



# Light is productive

## Lighting solutions for industry

Light is OSRAM

**siteco**  
AN OSRAM BUSINESS



# Complete lighting solutions for all industrial sectors

Flexible and efficient production with professional lighting tools

Storage, manufacturing and logistics. People, machines and processes.

All cogs have to be perfectly coordinated if an industrial company is to work successfully. An important precondition for this is the right light at the right time, and in the right location.

Employees need optimal visual conditions to work in a concentrated way without errors, and to safely operate machines – at the same time though companies have to keep a close eye on working expenses.

OSRAM and Siteco develop solutions for the industrial, trade and commercial sectors from a single source, including:

- luminaires
- light sources
- electronic control gear
- light management systems

It's overall efficiency that is of prime importance, ranging from economic products and simple mounting to flexible use thanks to modular systems, light control and upgrade options, leading ultimately to success at the end of the day.







# Success factors

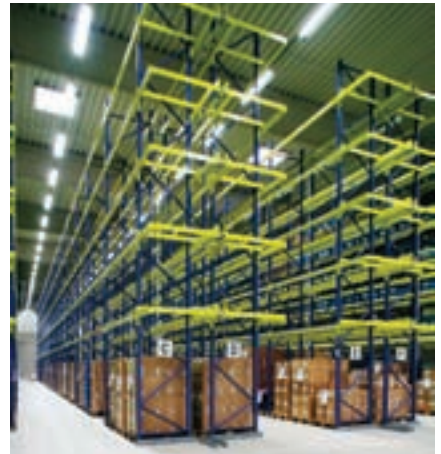
06



Productivity	06
Functionality	08
Efficiency	10
Future safety	12
Maintenance factor	14
Light control	16
Refurbishments	18

# Warehouses

20



Highbay racking	22
Logistics areas	24
Cold stores	26

# Production

28



Automotive industry – stamping plants and bodywork	30
Automotive industry – final assembly and quality control	32
Metal/electrical industry	34
Food industry	36
Chemicals/plastics industry	38
Transport industry	40
Wood industry	42

## Trade and commerce

44

Carpentry	46
Vehicle workshops	48



## Ancillary areas

50

Management buildings	52
Utility/equipment rooms	54
Car parks & facades	56
Parking lots, outdoor areas and paths	58



## Service

60

Product application matrix	62
Online tools	68
LED check list	70
Energy efficiency solutions	72
References	74



# The right light increases quality of work

Greater productivity with higher illuminance levels

## Light as a production factor

Daylight-similar light not only appears brighter but also has a stimulating effect, and light with a distinctive blue component has more effective access to the activating centres of our brains and the control centre of our inner clock. In this way it increases alertness, attention and the ability to concentrate in terms of performance.

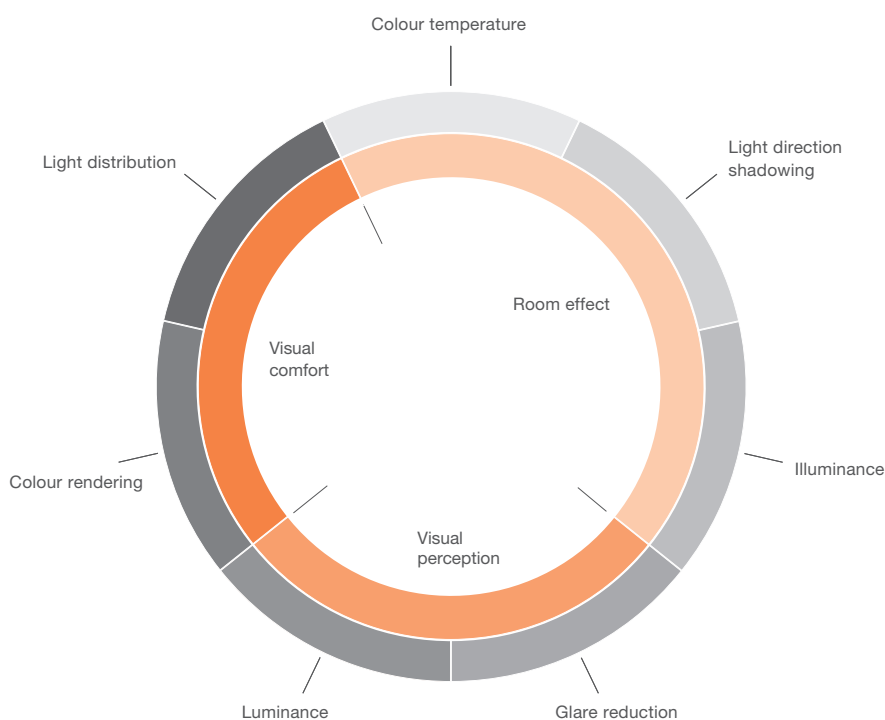
## Good: Light according to regulations

Clear normative guidelines exist for the operation of industrial and commercial lighting systems, and minimum requirements for the lighting of indoor workplaces are defined by the EN 12464-1 standard for Europe. Various quality criteria such as luminance, uniformity, glare reduction and contrast serve to quantify specified light quality according to the visual task. In addition to this, specific regional and national regulations exist concerning occupational safety for employees.



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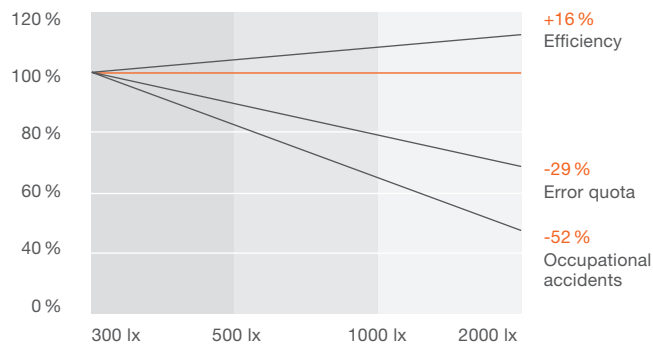
## Dimensions of light quality



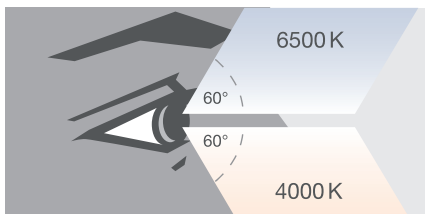
### Better: more light

Surveys demonstrate that workers simply feel better with higher levels of illuminance. They can concentrate more, fatigue less quickly, and can work with less errors to be more motivated, along with higher performance and greater efficiency. It therefore always pays to invest in light that exceeds legislative requirements.

### Productivity and illuminance

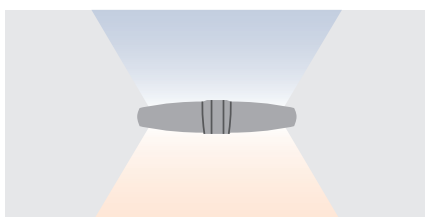


Source: "Industrial Lighting and Productivity (Metal Industry)" V. Bommel, W.J.M., and others, Licht 2002, Maastricht



### Best: biologically effective light

Biologically effective light is optimal, meaning on one hand light with higher blue components/colour temperatures, and on the other the direct/indirect distribution of light. Dynamic light with brightness levels and light colours modified according to the course of day support our natural biological rhythm to increase our sense of well-being and performance capability.



The biological effect is strongest when light is emitted from a wide-area source and from above. Indirect lighting, where a large and bright surface (e.g. a wall) reflects the light, thus has a stronger effect than the narrow distribution light from spotlights for example that only illuminate small areas.



### Exemplary for high productivity: the Modario® Power Module

- High illuminance with very good glare control
- HDP® (high definition prismatics) lighting technology for high visual comfort
- Direct and indirect components can be switched and dimmed separately with differing light colours
- 4-lamp configuration to a maximum of 80 W with multiwatt technology
- Maximum mounting height: 8 metres
- Suitable for industrial workstations with night shifts



# Light for industry dependably delivers

Greater success and less effort thanks to functionality

Industrial lighting solutions must feature complete reliability in terms of functionality and maximum lifespans among other factors.

Whether it's for heavy industry or foodstuffs, high or low temperatures, humidity or dust, chemicals or other aggressive materials, industrial lighting is installed in a

wide spectrum of locations and must be able to withstand specific and often very challenging ambient conditions. Two factors that significantly contribute to this are the protection rating (IP) and the impact resistance (IK) of installed luminaires.





### Protection against foreign bodies and humidity

The protection rating for a luminaire is designated using the IP code. The first character (1 to 6) specifies the level of protection against the ingress of foreign bodies, and the second character (1 to 8) describes the level of protection from humidity.

#### First character:

#### Protection against foreign bodies and humidity

IP 0 X	unprotected
IP 1 X	protection against solid foreign bodies > 50 mm
IP 2 X	protection against solid foreign bodies > 12 mm
IP 3 X	protection against foreign bodies > 2.5 mm
IP 4 X	protection against foreign bodies > 1 mm
IP 5 X	protection against dust
IP 6 X	sealed against dust

Source: EN 60529 | IP code (ingress protection)

#### Second character:

#### Protection against water

IP X 0	unprotected
IP X 1	drip-water protected
IP X 2	drip-water protected (inclination <15°)
IP X 3	spray water protected
IP X 4	splash water protected
IP X 5	jet water protected
IP X 6	protection against heavy seas
IP X 7	protection against temporary immersion
IP X 8	protection against continuous immersion

Source: EN 60529 | IP code (ingress protection)

### Protection against mechanical loads

The impact resistance of luminaires is specified by the IK code. Two characters designate the level of protection against mechanical loads on the housing: from 00 (unprotected) to 10 (20 joules) of load energy.



#### Exemplary for the perfect functionality: NJ700 LED

- Robust due to diecast aluminium housing with IP66 and IK08
- Suitable for ambient temperatures of -30°C to +45°C
- Long service life up to 50,000 hours
- Modular design with upgrade option for future LED modules and control gear
- For high halls with luminaire mounting heights of between 6 and 20 m
- Simple installation (ceiling/chain mounting, plug & play with external connection)

# Innovative light: power-saving and flexible

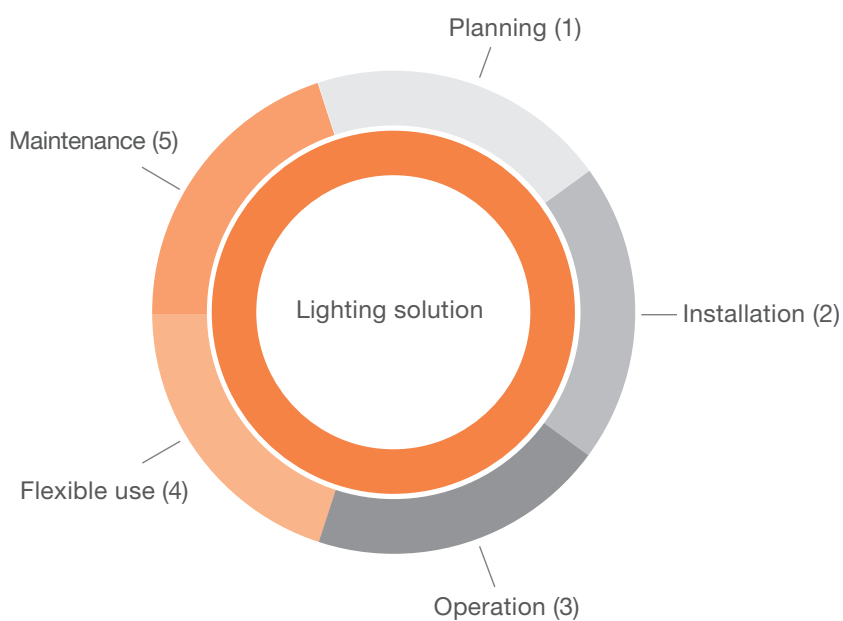
Cutting costs thanks to complete efficiency



Eberspächer, Wilsdruff/Germany

Perfect planning, intelligent design, safe operation and flexible use as well as simple and quick installation and maintenance – efficiency today with industrial lighting systems means the optimal and complete interaction of a wide range of factors, and reliability in particular.

## Complete efficiency



## Lighting solution

Luminaires as an efficient system of matched components and high-precision optics

### Planning (1)

Simple planning with online calculation, luminaire data and personal service

### Installation (2)

Savings in time and money during installation due to simple, standardised systems

### Operation (3)

Economic, reliable operation with savings potential thanks to LMS (DALI, sensors)

### Flexible utilisation (4)

Flexible changes in use due to modular, upgradable systems

### Maintenance (5)

Future safety (lifespan and quality) plus simple replacement and guarantees



**OSRAM system\* guarantee\***

Systematic quality from a single source is the OSRAM service philosophy. You benefit from this as a customer, and you are also on the safe side with our multi-level system guarantee for electronic control gear, light management systems and light sources. According to the lighting installation specification, OSRAM provides up to eight years guarantee on its high quality technology. With the right setup you thus have only a single service contact partner for your complete lighting installation, including all components.



\* conditions and details at [www.osram.com/guarantee](http://www.osram.com/guarantee)



**Exemplary for complete efficiency:  
T16 highbay luminaires on Modario® trunking systems**

- Matched system concept (housing, lamps, ECG, optics)
- IP20 or IP65 protection rating
- OSRAM Multiwatt Industry ECG (ON/OFF, DALI) with lifespan of up to 100,000 hours
- 93% luminaire light output ratios
- Homogeneous illumination with optics of highly reflective MIRO® aluminium
- For high halls with mounting heights of between 6 and 20 m
- Mounting: suspended or ceiling surface-mounted
- High flexibility with integration into Modario® trunking
- Ideal for refurbishing existing systems thanks to rapid amortisation (from 1.5 years)



# Professional light fulfils standards

Fitness for the future thanks to pioneering solutions

Efficiency is being increasingly stipulated on the legislative side both nationally and across Europe. In addition, specific certification has motivating factors for the voluntary implementation of high sustainability with new buildings and refurbishments, and is often subsidised

financially and through public communication. Lighting can total 15-80% according to use with power consumption in industrial buildings, and this provides high potential for savings.



Audi used car centre, Eching/Germany

## European legislation: EPBD (Energy Performance of Buildings Directive)

This directive supports the improvement of the total energy efficiency of buildings in the European Union, and stipulates minimum requirements for new buildings, extensions and refurbishments.



### LEED (Leadership in Energy and Environmental Design)

The LEED certificate is a system used internationally for classifying technical, ecological buildings and is awarded by the U.S. Green Building Council. It defines a series of standards for environmentally friendly, resource-protecting and sustainable construction, and awards various certificates according to a point-based system for new and refurbished commercial property (Certified, Silver, Gold, Platinum).

In the lighting category, points are awarded for complying with efficiency values according to the U.S. ASHRAE standard as well as for integrating light control.

### BREEAM (Building Research Establishment Environmental Assessment Method)



BREEAM is the longest established and most popular certification method for sustainable building. Eight categories are evaluated with points, for example energy, water, material, transport etc., and the seal of approval is awarded at four levels (excellent, very good, good, average).

The seal is awarded for the refurbishment and new construction of public buildings, offices and industrial operations.

In the lighting category, points are awarded for undercutting minimum efficiency values in accordance with national standards.

### DGNB



The DGNB ("German Association for Sustainable Building") awards a German seal of approval for sustainable construction together with the Federal Traffic Ministry.

The certification system evaluates the ecological, economic, socio-cultural, functional and technical quality of buildings as well as their process and location quality. An award is given in gold, silver or bronze according to the level of compliance to defined requirements. In the lighting category, points are given for lighting quality and for undercutting EnEV reference values.

### ZVEI has created a basis for the neutral evaluation of LED technology

How can LED luminaires be compared? What factors must be considered, and what reliable evaluation criteria exist? It's a fact that the new technology also brings with it new issues, and this is why the German Electrical and Electronic Manufacturers' Association (ZVEI) with its members has drawn up a new system for evaluating the performance capability of LED technology. In the future this will be the basis when evaluating LEDs and LED luminaires uniformly and therefore also manufacturer-independently. As a member of the ZVEI, we explain the most important points on **page 70** of this brochure.



# Efficient light can be efficiently planned

## The maintenance factor as a relevant criterion for planning

EN 12464-1 stipulates the maintenance factor when planning lighting installations, which in turn specifies the necessary over-planning between the maintenance value and new value for nominal illuminance.

The maintenance factor therefore directly influences the number of luminaires in planning, and thus also has a direct influence on the efficiency of the lighting system.

The maintenance factor MF is determined as follows:

### Lamp (LED) maintenance factor

**LLMF:** Lamp/LED luminous flux maintenance factor  
**LLF:** Lamp/LED lifespan maintenance factor

**LMF:** luminaire maintenance factor  
**RMF:** room maintenance factor

$$(LMF \times LLF) \times LMF \times RMF$$

Depending on lamp technology and thermal management with LED luminaires (manufacturer specifications)

Depending on ambient conditions, maintenance intervals and external luminaire state (CIE 97:2005)



Dirt-repellent surfaces, a high protection rating and intelligent thermal management are the criteria positively influencing the maintenance factor, for example with the Monsun® 2 LED.



**Calculation example for maintenance factors**

(see also the logistics hall refurbishment on page 19)



Luminaire type Lamps	Highbay reflector 1x HQI E 400 W	Highbay T16 4x T16 HO 80 W	NJ700 LED LED modules	
Lamp/LED relamping	8,000 h	18,000 h	50,000 h (L85/B10)	
LLMF	0.7	0.9	0.85	
LLF	0.9	0.9	1	Group replacement for HQI and L lamps
LMF: (LLMF x LLF)	0.63	0.81	0.85	
Luminaire maintenance factor - LMF*	0.92	0.92	0.92	Clean room 3-year maintenance interval
Room maintenance factor - RMF*	0.96	0.96	0.96	Clean room 3-year maintenance interval
Maintenance factor	0.55	0.7	0.75	
<b>Resulting number of luminaires</b>	<b>32</b>	<b>30</b>	<b>27</b>	

\* (CIE 97:2005)

Conclusion: the intelligent thermal management of LED luminaires is the precondition for low luminous flux degradation (e.g. 50,000 h / L85). This is an important basis for a high maintenance factor and thus efficient lighting solutions.

# Intelligent light for well-being and efficiency

## Managing light according to needs and cutting costs

Efficient lighting tools are the basis for solutions with low operating overheads and high quality of light, and if supplemented with light control, the savings potential can be significantly increased. The right type of light management depends decisively on specific building conditions and use of the areas. OSRAM offers a wide variety of DALI-based light control systems with suitable sensor technology, and thanks to

open, non-proprietary standards, such solutions can be simply integrated into common building management systems such as KNX and LON.

Luminous flux tracking, motion detection and control depending on movement and daylight can be implemented. Highly efficient supplements are daylight systems from Siteco, utilising both artificial light and daylight.

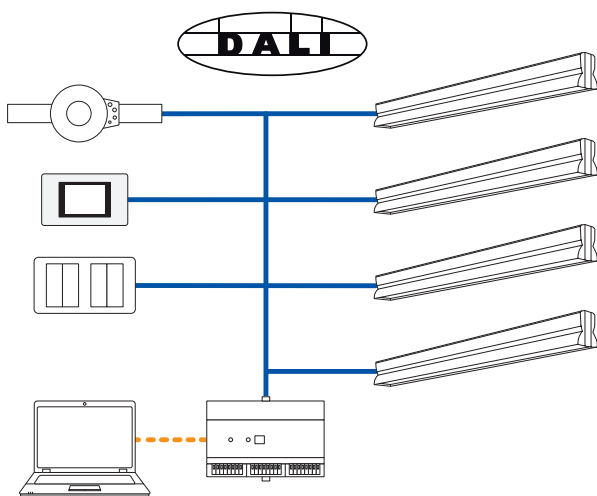


### Exemplary for the natural use of light: Siteco daylight systems

Sunlight can be optimally implemented using innovative daylight systems from Siteco.

These make use of the physical laws of reflection, absorption and refraction to perfectly illuminate rooms and also avoid excessive warmth. Both movable and stationary prismatic systems are available for glass facades as well as systems integrated into the intermediate spaces between glazing panes. The direct ingress of "hot" sunlight is always reflected and only diffuse "cool" daylight enters the room.

Energy consumption for artificial lighting and air-conditioning is reduced, and room comfort improved.



### Exemplary for the perfect control of light: DALI PROFESSIONAL

The innovative DALI PROFESSIONAL light management system from OSRAM is suitable for industrial halls or several single rooms.

It enables the control of 4 DALI lines with a total of 256 ECGs that can be controlled in up to 64 groups. Sensors are available for the light control functions shown, featuring tool-free integration into Modario® trunking systems or functioning as single sensors for installing in ceilings.

Commissioning takes place using a logical and graphical user interface.

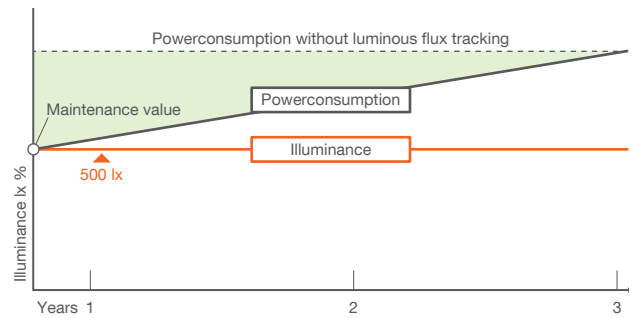
### Luminous flux tracking<sup>1)</sup>



Initial situation:

- Continuous use of areas
- No ingress of daylight
- e.g. production halls, assembly halls

The system is over-dimensioned under consideration of the reduction in luminous flux to maintain the maintenance value to the end of the maintenance cycle. The luminaire is dimmed from the beginning though to achieve the precise nominal illuminance. The advancing reduction in luminous flux is continuously compensated for by increasing the power draw. The effect of this luminous flux tracking is that the illuminance remains almost constant and energy consumption is optimised.



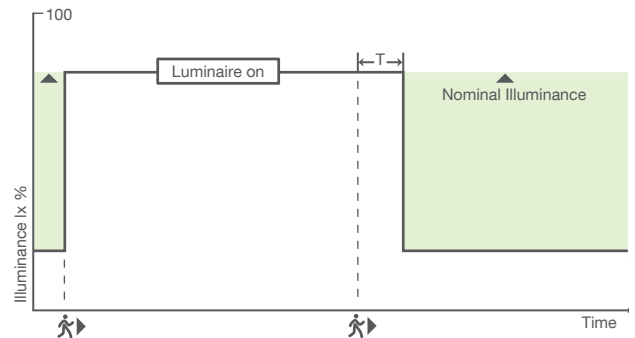
### Presence detection<sup>2)</sup>



Initial situation:

- Non-continuous use of areas
- No ingress of daylight
- e.g. intermittently used warehouse areas

With sensors, luminaires detect persons within a specific range. They switch from dimmed orientation lighting up to the required work lighting level. When the detection range is exited, the luminaires dim again after a delay period (T).



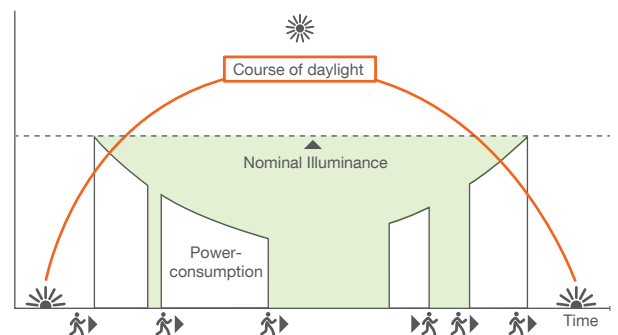
### Presence and daylight<sup>3)</sup>



Initial situation:

- Non-continuous use of areas
- Ingress of daylight
- e.g. warehouse areas and workshops

Daylight entering the space is used for lighting purposes. To ensure the required illuminance, the required quantity of artificial light is automatically supplemented when necessary, but only when people are in this area.



The level of savings potential depends on:

- the maintenance factor (EN 12464-1)
- usage of the hall (motion)
- constructional conditions (ingress of daylight)

Designations in accordance with EnEV/DIN V 18599-4

- 1) Constant luminous flux control
- 2) Presence sensors
- 3) Daylight-dependent control



# Good light gets better

Higher quality of light with lower costs thanks to refurbishing and upgrades

It has been estimated that more than 75% of industrial lighting installations are obsolete in Germany and other European countries. A refurbishment to new, high-efficiency LED or T16-based lighting solutions not only significantly cuts operating overheads, but the use of innovative lighting also increases lighting quality via higher illuminance levels and more uniformity or vertical illuminance. Improved vision and better recognition also lead to less error rates and higher productivity.

But which technology makes most sense where, when and how depends on the specific project and individual customer requirements. Reasons for refurbishments are for example spiralling power costs and short amortisation periods for investments, in turn achieved with long switch-on periods, low energy consumption and rapid installation without needing to alter the building substance. With an upgrade to LED luminaires for example, maintenance costs are significantly reduced due to the long lifespans. The use of Modario® trunking systems for example enables flexible modification of the lighting to changes in use or the tool-free upgrading of sensors for light control purposes.

Our cost-efficiency calculator enables you to simply and individually calculate amortisation times for your project: [www.siteco.de/wirtschaftlichkeitsrechner-innen](http://www.siteco.de/wirtschaftlichkeitsrechner-innen)

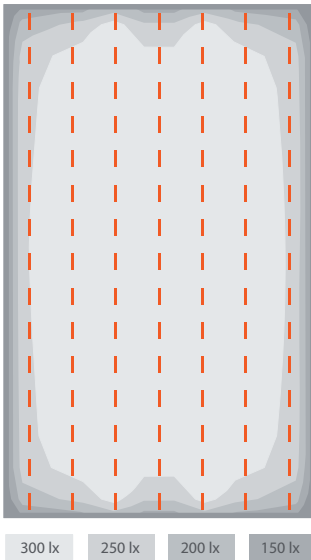
## Production hall upgrade



## Logistics hall upgrade



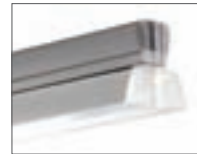
### Planning example



Lighting requirements according to EN 12464-1:  
 Medium-fine machine processing  
 $E_m \geq 300 \text{ lx}$  | MF 0.67  
 Room dimensions 30 x 50 x 8.5 m  
 Mounting height 7 m  
 4680 h/year @ 0.15 €/kWh



Trunking system  
T26, 2x 58 W, CCG



Modario® T16  
1x80 W  
wide distribution



Modario® LED \*)  
6250 lm  
wide distribution

No. of luminaires	115	115	110
Luminaire power consumption	142 W	91 W	54 W
Energy consumption/year	76,424 kWh	48,976 kWh	27,800 kWh
Energy cost savings/year	0	4,117 €	7,294 €
CO <sub>2</sub> savings/year	0	13.7 t	24.3 t

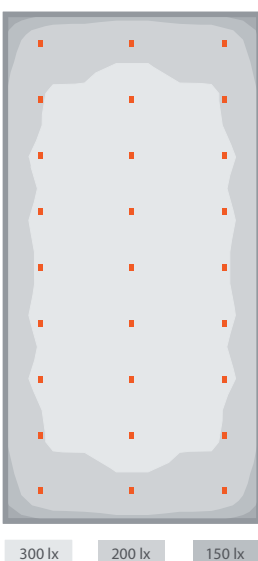
Luminance distribution working plane

Energy savings potential to:

36%

64%

### Planning example



Lighting requirements according to EN 12464-1:  
 Dispatch and packaging areas  
 $E_m \geq 300 \text{ lx}$  | MF 0.55 / 0.7 / 0.75  
 Room dimensions 50 x 25 x 16 m  
 Mounting height 15 m  
 4680 h/year @ 0.15 €/kWh



Highbay reflector  
HQI 400 W



Highbay T16  
4x 80 W  
narrow distribution



NJ700 LED \*)  
22500 lm  
narrow distribution

No. of luminaires	32	30	27
Luminaire power consumption	445 W	329 W	225 W
Energy consumption/year	66,643 kWh	46,191 kWh	28,431 kWh
Energy cost savings/year	0	3,068 €	5,732 €
CO <sub>2</sub> savings/year	0	10.2 t	19.1 t

Luminance distribution working plane

Energy savings potential to:

31%

57%

\*) As of February 2014









## We've got the perfect lighting solutions in stock

Semi-products, production equipment, materials and goods need to be stored logically, found simply and distributed rapidly. Industrial warehouse and logistics buildings fulfil highly diverse tasks and therefore place very specific and varied demands on lighting solutions.

# From top to bottom

Highbay racking usually has a fixed hall layout featuring shelving and aisles, and with luminaire mounting heights from 6 to 15 metres.



Injection Moulding Ensinger GmbH, Rottenburg-Ergenzingen/Germany

Confined spatial conditions, narrow traffic routes and high shelves frequently cause difficult lighting conditions, and often with the shadowing of complete areas. Homogeneous illumination and high vertical illuminance are important for the rapid identification of shelving content as well as packaging and shelf labelling. Luminaires and special trunking with narrow light distribution are ideal for supplying shelving levels with sufficiently good lighting conditions,

and because the line of vision is often upwards, luminaires have to fulfil maximum demands in terms of glare control. Highbay racking is also the ideal application for light management systems – lighting in halls or specific zones is automatically dimmed or only switched on when personnel is present, using motion-dependent control.



Picktower Zalando, Erfurt/Germany

### Lighting requirements

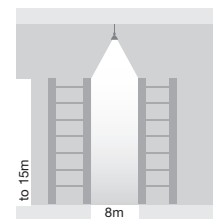
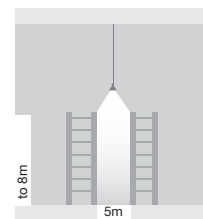
#### Minimum requirements in accordance with EN 12464-1:

- traffic routes with persons:  
 $E_m$  150 lx,  $UGR \leq 22$ ,  $U_0 \geq 0.4$ ,  $R_a \geq 60$
- (high) shelf front:  $E_m$  200 lx,  $U_0 \geq 0.4$

#### Planning criteria:

- High vertical illuminance  
on shelf fronts with good homogeneity
- Very good luminaire glare reduction for  
safe use of fork lift trucks

### Product recommendation



Modario®  
trunking system  
LED or T16,  
**MH 5–8 m:**  
narrow beam

Modario®  
trunking system  
LED or T16,  
**MH 8–15 m:**  
extremely narrow  
beam



# Ensuring successful motion

A combination of warehouse, areas without shelving and canopied semi-outdoor areas are characteristic of logistics areas.



Bosch-Siemens Hausgeräte, Giengen/Germany



Bosch-Siemens Hausgeräte, Giengen/Germany

Areas with logistical tasks usually have no fixed hall layout, enabling the flexible positioning of shelving, pallets and goods. Planar, homogeneous light is needed with illumination on all sides, as well as high vertical illuminance levels in shelving areas.

The transitions between indoor and outdoor areas represent special problem zones and possible danger, and solutions are essential that optimally modify lighting levels at all times of the day and night and in all weather conditions.

Canopied outdoor areas require higher protection ratings to reliably protect luminaires from the effects of fluctuating temperatures and adverse weather.

Logistics areas are ideal for high levels of energy saving achieved with motion-dependent light control.





Deutsche Post letter centre, Straubing/Germany

### Product recommendation

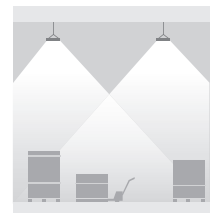
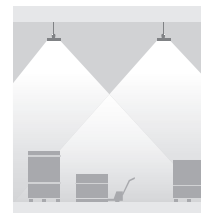
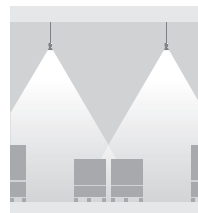
#### Lighting requirement

##### Minimum requirements in accordance with EN 12464-1:

- $E_m$  300 lx,  $UGR \leq 25$ ,  $U_0 \geq 0.6$ ,  $R_a \geq 60$

##### Planning criteria:

- High vertical illuminance for the optimal recognition of stocked goods from all viewing angles
- A combination of diffuse and directed light distribution for optimal contrast rendering and legibility of labels



Modario®  
trunking system  
LED or T16,  
**MH 5–8 m:**  
wide distribution

T16 highbay luminaire  
**MH 6–10 m:**  
wide distribution,  
**MH 10–15 m:**  
narrow distribution,  
IP65 for canopied  
outdoor areas

NJ700 LED  
highbay luminaire  
**MH 6–10 m:**  
wide distribution,  
**MH 10–15 m:**  
narrow distribution  
IP66 for canopied  
outdoor areas

# Frosty performance

Luminaires with higher protection ratings are mandatory in cold stores, and in combination with LED technology are the perfect solution, with constant performance even at low temperatures.

Extreme ambient conditions exist in cold stores, and these must be taken into account when specifying lighting systems. The luminous flux from fluorescent lamps for example sinks quickly in low temperatures.

LED luminaires are optimal for such applications as these emit complete luminous flux even in ice-cold temperatures, and also feature a high level of reliability and high robustness (for example the completely sealed system of the Monsun® 2 LED).





Damp-proof luminaires with LED are ideal solutions in cold stores: their performance remains constant even in low temperatures.

### Lighting requirement

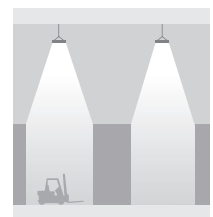
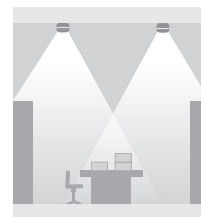
#### Minimum requirements in accordance with EN 12464-1:

- $E_m$  100 lx,  $UGR \leq 25$ ,  $U_0 \geq$ ,  $R_a \geq 60$  |  
 $E_m$  200 lx, if continuously occupied

#### Planning criteria:

- High vertical illuminance on shelf fronts or on stocked goods for best possible recognition
- Very good luminaire glare reduction for safe use of fork lift trucks
- Use of LED luminaires with higher protection ratings for low ambient temperatures

### Product recommendation



Monsun® 2 LED  
damp-proof luminaire  
**MH 3–6 m:**  
wide distribution,  
**MH 6–8 m:**  
narrow distribution

NJ700 LED  
highbay luminaire  
**MH 6–10 m:**  
wide distribution,  
**MH 10–20 m:**  
narrow distribution







## We provide continuous innovation

Specific visual tasks are decisive for correctly specifying lighting in industrial production conditions, and these tasks are in turn defined by the size, form and processing speed of products as well as ambient conditions and the level of flexibility for variable hall use and the modifying of manufacturing layouts.



# Impervious to rattle and shake

Lighting in stamping plants and bodywork areas must mainly be extremely tough and durable, as it's exposed to special loads, and usually around the clock.



## Stamping plants

Heavy machinery, strong vibrations, high halls and high temperatures in stamping plants make special demands in terms of toughness, resistance to temperature and the protection rating of the luminaires used. High vertical illuminance levels ensure a good legibility of displays and instruments, and homogeneous illumination is mandatory for the clear recognition of hazard zones, machines and other factors.

## Product recommendation

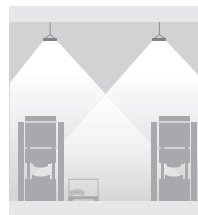
### Stamping plant lighting requirements

**Minimum requirements in accordance with EN 12464-1:**

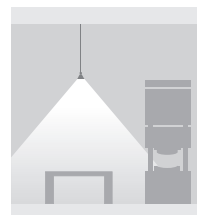
- $E_m$  300 lx,  $UGR \leq 22$ ,  $U_0 \geq 0.6$ ,  $R_a \geq 80$

**Planning criteria:**

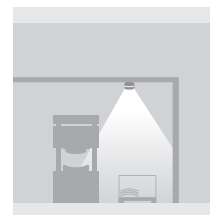
- Balanced ratio of horizontal and vertical illuminance for the shadow-free illumination of work areas
- Hall-oriented general lighting combined with workstation/machine-oriented lighting
- Low-maintenance, vibration-insensitive LED luminaires with higher protection ratings



NJ700 LED highbay luminaire, hall general lighting, **MH 6–20 m:** wide or narrow distribution



Modario® LED trunking system, workstation-oriented, **MH 5–8 m:** wide distribution



Monsun® 2 LED damp-proof luminaire, machine-oriented, **MH 3–6 m:** wide distribution



AUDI, Ingolstadt/Germany

### Bodywork

Welding and grinding in bodywork areas causes a high level of sparks and high dust loads. Dust-tight luminaires with higher protection ratings must be installed with housings resistant to sparks. When specifying luminaires, high illuminance and the homogeneous distribution of light must also be ensured.

### Product recommendation

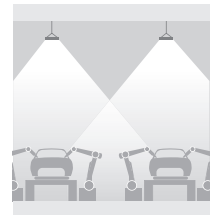
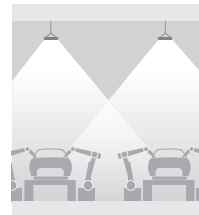
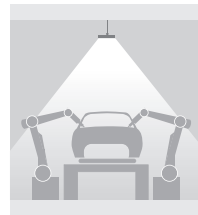
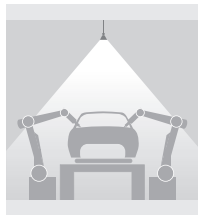
#### Lighting requirements Bodywork

##### Minimum requirements in accordance with EN 12464-1:

- $E_m$  500 lx,  $UGR \leq 22$ ,  
 $U_0 \geq 0.6$ ,  $R_a \geq 80$

##### Planning criteria:

- Dust-protected luminaires with suitable covers (e.g. PMMA) for welding and grinding workstations
- High light quality for efficient maintenance and efficient setting up of production machines



Modario® LED trunking system  
**MH 3–8 m:**  
wide distribution



Modario® trunking luminaire  
Trunking system, IP64  
**MH 3–8 m:**  
wide distribution



T16 highbay luminaire,  
**MH 6–10 m:**  
wide distribution



NJ700 LED highbay luminaire  
**MH 6–10 m:**  
wide distribution



# Complete attention to detail

Both large and small components must be combined and inserted with high precision on assembly and production lines, and perfect accuracy of fit and optimal material composition are guaranteed via quality control processes. Error-free work thanks to correct vision is thus elemental.



BMW Group Oxford/England

## Final assembly

Assembly work usually takes place around the clock over several shifts, and assembly halls must often cope with low daylight or none at all. This is the reason why high light quality as well as biologically effective light is recommended for precise, safe work processes. Trunking rows with suitable configurations guarantee homogeneous and high lighting levels on production and assembly lines, and the optimal distribution of light prevents disturbing reflected glare on glossy surfaces to facilitate work processes.

### Lighting requirements for final assembly

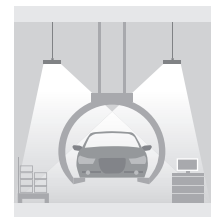
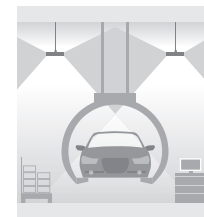
#### Minimum requirements in accordance with EN 12464-1:

- $E_m$  500 lx, UGR  $\leq$  22,  $U_0 \geq$  0.6,  $R_a \geq$  80

#### Planning criteria:

- A balanced ratio of vertical and horizontal illuminance for optimum recognition from all viewing angles
- Good glare reduction and contrast rendering for recognising details
- Indirect light components for ceiling illumination, for a balanced spatial and biological light effect

## Product recommendation



Modario® trunking system, T16 Power Module, **MH 3–8 m:** direct/indirect or asymmetric distribution

Modario® trunking system trunking luminaire, IP64, **MH 3–8 m:** wide or asymmetric distribution





BMW Group Oxford/England

### Quality control

Even the most minor errors need to be identified in quality control procedures, and often on high-reflection surfaces. This makes high demands on lighting quality: optimal glare control, natural colour rendering, high illuminance with a balanced ratio of vertical and horizontal light as well as good overall contrast are especially important.

Often supplementary workstation solutions are needed as well as general lighting. Luminaires with microprismatics feature very good glare reduction. Point-based light is good for identifying scratches, and planar light with low shadowing makes dents and bulges clearly visible.

### Product recommendation

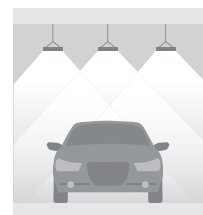
#### Lighting requirements Quality control

##### Minimum requirements in accordance with EN 12464-1:

- $E_m$  1000 lx,  $UGR \leq 19$ ,  $U_0 \geq 0.7$ ,  $R_a \geq 90$

##### Planning criteria:

- A balanced ratio of vertical and horizontal illuminance for optimum recognition from all viewing angles
- A combination of diffuse and directed light distribution for optimal contrast rendering
- Very good glare reduction for recognising surface structures and details



Modario® trunking system,  
T16 Power Module,  
**MH 3-8 m:**  
direct/indirect  
distribution

# Everything under control

From rough assembly to high-precision measuring, visual tasks range from highly simple to extremely challenging in the metal and electrical industries.





A wide variety of visual tasks and diverse lighting conditions exist in the metal and electrical sector, including welding, soldering, machining, quality control, inspection tasks, microchips, PCBs and small and large components. Vertical illuminance levels and high quality of light are needed for tasks with compact components, and when working with computer screens and machines with displays, VDU-compliant luminaires in accordance with EN 12464-1 are mandatory.

Shadowing and reflections need to be avoided according to specific activities, and luminaires with higher protection ratings are required in certain environments. The optimal mix of general lighting and zonal or workstation-oriented lighting makes sure of ideal conditions for work. Trunking systems enable sufficient basic lighting as well as flexible use of spaces, for example when reconfiguring individual machines or reorganising complete processes.

### Lighting requirement

Minimum requirements in accordance with EN 12464-1:

#### Metal industry

##### Rough and medium-fine processes

- $E_m$  300 lx,  $UGR \leq 22$ ,  $U_0 \geq 0.6$ ,  $R_a \geq 80$

##### Fine processes

- $E_m$  500 lx,  $UGR \leq 19$ ,  $U_0 \geq 0.7$ ,  $R_a \geq 80$

#### Electrical industry

##### Assembly work

##### Rough processes:

- $E_m$  300 lx,  $UGR \leq 25$ ,  $U_0 \geq 0.6$ ,  $R_a \geq 80$

##### Medium-fine processes:

- $E_m$  500 lx,  $UGR \leq 22$ ,  $U_0 \geq 0.6$ ,  $R_a \geq 80$

##### Fine processes:

- $E_m$  750 lx,  $UGR \leq 19$ ,  $U_0 \geq 0.7$ ,  $R_a \geq 80$

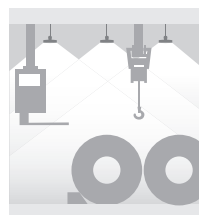
##### Very fine processes:

- $E_m$  1000 lx,  $UGR \leq 16$ ,  $U_0 \geq 0.7$ ,  $R_a \geq 80$

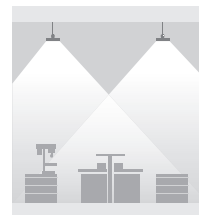
##### Planning criteria:

- Flexible lighting design featuring trunking systems for layout modifications
- Metal industry: luminaires with higher protection ratings according to ambient conditions
- A combination of general lighting and workstation-oriented lighting

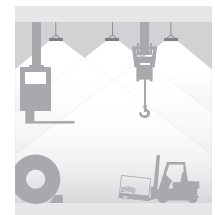
### Product recommendation



Modario® trunking system, T16 Power Module, workstation-oriented  
**MH 3-8 m:** direct, direct/indirect distribution



Modario® trunking system, trunking luminaire, IP64, workstation-oriented  
**MH 3-8 m:** wide distribution



NJ700 LED highbay luminaire, general hall lighting,  
**MH 6-10 m:** wide distribution



# An emphasis on quality and trust

Especially fresh lighting solutions are needed for companies in the foodstuff industry, and bright, natural light guarantees perfect quality and ensures an important sense of trust.



Specific quality and safety requirements exist in the food industry as defined by the International Featured Standards (IFS). For lighting, two preconditions are essential: all work areas must be sufficiently illuminated, and all lighting equipment must be protected against shattering and mounted to minimise the risk of breakage.

Luminaires with shatter protection covers of plastic prevent the soiling of foodstuffs. Especially high-lumen general lighting helps to more simply identify dirt to comply with the high hygienic standards in production areas and kitchens, and high illuminance levels and very good colour rendering are mandatory for the reliable control and evaluation of freshness and intactness.

According to the product and its processing, the specifying of luminaires must include the appropriate protection rating and with special luminaire versions if needed. In some sectors the production areas are regularly cleaned, and in such cases luminaires should be easy to clean and should have dirt-resistant, smooth surfaces. The resistance of luminaires to physical and chemical influences can be improved with special materials and surfaces.







Adelholzener Alpenquellen, Bad Adelholzen/Germany

**Product recommendation**

**Lighting requirement**

**Minimum requirements in accordance with EN 12464-1:**

**Medium visual tasks** e.g. workstations in breweries or chocolate factories

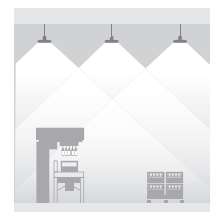
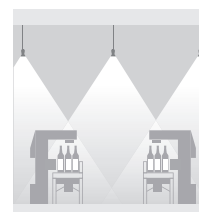
- $E_m$  200 lx,  $UGR \leq 25$ ,  $U_0 \geq 0.4$ ,  $R_a \geq 80$

**Finer visual tasks** e.g. product control

- $E_m$  500 lx,  $UGR \leq 22$ ,  $U_0 \geq 0.6$ ,  $R_a \geq 80$

**Planning criteria:**

- A balanced ratio of vertical and horizontal illuminance for optimum quality control and process safety due to good recognition
- Low-maintenance LED luminaires with higher protection ratings and easy-to-clean, smooth surfaces
- Use of luminaires with shatter protection via impact-resistant plastic covers of PC for IFS-certified warehouse and production areas



Monsun® 2 LED damp-proof luminaire, IP65, **MH 3-6 m:** wide distribution **MH 6-8 m:** narrow distribution



Modario® LED trunking system, IP20, **MH 3-8 m:** wide distribution



Modario® trunking system, trunking luminaire, IP64, **MH 3-8 m:** wide distribution

## Finding the right formula

Highly different lighting requirements exist in the chemical and plastic industries according to the specific sub-sector, and high illuminance, good colour rendering and highly resistant luminaire housings are essential.



Luminaires must often cope with particular ambient conditions, especially with the handling of chemical substances. High-resistance, robust housing materials are ideal in such situations, for example stainless steel, glass fibre-reinforced plastic, polycarbonate (PC) or polymethyl-methacrylate (PMMA), more commonly known as acrylic glass.

With process monitoring by personnel, sufficient illuminance levels make displays and instruments easy to read. It is important to avoid reflected glare, and glare control in accordance with EN 12464-1 for computer screens must be observed according to the specific activity. Significantly higher illuminance levels and good colour rendering characteristics are needed for laboratory areas.



Shell development laboratory, Cologne/Germany

**Product recommendation**

**Lighting requirements**

Minimum requirements in accordance with EN 12464-1:

**Permanently manned workstations in process plants:**

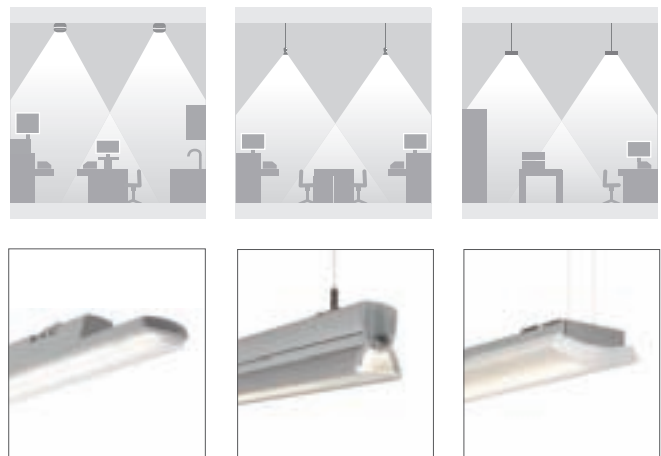
- $E_m$  300 lx,  $UGR \leq 25$ ,  $U_0 \geq 0.6$ ,  $R_a \geq 80$

**Laboratories:**

- $E_m$  500 lx,  $UGR \leq 19$ ,  $U_0 \geq 0.6$ ,  $R_a \geq 80$

**Planning criteria:**

- Very good glare control and contrast rendering for optimal visual conditions
- Luminaires with higher protection ratings and resistant materials



Monsun® 2 LED damp-proof luminaire, IP65,  
**MH 3-6 m:** wide distribution,  
**MH 6-8 m:** narrow distribution

Modario® LED trunking system,  
**MH 3-8 m:** wide distribution

Silhouette® LED  
**MH 3-5 m:** wide distribution



# Making sure of reliability

It's not only vehicles and means of transport that are under scrutiny in hangars, dockyards, depots and buildings - lighting must also comply to maximum quality requirements.



Linz AG, Linz/Austria

Lighting installations are designed primarily according to specific hall heights in buildings that accommodate and maintain aeroplanes, ships, trains, buses and trucks. Good horizontal and vertical visual conditions in all areas help to avoid possible mistakes, to identify existing deficiencies and also to localise potential areas of weakness.

High illuminance and glare-free light are mandatory for efficient, safe work and for safe movements between vehicles and means of transport. Motion-dependent light control is able to reduce energy consumption and therefore also cut operating overheads in suitable applications, and installing especially durable and maintenance-free luminaires, particularly in difficult-to-access locations, achieves lower maintenance costs and counteracts unplanned production stops or work interruptions.



**Product recommendation**

**Lighting requirements**

**Minimum requirements in accordance with EN 12464-1:**

**Testing and repair hangars**

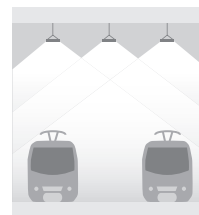
- $E_m$  500 lx,  $UGR \leq 22$ ,  $U_0 \geq 0.6$ ,  $R_a \geq 80$

**Maintenance and repair halls in railway facilities**

- $E_m$  300 lx,  $UGR \leq 22$ ,  $U_0 \geq 0.5$ ,  $R_a \geq 80$

**Planning criteria:**

- A balanced ratio of horizontal and vertical illuminance with good uniformity, for good visual conditions even at higher work levels
- The use of low-maintenance LED luminaires with good glare reduction for interruption-free maintenance work



T16 highbay luminaire  
**MH 6–10 m:**  
 wide distribution,  
**MH 10–20 m:**  
 narrow distribution

NJ 700 LED  
 Highbay luminaire  
**MH 6–10 m:**  
 wide distribution,  
**MH 10–20 m:**  
 narrow distribution



# The right cut

Hall heights and inherently high dust and dirt loads determine the specification of lighting for industrial wood processing.



Piles, timber joists and chipboard: a wide variety of semi-finished products for further processing are produced in the timber industry, for furniture factories or carpenter's workshops for example. Because of high dust, chip and soiling loads, luminaires with higher protection ratings against dust and also against humidity are needed. Luminaires with a D designation (formerly the FF designation) are stipulated for production locations exposed to fire hazards caused by dust or fibres. High impact protection for luminaires should also be observed because mechanical collisions with products cannot always be avoided.

Sufficient levels of illuminance and homogeneous brightness in all zones and at all levels are the most important factors for efficient working and the safe handling of machines.

Supplementary workstation luminaires may be needed for specific tasks, and presence and motion-controlled light management systems are recommended for areas with primarily machine-controlled processes with low frequency of personnel.





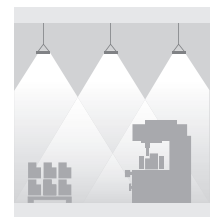
**Lighting requirement**

Minimum requirements in accordance with EN 12464-1:

- **With wood processing machines**  
 $E_m$  500 lx,  $UGR \leq 19$ ,  $U_0 \geq 0.6$ ,  $R_a \geq 80$
- **Selecting wood veneers**  
 $E_m$  750 lx,  $UGR \leq 22$ ,  $U_0 \geq 0.7$ ,  $R_a \geq 80$

- **Planning criteria:**
- Low-maintenance LED luminaires with high impact and dust protection for problem-free production processes
- Luminaires for production sites exposed to fire hazards due to dust or fibres (D designation)
- Good glare control, low-shadow illumination

**Product recommendation**



Monsun® 2 LED damp-proof luminaire  
**MH 3–6 m:** wide distribution,  
**MH 6–8 m:** narrow distribution

Modario® LED trunking system trunking luminaire, IP64  
**MH 3–8 m:** wide distribution





## Maximum demands even with smaller businesses

Energy-efficient and future-fit lighting is not only an essential factor for success with large-scale industrial companies. The right lighting solutions in the trade and commerce sector ensure safe and productive work processes, support reliably high quality and contribute to greater long-term success.





# Precisely the right dimensions

Sawing, planing, milling, turning, polishing and sizing: carpentry workshops often have highly diverse work processes with very differing lighting requirements. If wood processing mainly takes place in single rooms, room-oriented lighting with supplementary lighting for individual workstations is recommended.



Muoatathal Furniture Company/Switzerland

Frequent changes of workstations from one work step to the next or from one machine to the next are typical, and the right light enables precise work and protects from machine injuries. Uniformly high illuminance levels are needed over complete areas, as well as supplementary workstation light everywhere where more light is needed. Good glare reduction and the avoidance of strong reflections also help to achieve optimal visual conditions.

Because of high dust and soiling loads, luminaires should have higher protection ratings against dust and humidity. Luminaires with a D designation (formerly the FF designation) are obligatory for locations exposed to fire hazards from dust or fibres. Additionally, impact-resistant luminaires offer protection against mechanical knocks and bumps.



### Lighting requirement

Minimum requirements in accordance with EN 12464-1:

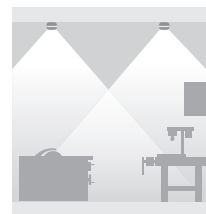
#### Work at joiners bench, sizing, assembly

- $E_m$  300 lx,  $UGR \leq 19$ ,  $U_0 \geq 0.6$ ,  $R_a \geq 80$

#### Planning criteria:

- Use of robust luminaires with high impact and dust protection for safe production sequences
- Luminaires for production sites exposed to fire hazards from dust or fibres (D designation)
- Workstation lighting concepts

### Product recommendation



Monsun® 2 LED  
damp-proof luminaire  
IP65

**MH 3-6 m:**  
wide distribution,

**MH 6-8 m:**  
narrow distribution

# Safe work for safe driving

Vehicle workshops provide repair, maintenance, cleaning, care and tuning, and the wide spectrum of work on vehicles has to be implemented extremely carefully. The demands on lighting are equally as diverse and challenging.

Insufficient daylight is frequent, and often windows are only located on one side, meaning that bright, homogeneous general illumination of workshops is a fundamental condition for precise, safe work. According to the particular activity or workstation, supplementary light such as for working on vehicle under-sides or special lighting solutions may be necessary.

In areas where coating takes place for example, high lumen-output, more planar-distribution "light ceilings" avoid disturbing reflections on glossy surfaces. Because of high dust loads and often humidity as well, luminaires with higher protection ratings should be specified, and in damp rooms, for example for car washing purposes, damp-proof luminaires with protection against jet water.







### Lighting requirement

Minimum requirements in accordance with EN 12464-1:

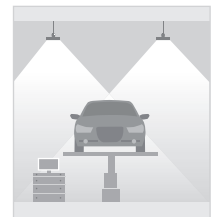
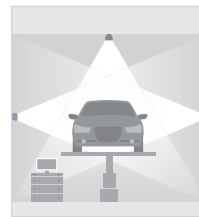
#### Vehicle service, repair and inspection

- $E_m$  300 lx,  $UGR \leq 22$ ,  $U_0 \geq 0.6$ ,  $R_a \geq 80$

#### Planning criteria:

- Robust luminaires with high protection rating and high impact resistance for optimal workshop processes
- Workstation lighting concepts

### Product recommendation



Monsun® 2 LED  
damp-proof luminaire  
**MH 3–6 m:**  
wide distribution,  
**MH 6–8 m:**  
narrow distribution

Modario® LED  
trunking system  
Trunking luminaire  
IP64  
**MH 3–8 m:**  
wide distribution



# We're glad to contribute to your success

Production and logistics are of elemental importance, but in addition to this, efficient lighting assumes important tasks in management areas and with building technology, on the way to work and back home again, for the safety and well-being of employees, and for the overall recognition factor and ultimate success of the company.



Müllerland, Hennef/Germany



# Managing everything easier

Administration buildings consist of offices, conference rooms, corridors, stairways, foyers and canteens, and they also bring together a wide variety of applications under one roof. Lighting is a factor that should not be neglected when considering the total energy concept, and it is here that LED solutions provide high savings potential, especially when combined with suitable light management systems.



Ensinger, Cham/Germany

## Offices and control centres

Lighting for computer screen workstations must comply with particularly high demands for illuminance, homogeneity and glare control, and minimum stipulations are specified in the EN 12464-1 standard. Higher illuminance levels enable a more flexible arrangement of workstations in the room, and increased attention and complete concentration is needed in computer control centres, usually around the clock. It's in such situations that the use of biologically effective light can make a significantly positive contribution.

## Foyers and reception areas

After seeing the outside facade, customers and visitors are then exposed to the second important impression of the company, its interior. For this reason, representative but also decorative and functional lighting is ideal. The right light gives a hearty welcome, creates a pleasant spatial atmosphere, emphasises the architecture and also helps visitors find their way.





### Corridors and stairways

Primarily bright and functional lighting is needed to enable visitors and employees to get from one place to the next safely and quickly. Efficient and durable lighting solutions designed for high switching frequencies are the first choice, and high energy-saving potential is achieved with the integration of motion sensors.

#### Lighting requirement

Minimum requirements in accordance with EN 12464-1:

##### Offices and control rooms with computer screens

- $E_m$  500 lx,  $UGR \leq 19$ ,  $U_0 \geq 0.6$ ,  $R_a \geq 80$

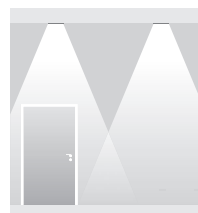
##### Entrance halls

- $E_m$  100 lx,  $UGR \leq 22$ ,  $U_0 \geq 0.4$ ,  $R_a \geq 80$

##### Traffic areas, corridors

- $E_m$  100 lx,  $UGR \leq 28$ ,  $U_0 \geq 0.4$ ,  $R_a \geq 40$

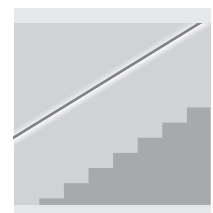
#### Product recommendation



Lunis 2° mini LED recessed downlight, symmetric medium distribution, diverse beam patterns, equipped with LED max. 45 W or HIT-CE 70 W



Mira° LED Recessed luminaire direct wide distribution, equipped with LED 1/2x 24 W



LUMILUX® COMBI LED direct wide distribution, open distribution, equipped with LED tube 1x 32W / 2x 25W

# Calculating for continuity

Equipment for operating essential technical plant and devices is found in all companies, whether for server rooms, utility rooms or plant rooms, and bright, reliable light is important as such spaces often lead a shadowy existence.



Eberspächer, Wilsdruff/Germany





Problem-free, successful operation is achieved with the help of utility and system rooms, and efficient lighting must be relied upon in such applications at all times. Vertical illuminance and bright, homogeneous light enable good legibility for displays and monitors and facilitate control, repair and maintenance work.

Luminaires with corresponding specifications should be selected if higher room temperatures or high humidity conditions exist, and light control with presence/motion detection is ideal according to room size, as personnel is not always attendant.

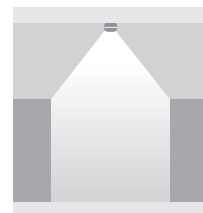
**Product recommendation**

**Lighting requirements**

**Minimum requirements in accordance with EN 12464-1:**

**Rooms for utility systems, switching rooms**

- $E_m$  200 lx
- $UGR \leq 25$ ,  $U_0 \geq 0.4$
- $R_a \geq 60$



Monsun® 2 LED damp proof luminaire  
**MH 3-8 m:**  
 wide or narrow distribution

# Achieving attentiveness

The facade of a company is often the first and most important external form of communication. Sufficient parking contributes to the stress-free start of a working day or business meeting.



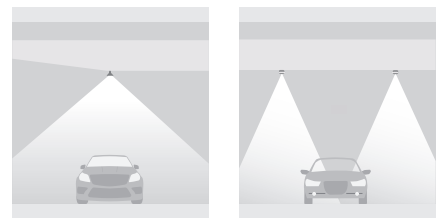
Bavaria underground car park, Munich/Germany

## Parking garages

Orientation and safety have top priority in parking garages, and well-illuminated parking spaces without shadow zones reduce the risk of accidents and also give a feeling of personal safety. Signs, vehicles and people can be identified better and more rapidly.

Company parking garages are normally busy at certain peak times – in the morning, at lunchtime or in the evening, and sensor-supported light management systems and controllable luminaires are ideal in such situations for exploiting existing energy-saving potential, of course only when no people are in the garage or no vehicle is in motion.

## Product recommendation



Modario® IP64 trunking system



Monsun® 2 LED damp-proof luminaire,

### Lighting requirements Parking garage\*

- Safety and orientation for pedestrians and drivers
- Illuminance: to 300 lux in entry and transit areas
- Entrance and exit routes (day):  $E_m$  300 lx,  $GRL \leq 25$ ,  $U_0 \geq 0.4$ ,  $R_a \geq 40$
- Entrance and exit routes (night):  $E_m$  75 lx,  $GRL \leq 25$ ,  $U_0 \geq 0.4$ ,  $R_a \geq 40$
- Traffic routes:  $E_m$  75 lx,  $GRL \leq 25$ ,  $U_0 \geq 0.4$ ,  $R_a \geq 40$

\* Excerpts from DIN EN 12464-1; During planning, the DIN or corresponding recommendations for road lighting should be observed for more precise determination of lighting requirements in relation to the application for traffic routes.



### Facade and building illumination

Modern exterior lighting can be used specifically as a marketing tool and an instrument for design. The right facade lighting together with company logos and other image carriers is able to effectively communicate the essence or corporate identity of a company and emphasise its positive image. But whether decorative lighting or functional light for canopied exterior areas is needed, suitable protection ratings are essential – and also certification as outdoor luminaires according to the specific installation location. Damp-proof luminaires with IP64 for example can be installed in canopied areas but not exposed outdoor areas.

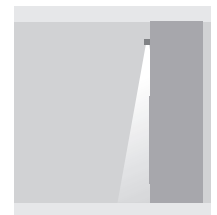
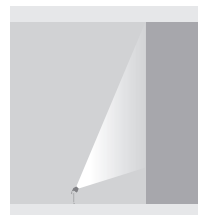
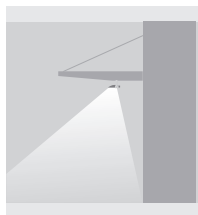


Daimler, Kecskemét/Hungary

### Product recommendation

#### Lighting requirements

- Illumination or accenting of facades and architectural details with floodlights or wall luminaires
- Low maintenance lighting system with high system service life
- Higher illuminance at entrance areas (1500 to 2000 lux) for improved orientation and customer guidance



SiCOMPACT® A2  
MINI/MIDI  
Floodlight with  
wall fixing

SiCOMPACT® R1  
MINI S  
projector

CB 90  
ground recessed  
luminaire

CL LED linear wall  
linear system for wall  
fixing



# Reaching the destination more easily

Whether it's delivery, work processes or outdoor tasks, a problem-free working day demands modern and functional outdoor lighting.



Daimler, Kecskemét/Hungary

## Outdoor areas and paths

Outdoor areas and access routes often become very busy with the movement of goods, changes in work shifts or visitor traffic. Modern, functional outdoor lighting is needed primarily for orientation and safety, and people, obstacles and signage have to be recognised clearly and quickly.

When selecting lighting systems, a focus should be placed on economic operation because the areas to be illuminated are usually large and the power-on durations long. In addition, high energy savings can be achieved by using intelligent light management systems with motion sensors and daylight sensors.

Outdoor luminaires with their especially robust materials and suitable protection ratings are also able to defy adverse weather conditions and extreme temperatures.

## Product recommendation

### Lighting requirements Outdoor areas and paths\*

- Creating a friendly and appealing atmosphere
- Ensuring traffic safety
- Low luminaire quantity with high light quality
- Simple maintenance and long service life
- Traffic routes/traffic surfaces/ passages:  $E_m$  5–50 lx,  $GRL \leq 45-50$ ,  $U_0 \geq 0.40$ ,  $R_a \geq 20$

\* Excerpts from DIN EN 12464-1; During planning, the DIN or corresponding recommendations for road lighting should be observed for more precise determination of lighting requirements in relation to the application for traffic routes.



SiCOMPACT® A2  
MIDI  
floodlight for mast  
mounting  
2200-6600 lm



Streetlight 10 mini  
LED  
mast luminaire  
2300-6100 lm



Streetlight 10 midi  
LED  
mast luminaire  
6100-13400 lm



Müllerland, Hennef/Germany

### Parking lots

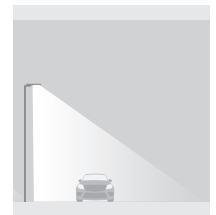
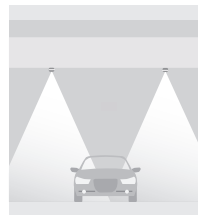
Well-illuminated parking spaces reduce the risk of accidents and also give a feeling of personal safety. Siteco mast luminaires feature high modularity, flexibility and economy, and efficiency levels can be still further improved with intelligent control technology. This always provides just enough light to comply with lighting standards, level of daylight and weather conditions.

Supplementary, zonal LMS regulation is often advantageous according to the size of the parking areas, and ensures even lower operating overheads with presence and motion control. At the same time, Siteco lighting systems score points in terms of high light quality, for example with the patented high definition cover of the Streetlight 10 LED luminaire. Light is emitted only onto parking surfaces, vehicle drivers are not subjected to glare and residents are not annoyed by stray light.

### Product recommendation

#### Lighting requirements for parking lots\*

- Entrance and exit routes (day):  $E_m$  300 lx,  $GRL \leq 25$ ,  $U_0 \geq 0.4$ ,  $CRI \geq 40$
- Entrance and exit routes (night):  $E_m$  75 lx,  $GRL \leq 25$ ,  $U_0 \geq 0.4$ ,  $CRI \geq 40$
- Traffic routes:  $E_m$  75 lx,  $GRL \leq 25$ ,  $U_0 \geq 0.4$ ,  $CRI \geq 40$
- Parking lot:  $E_m$  10–50 lx,  $GRL \leq 50$ ,  $U_0 \geq 0.25$ ,  $CRI \geq 20$
- Traffic routes/traffic surfaces/passages:  $E_m$  5–50 lx,  $GRL \leq 45$ –50,  $U_0 \geq 0.0$ ,  $CRI \geq 20$



Monsun® 2 LED damp-proof luminaire




SiCOMPACT® A2 MIDI LED floodlight 2200–6600 lm



Streetlight 10 mini LED outdoor luminaire 2300–6100 lm







# Starting a project together and achieving the goal together

## Service and consultation right from the beginning

Thoughts come about in the head, are formulated into ideas and grow to become solutions. The more heads used and the more knowledge, experience, creativity and passion brought into the processes, the better is the result. Our customers are experts for their specific requirements, and we have the requisite knowledge for specific lighting applications as well as the necessary lighting tools. The very best solutions are created when this know-how flows together as part of a continuous dialogue between experts.

















In practice this means that you can count on us, from initial planning phases up until implementation. As part of the process a contact person is at your side for all requirements occurring during the course of the project. Whether this concerns luminaires, lamps, control units or sophisticated light management systems, our experts are on-site and will make sure that good light helps you to achieve your aims.







### Your on-site partner

You can reach us via our comprehensive network of sales subsidiaries, with almost certainly one in your area. This is the direct contact to our lighting professionals. All addresses can be found on the rear of this brochure.

# For optimal specifications

## Warehouses

		Trunking systems			Highbay luminaires
					
		Modario® trunking system	Modario® trunking system	Modario® Power Module	NJ700 LED
Light source:		LED	T16	T16	LED
Mounting method: to Modario® system rail		■	■	■	
suspended					■
ceiling surface-mounted					■
DALI light control options		■	DALI type	DALI type	■
Highbay racking	22		 5-8 m  8-15 m	 5-8 m  8-15 m	
Logistics areas	24		 5-8 m		 6-10 m  10-15 m
Cold stores	26				 6-10 m  10-20 m





<b>Damp-proof luminaires</b>	
 <p>T16 highbay luminaire</p>	 <p>Monsun® 2 LED damp proof luminaire</p>
T16	LED
■	■
■	■
■	■
DALI type	■
  <p>6-10 m    10-15 m</p>	
	  <p>3-6 m    6-8 m</p>



# For optimal specifications


## Automotive production

		Trunking systems			Highbay luminaires
					
		Modario® trunking system	Modario® trunking luminaire	Modario® Power Module	NJ700 LED
Light source:		LED	T16	T16	LED
Mounting method: to Modario® system rail		■	■	■	
suspended					■
ceiling surface-mounted					■
DALI light control options		■	DALI type	DALI type	■
Automotive industry – stamping 30		 5-8 m			 6-10 m  10-20 m
Automotive industry – bodywork 31		 3-8 m	 3-8 m		 6-10 m
Automotive industry – final assembly 32			 3-8 m	 3-8 m	
Automotive industry – quality control 33				 3-8 m	













<b>Damp-proof luminaires</b>	
	
T16 highbay luminaire	Monsun® 2 LED damp-proof luminaire
T16	LED
■	■
■	■
■	■
DALI type	DALI type
	 3-6 m
 6-10 m	

# For optimal specifications

## Industry and trade production

		Trunking systems			Highbay luminaires		
							
		Modario® trunking system	Modario® trunking luminaire	Modario® Power Module	NJ700 LED		
Light source:		LED	T16	T16	LED		
Mounting method: to Modario® system rail		■	■	■			
suspended					■		
ceiling surface-mounted					■		
DALI light control options		■	DALI type	DALI type	■		
Metal/electrical industry	34 		 3-8 m	 3-8 m	 3-8 m	 6-10 m	
Food industry	36 		 3-8 m	 3-8 m			
Chemicals/plastics industry	38 		 3-8 m				
Transport industry	40 					 6-10 m	 10-20 m
Wood industry Workshops	42 46 		 3-8 m				



	Damp-proof luminaires	Diffuser luminaires
		
T16 highbay luminaire	Monsun® 2 LED damp-proof luminaire	Silhouette®
T16	LED	LED
■	■	
■	■	■
■	■	■
DALI type	DALI type	DALI type
	  3-6 m    6-8 m	
	   3-6 m    6-8 m    3-5 m	
  6-10 m    10-20 m		
	  3-6 m    6-8 m	

# Good light is created with precise tools

## Smart tools for planning lighting installations

Precise information about technical characteristics and exact luminaire specifications are the preconditions for planning lighting to create not just good light but also components for your success. Professional lighting is a highly complex interaction of various factors, concerning not a cure-all but always the best solution for individual needs.

We have developed a series of tools for your daily work in the planning of indoor and outdoor lighting installations, to help you to simply and reliably plan individual lighting. These tools are available for free on our websites.



### Siteco® Lighting Tool

The software program developed specifically for Siteco helps to find all luminaires via the familiar catalogue structure as well as using individual characteristics. A special feature is the simple and convenient transfer of relevant data via drag & drop to RELUX and DIALUX.

[www.siteco.com//lighting-calculation](http://www.siteco.com//lighting-calculation)

### Indoor cost-efficiency calculator

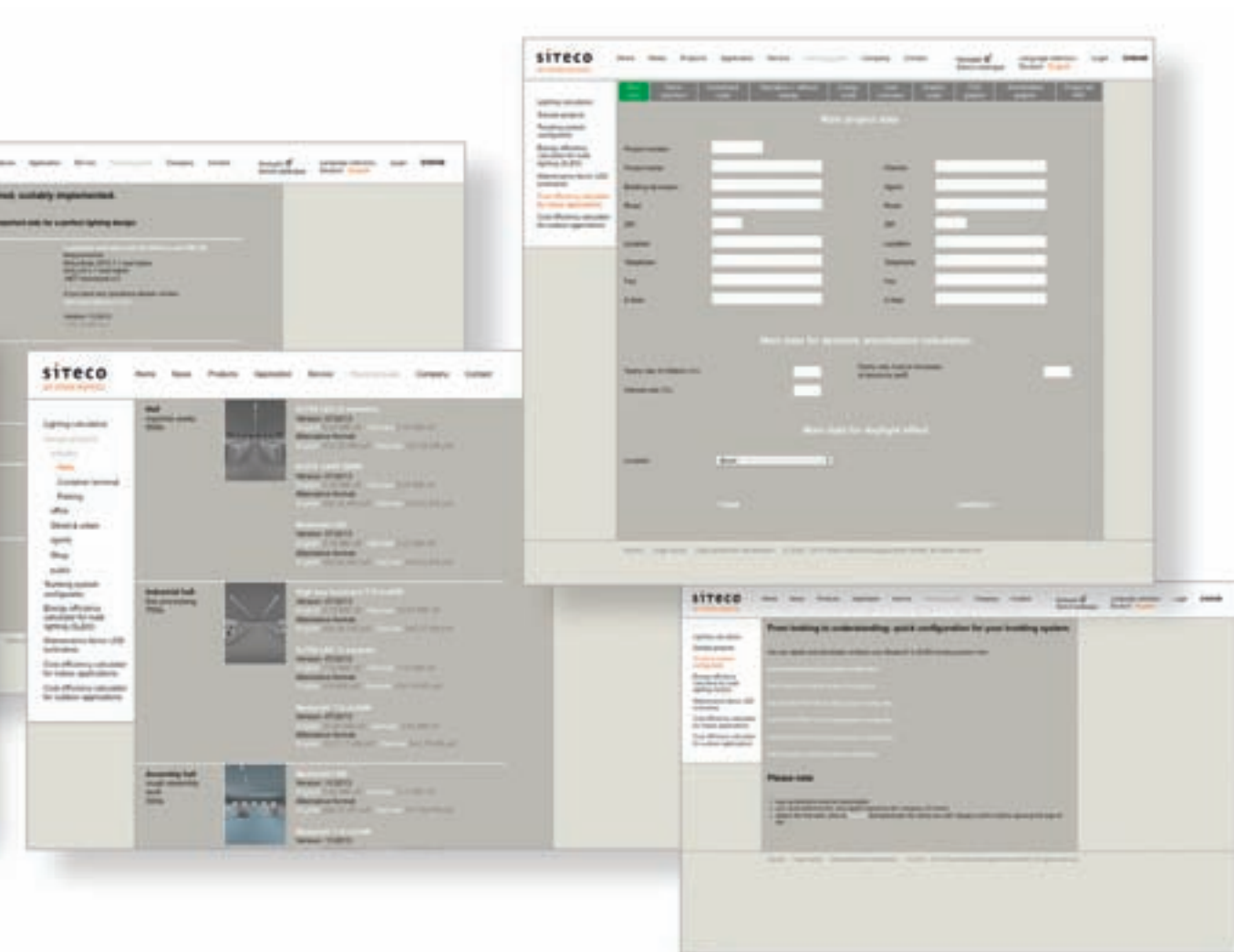
Which operating costs can be saved with lighting upgrades? How is CO<sub>2</sub> emission cut with LED technology? And how quickly is your invest amortised? The cost-efficiency calculator supplies all the answers – with comparisons of obsolete and new systems as well as downloading PDF documentation.

[www.siteco.com/en/planning-guide/cost-efficiency-calculator-for-indoor-applications.html](http://www.siteco.com/en/planning-guide/cost-efficiency-calculator-for-indoor-applications.html)

### Modario® trunking configurator

Plan comfortably and work successfully. With the Modario® trunking configurator, planning complex trunking systems becomes a simple exercise, and the program supplies information concerning availability, configurations and installation – simply, reliably and quickly. The Modario® trunking configurator is connected directly to the electronic catalogue.

[www.siteco.com/trunking-system-configurator](http://www.siteco.com/trunking-system-configurator)



### Sample systems

Are there similar tasks to my specific requirements? How was the solution created? Our online sample installations have been calculated by our lighting experts so that the specific solution is always optimal in terms of compliance with standards, quality of light and system efficiency. To be used as sources of inspiration or as specific solutions.

[www.siteco.com/sample-projects](http://www.siteco.com/sample-projects)

### Electronic catalogue

The up-to-date reference work with all Siteco and OSRAM indoor and outdoor luminaires, including all relevant data, ranging from product images and installation instructions to tender texts and photometric data, as well as plug-ins for light calculation software. Comprehensive, clear and user-friendly. A smart add-on is the Siteco rapid calculation tool as a random calculator for initial quantity estimations.

[www.siteco.com/indoor-luminaires](http://www.siteco.com/indoor-luminaires)  
[www.siteco.com/outdoor-luminaires](http://www.siteco.com/outdoor-luminaires)

[www.osram.com/indoor-luminaires](http://www.osram.com/indoor-luminaires)  
[www.osram.com/outdoor-luminaires](http://www.osram.com/outdoor-luminaires)



# Planning security and transparency thanks to new ZVEI designations for LED luminaires

The market for LED applications is rapidly expanding, and a large number of new and external market players are bringing products onto the market that do not fulfil their technical claims. This causes insecurity, misunderstandings and false impressions about product performances. To achieve safety and reliability when planning lighting installations it is however vital to use uniform and standardised (and thus comparable) quality criteria when evaluating technical statements.

The German Electrical and Electronic Manufacturers' Association (ZVEI), of which OSRAM and Siteco are members, has now drawn up a system of nomenclature that forms an obligatory basis for the evaluation of the technical performances of LED luminaires, and thus also enables uniform evaluations. The ZVEI work group recommends manufacturers to assume the following parameters and data for their technical information in the future.

## ZVEI nomenclature

**Rated luminaire input power  $P$**  (in W) (replaces power consumption) Effective power of the luminaire measured in watts (W) with nominal voltage.

**Rated luminaire luminous flux  $\Phi_v$**  (in lm) Total lumen output of a luminaire emitted in the visible spectrum in all directions; new value of luminous flux emitted according to predefined operating conditions, measured in lumens (lm).

**LED luminaire efficacy  $\eta_v$**  (in lm/W) (replaces luminaire efficiency) The quotient of the emitted rated luminous flux and consumed electrical rated power, measured in lumens/watt.

**Luminous intensity distribution of luminaires** Spatial distribution of light output from a light source; Luminous intensity distribution curves (LDC's) in C levels (0–180/90–270°).

**Colour quality** The colour quality of white light is specified according to the following characteristics:

**Correlated colour temperature  $T_{cp}$**  (in K) The light colour of white light is specified by the closest colour temperature; measured in Kelvin (K). The designations warm white to 3300 K, neutral white between 3300K and 5300 K and daylight white (>5300K) are used. Specification of the closest colour temperature is in 100K steps.

**Color Rendering Index (CRI)** Colour rendition is specified using the colour rendering index CRI. This measures the degree of similarity of a perceived object colour with its appearance using a specific reference illuminant.

**Colour tolerance** A classification of colour differentiation with identical colour temperature in 3/5/7 level MacAdam ellipses. These steps represent the measurement for colour difference. Light sources with a 3-step MacAdam ellipse colour difference differentiate less than two light sources with a colour difference corresponding approximately to a 5-step MacAdam ellipse.





#### Rated ambient temperature ( $t_a$ )

The operating behaviour of a luminaire is influenced by the ambient temperature. A value of 25° C requires no specification on the luminaire/ data sheet, but fluctuating values must be designated.

#### LED luminaire longevity criteria

The service life of LEDs is not only measured at the time of total failure but also with degradation, meaning that luminous output continuously reduces over time.

#### Rated life ( $L_x$ )

The rated or useful service life  $L_x$ , whereby luminous flux decreases to the component  $x$  of the original luminous flux, is used with regard to the luminous flux degradation of LED luminaires. Typical  $x$  values are for example 70 % (L70) or 80 % (L80) with a specific rated service life: e.g. 50,000 hours with an ambient temperature of 25° C.

#### Taking account of lumen loss ( $B_y$ )

The ratio of LED luminaires falling below a targeted luminous flux of  $x$  per cent (see  $x$  of  $L_x$ ) at the specified end of lifespan (e.g. 50,000 h) is specified with the term luminous flux reduction ( $B_y$ ). The value of B50 for example means that 50 % of a quantity of identical LED luminaires can fall below the declared  $x$  luminous flux level at the end of the rated service life  $L$ . The B50 specification (the nominal value) is used to specify the mean luminous flux of functioning LED luminaires at the defined end of their useful service life.

#### Taking account of abrupt failure ( $C_z$ )

The ratio of LED luminaires that have completely failed to the end of the rated service life  $L_x$  is specified with  $C_z$ . LED luminaires with LEDs that only fail singly or LED luminaires where only single LED modules from several fail are not deemed total failures. For example the value C3 means that 3 % of a quantity of identical LED luminaires have completely failed within their lifespan and thus no longer emit light.

Source/text ZVEI guideline (preliminary version 10/2013)

# OSRAM energy efficiency solutions

The OSRAM team of experts is also available for consultation and implementation with the modernising of inefficient lighting systems.

## Place your trust in our expertise

We develop lighting solutions together with you that are characterised by maximum technical and design quality, and at the same time we integrate the complete spectrum of relevant economic and ecological aspects.

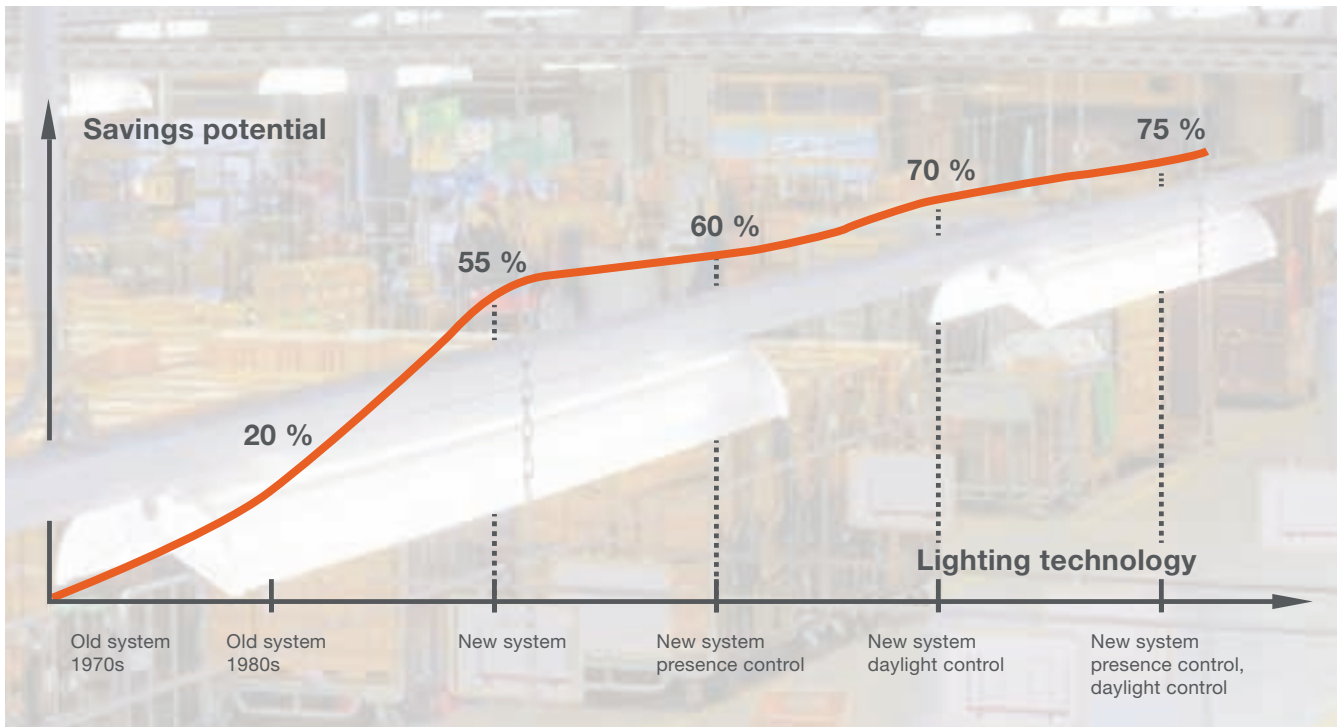
You benefit from our many years of diverse lighting expertise in all applications (industry, office, retail, road lighting, sports, hospitality, healthcare and many others), and of course our pioneering role with technology.

## Energy-efficient lighting optimisation

As an energy audit partner, OSRAM provides energy-efficient lighting optimisation processes. The analysis and optimisation of existing lighting installations is focused upon. This comprehensive service, consisting of the evaluation, planning and implementation of the broad OSRAM product and service spectrum, has already been used by many partners to achieve significant energy and cost savings.







### Steps for energy-efficient lighting optimisation

#### 1. Preparation:

A questionnaire is completed that describes your project in more detail. OSRAM then analyses your data.

#### 2. Location analysis:

OSRAM inspects your site, analyses the existing lighting installation and draws up new and energy-efficient lighting concepts. Together with you we then decide on the optimal solution.

#### 3. Final report:

A final report shows you all investments, amortisation periods and possibilities for saving at a glance.

#### 4. Implementation:

OSRAM accompanies you over the complete project implementation phase.

If you require more detailed information about Energy Efficiency Solutions, then simply send an e-mail to the OSRAM team of experts: [EES@osram.de](mailto:EES@osram.de)

# Our light is a global player

## References from the industrial sector

Industrial companies across the world are as diverse as the components and materials they process, the products they manufacture and the goods they supply. There is however one common denominator: light. And of course its effects and how it creates suitable work conditions for people to do their job safely and reliably.

Our lighting experts in the highly diverse OSRAM network know how optimal customer-specific solutions look like and which lighting concept is best suited to which requirement, and can recommend the very best solutions. A wide range of successful global projects documents this expertise as well as the inherent diversity of our customer-specific solutions.





#### Manufacturing references

- Adelholzener Alpenquellen, Bad Adelholzen/Germany
- Audi, Ingolstadt/Germany
- Bavaria car park, Munich/Germany
- BMW, Dingolfing/Germany
- Bosch Siemens Haushaltsgeräte, Giengen/Germany
- Daimler, Kecskemet/Hungary
- Eberspächer, Wilsdruff/Germany
- Griesson – De Beukelaer, Ravensburg/Germany
- Linz AG, Linz/Austria
- Mini, Oxford/Great Britain
- Muoatathal furniture company/Switzerland
- Suburban railway carriage hall, Linz AG, Linz/Austria
- Siemens Eromutechnika, Budapest/Hungary

- Spritzgusswerk Ensinger GmbH, Rothenburg-Ergenzingen/Germany
- Tetra Pak, Jeddah/Saudi Arabia
- VW, transparent factory, Dresden/Germany
- VW, Wolfsburg/Germany

#### Logistics references

- Deutsche Post letter centre, Straubing/Germany
- DHL, Frankfurt a. Main/Germany
- Zalando Pickettower, Erfurt/Germany



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