectural lighting. In other words, it has taken ERCO less than 20 years since the invention of white LED light to develop today’s highly precise, efficient and low-maintenance ERCO LED technology based on the guiding principle of projected LED light.

Considering this huge step forward in lighting technology, the following pages give you all the details of what this signifies for our products whilst providing insight into the photometric systems that explain the superior quality of ERCO LED lighting tools — extending from the various different lenses in the context of their application to LED modules and control gear through to thermal management.
Uniformity and width: The lens wallwasher

The lens system in wallwashers enables the illumination of vertical surfaces, with the light beginning just below the ceiling. The elongated collimator projects the light of the LEDs onto the wall at an optimal angle, achieving uniform light distribution with large luminaire spacing. The result gives a brighter impression of the room.

Different light distributions:

As well as the primary LED lens, ERCO spotlights, projectors and in-ground luminaires use an optical system that assimilates collimating and interchangeable Spherolit lenses into a single unit. This results in the availability of different light distributions for hugely creative deployment in any project, whatever the shape and size of the luminaire.

Maximum visual comfort: The diffuser lens with darklight reflector – Quintessence

Quintessence downlights combine a diffuser lens with a darklight reflector for an optical system that produces an exceptionally wide beam pattern with a superb cut-off angle. This ensures uniform ambient lighting with large luminaire spacing and efficient glare control.

Collimating lenses for any spatial dimension – Compact, Quadra and Starpoint

The one-piece lens system of the Compact, Quadra and Starpoint downlights combines the photometric principles of collimating and Spherolit lenses for a compact design. The curvature and surface texture of the lens determine its optical properties, offering the designer a variety of light distribution options with a wide choice of lumen packages.

Efficient planning: The free-form lens – Skim

Skim downlights project the LED light through a drop-shaped lens that determines the light distribution. With wide flood and oval flood as its two characteristics, Skim offers a highly efficient system with superior glare control for low-cost lighting solutions.

Product development at ERCO always begins with a definition of the specific application of the prospective lighting tool. ERCO designs luminaires with focus on a perception-oriented approach to lighting design, based on the principles set out by American lighting designer Richard Kelly.

In the 1940, Kelly developed the "language of light", distinguishing three basic qualities of light that enable an enormous diversity of lighting solutions: Glare-free downlights or wallwashers produce ambient lighting with a soft, uniform beam to facilitate orientation – Kelly described this as "ambient luminescence". Spots with different illuminance levels accentuate objects and important areas with directed light – referred to as "focal glow". The "play of brilliants", finally, is light as an aesthetic end in itself, such as light art, moving light, chandeliers and other decorative lighting tools.

Today, these principles still provide a solid basis for qualitative lighting design – and the development of ERCO optical systems. Our modular lens system with Spherolit technology enables a wide range of lighting accents, whereas various downlight systems achieve homogeneous ambient lighting in any size of room. Uniform vertical illuminance as the ultimate challenge in lighting design takes "ambient luminescence" to a whole new level: Wallwashing optimises the visual comfort in almost any architecture, draws the user inside and directs the attention onto façades, shelves and other vertical surfaces.

LED optical systems at a glance

Projection replaces reflection

ERCO designs LED luminaires with focus on the principle of light projection. The conventional point light sources used in the past emitted light in a solid angle of virtually 360°, whereas the inherent design of LEDs means that their light is directed in a solid angle of less than 180°. Using a lens system with precise projection, ERCO ensures reduced losses due to spill light or light emitted towards the façade (shown red in the drawing). At the same time, the higher transmission efficiency of lenses compared to that of reflectors produces a higher light output ratio which results in the greater luminous flux from the luminaire. In practice, it comes down to how much light arrives on the target surface.
Spherolit technology for different light distributions

Directed light used to accentuate fashion, art, information boards, furniture ensembles or individual areas of the room – referred to as “focal glow” – creates attention and facilitates orientation. ERCO LED spotlights and projectors are highly versatile precision lighting tools designed for purposes such as the glare-free illumination of artwork, the pinpoint accentuation of product presentations, the scenic lighting of historic features or evocatively dramatic light for the event and gastronomy sector.

The patented Spherolit lens system, specially developed by ERCO for LED technology, stands for the broadest possible scope for design with absolute precision. Based on the principle of light projection, a collimating lens concentrates the light of the LEDs efficiently in a parallel beam without losses due to spill light.

A subsequent disc-shaped Spherolit lens determines the actual light distribution for the specific application. This approach of a modular lens system, especially combined with the interchangeable Spherolit lenses, enables a broad spectrum of light distribution options, regardless of the size and output of the lighting tool. What this means is that the Spherolit lens system liberates the designer from technical and formal constraints to enable perception-orientated lighting concepts.

Spherolit lens (modular lens system)
The semi-spherical light emitted through the silicon lens of each LED (primary lens) is focused through a polymeric collimating lens (secondary lens) and aligned into a parallel beam for maximum luminous efficacy. The interchangeable Spherolit lens, made of optical polymer, in front (tertiary lens) determines the light distribution of the luminaire based on the shape of the spherolites.

The workings of the Spherolit lens
By designing the shape of the domed spherolites populating the surface of each Spherolit lens individually, a wide range of lens characteristics can be created. The parallel incident light is spread to a greater or lesser extent depending on the curvature of the surface. This results in lenses that have different beam angles, ranging from narrow spot to wide flood, whilst retaining the same overall geometry. In addition, asymmetrical spherolites enable oval beams and wallwashing lenses. The homogeneous arrangement of the individual segments enables the light of multiple collimating lenses to be directed using a single Spherolit lens. A characteristic feature of this approach is light of the highest quality; the beams are particularly uniform and have a clean, slightly soft edge.

The spot Spherolit lens has flat spherolites producing low dispersion for a narrow beam angle. The wide flood Spherolit lens has the greatest curvature. The wide spread produces a beam with a large emission angle.

Narrow spot light distribution used to accentuate small objects with high illumination or to cover considerable distances between luminaire and object. Beam angle < 10°.

Spot light distribution for accent lighting for objects of all kinds, especially to reveal the three-dimensional shape. Beam angle 10°-20°.

Flood light distribution for efficient accentuation of large objects or to uniformly emphasise a complete spatial zone. Beam angle 25°-35°.

Wide flood light distribution for flexible, flooding illumination of surface areas and spatial zones, especially useful for the presentation of goods. Beam angle > 45°.

Oval flood Axially symmetrical light distribution with flood characteristics produced by a rotatable oval beam of about 30° by 90°.

Wallwash Light distribution for highly uniform vertical illumination with efficient visual comfort for a wide spatial impression.
Ambient lighting
Optical systems in downlights

Uniform general light emitted from ceiling-integrated luminaires, defined as “ambient luminance” by Richard Kelly, facilitates orientation and gives a feeling of safety. Excellent glare control enhances the visual comfort required for offices, administration buildings and educational facilities as well as the home. Almost half a century of experience in downlight development qualifies ERCO as a specialist in powerful and highly efficient LED recessed luminaires. While the flexibility of Spherosil lenses accounts for the merit of spotlights, it is the efficiency of the compact lens system in downlights that is helpful in its own right. This enables the designer to reap the benefits of ceiling-integrated mounting without limitations in the concept. Thanks to their low recess depth, downlights afford great flexibility in the coordination of the ceiling plan; the luminaire itself blends discreetly into the background, focussing users’ attention on the light effects. Downlight systems with different light distributions provide the flexibility to define complete, integrated lighting concepts for related areas – such as efficient zonal lighting in the office. The rotationally symmetrical and oval light distributions enable the designer to respond individually to specific architectural features without the need to specify a different style of luminaire and specific architectural features without the need to specify a different style of luminaire and without compromising on the design.

Free-form lens – efficient and glare-free Available with wide flood or oval light distribution, Skim offers efficient visual comfort with a high light output ratio. A unique feature is the complex convex shape of the lens that lends it aesthetic appeal. Skim achieves excellent efficiency with a priori to performer ratio designed particularly for projects focused on economy.

Collimating lens with wide light distribution Powerful lens technology for maximised diversity: Compact and Quadra downlights combine various different lumen packages with highly efficient light distributions, making them a flexible lighting solution for rooms of any size.

Free-form lenses in Skim downlights (integral lens system) The free-form lens made of optical polymer has been meticulously calculated and engineered to project soft, glare-free LED light precisely and efficiently onto the target surface.

Collimating lenses in Compact and Quadra downlights (integral lens system) Collimating lenses focus the light of the LEDs efficiently in a parallel beam in order to create a rotationally symmetrical or oval light distribution depending on the curvature of the surface.

Collimating lens for small dimensions Small size and three efficient light distributions with excellent visual comfort: Starpoint downlights encourage wide luminaire spacing even in rooms with low ceilings.

Wide light distribution The wide, rotationally symmetrical light distribution creates a balance between horizontal and vertical illuminances, suggesting its use for efficient ambient lighting in offices, sales areas and movement zones.

Oval flood light distribution The oval light distribution lends itself particularly to the semiconcentrated illumination of desks, merchandising tables, walkways and long aisles. Precise beam alignment is achieved by rotating the luminaire.

Downlights replace linear luminaires
Downlights offer an efficient, aesthetically appealing alternative to lighting solutions with linear luminaires, that previously defined offices, administration buildings and educational facilities. Efficient lens systems open up a wide range of new options by projecting the light in specific patterns, generating wide beam characteristics or oval light distributions. This allows for linear arrangement with large luminaire spacing, resulting in energy-efficient solutions with focus on perception-oriented lighting for aspects such as conference tables or movement areas. Small luminaire diameters combined with large luminaire spacing ensure that downlight solutions integrate into any architecture. The result is greater freedom in flexible ceiling design, without dominating the architecture.

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Efficient visual comfort is an essential aspect of perception-orientated lighting design. Subtle light from a virtually invisible source in the ceiling achieves its full effect only if the downlights are optimally shielded. The photometric system of Quintessence downlights is designed for excellent visual comfort with maximised luminaire spacing. The combination of a specially developed diffuser lens and a darklight reflector achieves a 90° emission angle with a 40° cut-off, enabling the luminaires to be spaced up to 50% further apart and yet retain their high visual comfort. The extra wide flood light distribution results in superbly uniform illumination in the horizontal plane, whilst the cylindrical illuminance components ensure good facial recognition and spatial perception, making this combination ideal for high-end applications with varying user requirements, such as in educational, transport or administration buildings.

The principle of maximum visual comfort

The optical system of Quintessence solves two photometric challenges at once: An exceptionally wide light distribution with a 90° emission angle as well as superb glare control with a 40° cut-off. High cylindrical illuminance with exceptionally uniform horizontal components are characteristic for this light distribution, meaning that a decrease in illuminance levels between two luminaires will be imperceptible, even if with wider spacing. For exceptional uniformity of the beam, the diffuser lens with darklight reflector allows luminaires to be spaced at roughly 1.5 times the height of the luminaire above the working plane.

Diffuser lens and darklight reflector in Quintessence downlights

The diffuser lens produces a uniform beam with amazing glare control, whilst the darklight reflector in front defines the width and cut-off angle of the light distribution, avoiding glare in the reflector.

Extra wide flood light distribution

Light distribution with an emission angle of 90° and a 40° cut-off for uniform lighting with high cylindrical illuminances.

Quintessence double-focus downlights for high rooms

For efficient glare control in spaces with ceilings of more than 5m, we recommend using Quintessence double-focus downlights. As well as offering the same luminaire diameter, their lens system ensures unparalleled glare control.
Vertical illuminance
Optical systems in wallwashers

The vertical planes of an environment constitute up to 80% of our visual perception. This explains why vertical illuminance plays such a crucial role in qualitative lighting design. Wallwashing enhances the perception of space whilst increasing the impression of brightness and optimising the visual comfort by reducing contrast. Add to that the amazing effect of vertical illuminance that gives compact rooms a more spacious and higher appearance. As well as that, illuminated walls have a magical quality that lends itself particularly to enhancing the ambience in restaurants and in the home, whereas grazing light makes a feature of materials and surface structures – as on façades – for a relief-like effect. With its compelling advantages, vertical illuminance adds to the aesthetic appeal of “ambient luminescence” and “focal glow” whilst at the same time supporting efficient and economical lighting concepts in offices, administration buildings, shops, places of worship and public areas.

Be it from the ceiling or in-ground, close to the wall or from a great distance, for indoor and outdoor application – wallwashers are an integral part of ERCO’s product range. Developed in-house with asymmetrical light distribution, the ERCO lens systems produce beams of utmost precision and uniformity.

Overview of wallwashing
A primary point to consider in perception-oriented lighting design is vertical illuminance. The type and intensity of wallwashing determines the characteristic features of the lighting concept. We have summarised the broad potential of vertical illuminance with ERCO lighting tools for you here.

1. Spotlights
For optimum alignment of track-mounted lens wallwashers positioned at an ideal offset from the wall, the spotlights should be tilted at an angle (α) of 35°.
Rough guide: α = 35°
Rough guide: a = 1/3 x h

2. Lens wallwashers
Depending on the type of lens wallwasher, the luminaires spacing (d) for some wallwashers may be up to 1.5 times the offset from the wall (a).
Rough guide: d ≤ 1.5 x a
Rough guide: a = 1/3 x h

3. Recessed grazing light wallwashers
Arranged in a linear configuration in the ceiling, with spacing of up to 10cm, grazing light wallwashers such as Lightgap achieve good uniformity on the wall.
Rough guide: a = 10cm

4. Projectors
For optimum alignment to achieve efficient wallwashing using projectors positioned at an ideal offset from the wall, the luminaires should be tilted at an angle (γ) of 55°.
Rough guide: γ = 55°
Rough guide: a = 1/3 x h

5. In-ground luminaires
Similar to recessed luminaires for ceilings, the ideal offset from the wall (a) for in-ground luminaires is around one third of the wall height (h).
Rough guide: a = 1/3 x h

6. In-ground grazing light wallwashers
As a grazing light wallwasher, the Site in-ground luminaire produces excellent uniformity with a wall offset (a) of around 20cm.
Rough guide: a = 20cm

The optical system in lens wallwashers
A linear collimating lens directs the light of neatly aligned LEDs onto a lens that, in turn, refracts the beam towards the wall. A reflector bounces the light reflecting off the lens surface onto the wall zone near the ceiling.

The optical system for uniform vertical illuminance
Superbly uniform washlighting, with a homogeneous upward right up to the ceiling and seamless beam transitions are characteristic of ERCO’s wallwasher technology.
LED modules

How can you define the quality of LEDs? Look at the actual diodes, but more so, consider them in context, in other words, on the printed circuit board. ERCO only sources LEDs from leading manufacturers, specifying the highest standards of luminous flux, luminous efficacy, colour rendering, colour locus and consistent electronic characteristics in mass production. The LED binning used are updated every year for new product development as well as to guarantee that existing ERCO luminaires are equipped with only the most advanced technology.

Committed as always to meeting the highest standards of quality and quantity, ERCO develops and populates its LED modules in-house. To achieve the intended light effect with maximum efficiency, the layout for each separate light distribution is created with painstaking attention to detail and matched individually to the right lens system. This ensures that ERCO is always in control of the heart of its lighting tools, enabling exceptionally brilliant and superior performance.

Why ERCO LED modules?

It is only when all the system components are designed for optimum compatibility that LED luminaires guarantee high efficiency and a long functional life. With this in mind, ERCO designs and produces its LED modules in-house and will replace any module that develops a fault due, for example, to overvoltage. Within a given production year, ERCO always uses the latest generation of LEDs based on optimised binning parameters. For clear identification of the LED modules even after an update, ERCO specifies a ten-digit version number alongside the article number, which is found on each luminaire. This number, which applies to a luminaire range, remains the same and bears no reference to the LED generation. In other words, a spotlight and a downlight may use the same LED generation despite the difference in version number.

In-house PCB design

ERCO develops and populates its PCBs in-house. Strict testing to the highest standards of quality and efficiency means exceptionally low failure rates.

Why ERCO LED modules?

ERCO high-power LEDs

ERCO uses the same high-power LEDs for all LED lighting tools. At 700lm, an LED has an output of around 2W. This results in a luminous efficacy of 138lm/W for neutral white LEDs and 188lm/W for warm white LEDs (status as of 2016).

In-house PCB design

ERCO develops and populates its PCBs in-house. Strict testing to the highest standards of quality and efficiency means exceptionally low failure rates.

Why ERCO LED modules?

Relative damage factor

Light source Relative damage factor (f/dm2/1000lm)

LED warm white, Ra 90 0.149
GT 12-RIE with UV filter 0.158
GT 12-REE 0.169
HIT 930 0.183

The relative damage factor specifies the ratio of the damaging radiation intensity and the illuminance. Since the LEDs used in our lighting tools are practically UV- and IR-free, ERCO luminaires with warm white light are ideal particularly for lighting tasks with conservation requirements, such as in the museum.

Relative damage factor

Light source Relative damage factor (f/dm2/1000lm)

LED warm white, Ra 90 0.149
GT 12-RIE with UV filter 0.158
GT 12-REE 0.169
HIT 930 0.183

The relative damage factor specifies the ratio of the damaging radiation intensity and the illuminance. Since the LEDs used in our lighting tools are practically UV- and IR-free, ERCO luminaires with warm white light are ideal particularly for lighting tasks with conservation requirements, such as in the museum.

Different light colours

ERCO deploys white LEDs in two light colours: 3000K for warm white and 4000K for neutral white. LEDs with a warm white light colour generally provide better colour rendition quality, whereas neutral white LEDs have higher luminous efficacy.

High lumen maintenance

Advanced passive thermal management ensures that at least 30% of all LEDs still achieve more than 90% of the original luminous flux at up to 50,000 hours. Effectively, this means that the luminous flux of no more than 10% of all LEDs in this period reduces to 90% or less.10x8/100. Up to this point, the failure rate of individual LEDs used at ERCO is just 0.1%, meaning that even after 50,000 hours, the luminaire remains fully operational.

Precise chromaticity location in LED selection

All LEDs exhibit a degree of production tolerance in areas such as the light colour. ERCO takes account of these variations by specifying chromaticity tolerances within the tightest viable parameters. All ERCO LEDs have a chromaticity variation of less than 3 SDCM (Standard Deviation of Colour Matching), meaning that any colour deviation between individual LEDs is barely perceptible to the human eye. Even after 50,000 hours, this difference is still below 3 SDCM.

Optimum colour rendering

ERCO offers only the best possible colour rendering, with a Ra >90 for warm white light and a Ra >80 for neutral white light. LEDs in ERCO luminaires with white light have a continuous spectrum without emphasis on individual spectral ranges by adding coloured LEDs. This guarantees a faithful reproduction of colours with consistent depth and vibrancy through to the end.

Coloured light

ERCO LED luminaires with RGBW technology enhance scenographic lighting concepts by allowing precise adjustment of the colour temperature over a wide range, mixing red, green, blue and white LEDs to produce a colour palette ranging from subtle pastel hues to rich saturated colours. The compensation factors for matching mixed colours are stored permanently in the control gear.

Why ERCO LED modules?

It is only when all the system components are designed for optimum compatibility that LED luminaires guarantee high efficiency and a long functional life. With this in mind, ERCO designs and produces its LED modules in-house and will replace any module that develops a fault due, for example, to overvoltage. Within a given production year, ERCO always uses the latest generation of LEDs based on optimised binning parameters. For clear identification of the LED modules even after an update, ERCO specifies a ten-digit version number alongside the article number, which is found on each luminaire. This number, which applies to a luminaire range, remains the same and bears no reference to the LED generation. In other words, a spotlight and a downlight may use the same LED generation despite the difference in version number.

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Long-life LEDs enable significant reduction in the energy consumption and maintenance requirements of a lighting system, but their new technical parameters require a change of approach to lighting design, discarding concepts based on conventional technology. Whereas previously the lamp wattage was a reference point for its luminous flux, constant advances in technology mean continually improving connected loads and luminous flux. For this reason it is advisable to consider LED luminaires in terms of their lumen categories. A similar problem arises with the term “lamp life”. For conventional lighting technologies, the “rated life” of a lamp usually indicates the time after which 50% of the lamps have failed to the point of replacement. The specified threshold for loss of luminous flux over the lamp’s functional life therefore means total failure. ERCO LED luminaires guarantee minimal drop in the luminous flux of individual LEDs, and even then remain fully operational for an exceptionally long period, beyond the specified 50,000 hours. The term “rated life” therefore is misleading here; a more accurate indicator for the performance of ERCO lighting tools is the lumen maintenance factor as the exact opposite of lumen depreciation.

**Longevity of ERCO lighting tools**

Lumen maintenance and failure rate

Long-life LEDs are electronic components that exhibit a slow decrease in luminous flux over time. The specification of precise L and B values, in conjunction with an operating period in hours, is a new part of the planning process. In nominal terms, this value is useful only if the operating temperature in the luminaire is kept within the approved range. Advanced thermal management in ERCO LED luminaires provides a sufficient buffer, particularly in critical environments and installation situations. As a quick guide, we have answered the three most frequently asked questions on the subject of lumen maintenance:

**What does the L/B specification stand for?**

The L/B values specify the drop in luminous flux of individual LEDs. ERCO uses LEDs of the highest standard currently available on the market. The L90/B10 specification with 50,000h means that within these 50,000 hours no more than 10% of the LEDs used (B) achieve less than 90% of their original luminous flux (L).

**What happens after the specified operating hours?**

Even after 50,000 hours, ERCO LED luminaires remain fully operational. The L/B value reveals nothing about the total failure of individual LEDs. The LEDs used at ERCO have a failure rate as low as 0.1% for 50,000 hours, whereas the standard failure rates in the market range at 0.2% for 1,000 hours, making them higher by a factor of 100. Unless the maintained value of illuminance drops after 50,000 hours, there is no reason to replace the luminaire.

**How do you recognise long-life LED luminaires?**

Next to the L/B value, full details of lumen maintenance typically include a specific time. Since manufacturers work with different standards (e.g. L90/B10, compared to L70/B50) there is no easy conversion. As a quality criterion of the LED, the lumen maintenance has a bearing on the lamp lumen maintenance factor of a luminaire and therefore is provided on the ERCO product data sheet as a useful parameter in the field.

### LED lumen maintenance – the definition

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### Lumen maintenance in a project: A comparison

**Comparing the lumen maintenance of LED luminaires**

The illumination levels prescribed in relevant standards are maintained values, which means that the real value should never drop below them. The planning concept should therefore provide for a safety buffer in the form of a maintenance factor (MF). The maintenance factor compensates for the degradation of the LEDs, but also for the effects of dust and dirt. Experience has shown, however, that dust deposits in clean indoor areas, such as the office, are of very little consequence today to the efficiency of LED lighting tools which are designed with an integral optical system. In applications that primarily require directed light, such as in the shop or museum, the room surface maintenance factor can also be disregarded. The primary consideration for the maintenance factor; and particularly for a comparison to equivalent luminaires, therefore is the lamp lumen maintenance factor (LLMF). Based on the manufacturer’s lumen maintenance specifications, the LLMF may vary greatly, especially when using the L90/B10 for 50,000 hours to ensure a greater degree of planning certainty. For major projects, such as office and administration buildings with typical, repetitive floor plans, a simple sample calculation will illustrate the advantage of L90/B10 LEDs used at ERCO compared to the current standard L70/B50.

### Current standard: L70/B50

**LLMF table (as at 2016)**

<table>
<thead>
<tr>
<th>h x 1000</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>LLMF</td>
<td>0.98</td>
<td>0.96</td>
<td>0.94</td>
<td>0.92</td>
<td>0.90</td>
</tr>
</tbody>
</table>

### ERCO: L90/B10

**LLMF table (as at 2016)**

<table>
<thead>
<tr>
<th>h x 1000</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>LLMF</td>
<td>0.94</td>
<td>0.88</td>
<td>0.82</td>
<td>0.76</td>
<td>0.70</td>
</tr>
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</table>

**Current operating hours**

<table>
<thead>
<tr>
<th>h</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>0.90</td>
<td>0.96</td>
<td>0.97</td>
<td>0.98</td>
<td>0.99</td>
</tr>
<tr>
<td>B</td>
<td>0.70</td>
<td>0.96</td>
<td>0.97</td>
<td>0.98</td>
<td>0.99</td>
</tr>
</tbody>
</table>

**Maintenance factor (MF)**

\[ MF = LLMF \times LSF \times LMF \times RSMF \]

**Example: Maintenance factor in the field**

- **Recessed downlight, wide beam**
  - L/W/H = 21.5/15/3m
  - Em (+0.75m) = 321lx

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For quality purposes, ERCO primarily uses its own control gear for DALI and phase dimmable luminaires. In turn, this means that proprietary ERCO luminaires and driver systems outperform all other alternatives in the field, with optimised, consistent dimming characteristics across the ERCO range, making the solutions ideal for filming in LED light. The control gear is precisely matched to the relevant LED module, offering a tested and effectively sealed unit for low-maintenance operation.

Control gear

Tested safety
ERCO luminaires are always provided with matched, pre-connected control gear, offering a tested and effectively sealed unit.

Flicker-free light
LEDs that are dimmed using pulse width modulation (PWM) in filming can produce unwanted image artefacts in the form of spurious lines. This is explained by the longer onoff cycles of the LED that reduce its brightness. For flicker-free light, ERCO DALI control gear uses the constant current dimming method (CCR), which varies the power to the LED. Phase dimmable ERCO control gear deploys a combination of both methods, changing from constant current dimming used across the main dimming range to PWM from 15% downwards. The small PWM range means less interruption of the current flow, thereby reducing the dimming level suitable for filming still further.

Colour compensation with LED varychrome luminaires
For production-related reasons, the dominant wavelength of coloured LEDs also extends within certain limits. To ensure precise and consistent colours, each colour-compensated ERCO RGBW luminaire is measured and adjusted individually in the factory. The compensation factors are permanently stored in each separate control gear.

Optimised electro-magnetic compatibility (EMC)
ERCO luminaires with control gear are developed, optimised and tested as a unit. This ensures reliable compliance with current EMC requirements.

Switchable
Switchable luminaires can be operated using any manual switch or actuator.

Optimised number of circuit breakers
ERCO uses only high-quality components in its control gear to reduce the start-up peaks. In contrast to conventional solutions, the number of required circuit breakers therefore depends on the load during operation.

DALI dimmable
The DALI dimmable luminaires are suitable for DALI-based lighting control systems and are compatible with the 2.0 standard. Individual control allows for totally flexible lighting scenes.

Phase dimmable
Dimmable luminaires can be controlled using trailing-edge dimmers, making them ideal for an energy-efficient upgrade to existing lighting installations that are often equipped with this widely-used dimmer technology.

Optimised number of circuit breakers
ERCO uses only high-quality components in its control gear to reduce the start-up peaks. In contrast to conventional solutions, the number of required circuit breakers therefore depends on the load during operation.
LEDs produce heat to generate light. Unlike conventional lamps, however, the heat is not emitted as infrared light, but dissipated via the LED module and the luminaire housing. Good thermal management therefore is indispensable for the efficiency of the LEDs as well as the integrated control gear in luminaires such as spotlights. With this in mind, ERCO’s holistic development approach combines photometric, electrical, mechanical and thermally efficient components in a single system. This unit is tested in simulations and measurements as part of the design process to ensure optimised thermal management of each luminaire in the field, achieving the enhanced levels of luminous efficacy and lumen maintenance measured in the laboratory.

**Thermal management**

LEDs are very sensitive to thermal stress, as heat degrades the chip causing gradual reduction in luminous flux over time. Elevated temperatures on the chip accelerate the degradation process, making optimised thermal management in the luminaire an essential factor in achieving the full potential of an LED throughout its entire functional life. This is why ERCO considers an LED luminaire as a single system consisting of photometric, electrical and mechanical components, ensuring in this way that the heat generated in the luminaire during continuous operation does not impair the longevity and efficiency of the LEDs.

**The effect of heat on LEDs**

In high-power LEDs, as with other lamps, heat is generated because of the flow of current. This heat is largely dissipated to the rear of the luminaire via the PCB and the interface to heat sinks or the luminaire housing, resulting in light that is largely free of infrared radiation. This aspect is particularly relevant for museums with conservational requirements, but also for the illumination of heat-sensitive foodstuffs.

**Heat dissipation**

With spotlights, the heat can be efficiently dissipated away from the LED module via the housing. The cast-aluminium material gives the luminaire good thermal conductivity and a high thermal capacity. The large-area connections between the rear of the housing and the LED’s PCB ensure good heat conduction.

**Heat dissipation via cooling fins**

The correct design of cooling fins ensures that the recessed luminaires have an ideal thermal balance. The position, length and thickness of the cooling fins are thermally simulated in the development process to determine the optimum design for efficient heat dissipation.

**Dissipation through heat sink plate**

In certain housing shapes, such as with Cylinder surface-mounted luminaires for the outdoor area, it can be necessary to fit an additional heat sink plate between the LED module and the luminaire housing to improve thermal coupling. Here too, the construction and dimensioning are based on thermal simulations that are part of the design process.
The potential to organise and structure space, enhance architecture or model objects with light is virtually unlimited. ERCO develops lighting tools to produce and guide light efficiently and precisely in any spatial situation and dimension. ERCO LED luminaires for indoor and outdoor areas are fully integrated into the systematic structure of the overall ERCO range.

Whereas the distinct functional design of the lighting tools, specially developed by ERCO’s design team to reflect the requirements of LED technology, is the most prominent aspect of the system, its heart is designed around different – and, for spotlight, exchangeable – light distributions, a wide variety of lumen categories as well as identical light colours. For easy commissioning and operation, the lighting tools additionally offer a huge range of tested mounting options, with defined control interfaces and uniform terminology. This allows the designer to combine ERCO LED luminaires as required to solve even complex lighting tasks without compromising on light quality and flexibility.

**Luminaire system**

**Luminaire ranges**

Whether it be for precise accentuation or the wash-lighting of a huge façade – the uniform product design, consistent light distribution options and identical light quality, with a diversity of sizes and lumen packages, enable the designer to select the luminaire best suited for the project.

**Spotlights and track**

Innovative LED spotlights can be simply installed into existing ERCO track installations.

**Quintessence**

The modular system of Quintessence is based on uniform mounting rings and mounting frames. This enables luminaires with different characteristics to be installed. Subsequent modifications such as replacing a low-voltage halogen downlight with an LED directional luminaire do not present any difficulty with Quintessence.

**Light distribution options**

With characteristics ranging from narrow spot to wide flood, the light intensity distributions of the LED luminaires follow the established structure of ERCO's product range and offer a wide scope for design, complemented by the new washlighting characteristics oval flood and wallwash. Replaceable Spherolit lenses provide additional flexibility in selected luminaires.

**Lumen categories**

With the luminous efficiency of LEDs continually improving, annual updates of the criteria and standards for binning ensure continuously optimised efficiency of the ERCO LED luminaires – making it particularly important when planning to think in terms of lumen categories. The LED luminaires in the ERCO product range cover a wide variety of lumen categories and therefore offer an appropriate solution for a large number of lighting tasks.

**Light colour**

By using deliberate contrasts between warm white and neutral white light, the lighting designer can create subtle contrasts and atmospheres while also responding to specific material properties. Varicolour LED luminaires additionally offer lighting tools for vibrant effects with saturated or pastel colours.

**Easy and reliable handling extends to digital lighting tools**

The ERCO system design is convincing not only from a design point of view, but also from a technical perspective. For optimised efficiency, existing installations with conventional lamps on ERCO track can be supplemented quickly and easily with LED spotlights, or replaced altogether, whilst the design of the LED spotlights can also be combined with conventional spotlights. Accessories such as the uniform mounting rings of the Quintessence range of recessed luminaires provide additional flexibility. Upgrades to more efficient LED technology or just small changes to the photometric distributions are simple matters due to the modular system.

**Modular product design**

Whether recessed luminaires, surface-mounted version or free-standing model – ERCO designs and develops luminaires with the objective of providing ranges with cross-category features. This approach enables the designer to define complete, integrated lighting concepts for related areas and to respond individually to specific architectural features without the need to specify a different technology or light distribution and without compromising on the design.
Case study

LED in the office: Downlights replace linear luminaires

Too little flexibility in the interpretation of national and international standards, combined with old-fashioned planning approaches using only uniform ambient lighting targets without hierarchies, can often result in lighting solutions that fail to consider the use of space and therefore lack the visual comfort required for offices. Conventional linear luminaires, for example, leave few alternatives apart from the traditional matrix layout. By contrast, LED downlights can be positioned as required, offering differentiated light distributions with amazing visual comfort that direct the light precisely where it is needed. Vertical illuminance on walls enhances the impression of brightness, making rooms appear visually higher and wider. As well as optimised luminaire arrangement, LED technology enables cost-effective lighting solutions oriented around the current standards for workplace lighting that meet the user requirements. At the same time, the freedom gained in flexible ceiling design leads to a new, liberated spatial aesthetic.

Conventional lighting design for offices

The traditional matrix layout of linear luminaires illuminates the office without considering the visual task at hand, resulting in higher energy needs for adequate lighting conditions, leaving a dull and monotonous impression of the room.

Lighting design for offices with LED downlights

Zoned lighting where it is needed: Efficient illumination with excellent glare control and high cylindrical illuminances for the workplace, combined with highly precise and uniform light for movement areas as well as vertical illuminance for a bright impression of the room make for a highly efficient concept with optimised orientation and contrast.

Conclusion

Whereas intelligent design concepts maximise the energy efficiency and low maintenance of LED lighting, a perception-orientated approach minimises the number of luminaires for optimised energy usage with enhanced visual comfort.

Case study

LED in the office: Downlights replace linear luminaires

<table>
<thead>
<tr>
<th>Key figures</th>
<th>Based on an average illuminance of at least 300lx around the workplace:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of luminaires</td>
<td>32</td>
</tr>
<tr>
<td>Connected load (kW)</td>
<td>0.79</td>
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<tr>
<td>Load per unit area (W/m²)</td>
<td>2.99</td>
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<table>
<thead>
<tr>
<th>Key figures</th>
<th>Based on an average illuminance of at least 300lx for workplaces:</th>
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<tbody>
<tr>
<td>Number of luminaires</td>
<td>50</td>
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<tr>
<td>Connected load (kW)</td>
<td>1.50</td>
</tr>
<tr>
<td>Load per unit area (W/m²)</td>
<td>5.66</td>
</tr>
</tbody>
</table>

Required luminaires 50
Connected load 1.50 kW
Load per unit area (W/m²) 5.66
Energy requirement in W/m² 2.99

Zoned LED lighting

Conventional matrix lighting
Case study
LED in the foyer: Qualitative, not quantitative lighting design

The foyer of an administration building, company, or concert hall is often the primary point of contact and with it a good representation of the user of the space. Typically expansive and frequently using high ceilings, it takes on a prestigious role, serving as reception and waiting area whilst providing access to all parts of the building. A striking lighting design helps to create an environment in support of the corporate identity. This multifunctional approach must be addressed with a differentiated lighting concept for maximum efficiency.

Qualitative lighting design applies the methods of perception psychology for efficient emphasis of individual zones. One way to facilitate orientation, particularly in large rooms with high ceilings, is to create the impression of depth using brightness contrasts between foreground and background. Targeted illumination of functional zones, such as stairs, reception desk and waiting area, divides up the space and directs attention. Wallwashing adds to the impression of brightness and, in the daytime, compares to the natural light that illuminates the areas near the façade, whereas at night it affords a view inside, giving the appearance of a transparent façade.

Qualitative lighting design in foyers

Easy orientation, bright impression: A perception-orientated design divides the room into light zones. Wallwashers, double-focus downlights and downlights with oval flood distribution combine to respond to the given spatial geometries and usage profiles.

Quantitative lighting design in foyers

Large rooms are perceived as confusing when functional zones are designed and illuminated identically without consideration to their spatial context. Given hierarchies of the architecture must be supported by an appropriate lighting concept.

Conclusion
Qualitative lighting design in high rooms creates separate functional zones that facilitate orientation. Energy-efficient ERCO LED luminaires with precise light distributions enable large luminaire spacing for a cost-conscious lighting concept.

Key figures
Based on an average illuminance of at least 300lx at the reception and a minimum of 100lx for movement areas:

- Number of luminaires: 25
- Connected load (kW): 0.61
- Load per unit area (W/m²): 2.02

Key figures
Based on an average illuminance of at least 300lx at the reception and a minimum of 100lx for movement areas:

- Number of luminaires: 30
- Connected load (kW): 1.09
- Load per unit area (W/m²): 3.64

<table>
<thead>
<tr>
<th>Required luminaires</th>
<th>Connected load in kW</th>
<th>Energy requirement in W/m²</th>
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ERCO planning data
Product data sheets in the ERCO Program

ERCO offers various complementary media channels to support technical and creative designers optimally at every stage of their work. Available in print and online, our extensive product and project information—from catalogue through to newsletter—is published in seven languages and reflects differing international technical environments. The layout, structure and terminology of all our material have been unified to make it easier for the user to navigate through the ERCO range. All ERCO media have been optimised to address current issues in lighting design with LED—so, for example, our multipage product data sheets:

Overview of product features
Technical drawings together with ERCO icons provide a quick overview of the main product features—such as luminaire dimensions and installation situations, size, cut-off angle, light control and distribution, as well as approvals.

Technical information on the luminaire
This section specifies the main technical, electrical and mechanical features to help find the right lighting tool for your project, including light colour, output and luminous flux of the LED module, as well as mounting details such as cable length, luminaire weight, material and colour.

Detailed technical data
Further details on technical and electrical product features help to resolve specific lighting issues quickly and include the luminaire’s connected load and luminous flux. LED-specific aspects such as lumen maintenance and colour deviation, as well as information on dimming.

Specification of the technical environment and update status
ERCO updates the data sheets periodically. Additional data such as 3D files, light distribution curves, tender texts and mounting instructions can be downloaded at www.erco.com/article numbers.

Site-specific planning data
Key parameters such as the number of luminaires per 100lx and the luminance values for current luminaire modules enable an estimated calculation of lighting installations at the planning stage. All figures are based on a room height of 3m, with a maintenance factor of 1, and must be converted to the specific project data. The correction table provides the required factors to be applied when using the utilisation factor method.

Maintenance factor
The quality of ERCO LED lighting tools with excellent lumen maintenance and splash-proof housing towards the room, as can be found in most downlights, reflects in a high maintenance factor, expressed as LMF and LMR. As well as enabling the design of lighting installations with a low connected load, this allows an objective comparison with other products.

Overview of product features

Technical information on the luminaire

Detailed technical data

Specification of the technical environment and update status

Site-specific planning data

Maintenance factor

Product-specific accessories
Each product data sheet gives details of the mechanical and technical accessories that are suitable for the relevant product, for example cover and mounting rings, bavories and mounting plates.