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Review

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DALI COMMENTARY BY PAUL DROSIHN, DALI ALLIANCE

MATERIALS AS A KEY ENABLER
BY MARTIJN A. BEUKEMA, DOW

TURNING RESEARCH INTO BEST PRACTICE BY PETER THORNS, CIE

BEHIND THE WORLD'S MOST DEMANDING LIGHTING PROJECTS

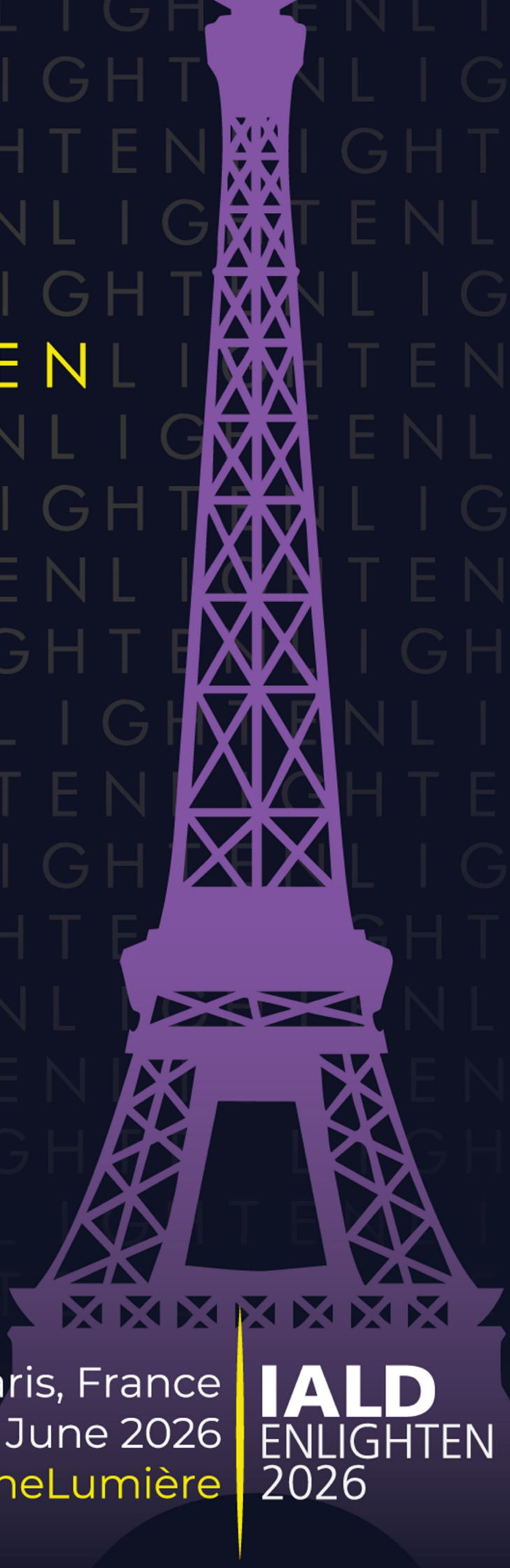
DALI – the global standard for interoperable digital lighting control

The Global Information Hub for Lighting Technologies and Design

DALI Alliance

DALI 2 D4 DALI+

IALD ENLIGHTEN EUROPE 2026



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Lighting the Smart Building Era

The future of intelligent buildings will not be defined by individual technologies, but by the ability of systems to communicate and collaborate. Lighting, sensors, controls, software platforms, and building services are increasingly converging into integrated ecosystems that enable greater efficiency, sustainability, and user comfort. As buildings become more connected, interoperability is becoming a key requirement for long-term success.

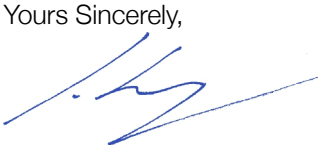
Within this evolution, lighting has moved far beyond its traditional role of providing illumination. Today, lighting infrastructure serves as a platform for automation, monitoring, and building-wide intelligence, creating new opportunities for manufacturers, system integrators, designers, and building owners. Among the technologies supporting this development, DALI has established itself as one of the industry's most successful examples of open collaboration. It has evolved from a lighting control protocol into a widely adopted ecosystem that enables interoperability across products, applications, and projects of every scale.

This issue of LED professional Review highlights the breadth and maturity of this ecosystem. We begin with the Zayed International Airport in Abu Dhabi, currently the world's largest DALI installation. Paul Drosihn provides insights into the future of open lighting control, while Simmtronic showcases how DALI-2 enables flexibility and intelligent integration at Co-op Live. Further developments are reflected in Lunatone's discussion of DALI-2 multi-master structures and Bluetooth SIG's new certification specifications for Bluetooth® NLC-to-DALI gateways. Together, these contributions illustrate how different technologies can complement one another to create more flexible building infrastructures.

Beyond technology, we also explore the broader lighting community through contributions from the CIE, international industry events, and our interview with Dow's Martijn Beukema.

As intelligent buildings continue to evolve, open ecosystems, standardized communication, and collaborative innovation will shape the next generation of connected infrastructure. The most successful solutions will be those that enable seamless cooperation across the entire building environment.

Yours Sincerely,



Siegfried Luger

Founder & CEO of Luger Research e.U.
Publisher of LED professional, Trends in Lighting, LpS Digital, and the Global Lighting Directory

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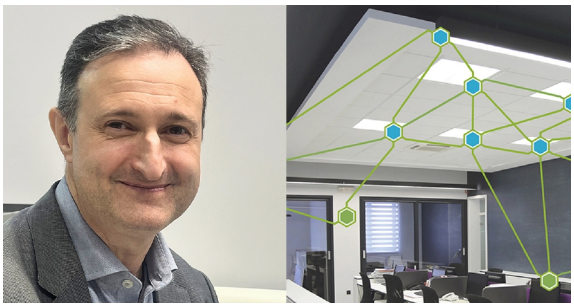

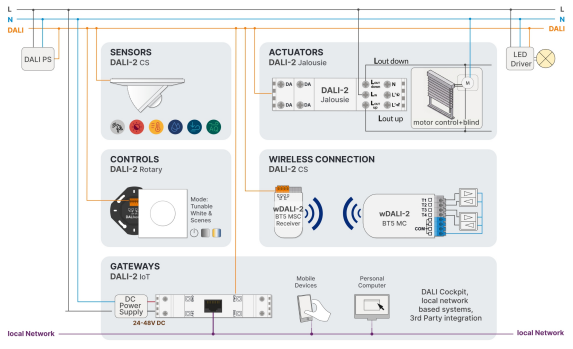

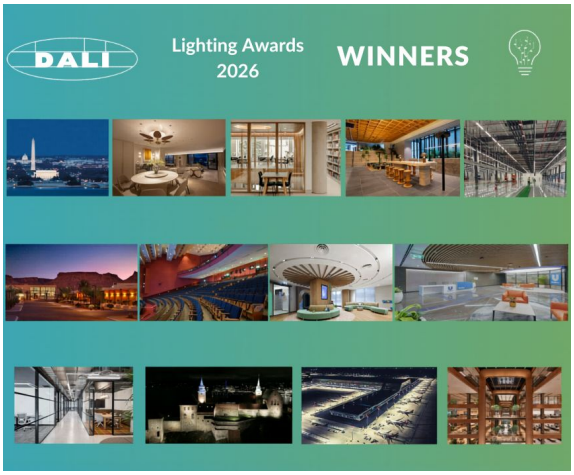

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ADVERTISING INDEX

DALI – The Open Standard for the Next Generation of Lighting Control

Paul Drosihn

Paul Drosihn is the General Manager of the DALI Alliance. A management expert with more than 30 years of experience in the electronics and LED lighting industries, he has previously held a number of leadership positions in sales, business development, and strategic marketing. Drosihn is a member of the IEEE and AMBA, and a Fellow of the Institute of Leadership and Management.

Data Integration and Hybrid Systems are the Future of Smart Lighting

Today, lighting systems are increasingly becoming an integral part of a connected building infrastructure. They no longer just provide light, but also data, status information, and control signals for building management platforms. This increases the importance of robust, open standards that reliably connect different systems. The DALI Alliance is driving this transformation forward by providing the technical framework for interoperable lighting control across wired, wireless, and hybrid architectures.

In the lighting market, lighting, building automation, and the IoT are increasingly converging. Lighting is no longer viewed and planned in isolation; rather, it is an integral part of a digital building strategy. This requires standards that ensure vendor independence, technical security, and scalability. The DALI ecosystem meets these requirements with clear specifications and neutral certification.

From Lighting to Data Platform

Many applications today rely on the DALI-2 standard. As a certified foundation for wired systems, it ensures reliable, cross-vendor interoperability. At the same time, D4i has established itself as an important extension for data-driven lighting. D4i drivers are DALI-2 certified and yet have mandatory features: energy, diagnostic, and asset data are stored in the driver and can be read out as needed. This enables more efficient operating strategies, smart data approaches such as predictive maintenance, and data-driven building optimization.

Hybrid Systems on the Rise

While BUS cables remain the foundation of controlled lighting systems, the demand for wireless extensions is growing, especially in existing buildings and during renovations. New gateway technologies enable the integration of wireless protocols. Last year, DALI Alliance published test and certification specifications for Wireless-to-DALI gateways for use with Bluetooth NLC or Zigbee systems. This creates scalable infrastructures that can be flexibly adapted to different requirements.

DALI+ consistently builds on this development. It extends DALI-2 into the wireless and IP-based domains by utilizing Thread as a wireless mesh networking technology. This opens up new possibilities for the design and implementation of lighting systems where wires cannot be used. Using the same system logic, mixed wired and wireless architectures can also be implemented without any loss of functionality.

Market Development and Dynamics

In addition to the technology, the market is also showing clear momentum: global demand for interoperable, standardized solutions is rising—driven by growing requirements for energy efficiency, sustainability, and digital infrastructure. DALI-based systems are gaining ground, particularly in large infrastructure projects and in the smart city environment.

Pooling and Making Knowledge Accessible

As systems become more complex, the need for information increases. DALI Alliance is therefore expanding its offerings of training and technical guidelines for designers, integrators, and operators.

Last but not least, topics such as cybersecurity and regulatory requirements are also coming into sharper focus. This is because networked lighting systems must be designed to be secure and compliant with standards as part of the IoT. Open standards are an important foundation for this—but they must be supplemented by clear implementation guidelines.

DALI is at the heart of a dynamic and fundamental transformation in lighting. Its combination of interoperability, data capabilities, and technological openness makes the standard a key building block of smart buildings. Companies benefit from this powerful protocol and can develop innovative products and applications—from energy-efficient lighting solutions to fully networked, data-driven infrastructures. In this way, DALI opens up new possibilities and shapes the next generation of lighting control. ■ P.D.


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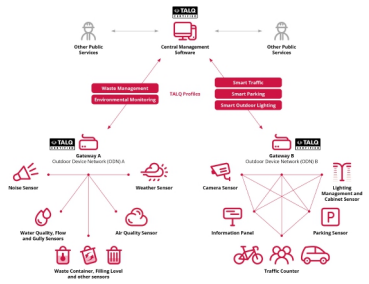
First Solution Certified Against New DALI D4i TALQ Zhaga Profiles

www.talq-consortium.org

The TALQ Consortium, which developed the Smart City Protocol, a global interface standard for smart city applications, announces the first certified solution against the new DALI D4i Zhaga profiles. The recently re-certified Central Management Software (CMS) includes now both 'DALI D4i Luminaire TALQ Zhaga' and 'DALI D4i Sensors TALQ Zhaga' profiles, introduced with Version 2.7 of the TALQ Specification. This marks an important step towards more interoperability and seamless data exchange in smart outdoor lighting ecosystems. Currently the in total 85 products as officially TALQ-certified listed solutions include 37 Central Management Software (CMS) and 48 TALQ Gateways (Outdoor Device Networks, ODN).



As investments in new street lighting infrastructure and in other smart city applications are long-term investments, cities and communities more and more ask for interoperable and open solutions which allow them to combine different vendors throughout several investment and roll-out cycles. For many years, the TALQ Consortium has been supporting cities in their tendering processes and supplier selection. This is done not only through the certification of solutions successfully integrating the TALQ Smart City Protocol standard, but also by defining typical profiles, functional city test cases and publishing detailed capability lists of TALQ-certified products to ease cities' definition of individual requirements.

TALQ Profiles group various smart city use cases: By defining TALQ Profiles, the Consortium has used its members' expertise to group several smart city use cases and defined for each profile a set of mandatory and optional functionalities. The existing profiles for Cabinet Control, Environmental Monitoring, Lighting, Lighting Asset Management, Smart Parking, Smart Traffic, and Waste Management were recently enlarged with the two new DALI D4i Luminaire TALQ Zhaga and DALI D4i Sensors TALQ Zhaga profiles. The concept of TALQ Profiles and functional test cases allows a step-by-step approach to define tender requirements. For cities, utilities, project planners and consultants, the profiles, the TALQ Tender Template and the product filtering tool on the consortium's website provide a practical guide when drafting a tender and evaluating solutions. All these elements are available publicly and free of charge. By including tailored requirements in their tenders, cities can better select matching products to individual needs, ensure that certified products implement a consistent, well-defined feature set and avoid vendor lock-in by relying on interoperable multi-vendor solutions.

TALQ Profiles typically allow flexibility for the way in which TALQ components implement specific use cases, such as the broader street lighting profile. The two new DALI D4i TALQ Zhaga profiles, however, impose a stricter framework aligned with the DALI books comprising D4i by making all functionalities mandatory. This reduces implementation variability and supports predictable behavior across systems from different vendors.

More certified solutions every month: All 85 officially TALQ-certified products are listed on the Consortium's website, including a detailed capability list for each system. These lists summarize per product which TALQ Profiles are supported and which functional tests have been passed, using easy to understand, application-oriented descriptions.

Among the certified solutions, one product is already certified against both of the new DALI D4i TALQ Zhaga profiles introduced with Version 2.7 of the TALQ Specification. Robert Tissing, CEO of Luminext, explains: "As active contributors to the development of the TALQ Protocol, we moved quickly to make these new profiles available to our clients, immediately after the standard was released. Thanks to the outstanding work of our software team, certification was achieved the very next day — ensuring our clients can start benefiting from this capability right away."

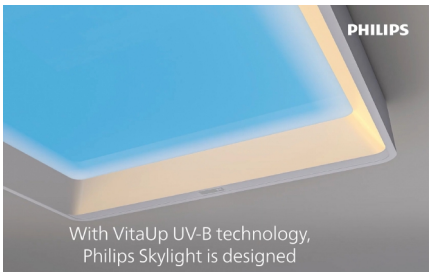
"We are proud to see not only the number of certifications climbing every month but also an understanding is growing of which functionalities are necessary to design a powerful and scalable infrastructure throughout the entire smart city landscape globally," adds Simon Dunkley, Secretary General of the TALQ Consortium.

Certified products are classified as CMS or Gateways. It is important to understand that the TALQ Gateway is a logical function and is typically distinct from communication gateways (such as LoRaWAN and Mesh gateways) used within Outdoor Device Networks (ODN). The TALQ Gateway represents the standardized interface between an ODN and the CMS. The TALQ Protocol, and therefore the TALQ Gateway, is network agnostic and independent of the underlying communication technology. ■

Philips Skylight, Designed to Bring the Feeling of Daylight Indoors

www.signify.com

Signify announced Philips Skylight, a new ceiling lighting range designed to recreate the feeling of daylight indoors. Inspired by the natural brightness, depth and rhythm of sunlight, Philips Skylight combines advanced LED lighting technologies with intuitive everyday experiences to help people feel more connected to natural light — even while indoors.



As people spend an increasing amount of time indoors, access to natural daylight has become more limited. New Signify research found that 58% feel they spend too much time indoors, while 89% say they feel more energetic when they get enough daylight. In addition, 43% are open to solutions that recreate daylight indoors. Philips Skylight was developed to address this shift, helping people bring the feeling of daylight into their homes.

"Light has always been about more than illumination," said Hellen van der Plas – CEO Signify Netherlands and Global Business Leader Philips LED. "For 135 years, we have continuously evolved how lighting improves people's lives — from electric light to LED, and now towards experiences that support wellbeing, comfort and how people feel in their homes every day. As people spend more time indoors, there is an opportunity to rethink the role lighting can play in helping people feel more connected to the natural rhythms of daylight. Skylight reflects that next step."

Using Signify's NatureConnect technology, Skylight is designed to reproduce the natural brightness, shades and depth of daylight, creating the visual impression of a window to the sky inside the home. The slim ceiling panel delivers soft, evenly distributed illumination that helps create brighter, more comfortable living environments.

The integrated auto day rhythm feature automatically adjusts brightness and tone throughout the day. Supported by Philips BioUp LEDs, Skylight delivers brighter, blue-enriched light during the day and warmer light in the evening, inspired by research on circadian stimulation and alertness.

Users can select from five preset daylight-inspired scenes depending on their activities, ranging from focused daytime lighting to warmer evening ambiance.

The Philips Skylight family also includes Philips Skylight VitaUp variants, featuring an integrated UV-B module designed to support the body's natural vitamin D production indoors. The VitaUp feature includes integrated safety controls, including automatic shutoff after eight hours or manual control via the included remote.

Learn all about Philips Skylight here:
http://www.philips.com/skylight

Designed for everyday living

Philips Skylight is designed for intuitive everyday use. The range includes:

- Philips Skylight Medium
- Philips Skylight Large
- Philips Skylight VitaUp Medium
- Philips Skylight VitaUp Large

All variants include:

- Surface mounted slim ceiling profile
- Included remote control
- Five preset lighting scenes
- Auto day rhythm functionality
- IP44 rating for use in bathrooms and damp environments

Philips Skylight and Philips Skylight VitaUp will become available across selected European markets starting June 2026. ■

Telefónica Tech Digitizes Public Lighting in the Municipality of Burriana

telefonicatech.com

The joint venture formed by Ferrovial Energía and Endesa has chosen Telefónica Tech as its technology partner to carry out its project to digitize public lighting in the municipality of Burriana (Valencia).

Telefónica Tech has implemented its smart lighting solution to enable Ferrovial Energía and Endesa to remotely manage the municipality's LED streetlights individually. The technology company has deployed more than 6,300 nodes designed and manufactured by Tellink and equipped them with NB-IoT connectivity, which allows for mass deployments and coverage in hard-to-reach areas, so that the information collected at each light can be transmitted to a platform for monitoring and remote control.

Telefónica Tech's smart lighting solution will enable the consortium to remotely and efficiently control the functioning, operation and maintenance of the lights. It offers the ability to regulate the light intensity of each light according to the city's needs, avoiding having streetlights on or at maximum intensity in areas with little traffic or, conversely, increasing lighting during events with large crowds.

Likewise, the digitization of public lighting also facilitates the monitoring of consumption and optimizes infrastructure maintenance by having the ability to detect faults or breakdowns remotely and before they occur and affect the service provided to citizens.

The project also has a clear environmental component and generates numerous benefits in terms of citizens' quality of life. The adaptability of the lighting at any given time contributes to increased safety and sustainability in the municipality, reducing light pollution, energy consumption and, consequently, the carbon footprint.

The Ferrovial Energía-Endesa joint venture states that "making streetlights smart not only helps to improve energy efficiency but also optimizes maintenance tasks and facility management by monitoring consumption and taking action in response to any deviations that may occur. The joint venture is responsible for making the multi-million-pound investment in the digitization of public lighting in the municipality of Burriana".

Dario Cesena, Director of IoT at Telefónica Tech, says: "Our smart street lighting solution consists of connecting the different lighting points with NB-IoT technology to facilitate efficient and sustainable remote management. With this solution, utilities can reduce energy consumption in cities and, with it, local councils' electricity costs, achieving, among other things, savings in maintenance by being able to predict possible faults or breakdowns."

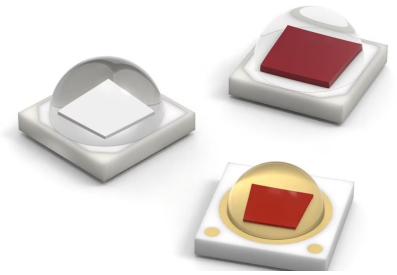
Dionisio Martínez, CEO of Tellink, says: "Tellink is proud that the joint venture formed by Ferrovial Energía and Endesa is once again counting on Telefónica Tech and us for a new mass deployment of Tellink TSmart-ZD4i smart lighting controllers, together with the remote management software platform. Tellink's remote management systems help to

achieve two objectives simultaneously: improving the quality of public lighting for citizens and visitors and enabling the municipality to reduce its energy costs and meet its sustainability goals." ■

Würth Elektronik Expands its Horticulture LED Portfolio

redexpert.we-online.com

Würth Elektronik has made a name for itself with LEDs for controlled plant cultivation and has expanded its WL-SMDC Horticulture product line with new LEDs in the 3535 package.



These LEDs feature a photon efficacy (PPE) of up to 4.9 µmol/J and a photosynthetic photon flux (PPF) of up to 6.34 µmol/s. The three LEDs – with wavelengths of 450, 660, and 730 nm – set new standards for professional lighting solutions in greenhouses and in Controlled Environmental Agriculture (CEA).

The LEDs are dimmable and controllable, enabling precise adjustment of light intensity and spectrum. The "Horticalculator" on the REDEXPERT online simulation platform can be used to create and optimize customized lighting recipes. Spectral mixes can be precisely matched to different plant species, growth stages, and plant quality parameters.

Scientifically sound

The new series is aimed specifically at developers and manufacturers of lighting systems for greenhouses, vertical farming, controlled-environment agriculture (CEA), container farming, specialty crops, research applications, as well as algae and aquarium lighting. Their high efficiency, increased output, and compact 3535 package make these LEDs ideal for modular, large-scale, and energy-optimized lighting concepts. Würth Elektronik works closely with research institutions, ensuring scientific insights have been incorporated into this new generation of horticulture LEDs.

All Würth Elektronik horticulture LEDs are available from stock without a minimum order quantity. Free samples can be requested for development projects.

"Controlled Environmental Agriculture supports and complements conventional agriculture and horticulture wherever it reaches its limits, such as in the year-round regional supply of fresh produce. Our horticulture LEDs enable this. In view of the growing global population, location-independent food production is set to play a key role in the future," says Alexander Gerfer, CTO of the Würth Elektronik eiSos Group. ■

Zumtobel Supports Compliance with the EU Buildings Directive

www.zumtobel.com

By the end of May 2026, EU member states had to transpose the Energy Performance of Buildings Directive (EPBD) into national law. This will introduce new minimum energy efficiency standards for new and existing buildings. In the non-residential sector, the least energy-efficient 16% of the building stock must be modernized by 2030; by 2033, this share will rise to the worst-performing 26%. Building renovation is set to be encouraged through investment incentives.

Lighting plays a key role within the EPBD. Zumtobel positions itself as a strong consulting and implementation partner for owners and planners, particularly in the areas of automation, sensor technology, and documentation. Its portfolio includes luminaires, lighting infrastructure, and lighting management systems designed to translate EPBD requirements into practical solutions – energy-efficient, smart, and people-centric. In addition, Zumtobel provides performance and lifecycle data that can serve as a basis for legally compliant planning.

Lighting management in the EPBD context

With regard to lighting, the EPBD highlights energy efficiency, indoor environmental quality (IEQ), and the Smart Readiness Indicator (SRI) as central factors. The SRI focuses on the integration of control, data analytics, and monitoring into the building automation system, including sensor-based control according to occupancy and daylight availability, regular performance checks, and predictive maintenance. EPBD documentation explicitly references lighting in the context of recommended integration into building automation systems and cites lifecycle calculation data – including global warming potential – as part of the evidence base.

Zumtobel's intelligent, sensor-based lighting management system LITECOM can meet these requirements comprehensively. The highly adaptable system helps achieve energy savings, improve visual comfort, and reduce operating costs. Using intelligent sensors and advanced control technology, light is used only when it is genuinely needed – aligned with the visual task, available daylight, and the presence of people, continuously dimmed as required.

"Intelligently controlled, sensor-based lighting solutions are pivotal to meeting EPBD requirements – they can help maintain a building's value, reduce energy consumption and improve lighting quality," says Sebastian Gann, Sustainability Director at the Zumtobel Group.

For planning EPBD-compliant lighting, standard EN 12464-1 provides a strong foundation. It sets out requirements for illuminance levels, light quality (color rendering), uniformity, and glare limitation. In addition, LITECOM uses sensors to determine precisely how much daylight is available, whether glare protection is required, and how much artificial light needs to be supplemented. For this purpose, LITECOM offers predefined sequences aligned with the day–night rhythm. By dynamically adjusting light color and intensity to match the body's biological rhythm, it supports lighting concepts that put people at the center (Human Centric Lighting, HCL). During the day, the light has an activating effect; in the evening, it promotes calm and relaxation and can have a positive impact on sleep.

The EPBD also stipulates that sustainability must be documented in a building resource passport. Zumtobel can already provide the necessary data today – for example through environmental product declarations and evaluations based on its in-house Circular Design Rules. In EPBD terms, lighting becomes future-ready when it is planned as a controllable, integrable, and documentable system – one whose in-use energy profile can be transparently verified and whose components are designed for circularity. ■

Fagerhult is Switching LEDs to Reduce its Climate Impact

www.fagerhult.com

Fagerhult is implementing a major change with the aim of reducing the climate impact of its luminaires. By switching to the latest LED technology, Fagerhult is able to reduce annual emissions by 2,250 tons CO_2e from the products it sells. "A small change in each

luminaire that has a huge overall impact," says Niclas Thulin, Sustainability Manager at Fagerhult.

The decision to replace the LED technology in the luminaires is a strategic one and has been made at management level. In practice, this means that the majority of Fagerhult's indoor range will be equipped with new LEDs featuring the latest generation of Flip Chip technology. This change will improve efficiency and reduce energy consumption by 5–10 percent, depending on the luminaire model.

A SMALL CHANGE WITH A BIG IMPACT
"Successful sustainability efforts entail focusing on the right things. In all, 85 percent of Fagerhult's total climate impact across the entire value chain – Scopes 1–3, in other words – comes from the energy consumption associated with the use of our products. If we can improve efficiency and reduce electricity consumption from a significant portion of our product range, this will have a major impact," says Niclas Thulin.

"It's always difficult to predict exactly how much a change will save, since there are many factors at play. But by using data from 2025 – how many luminaires we sold and to which markets – and assuming that they are used for an average of 50,000 hours without lighting control, we estimate potential savings of approximately 2,250 tons of CO□e each year."

That is basically an entire forest:

"That's roughly equivalent to the amount of carbon dioxide absorbed by 90,000 trees in a year**. As a result, this change could have a significant impact on both our own and our customers' environmental efforts."

DOUBLING THE OPERATING TIME
The change also offers other sustainability benefits. The operating time of the luminaires is doubled from 50,000 hours to 100,000 hours. In the long run, this will entail a reduction in the consumption of resources such as raw materials and other materials. It will also provide financial benefits for our customers, who can make a secure and profitable investment in energy-efficient lighting with a longer working life. With this new technology, all luminaires will also have a Constant Light Output, providing stable, high-quality light throughout the luminaire's working life. Put simply, good lighting ergonomics at work.

HOW IT WORKS
A small change that produces big results – what exactly makes the difference from a technical standpoint?

"Our approach involves replacing standard LEDs with the latest generation of Flip Chip technology. In simple terms, Flip Chip has a more advanced design in which electrodes and other contact surfaces are positioned in such a way that they do not block or affect the light output. Flip Chip LEDs are simply more energy-efficient and robust," explains Niclas Thulin.

Luminaire models that already feature this type of LED will be upgraded to the latest generation of Flip Chip, as will all models that were previously equipped with standard LEDs.

A WIN-WIN FOR EVERYONE
The cost of the upgrade will not be passed on to customers in the form of more expensive luminaires but will be financed through the logistical benefits that the change will bring.

"Larger purchase volumes and fewer item numbers mean we can offer these added benefits. Improved energy efficiency, a longer working life and better light quality, lower energy consumption and, above all, a significant contribution to the climate," says Niclas Thulin.

"Here at Fagerhult, we are committed to fulfilling our social responsibility and offering solutions that can address both climate change and the challenges associated with future electricity supplies. In our opinion, our customers shouldn't have to choose between affordability and sustainability when it's possible to have both. It's a win-win for everyone." ■

Helvar and Solar Danmark Announce Strategic Partnership

helvar.com

Helvar and Solar Danmark announced an exciting new strategic partnership, coming into effect from today. This collaboration unites Helvar's world-class intelligent lighting control solutions with Solar Danmark's extensive distribution network, robust logistics, and profound market expertise.

As the demand for sustainable and smart building technologies accelerates, this partnership positions both organizations to better serve the evolving needs of the Danish market. By leveraging Solar Danmark's exceptional reach, the collaboration streamlines access to end-to-end lighting solutions, empowering commercial, educational, and healthcare facilities across Denmark to future-proof their operations and achieve ambitious energy-saving targets.

A Shared Vision for Growth

Michael Hauge – Business Development Manager, Helvar
"We have had a strong collaboration with our previous partner over a number of years and we truly appreciate the efforts made to build Helvar's position in Denmark. With the transition to Solar Danmark, we are taking the next step in our growth strategy. Solar Danmark brings a strong market position, a solid setup, and a clear ambition to develop the business together with us. For our customers, this means improved availability, stronger support, and closer collaboration around energy-efficient and intelligent lighting control solutions."

Kim Långström – CEO, Helvar
"We are very proud to welcome Solar Danmark as a key strategic partner. Denmark consistently leads the way in sustainability and smart building innovation, making it a crucial region for our growth. By joining forces with a powerhouse like Solar Danmark, we are ensuring that our Danish customers have access to the most advanced lighting control solutions available. This partnership is a powerful testament to our shared vision of building a smarter, more sustainable future."

Michael Lind Schmidt – Vice President, Solution Sales, Solar Danmark
"Customers need more than just a good lighting environment – they must also be able to meet new energy requirements and expectations for energy-efficient operations. With Helvar's expertise in lighting control, we are strengthening our overall offering, making it easier for both installers and end customers to access the right components, consultancy and support."

Benefits for our Customers

This transition is fundamentally designed to provide an enhanced experience for all customers across Denmark. By establishing this partnership, customers will benefit from Solar Danmark's industry-leading logistics, local stocking capabilities and a strong commitment to market education. Furthermore, the combined technical expertise of both organizations will offer enhanced, on-the-ground support, from initial specification through to installation and commissioning.

The collaboration aligns seamlessly with Helvar's established 'Concept to Completion' philosophy, whilst complementing Solar Danmark's dedication to robust customer service. By uniting this comprehensive approach to supporting projects at every stage with Solar Danmark's extensive reach, both organizations are focused on ensuring that delivering intelligent lighting controls is a highly efficient and straightforward experience for all stakeholders involved.

The official launch of this partnership reflects a shared, long-term commitment to the region, ensuring customers have the peace of mind that the solutions they rely on are backed by global expertise and unparalleled local delivery. ■

Laser Evo Extends the Laser Blade Legacy with More Than One Million Lighting Configurations

www.iguzzini.com/de/laser-evo

Building on the success of the iconic Laser Blade family, iGuzzini introduces Laser Evo, a highly versatile downlight system that redefines visual comfort through unprecedented design flexibility and performance.

Since the launch of Laser Blade in 2012, iGuzzini has transformed the perception of architectural downlighting by making the light source virtually disappear from view while delivering outstanding visual comfort. With Laser Evo, the company takes this concept to the next level, combining advanced optical technologies with an exceptionally broad range of configurations to support virtually any architectural vision.

Designed for retail, hospitality, residential, and commercial environments, Laser Evo offers more than one million possible configurations, enabling designers to tailor lighting solutions to the specific needs of every project. The system combines a wide range of shapes, dimensions, finishes, optics, and installation options while maintaining the visual comfort and lighting quality that have become synonymous with the Laser family.

Available in eight sizes and five configurations—Fixed, Adjustable, Tilted, Shallow, and Wall Washer—Laser Evo accommodates a broad range of lighting requirements. The Fixed version is further enhanced by multiple "supercomfort" optical designs, including Cone, Dome, Dome Space, Soft, Soft Space, and Squircle, allowing seamless integration into both minimalist and expressive architectural concepts.

Laser Evo covers an extensive performance range, with diameters from Ø17 mm to Ø153 mm and luminous flux levels from 100 to 4,000 lumens, making it suitable for applications ranging from intimate residential spaces to large-scale commercial environments. Select versions are available with IP65 protection, extending the system's use to more demanding conditions.

A key innovation is the new Push&Go system (patent pending), available on larger-diameter versions. This solution enables refractors and optical accessories to be exchanged quickly and safely without tools, simplifying maintenance and allowing lighting schemes to evolve over time.

In addition to optical performance, Laser Evo is designed for the era of intelligent buildings. The system supports advanced lighting control through DALI-2, Casambi, and an invisible RF sensor integrated within the ceiling architecture. These technologies optimize both user comfort and energy efficiency while enabling seamless integration into smart building ecosystems. Additional smart services, including push notifications through the Jiminy application, further enhance interaction between spaces and occupants.

Laser Evo delivers exceptional efficiency of up to 145 lm/W while achieving UGR values below 10, ensuring superior visual comfort even in demanding applications. Combined with its discreet design language, advanced control capabilities, and virtually limitless customization options, Laser Evo establishes a new benchmark for architectural downlighting. ■

Melexis Integrates On-Chip DC/DC Power to Simplify LIN RGB Automotive Lighting

www.melexis.com

Melexis announces the MLX81119, an 18-channel LIN RGB LED controller with an integrated DC/DC converter, designed to simplify and optimize automotive lighting systems. By generating the LED supply voltage locally on-chip, the MLX81119 significantly reduces power dissipation, external components and space requirements in increasingly dense vehicle applications such as door panels, dashboards and charge port lighting.

Lighting has become a key element of modern automotive design. Across both interior and exterior domains, OEMs are increasing the number of lighting deployments to support new functionality, personalization, and brand differentiation. However, physical, efficiency, and thermal constraints are becoming more severe as more electronics are deployed deeper within the vehicle. In conventional architectures, supplying LEDs via external DC/DC converters increases heat generation, component count, and layout complexity, making it harder to meet these constraints at scale.

The 18-channel MLX81119 addresses this challenge by integrating a 1 A DC/DC converter that generates an optimized local LED supply voltage, programmable between 2.5 V and 6 V. Rather than dissipating excess voltage as heat, the device dynamically adapts the LED supply to the active color mix and operating conditions, significantly reducing power losses and thermal stress. This level of voltage optimization is not achievable with fixed external DC/DC converter solutions.

With 18 low-side current sources configurable up to 60 mA and independent 16-bit PWM control, the MLX81119 supports up to six RGB LEDs per device, enabling smooth color transitions and advanced lighting animations. Built-in direct and indirect temperature sensing allows active compensation across all channels, maintaining stable color points over the full automotive temperature range.

Building on the proven MLX81118 architecture, the MLX81119 integrates a complete LIN system, including transceiver and protocol handler, fully compliant with LIN 2.x and SAE J2602. Developed according to ISO 26262, the device supports up to ASIL B implementations depending on the system safety concept, making it suitable for functional safety-relevant interior and exterior lighting applications. ■

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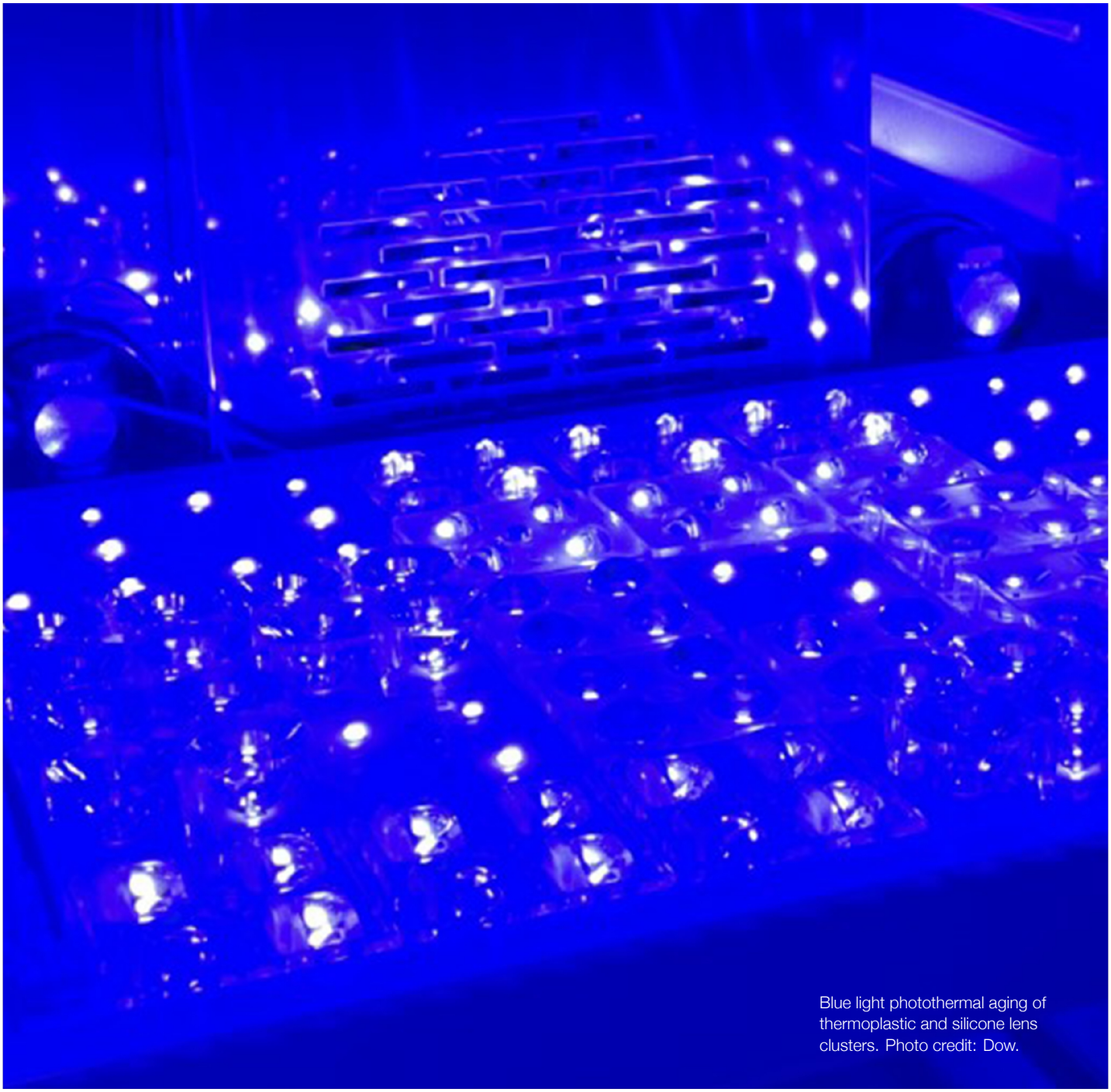
Materials as a Key Enabler for Next-Generation Lighting – Martijn A. Beukema, Technical Service & Development Scientist at Dow



Blue light photothermal aging of thermoplastic and silicone lens clusters. Photo credit: Dow.

As lighting technology reaches maturity, innovation is shifting toward materials, system integration, and long-term reliability. Deeper insights into material behavior—such as Dow's recent work on optical aging—are becoming increasingly critical to enabling next-generation lighting designs. In this exclusive interview Martijn A. Beukema draws on more than two decades of experience in LED optics, materials, and luminaire design to provide valuable perspectives on how deeper material understanding and long-term optical stability are becoming key drivers for future lighting innovation.

www.dow.com

LED professional: **Martijn, let's start with your role—what do you do at Dow, and how does your work connect to the lighting industry?**

Martijn A. Beukema: I work at the intersection of application development and customer collaboration, partnering closely with lighting manufacturers and our internal R&D teams to develop material solutions tailored to lighting systems. My scope covers both new product innovations and the optimization of existing solutions—from optically clear silicones for secondary optics to protective materials used in electronics and housing assemblies.

With a background in light–matter interactions, I've always been fascinated by how materials influence optical performance. The LED revolution—accelerated by the invention of the blue LED by Shuji Nakamura[1]—fundamentally reshaped the lighting industry. Dow has been part of that journey for decades, and we continue to deepen our understanding of how materials can push performance further.

LED professional: **Lighting has matured in many ways. From your perspective, how strategic is this segment for Dow today?**

Martijn A. Beukema: Lighting remains a strategically important segment for Dow, even as the industry matures. The transition from conventional lighting to LED has fundamentally changed how luminaires are designed, manufactured and integrated into systems.

Modern luminaires require advanced materials across the system—from LEDs and drivers to PCBs, heat management components and secondary optics. At the same time, new assembly approaches and higher performance expectations are driving material innovation.

We see continued growth, particularly in demanding applications such as sports, horticultural, street, area and automotive lighting. These environments require materials that can withstand high thermal and photothermal loads while maintaining long-term reliability.

A key differentiator for Dow is our early engagement with customers. We collaborate at the design stage to guide material selection and system optimization, helping enable energy efficiency, durability and ultimately lower carbon footprints. We also work across the value chain to accelerate innovation at a system level.

LED professional: **What are the biggest challenges lighting manufacturers are dealing with right now—and where do materials come into play?**

Martijn A. Beukema: While the challenges facing lighting manufacturers are broad, one area where materials play a critical role is in preventing premature system failure.

Industry expectations for luminaire lifetimes[2] have increased significantly—often targeting 50,000 to 100,000 operating hours. This raises both performance expectations and warranty risks. Unlike legacy lighting technologies, where failure was largely confined to the filament, modern LED systems are more complex, and material performance increasingly becomes a limiting factor.

Long-term reliability now depends on how materials behave under combined stresses—thermal, optical, electrical and environmental—over extended periods. This makes deep expertise in material science, aging behavior and accelerated testing essential.

In addition, as LEDs approach their theoretical efficiency limits[3], further gains in system performance are increasingly enabled by materials. For example, thermal interface materials and protective silicones help manage heat and maintain optical performance, directly influencing system efficiency and lifetime.

LED professional: **When it comes to LED systems, where do advanced materials—especially silicones—really make a difference?**

Martijn A. Beukema: Silicones bring the greatest value in applications that demand long lifetime, optical stability and reliability under combined thermal and optical stress.

In LED optics, silicone lenses offer superior resistance to yellowing and maintain optical clarity over time. This enables higher drive currents, increased light output, and the development of more compact or high-density designs—such as slim luminaires or tightly packed LED arrays.

[1] www.nobelprize.org/uploads

[2] www.lightingeurope.org/images/guidelines

[3] Nature Energy | Volume 10 | May 2025 | 616–629.

Compared to thermoplastics, silicones are inherently more stable under harsh operating conditions. This translates into a lower risk of performance degradation, reduced warranty exposure and improved long-term system reliability.

While silicones may involve higher upfront material costs, they often deliver lower total system costs by enabling a longer service life and more stable performance.

LED professional: Dow has been a long-standing player in this space. What sets your solutions apart from other material suppliers?

Martijn A. Beukema: Dow's strength lies not only in materials, but in how we apply them.

We combine deep material science expertise with application-level understanding, supported by technical studies, optical validation and real-world testing. Our global team brings together competencies in chemistry, physics and multiple engineering disciplines to solve complex system challenges.

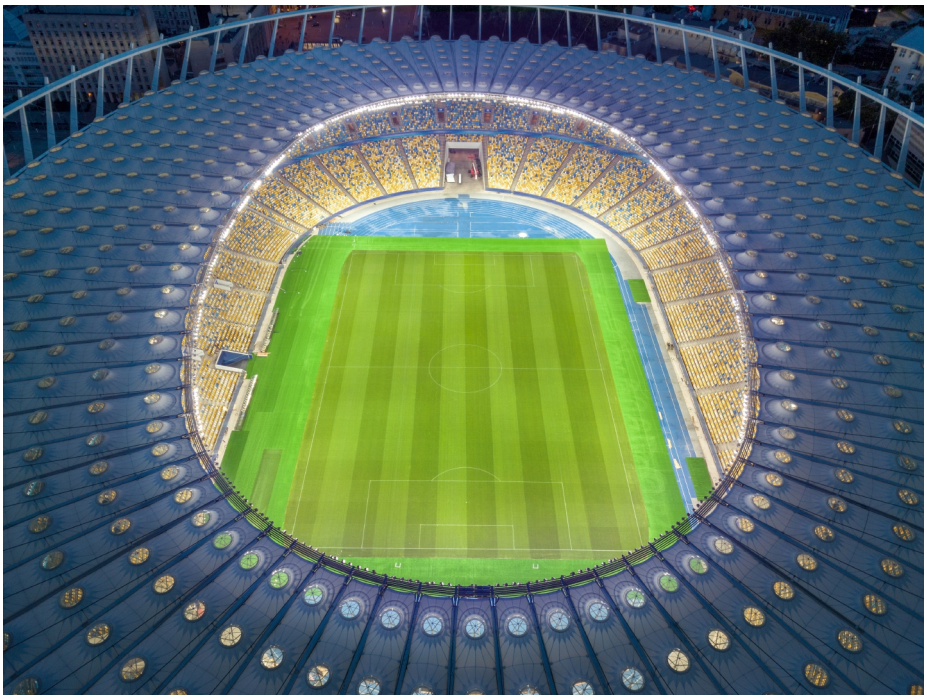
Importantly, we operate across the full secondary optics value chain—from optical design and molding to industrial processing. Our application laboratories cover every building block of the LED module, allowing us to evaluate materials in realistic system conditions.

This integrated approach enables us to co-create solutions with customers that are optimized not only at the material level, but at the system level.

LED professional: Dow recently published a study on blue light photothermal aging of LED optics[4]. What triggered this research, and what key gap were you aiming to address?

Martijn A. Beukema: There is a substantial body of research on photothermal aging of thermoplastics, but much of it is based on simplified test samples that do not fully represent real-world optical components, such as injection-molded lens clusters.

At the same time, while LED package reliability has been extensively studied, there has been less focus on the long-term behavior of secondary optics under realistic operating conditions.



Aerial drone view of a high-power pitch lighting system. Photo credit: Dow.

In discussions with customers, there was general awareness of the performance advantages of silicone optics, but a lack of comparative data against commercially available thermoplastic solutions. That gap motivated our study.

We leveraged our existing aging data on Dow's SILASTIC™ moldable optical silicones and expanded our investigation to assess how different thermoplastic lens clusters perform under more representative conditions. The goal was to better understand performance limits and identify scenarios where material choice can make a critical difference.

LED professional: The study points to degradation—and even catastrophic failure—of thermoplastic optics under real operating conditions. How relevant is this risk for today's high-power lighting applications?

Martijn A. Beukema: The relevance depends on operating conditions—particularly the photothermal load and the specific material formulation.

Our results confirmed that PMMA is generally more stable than other thermoplastics, which aligns with industry knowledge. However, it still requires careful thermal management to avoid deformation when operating limits are exceeded.

Performance can also vary depending on raw material sourcing, stabilizer formulations and processing conditions at the molder.

A key observation is that once stabilizing additives are depleted, degradation can accelerate rapidly. Under high irradiance conditions, this can lead to thermal runaway—resulting in severe discoloration, deformation or even material failure.

By contrast, silicones exhibit intrinsic stability under typical luminaire operating conditions, even beyond the thermal limits of many thermoplastics, which significantly reduces these risks.

LED professional: Based on your findings, how should luminaire manufacturers rethink material selection for long-term reliability?

Martijn A. Beukema: Manufacturers already manage known limitations—for example, by increasing the distance between LEDs and optics or adjusting drive currents.

However, our findings highlight the importance of evaluating material behavior over the full system lifetime, not just initial performance.

[4] https://www.dow.com/en-us/market/mkt-electronics/sub-elec-lighting/app-elec-light-optics.html

Thermoplastic optics rely on stabilizing additives, which degrade over time. Once depleted, material performance can deteriorate quickly under combined thermal and optical stress.

Silicones, in contrast, are inherently stable across UV, visible, and near-infrared wavelengths and do not rely on such additives. This makes them particularly well suited for high-intensity or UV-related applications.

Ultimately, selecting the right material is about balancing performance, reliability and system-level design—especially in demanding operating environments.

LED professional: **Beyond this study, can you highlight recent innovations from Dow that are relevant for lighting?**

Martijn A. Beukema: Dow continues to innovate across several key material areas for lighting.

Our portfolio includes moldable optical silicones for high-power LED lenses, optical potting solutions for linear lighting, thermal interface materials and pottants for heat management, as well as high-durability adhesives and sealants.

We are also advancing carbon nanotube-based thermal technologies to improve heat spreading in compact, high-power modules.

These developments address critical industry challenges—thermal management, optical stability, environmental resistance and long-term reliability. As always, we continue to co-develop new solutions with customers to meet evolving system requirements.

LED professional: **The industry is evolving fast—what key trends are shaping the next phase of lighting?**

Martijn A. Beukema: Several trends are shaping the future of lighting.

We see continued advancement in smart and connected systems, increasing adoption of solar and off-grid lighting, and growing interest in modular and additive manufacturing approaches such as 3D printing.

At the same time, luminaires are becoming more integrated with sensors, controls and building systems. There is also rising demand for tunable and adaptive lighting solutions.

Across all these trends, sustainability, system efficiency and long-term performance remain central—and materials play a key enabling role.

LED professional: **Smart and connected lighting continues to gain traction. How does this shift impact material requirements?**

Martijn A. Beukema: As systems become more integrated and complex, material requirements increase accordingly.

Materials must support higher performance, improved reliability, and compatibility with advanced electronics and sensing technologies. This further reinforces the importance of early-stage collaboration between material suppliers and system designers.

At Dow, we continue to work closely with customers to support these evolving requirements from the outset.

LED professional: **Looking ahead, what role will materials play in the next generation of lighting?**

Martijn A. Beukema: Even as LEDs approach their theoretical efficiency limits, materials remain a key lever for improving system performance.

Material selection directly impacts thermal management, optical efficiency, durability and overall system reliability. This is where meaningful gains can still be achieved.

Dow is committed to supporting customers across the value chain with high-performance silicone-based materials that enable more efficient, durable and sustainable lighting systems—particularly in demanding, high-power applications.

LED professional: **Thank you for providing these valuable insights into the future of lighting materials and system reliability.**

Martijn A. Beukema: My pleasure. ■

Martijn A. Beukema is a Technical Service & Development (TS&D) Scientist at Dow, based in Seneffe, Belgium, where he focuses on material solutions for LED lighting applications. In addition, he serves as Application Technology Leader for the lighting segment, supporting the development and implementation of material technologies across global applications.

He earned a Master's in Applied Physics from the University of Twente, Netherlands (1996), and has worked in research, development, and customer roles throughout Europe. With expertise in optical physics and engineering, his focus for the past 20 years has been LED light engines and luminaire design.

In his current role, Martijn works at the interface between material development and lighting system design, collaborating closely with both internal teams and customers. He supports applications ranging from secondary optics to the protection of electronic components and luminaire assembly, with a particular focus on silicone-based materials.

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Zayed International Airport, Abu Dhabi – The World's Largest DALI Installation

Delmatic

Zayed International Airport Terminal A in Abu Dhabi has become one of the most advanced airport developments ever completed. Spanning 742,000 sq.m and serving as a new global gateway to the UAE capital, the terminal incorporates the world's largest DALI lighting control installation. Delmatic delivered a fully integrated open-protocol lighting management system combining DALI, LON, BACnet, IP, and connected building technologies to control, monitor, and optimize approximately 215,000 luminaires across the entire facility.

Project Overview

The new Zayed International Airport Terminal A spans 742,000 sq.m, making it one of the largest airport terminals in the world and a spectacular gateway to Abu Dhabi.

At the heart of the project is the world's largest DALI lighting control installation. The Delmatic system delivers intelligent site-wide lighting management and monitoring while interfacing seamlessly with the Building Management System (BMS), Emergency UPS, Fire Alarm, and Audio Visual systems through BACnet/IP and VFC protocols.

The installation manages and monitors approximately 180,000 DALI luminaires, 35,000 DALI emergency luminaires, and more than 10,000 DALI sensors, switches, and scene-setting panels, coordinated through 3,400 single- and multi-universe DALI control modules.

Lighting scenes and illumination levels automatically adapt throughout the day according to occupancy, daylight availability, and operational requirements. An innovative application of DALI technology can be found throughout the immigration halls, where red and green LED indicators integrated within the turnstile system are automatically controlled via interfaces with the airport's immigration management platform.

The airport received an Estidama 3 Pearl Rating, making it the highest-rated airport terminal in the GCC and the largest individual building ever to achieve this certification. The project was also recognized internationally, winning first place in the Infrastructure category at the 2023 DALI Awards. Additionally, the terminal featured prominently in the blockbuster film *Mission: Impossible – Dead Reckoning*.

Open Protocol Solutions for One of the World's Largest Buildings

A Delmatic open-protocol LON, DALI, and BACnet lighting management system was deployed throughout Zayed International Airport Terminal A, one of the largest and most technologically advanced airport terminals ever constructed.

The system controls, monitors, and manages lighting across all public, operational, front-of-house, and back-of-house areas while seamlessly integrating with the central battery network to provide real-time monitoring of emergency lighting performance and battery status.

"The Midfield Terminal Building was a cutting-edge project in terms of the technologies and systems that were implemented for the first time."

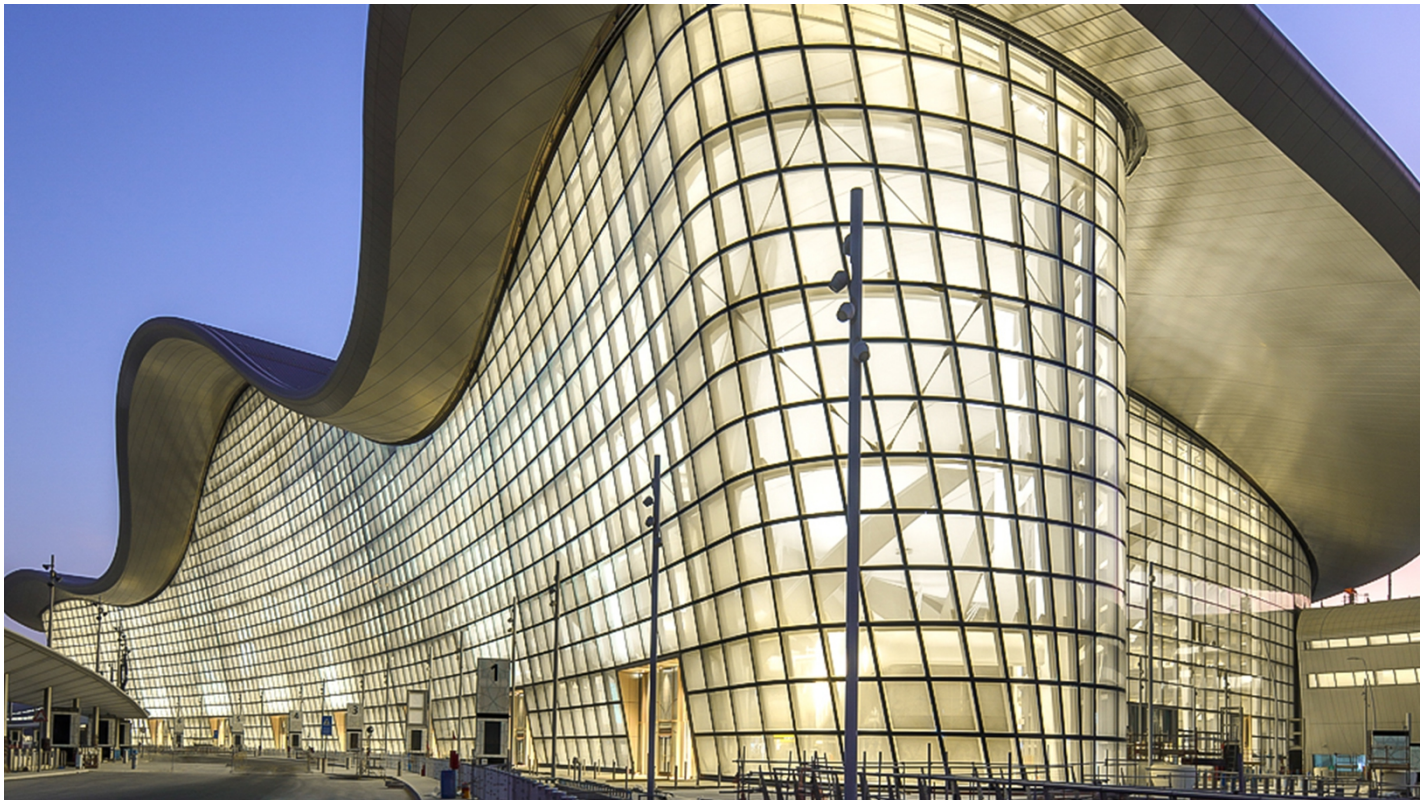
ALI MAJED AL MANSOORI, CHAIRMAN OF ABU DHABI AIRPORTS COMPANY

The World's Largest DALI Installation

The lighting management system became the largest DALI installation in the world, combining DALI Buswire, Broadcast, and Plug-in technologies with a comprehensive range of DALI sensors and local control devices.

The system optimizes energy performance through daylight harvesting and occupancy-based control strategies. Lighting scenes were automatically activated according to

delmatic.com



Delmatic's largest DALI control system in the world manages 235,000 normal and emergency luminaires throughout the 742,000 sq. terminal. The system seamlessly shares data with the building management, emergency power, fire safety, HVAC, AV and operational systems to maximize sustainability.

schedules, solar events, occupancy detection, and daylight availability. The complete installation was managed and monitored through a site-wide IP network using advanced graphical software. Integration with other airport systems further enhanced operational efficiency and sustainability performance.

As one of the most ambitious lighting control projects ever delivered, the installation demonstrated how DALI technology can scale far beyond conventional building applications. The project validated the capability of open protocols to support complex, mission-critical infrastructure while maintaining flexibility, reliability, and long-term interoperability.

Connected Systems

Delmatic's connected systems architecture enabled advanced energy optimization by sharing occupancy and environmental data with other building services.

By creating a real-time digital representation of building occupancy and daylight conditions, the system allowed lighting, HVAC, and other energy-consuming services to respond dynamically to actual usage patterns. This integrated approach improved operational efficiency, reduced energy consumption, and enhanced occupant comfort throughout the terminal.

Almost every modern building utilizes occupancy sensors for lighting control. Delmatic extended the value of these sensors by sharing occupancy information with connected building systems, ensuring that heating, cooling, and other services operated only where and when required.

This approach transformed lighting controls into a valuable source of operational intelligence, helping to create a more responsive and efficient building environment.

Emergency Lighting and Central Battery Monitoring

Delmatic systems seamlessly integrated with central battery networks distributed throughout the airport to monitor battery performance and operational status. Real-time battery data are combined with the monitored status of every emergency luminaire and driver to create a comprehensive emergency lighting management platform.

With approximately 180,000 luminaires installed across the airport, including around 35,000 emergency luminaires connected to the central battery system, Delmatic provided continuous monitoring of lighting performance and operational status throughout the facility. Detailed information was accessible through Delmatic's graphical software platform, while key performance indicators were displayed on centralized monitoring screens.

The system also supported mixed emergency lighting environments, allowing central battery systems and self-contained emergency luminaires to be tested, monitored, and managed through a single unified platform.

Continuous monitoring allowed facility managers to identify faults instantly, optimize maintenance activities, and support compliance with safety requirements across the entire airport complex.

Minimizing Environmental Impact

The terminal was designed to minimize its environmental impact. Significant reductions in energy consumption were achieved through a climate-responsive façade, intelligent building systems, and advanced energy monitoring technologies that continuously analyzed performance and identified optimization opportunities.

The project team worked closely with Masdar, whose zero-carbon city and Masdar Institute–also equipped with Delmatic DALI systems–are located adjacent to the airport.

By combining advanced architectural design with intelligent lighting controls, the project established a benchmark for sustainable airport development in the Middle East.

Summary

Zayed International Airport Terminal A demonstrates the scalability and versatility of DALI technology at the highest level. As the world's largest DALI installation, the project integrates approximately 180,000 luminaires, 35,000 emergency luminaires, 10,000 control devices, and 3,400 DALI control modules into a single intelligent lighting management platform.

Beyond lighting control, the system seamlessly connects with building management, emergency power, fire safety, HVAC, AV, and operational systems, showcasing how DALI can serve as the foundation for fully integrated smart infrastructure. The project stands as a benchmark for large-scale transportation hubs worldwide and highlights the role of open standards in delivering operational efficiency, sustainability, flexibility, and long-term future readiness. ■

Delmatic is a leading international supplier of smart, integrated lighting management networks, designing and deploying cutting-edge systems for iconic projects around the world.

Its wired, wireless, and hybrid solutions leverage the latest IoT open protocols–including DALI-2, MQTT, BACnet, IP, and BLE–to deliver advanced management, monitoring, and data-sharing capabilities across physical and cloud-based networks. Innovative sensors, state-of-the-art controllers, and powerful user interfaces continuously monitor and optimize lighting and connected building services.

Data collected from extensive sensor networks enables real-time adaptation to environmental and occupancy changes, automatically adjusting lighting levels, color temperature, and building services. These intelligent systems improve sustainability, reduce operational costs, increase energy efficiency, and enhance occupant comfort and well-being.

The system optimizes energy efficiency through sophisticated daylight-harvesting strategies which adjust lighting levels across the day according to real-time daylight availability and occupancy.

PROJECT INFORMATION
Location: Abu Dhabi
Size: 742,000 sq.m
Architect: KPF
Consultant: Arup
Contractor: Anel

DELMATIC'S SCOPE OF WORKS
Design & Development, DALI, LON, BACnet, IP, Emergency Monitoring and Testing, UPS Integration, BMS Integration, HVAC Integration, AV Integration, Load Shedding Integration, Fire Alarm Integration, Security System Integration, Scene Setting, Project Management, Connected Systems, Lifetime Support.

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Lighting scenes automatically adapt throughout the day according to occupancy, daylight availability, and operational requirements: daytime scenes maximize energy efficiency.

Dusk, evening and night scenes create aesthetic lighting effects to enhance passenger experience and orientation.

Smart sensors relate lighting levels to occupancy and share occupancy information with connected building systems, ensuring that heating, cooling, and other services operate only where and when required.

"Delmatic was founded by my parents in 1959 when we pioneered the concept of electronic control of lighting. Today, sixty-five years later and a second-generation family company, we have remained staunchly independent and are proud of our position at the technical forefront of the international lighting management industry.

What to other companies is just a job providing income for some distant parent or investment company is, to me and my team at Delmatic, an integral part of our lives, and we receive many favorable comments not only on the operation and longevity of our systems, but also on the performance and commitment of our team – many of whom have been with and grown with us for many years.

We gain immense satisfaction from knowing that within so many of the largest, landmark buildings around the world, our hardware, our software, our designs and our innovations are quietly saving energy, enhancing flexibility and efficiency, and ensuring comfort and convenience.

We enjoy our ongoing relationships with consultants, contractors and clients, as well as sharing our knowledge and expertise with companies and individuals who are looking for the best in lighting management."

–Stephen Woodnutt, CEO Delmatic

All images courtesy of Delmatic.

23,500 Seats, One Intelligent DALI-2 Platform – How DALI-2 Became the Foundation for Proactive Lighting Control Across Co-op Live, the UK's Largest Indoor Arena

Simmtronic

When Co-op Live opened in Manchester, it became the UK's largest indoor arena, with a capacity of 23,500. It was designed from the outset to host some of the most demanding live entertainment productions in the country: major international touring acts, sporting events, corporate functions and hospitality services within a single, highly immersive environment.

For the lighting control infrastructure, the scale of the venue was only part of the challenge. The installed system comprises nearly 9000 luminaires, over 800 DALI-2 control lines and over 1500 input devices distributed across 33 IP Area Controllers. But the raw figures don't capture the operational complexity. A building of this type does not operate as a single space. It operates as dozens of them. Public concourses, artist corridors, hospitality suites, production zones, offices and back-of-house service areas each carry different operational requirements, different user expectations and different lighting behaviors. Some prioritize atmosphere and dynamic color. Others depend entirely on reliability and quiet automation. The control platform had to serve all of them through a single, coherent system.

www.simmtronic.com
office@simmtronic.com

This article describes how a DALI-2 control infrastructure delivered by Simmtronic supports day-to-day operation of the venue. It focuses on four operational themes: the Simmtronic Live Status Viewer as the true window into the system, supporting proactive maintenance and rapid configuration; automated emergency testing through integration with the venue's central battery infrastructure; BACnet integration that allows the venue's AV production environment to drive lighting during live events; and the dynamic color control infrastructure that supports artist corridors and other immersive spaces.

Why DALI for a Venue of This Complexity

DALI (Digital Addressable Lighting Interface) has, over the past two decades, become the most widely adopted protocol for commercial and architectural lighting control. Its strengths are well documented: each luminaire and control device on a DALI bus carries an individual address, and the protocol is supported across virtually every major lighting manufacturer.

The evolution of the standard into DALI-2 (IEC 62386) introduced several refinements that matter to a project of this complexity. The most significant is the independent certification program: devices carrying the DALI-2 mark must pass testing by an accredited body, providing a meaningful guarantee of cross-manufacturer interoperability.

At Co-op Live, the installed Lighting Control Modules are Simmtronic's DALI-2 compliant riser mounted Hardwired Hubs. Each has been independently tested and certified against the rigorous DALI-2 standard, which gives the project the assurance of full protocol compliance and reliable interoperability across the wider DALI ecosystem connected to it. The Simmtronic platform then supports these LCMs and the connected DALI devices throughout their operational life.

The versatility of the platform is one of its defining qualities. The same Simmtronic infrastructure that supports Co-op Live also operates across commercial offices like 22 Bishopsgate and The Scalpel, and across education environments like the University of Northampton. The system is not tied to a single building type. It is designed to be adaptable, scalable and suited to the operational reality of whatever environment it serves.

What matters most to a venue like Co-op Live is not the protocol version in isolation. It is what the protocol enables when combined with intelligent head-end software, well-designed input devices and a coherent commissioning approach: every luminaire individually addressable, every group and scene reconfigurable in software, feedback is reported through the same bus, and every change traceable through a single operational interface.

The Street, public concourse. Image credit: Simmtronic / Jon Parker Lee Photography.

A Single-master Architecture

Across Co-op Live, day-to-day control of the luminaires originates from 33 IP Area Controllers distributed throughout the building. Each controller manages the lighting fed from its local distribution boards, communicating directly with the connected Lighting Control Modules, sensors and DALI infrastructure within its area. The intelligence is distributed: real-time control does not depend on a single central processor, and there is no single point of failure. If any one part of the network is interrupted, the rest of the system continues to function autonomously.

The Simmtronic SPC.3020 head-end sits above this distributed control layer as the operational window into the system. It is where the BACnet integration with the production AV environment is configured, where the SPN.200 automated emergency testing is managed, and where the Live Status Viewer brings operational and maintenance visibility together in a single interface.

The architecture has direct operational consequences. The facilities team manages one system, one interface and one point of oversight. External systems do not control lighting independently; they communicate with the Simmtronic platform through open protocols, including BACnet, DALI and volt-free contact inputs, and the Simmtronic platform interprets and executes the appropriate action. The behavior of every luminaire across the venue, regardless of area or function, remains consistent, auditable and manageable from a single platform.

Where multiple subsystems control lighting independently, even in well-engineered installations, the operational and maintenance burden quickly multiplies. Conflicts arise between automation rules, error diagnosis crosses system boundaries, and configuration changes ripple unpredictably. The single-master model avoids these issues by ensuring that all control authority sits in one place, while still allowing other systems to interact with lighting through well-defined integration interfaces. The lighting control infrastructure becomes a service that other systems use, rather than a peer they must coordinate with.

Proactive Maintenance Through the Live Status Viewer

In a venue running a considerable number of events per year across multiple spaces and seating configurations, maintenance has to be proactive. Comprehensive, real-time monitoring is the hallmark of a professionally instrumented installation: its value lies in giving the facilities team continuous confidence in the system and the ability to act early, so that routine maintenance is anticipated and handled quietly, before it is ever visible to anyone in the venue. Anything needing attention is identified by the system itself rather than waiting on an occupant to report it and is located precisely and presented to the maintenance team in a form that supports rapid resolution.

This is the role of the Simmtronic Live Status Viewer: an event-driven graphical interface that provides real-time visibility of every Simmtronic device and every DALI luminaire across the installation. The status of every device is surfaced in the Viewer as it changes, rather than requiring the engineer to poll the equipment.

The Viewer's central feature is automatic root cause analysis, which directs the engineer straight to the one item that needs attention rather than a long list to work through. Where a single underlying cause produces several knock-on symptoms (for instance, a bus communication issue affecting downstream devices) the system identifies the root cause and sets the secondary symptoms aside, so resolution is faster and more certain. Each item is accompanied by detailed guidance and a recommended remedial action.

For the facilities team at Co-op Live, this translates into several day-to-day capabilities:

- **System status is visible at a glance.** The Status Viewer presents the live status of the whole venue, color-coded against the floor plans, with a key explaining every symbol. Anything requiring attention can be filtered by area or floor.
- **DALI bus topology is visible.** The Viewer displays the physical connections between devices across the DALI buses, which helps maintenance teams locate cable breaks, loose connections and similar physical markers that would otherwise require significant time to diagnose.
- **Inventory is comprehensive.** The Viewer extracts and displays full inventory and configuration information from every DALI device on the system: manufacturer, model, serial number, firmware version and lamp run-hours, supporting both warranty management and proactive lamp replacement.
- **History is replayable.** The Head-End logs every event for every device, including presence detection, light output levels and photocell readings. The Viewer can recall and display full system status for any historical point since installation. This is useful for tracing causes of unexpected behavior or analysing occupancy patterns over time.

For Maintenance Engineers, the Live Status Viewer also functions as a configuration tool. Where an operations team member needs to adjust a scene level, perhaps to refine the look of a hospitality area or rebalance a concourse for a particular event configuration, they can do so through a

simple graphical interface, selecting one or more luminaires and entering the required light level. Live levels can be set up, adjusted and captured as scenes for future recall.

Access to these tools is controlled through the SPECS Authentication, Authorisation and Accounting System. Engineers with appropriate training have access to the broader SPECS Manager environment, where complex configuration changes can be made. Day-to-day maintenance staff use a simpler subset of tools that supports the most common adjustments (preset scene levels, presence timeouts and similar settings) without exposing more sensitive configuration parameters.

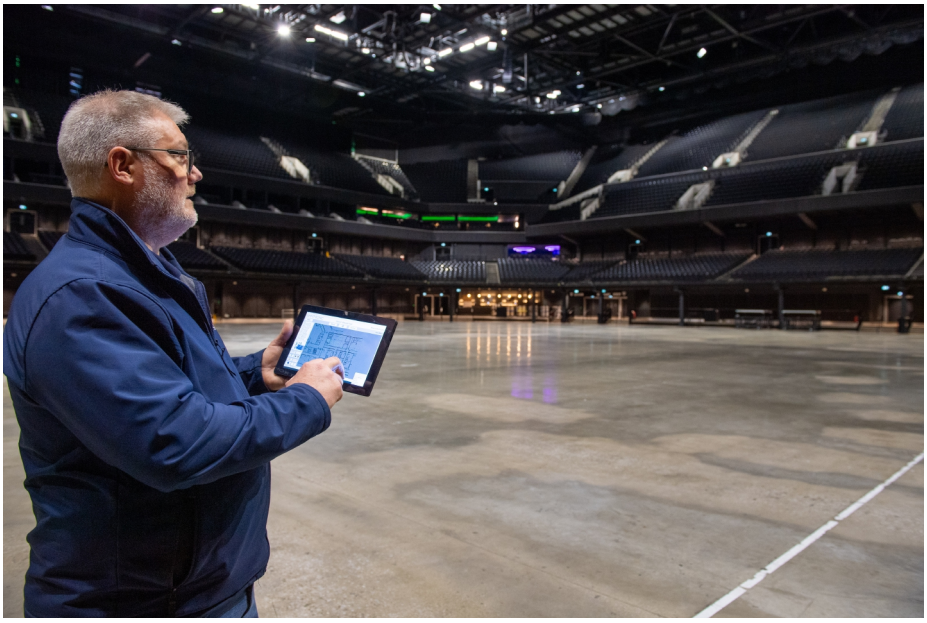
The combination of system health monitoring, inventory management, history replay and easy adjustment in a single graphical interface means the venue's facilities team can perform the majority of operational tasks themselves, without external support. It is what makes the infrastructure operationally self-sufficient over the venue's long lifecycle.

Automated Emergency Testing Through the SPN.200 System

Emergency lighting in a large public venue presents a difficult balance. Statutory testing under BS 5266 requires that every emergency luminaire be tested for both function and duration. In a venue like Co-op Live, where the building may be in use for events on any given day, those tests cannot disrupt occupants. More importantly, they must never compromise the safety of any area.

At Co-op Live, the emergency lighting is delivered through four Central Battery Units (CBUs) powering DALI-ballasted emergency luminaires. The Simmtronic SPN.200 Automatic Testing System integrates directly with the CBUs to manage testing, monitor system health and record the statutory testing regime.

The architecture is fundamentally fail-safe. In normal operation, each emergency luminaire is powered from the CBU and controlled by DALI commands from the lighting system. In the event of a power outage, the DALI line loses power and the DALI-compliant ballast automatically lights at its pre-configured emergency level, using mechanisms built into the DALI standard specifically for this purpose. No communication to the luminaire is required for emergency operation. This makes the emergency response inherently reliable: if anything in the lighting control chain is interrupted, whether an LCM, a DALI bus or the head-end itself, the emergency lighting still activates.



The Event Bowl with Simmtronic Live Viewer. Image credit: Simmtronic / Jon Parker Lee Photography.

Because the DALI buses are powered from the local lighting circuit, there is no requirement for change-over relays at each emergency luminaire. The luminaires are fed from the CBU and the DALI ballast handles the transition to emergency operation autonomously. This single design decision delivered significant on-site savings in both equipment cost and installation labor. It also simplifies long-term maintenance: there are no individual change-over relays at each luminaire to fail or replace.

The SPN.200 system manages testing in three layers:

- **Continuous monitoring.** The ATS interrogates every DALI ballast continually. Ballast, wiring or lamp feedback is reported as soon as they are detected, rather than waiting for the next scheduled test. The CBU's own status indicators (system in operation, supply from battery, and battery charge state where available) are surfaced through the Live Status Viewer.
- **Monthly function tests.** The ATS commands the CBU to simulate a supply failure for a short period, sufficient to verify that every emergency luminaire lights correctly from battery power. Each ballast is individually interrogated to confirm it is responding and correctly lit. Function tests run automatically out of hours, with no walk-test requirement.
- **Annual duration tests.** A full three-hour discharge test on each CBU verifies that the battery can sustain the rated load for its declared duration. The ATS will only initiate a duration test once it has confirmed that the CBU is fully recharged and that an adequate proportion of luminaires are responding correctly.

The testing sequence is carefully ordered to protect building safety throughout. Before commanding a CBU to switch to battery supply, the ATS first verifies that every DALI ballast in the connected emergency luminaires is responding and correctly configured. If an inadequate proportion of luminaires are operational, the test is aborted before any battery discharge takes place, preventing unnecessary depletion of the batteries. Only when the system is confident the test will be valid does it command the CBU to switch to battery operation, verify each luminaire continues to light from the battery, and return everything to normal supply once the test is complete.

The practical consequences for Co-op Live are substantial:

- **Coverage is 100%.** Every emergency luminaire is tested, not just a sampled subset, and every test result is centrally logged.
- **Record keeping is automatic.** Test history for every luminaire and every CBU is recorded and available for inspection at any time. Test report summaries can be generated and printed on demand.
- **Diagnostics are intelligent.** The system distinguishes between ballast fail-

ures, lamp failures, battery and inverter queries, and presents a clear remedial action for each.
- **Locations are shown graphically.** Any item requiring attention is displayed with maintenance instructions that can be printed.
- **Pre-emptive detection.** Many defects are caught between formal tests through continuous ballast monitoring, rather than only being discovered at the next scheduled test.

The SPN.200 approach is highly integrated within the wider SPECS platform. Emergency lighting status appears in the same Live Status Viewer used for general feedback management, so an issue on an emergency luminaire is presented to the operator through the same interface as any other fault in the building.

For a venue with the public-facing safety profile of Co-op Live, the operational reassurance this provides is significant. The system delivers complete, automated, statutorily compliant testing without ever putting an area of the building at risk during a test cycle.

BACnet Integration with the Production AV Environment

Modern entertainment venues operate with deep integration between their AV, lighting, building management and production systems. At Co-op Live, this integration was particularly important during live events, where the production team required the ability to manage lighting scenes and color environments directly from the production AV environment, without requiring an operator to be present at a Lighting Control interface during a show.

The integration is delivered through Simmtronic's BACnet interface, configured from the SPC.3020 head-end and forming part of the SPN.400 Data Exchange Suite. The BACnet interface exposes lighting system data and control points to other building and IT systems through a well-defined open standard, allowing external platforms to send control commands and to retrieve status information from the lighting infrastructure.

Architecturally, the integration follows the single-master principle. The production AV environment does not assume direct control of the lighting infrastructure. Instead, the AV system sends BACnet instructions to the Simmtronic head-end: change to this scene, set this group to this color, recall this preset. The Simmtronic platform interprets those instructions and executes the appropriate action on the lighting infrastructure. To the production engineer, the experience is seamless: scene changes happen on cue from the AV environment. But the lighting infrastructure remains under unified Simmtronic control throughout, with all activity logged through the Viewer and visible to the facilities team.

Control Room with Simmtronic Equipment. Image credit: Simmtronic / Jon Parker Lee Photography.

This approach has several advantages over a more direct or distributed control model:

- **All lighting activity is logged centrally.** Every scene change triggered by the production environment is recorded by the Simmtronic head-end and appears in the historical event log.
- **The lighting infrastructure cannot be inadvertently misconfigured.** The AV environment can only trigger predefined behaviors (scenes, presets, levels) that have been configured within the Simmtronic system. Lower-level configuration parameters remain protected behind the lighting management interface.
- **Integration is robust to change.** As production workflows evolve, new BACnet objects can be added to the integration without changes to the AV system architecture.
- **Responsiveness is configurable.** Where low latency is important, the BACnet Initiator mechanism pushes events to the external system as they occur, rather than relying on the external system to poll. This is particularly useful for presence indications and other event-driven data.

At Co-op Live, the BACnet integration is the route by which the production AV environment communicates with the lighting infrastructure during live events. The same interface provides a defined path for other building systems to interact with the lighting platform, whether to send control commands or to retrieve status data such as presence indications, or luminaire health for use elsewhere in the wider building technology stack. The lighting infrastructure becomes a data source for the wider building intelligence layer, providing some of the most operationally useful real-time data available in any modern commercial venue: presence at every detector, light level at every photocell, and luminaire status across the estate.

Dynamic Color Control Through DMX and the Live Status Viewer

A meaningful proportion of the lighting at Co-op Live is color-changing: artist corridors with immersive RGB environments, accent areas that shift color according to event branding, and dynamic surfaces that respond to production cues. The control infrastructure for these spaces is built around DALI-driven DMX conversion, with Simmtronic SPO DALI-to-DMX interfaces plugged directly into our DALI2 Lighting Control Modules and feeding the color-changing fittings downstream.

The SPO interface is designed specifically for this use. It draws its power from the LCM and converts the DALI signal from the LCM into a DMX output. The interface supports a 50-color pre-programmed RGB

palette selectable directly from SPECS3 scenes, as well as DALI short-address to DMX-channel mapping for finer control where required.

This approach gives the venue the benefits of DMX's high-speed, high-resolution color control where it is required, while keeping color-changing lighting fully integrated within the Simmtronic DALI infrastructure. The DMX interfaces then sits downstream of the Simmtronic platform. They are not independent control systems, but extensions of the main platform's reach into color-changing territory. Scenes, presets and dynamic effects across these areas are configured, stored and recalled in the same way as conventional dimming scenes elsewhere in the venue. For the operations team, the practical interface for color control is the same Live Status Viewer used for system management and scene adjustment. The configuration tool for multi-colored luminaires provides two complementary methods for setting color:

- **The Color Wheel.** Operators select one or more luminaires, then choose a base color from a graphical color wheel and adjust brightness with a slider. This is the natural method for establishing the look of a space quickly. Operators move through color space visually rather than working with numerical values.
- **RGBW values.** Where precision matters, perhaps matching a brand color or replicating a lighting state from a previous event, operators can enter exact RGB or RGBW values, with full numerical control over each channel.

The configuration tool also provides copy-and-paste functions across multiple luminaires, which is essential when setting up complex lighting patterns across long corridors or large dynamic surfaces. A configuration applied to one luminaire can be copied to a group of others at the click of a button, ensuring consistent behavior without the risk of manual entry errors.

For Co-op Live, the outcome is a color control environment that supports rapid amendment during event set-up, freeing the team to focus on the more time-consuming areas of venue preparation, alongside the precision required for considered scene design. The same Engineer working on proactive maintenance in the venue's back-of-house spaces can, through the same interface, step into the artist corridors, adjust the color of an immersive lighting installation, capture the result as a scene, and recall it for future events.

What Co-op Live Demonstrates for DALI-2

Co-op Live is a venue of considerable operational complexity: multiple usage modes, diverse spaces, demanding production workflows and a significant public safety profile. Delivering a lighting control infrastructure that supports all of this through a single coherent platform required more than a robust hardware installation. It required a head-end software environment capable of turning the data flowing through the DALI buses into usable operational intelligence, and integration tools that could connect the lighting infrastructure cleanly to the wider building and production technology stack.

The Simmtronic platform at the venue provides this through a tightly integrated combination of capabilities: DALI-2 compliant LCMs as the addressable foundation; the SPN.200 automatic testing system for compliant emergency monitoring that never puts any area at risk; the SPC.3020 head-end and SPN.400 data exchange suite for clean BACnet integration with the AV production environment; the SPO DALI-to-DMX interface for dynamic color control where it is needed; and the Live Status Viewer as the operational and maintenance window across all of it.

For specifiers and operators considering DALI-2 for a complex venue, the lesson is that the value of the protocol is realised in what the head-end software does with the data it carries. DALI-2 provides the foundation. What the on-site engineer experiences day to day, including proactive maintenance, automated testing, integrated control and intuitive color management, depends on the software environment built around it.

That distinction matters increasingly as commercial and entertainment buildings become more data-driven, more integrated with adjacent systems, and more accountable for their operational performance. Lighting control infrastructure is no longer an isolated electrical service. It is one of the most valuable real-time data sources in any modern building, and at Co-op Live it is delivering on that potential. For the venue itself, the practical outcome is a lighting platform it can trust and run with confidence: predictable in daily operation, self-sufficient for its facilities team, and engineered so that the rare event needing attention is handled quietly and early, well before it could ever reach an audience. ■

About Simmtronic

Simmtronic is an Made in Britain UK-based designer and manufacturer of intelligent lighting control systems, established in 1990 and based in Hoddesdon, Hertfordshire, with regional offices in Manchester, London and Leeds. Simmtronic employ over 120 staff, around 30% of whom are commissioning engineers, and a significant proportion of the technical team carry thirty years or more of lighting controls experience.

What distinguishes Simmtronic's delivery model is that every stage of a project, from quoting and design through drawing production, hardware manufacture, software development, commissioning and aftercare, is carried out by Simmtronic staff at Simmtronic facilities. Nothing is outsourced to third parties. For a project of the complexity of Co-op Live, this end-to-end control matters: design decisions, manufacturing tolerances, commissioning approach and ongoing support all sit within the same organisation, removing the coordination overhead, and the risk, of multi-vendor delivery.

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DALI-2 Multi-Master Structure: Foundation for Flexible Room and Building Control

Lunatone

Every DALI installation is ultimately measured by its functionality: daylight-dependent control, presence detection, scenes and light-moods, easy retrofitting and connection to building-wide services. How these functions are implemented is a question of planning and therefore of the chosen control structure. There are two basic options, a single central controller (Single-Master), or several equal-ranking devices on the same DALI line (Multi-Master). This article shows which functions are typically required, why the multi-master approach is well suited to demanding installations, how it can be realized and which Lunatone devices offer these functions.

From Function to System – Typical Requirements

Determining the required functions is the start of any planning process: what is the room used for? Defining these target functions first, keeps the later device selection focused and prevents an installation from being over- or under- equipped. Some common requirements are the following, each one drawing on several components working together:

- Daylight optimization: a sensor measures brightness and presence, a blind module moves to a glare-free position, and luminaires compensate for the missing share of light.
- A Presentation mode: a control device calls up a scene: the light is dimmed, the blinds close, and if required an audio signal or a defined radio source starts.
- Retrofitting: Existing push-buttons are integrated via pushbutton modules, additional controls are added wirelessly, and non-DALI loads are controlled via relay modules.
- Building-wide services: Local rooms retain their functions, while IoT gateways add monitoring, APIs, dashboards, energy data and service tools.

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office@lunatone.com

DAYLIGHT OPTIMIZATION

excessive brightness → blind moves to block direct sunlight, lighting is adjusted

WORKPLACE CONTROL

Presence detected → optimal light intensity, blind position and energy efficiency

PRESENTATION MODE

scene activated via DALI Rotary → blinds close, light is dimmed

Typical application scenarios.

Single-Master versus Multi-Master

To realize the previously mentioned requirements there are two strategies: “Single-Master” or “Multi-Master”. The decision which suits the project should be made at the beginning of the planning.

In the typical Single-Master approach, a central controller evaluates all inputs and sends commands to luminaires, relays, blinds and other actuators. Push-buttons and sensors operate in instance mode, reporting events and measured values to this single controller, which makes all the decisions. The structure is clear, but it creates a pronounced dependency on a single device or a single control level.

In the Multi-Master approach, several devices work together on the same DALI line. Sensors and control devices act as application controllers: they send DALI commands to groups and individual addresses or recall scenes. A gateway or controller can additionally monitor the line, collect data and coordinate building-wide strategies. The ability to control one line from several points has been part of IEC 62386 since DALI-2 and is therefore usable across manufacturers.

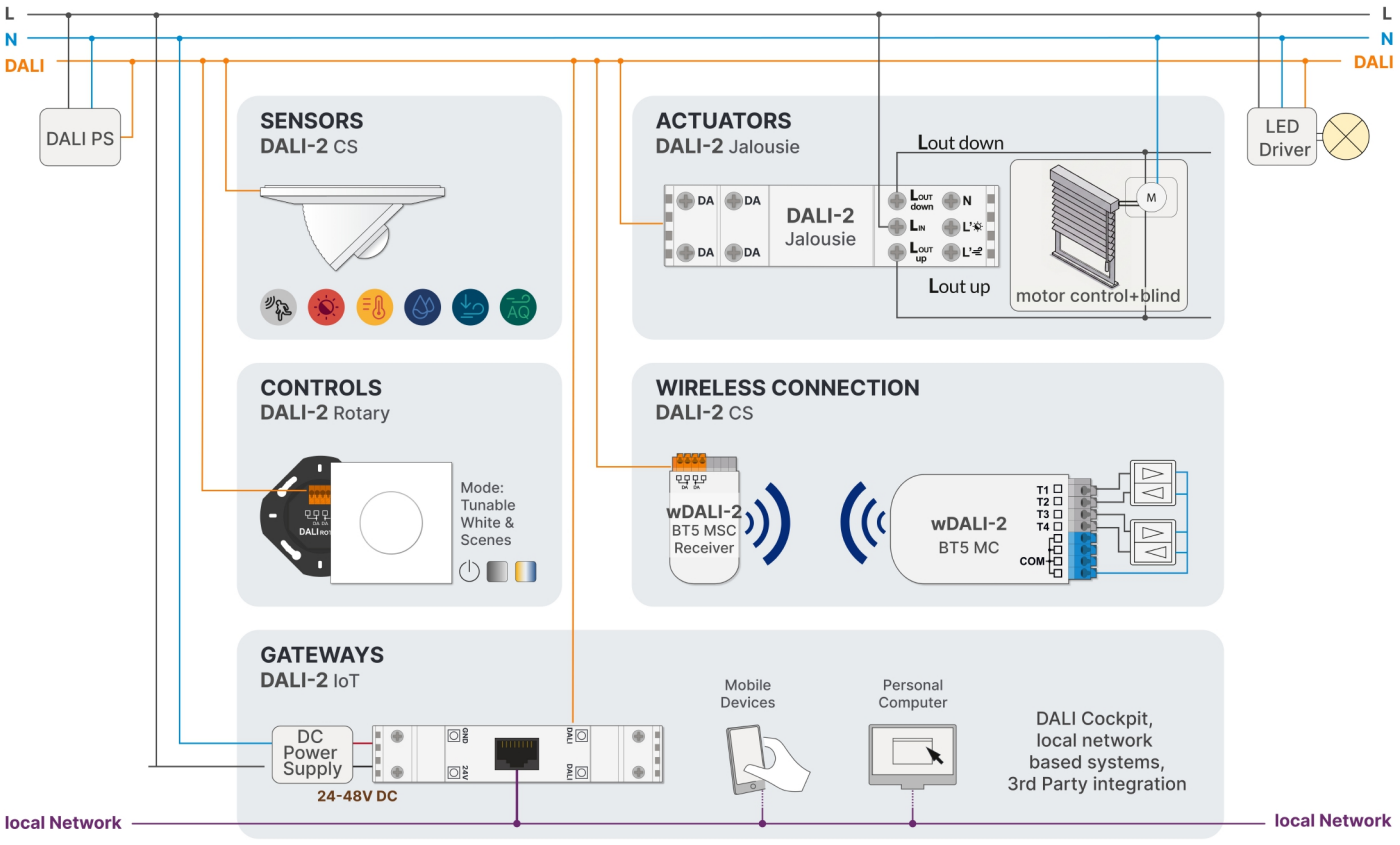
The practical benefit of the Multi-Master approach lies in resilience and expandability: Key functions can be spread deliberately across devices – a local sensor keeps presence-based control running even when an IoT gateway is temporarily offline. At the same time, later extensions such as an additional control point, sensor or actuator can be added with less effort, because the control logic is not concentrated at a single point. Therefore, the Multi-Master approach is not only the obvious choice for smaller installations where a single control unit is unnecessary but can also be of advantage for bigger systems.

Many Lunatone devices can be switched between the two strategies– application controller and instance mode – and thus adapt to the chosen structure. For installations with a central third-party controller, Lunatone additionally offers dedicated integration variants (-INT), which issue no commands of their own, only deliver events and measured values to the PLC, building management system or third-party platform. The desired strategy is therefore less a product choice than a deliberate structural decision at the start of the project.

Multi-Master in a Meeting Room

A meeting room illustrates the principle very clearly: The motion and light sensor as the Lunatone DALI-2 CS detects presence and measures brightness. In application-controller mode, it controls the lighting group directly and holds the target illuminance by constant-light control as the daylight changes. A display, a rotary control or a push-button coupler handles manual operation, the blind module moves the shading, relay modules switch additional loads, and LED drivers execute the lighting commands.

In this structure, the local functions do not have to wait for input of a central controller. Manual commands, sensor events and actuator functions interact on the DALI line. A gateway or a building-management controller can additionally monitor the line and coordinate building-wide strategies, while the room itself remains operational according to its local configuration.



Wiring of a DALI-2 line – functional building blocks.

DALI Devices – Functional Building Blocks

Following a modular principle, Lunatone DALI devices enable function to be added block by block, from sensor to control element to actuator and gateway. The components below fulfill the functional basis of the previously described room requirements.

Sensing: DALI-2 CS and DALI-2 CS THP-AQ

The DALI-2 CS combines motion detection, light measurement and local room logic, and can switch, dim, call up scenes or perform constant-light control depending on presence and brightness. The THP-AQ variants add temperature, relative humidity, air pressure and air quality, making the sensor a bridge between lighting automation and room-comfort data. IEC 62386 Part 306 plays a key role: this part standardizes general sensor information and measured values for DALI input devices, so that room data becomes usable across manufacturers.[1]

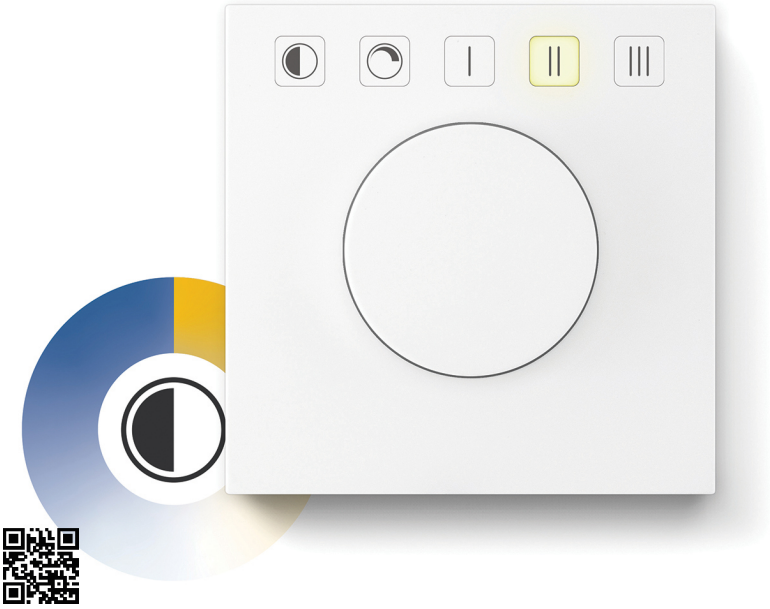
Control: DALI-2 ROT, Push-Button Couplers DALI-2 MCs and the 7-inch DALI-2 Display

DALI-2 ROT offers familiar rotary and push operation for switching, dimming, scenes and color functions, while push-button couplers such as DALI-2 MC and MC Mini integrate existing switch ranges – particularly important in retrofitting. The 7-inch DALI-2 Display extends this control concept with a configurable touch surface for more complex rooms: widgets for switching, dimming, scene recall, RGB color control and color temperature can be adapted to fit the room function, instead of being tied to a rigid switch layout.[2,3]

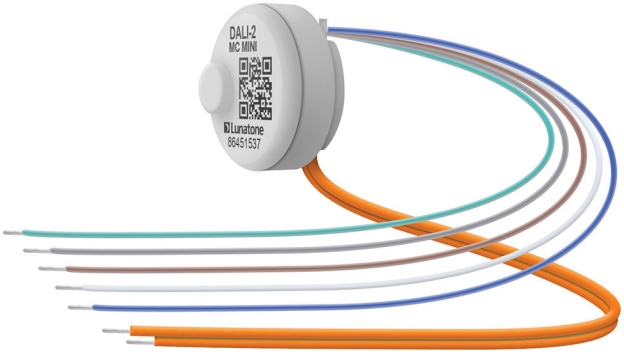
Actuators: DALI-2 Jalousie, DALI-2 RM and DALI-2 Audio

The DALI-2 Jalousie blind module connects a 230 V blind motor to the DALI line and makes positions and shading scenes part of the same room logic as the lighting, crucial for daylight use, glare protection and presentation scenes. Relay modules such as DALI-2 RM8 or RM16 integrate non-DALI loads, and the DALI-2 Audio Interface brings internet radio, audio files or announcements into room scenes (for example in hotels, wellness areas or reception zones).[4]

Lunatone DALI-2 CS Mini GW Art.Nr.: 86457244-GW-_.



Lunatone DALI-2 ROT Touch Art.Nr.: 86459338-5T-L3.



Lunatone DALI-2 MC Mini Art.Nr.: 86451537.

[1] https://lunatone.com/wp-content/uploads/2020/10/86457244-und-86457244-IP65_DALI_CS_Mini_EN_D0091.pdf

[2] https://lunatone.com/wp-content/uploads/2021/08/86459338-3T_86459338-5T_DALI2_ROT_TOUCH_EN_D0100.pdf

[3] https://lunatone.com/wp-content/uploads/2026/01/86451537-DALI-2_MC-Mini_EN_D0143.pdf

[4] https://lunatone.com/wp-content/uploads/2026/01/DALI-2_Jalousie_EN_D0145.pdf

Wireless connection: wDALI-2

When no DALI wiring is available or control points should remain flexible, the wDALI-2 wireless connection can extend the DALI system. Wireless bridges or remote controls can integrate in the DALI line without additional cables. This is especially valuable in retrofitting, when scene buttons or further control points are added at a later stage.[5]

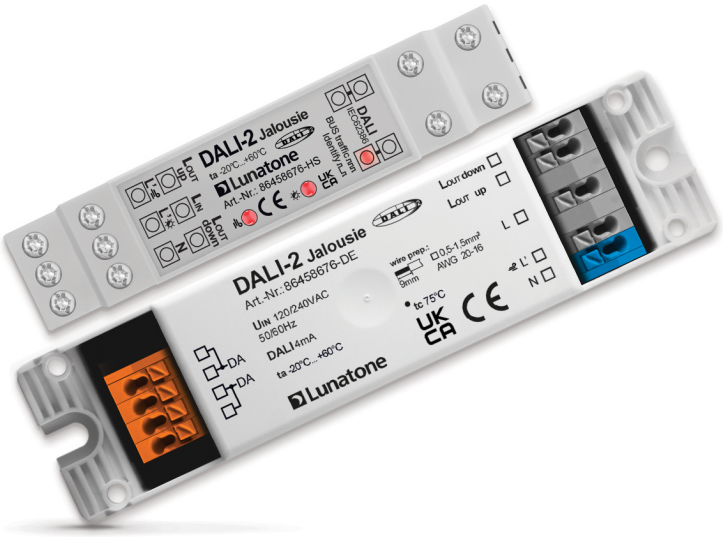
Gateways and Building-Wide Light Management

The DALI-2 IoT Gateway connects the room level with higher-level applications: it enables monitoring and operation via PC or smartphone and provides APIs for customer-specific integrations; the IoT4 Gateway extends this to four DALI lines. The local DALI line remains the functional layer, the IoT adds monitoring, data access and services on top, as well as DALI device configuration via the DALI Cockpit Software tool (https://www.lunatone.com/en/product/dali-cockpit/), that is a powerful tool for configuration, monitoring and troubleshooting for DALI systems.[6]

Conclusion

DALI can not only be used in the typical field of lighting control but develops into an intelligent control system and infrastructure for room data, operation and services. The strength of the Multi-Master approach lies in the distribution of roles within the control structure, while the Single-Master approach integrates well in systems with other central building automations. Lunatone devices are available and well suited for both approaches with either powerful and versatile control functionality as application controllers or reliable DALI-2 certified instance devices for integration in Single-Master systems. ■

Lunatone wDALI-2 Extra Long Range Remote Art.Nr.: 87313951-L01,
Lunatone wDALI-2 Remote Receiver PS Art.Nr.: 87313917-PS,
Lunatone wDALI-2 Remote Receiver Art.Nr.: 87313917.



Lunatone DALI-2 Jalousie Art.Nr.: 86458676-HS,
Lunatone DALI-2 Jalousie Art.Nr.: 86458676-DE.

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Want to know more about DALI?
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Lunatone DALI-2 IOT Gateway Art.Nr.: 89453886.

[5] https://lunatone.com/wp-content/uploads/2025/04/87313951_87313917_wDALI2_Remote__Receiver_EN_D0135.pdf
[6] https://lunatone.com/wp-content/uploads/2021/08/89453886_DALI2_IOT_EN_D0099.pdf

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REGULAR MEMBER BENEFITS

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REGULAR MEMBER BENEFITS

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REGULAR MEMBER BENEFITS

Participate in interoperability test events (Plugfests)

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- ✓ Full list of members

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www.dali-alliance.org/membership

New Test and Certification Specifications for the Bluetooth® NLC to DALI Gateway

Jason Marcel, Senior Marketing Program Manager, Bluetooth SIG

The DALI Alliance, the global authority on lighting technology standardization, has announced a major milestone in the evolution of smart lighting systems: the launch of its test and certification specifications for the wireless to DALI Gateway that dramatically accelerates the deployment of Bluetooth® Networked Lighting Control (NLC). This release marks a transformative step toward seamless integration between wired DALI lighting systems and leading wireless protocols such as Bluetooth® Mesh Networking.

These new specifications are designed to ensure robust interoperability between wired and wireless lighting components, enabling building managers, developers, and manufacturers to deploy flexible, scalable, and intelligent lighting solutions. By bridging the gap between precision-controlled wired systems and the agility of wireless networks, the DALI Alliance is helping to pave the way for a new era of smart building automation.

Bridging DALI and the Bluetooth NLC Ecosystem

The Bluetooth NLC to DALI Gateway serves as a standardized translator between DALI systems (specifically DALI-2 and D4i devices) and the Bluetooth NLC ecosystem. The gateway allows Bluetooth NLC solutions to control wired DALI devices and access their rich data sets, including luminaire diagnostics, energy usage, and performance metrics. This interoperability empowers lighting systems to operate as unified platforms, regardless of the underlying communication protocol.

The specification ensures that the gateway can reliably translate commands and data between DALI and Bluetooth NLC devices, enhancing compatibility and promoting a consistent user experience. This standardization is critical for accelerating the adoption of networked lighting solutions in commercial and industrial environments where flexibility, reliability, and scalability are paramount.

“It is not often that you see independent architectures that match and extend each other so well,” said Szymon Slupik, CTO and co-founder of Silvair. “This technology match, together with the close collaboration between the Bluetooth SIG and DALI Alliance, means that the market will benefit from a wider selection of interoperable intelligent lighting components.”

The newly released specifications allow wired DALI products (DALI-2 and D4i) to be controlled within wireless ecosystems, offering greater flexibility and adaptability. Additionally, the gateway can translate seamlessly between DALI and Bluetooth® NLC, providing robust interoperability.

Bluetooth NLC as the Smart Building Backbone

The integration of wireless protocols with DALI lighting systems is more than a technical achievement; it’s a strategic enabler for smart building innovation. Lighting infrastructures, due to their ubiquity, are uniquely positioned to serve as the backbone of intelligent buildings.

Enabling sensor-rich lighting systems to communicate with building management systems (BMS), such as HVAC and security, allows the gateway to unlock new capabilities in energy efficiency and occupant comfort. By standardizing a multitude of data points — from device asset information and energy consumption to predictive maintenance — device-level data becomes foundational, enabling the deployment of efficient, reliable AI-based building systems.

As such, Bluetooth NLC systems can now act as the central nervous system of a building, facilitating advanced services like indoor navigation, asset tracking, and automated environmental adjustments. This convergence of lighting and IoT technologies supports the development of sustainable, human-centric buildings that respond dynamically to occupant needs and operational demands.

www.bluetooth.com

"The introduction of these test and certification specifications for wireless to DALI Gateways is a significant milestone," said Paul Drosihn, general manager of the DALI Alliance. "It opens up new possibilities for integrating DALI with wireless systems, creating a broader range of solutions for the industry. By standardizing these gateways, we're promoting interoperability and providing a path forward for developers, manufacturers, and professionals in building automation."

"This technology match, together with the close collaboration between the Bluetooth SIG and DALI Alliance, means that the market will benefit from a wider selection of interoperable intelligent lighting components," said Szymon Slupik.

The Importance of Standardization

Standardization is the cornerstone of interoperability and mass adoption. The collaboration between the Bluetooth SIG and the DALI Alliance exemplifies how industry-defined standards can remove barriers to innovation. By aligning the Bluetooth distributed control architecture with the DALI application controller concept, the two organizations have created a unified framework that supports a wide range of intelligent lighting components.

A finger touches the screen on a wireless central control monitoring system, adjusting the temperature in a building. "The standardized gateway enables seamless integration between DALI's trusted wired systems and Bluetooth NLC, the leading wireless lighting standard," said Neville Meijers, CEO of the Bluetooth SIG. "The collaboration highlights the power of open, industry-defined standards in driving innovation, building market confidence, and untapping the full potential of intelligent lighting systems."

Wireless Lighting Market Momentum

Bluetooth® NLC is gaining significant traction in commercial lighting. Vendors like Inventronics, Delta Electronics, Fulham, OSRAM, Sylvania, and Zumtobel are driving adoption through large-scale deployments in offices, warehouses, retail spaces, and horticulture environments.

The decentralized architecture of Bluetooth NLC distributes intelligence across the network, eliminating single points of failure and enhancing system resilience. Combined with DALI's precision and scalability, this architecture supports the development of lighting systems that are not only reliable but also deeply integrated into broader building operations.

The launch of test and certification specifications for wireless to the DALI Gateway marks a pivotal moment in the evolution of smart lighting. By enabling seamless integration between wired and wireless systems, the DALI Alliance and its partners are laying the foundation for intelligent, interoperable, and energy-efficient buildings. As the industry embraces these standards, the future of commercial connected lighting looks brighter than ever. ■

Bluetooth®

Jason Marcel, Senior Marketing Program Manager, Bluetooth SIG, Inc.

Jason Marcel plays a pivotal role in shaping and advancing high-impact, Bluetooth® centric material for a variety of marketing platforms. Over his nine-year tenure at the Bluetooth SIG, he has leveraged his expertise to deliver compelling, informative content that engages technical audiences across commercial and industrial sectors.

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DALI Lighting Awards 2026 – Highlight Interoperability and Innovation

LED professional Editors

The presentation of the DALI Lighting Awards 2026 at the Light + Building 2026 underscored the growing importance of standardized, interoperable lighting control in modern buildings and urban environments. Organized by the DALI Alliance, the international awards program recognized outstanding projects that demonstrated the practical and innovative application of DALI-based lighting systems worldwide.

This year's edition recorded a significant increase in participation, with submissions nearly tripling compared to previous years. Entries were received from across Europe, Asia, the Americas, Oceania, and Africa, reflecting the global reach and rapid adoption of DALI technologies. The awards were structured into two main categories: Application Awards, recognizing real-world implementations, and Innovation Awards, focusing on technological advancements and new applications.

A total of 13 winning projects were selected, complemented by three highly commended entries. The diversity of the awarded projects illustrated the versatility of DALI systems across a wide range of applications, from residential and commercial environments to industrial facilities and smart city infrastructure.

In the Application Awards category, the Estoril Court luxury residence in Hong Kong, delivered by Zhuhai LTECH Technology, demonstrated advanced residential lighting control. In commercial interiors, Litelab was recognized for the Hindustan Unilever workplace in Mumbai, where DALI was integrated with daylight utilization and building management systems to create an efficient and user-centric environment. BEGA received the award for the exterior lighting of Akershus Fortress in Oslo, while B.E.G. was honored for its scalable lighting solution at the Bosch Research and Development facility. In the Smart Cities and Infrastructure category, Signify was awarded for its lighting design at Ezhou Huahu Airport in China.

The Innovation Awards highlighted key technological developments shaping the future of lighting control. Crown House Technologies was recognized for its use of the D4i standard in Oxford's Stephen A. Schwarzman Centre for the Humanities, enabling data-driven building optimization. Tridonic stood out by winning two awards: one for emergency lighting integration at the American University in Cairo and another for the AlUla Film Residence, which showcased intelligent energy-saving strategies.

Further awards reflected emerging trends such as human-centric lighting, smart city integration, and advanced system interoperability. Elekon was honored for its hospital project in Istanbul, while Flashnet demonstrated large-scale smart city integration in Washington, D.C. The implementation of DALI+ at 500 Bourke Street in Melbourne by Lightmoves and Zencontrol highlighted the growing importance of wireless and IP-based control systems. Additional recognition went to Bluebottle for connected lighting at Gate 8 in Australia and to Foster + Partners and Delmatic for their integrated lighting control at Apple's headquarters in London.
Special commendations were awarded to Delta Greentech, Helvar, and Inventronics for projects demonstrating excellence in design, smart infrastructure, and sustainability.

As Paul Drosihn, General Manager of the DALI Alliance, noted, the "quality and diversity of submissions were exceptional", reflecting the continued global growth of DALI as a foundation for intelligent and interoperable lighting systems.

Overall, the DALI Lighting Awards 2026 demonstrated that lighting control has evolved into a key enabler of smart, connected, and energy-efficient environments, with standardized systems playing a central role in future-ready building and city infrastructures.

DALI Lighting Awards 2026 – Winners Overview

Application Awards

- Residential: Zhuhai LTECH Technology – Estoril Court Luxury Residence
- Commercial Interior: Litelab – Hindustan Unilever
- Commercial Exterior: BEGA – Akershus Fortress
- Industrial: B.E.G. – Bosch R&D Manufacturing Facility
- Smart Cities & Infrastructure: Signify – Ezhou Huahu Airport

Innovation Awards

- Best Use of D4i: Crown House Technologies – Stephen A. Schwarzman Centre
- Emergency Lighting Integration: Tridonic – American University in Cairo
- Human Centric Lighting: Elekon – Acibadem Kartal Hospital
- Integration into Other Systems: Flashnet – Washington D.C.
- Best Use of DALI+: Lightmoves & Zencontrol – 500 Bourke Street
- Sustainability & Energy Efficiency: Tridonic – AlUla Film Residence
- Smart & Connected Lighting: Bluebottle – Gate 8
- Innovation in Lighting: Foster + Partners / Delmatic – Apple Battersea

Highly Commended

- Delta Greentech – Dishuiyun Hall
- Helvar – Lublin Metropolitan Railway Station
- Inventronics – Baotou Aluminium Project

Lighting Awards 2026

WINNERS

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Lighting Awards
2026

WINNERS









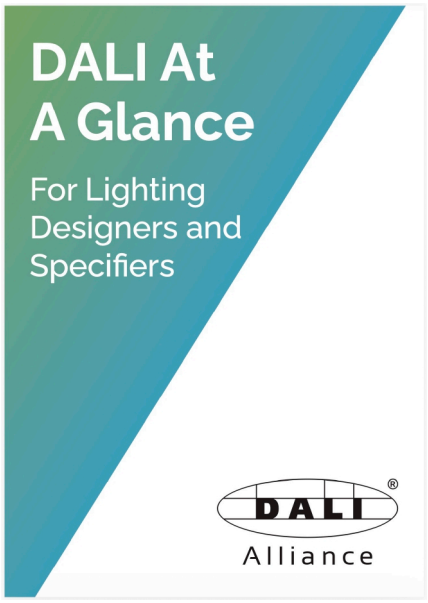




Core DALI Resources for Smart Lighting Professionals

LED professional Editors

DALI at a Glance – For Lighting Designers and Specifiers



The document "DALI At A Glance – For Lighting Designers and Specifiers" provides a comprehensive overview of the DALI ecosystem and explains why DALI has become one of the most important standards for modern lighting control. It positions DALI as a future-oriented, interoperable, and scalable platform that supports intelligent lighting systems across commercial, industrial, educational, healthcare, and outdoor applications.

At its core, DALI is described as a globally standardized digital communication protocol based on IEC 62386, enabling seamless bi-directional communication between lighting components such as luminaires, sensors, controllers, and building management systems. One of the key strengths emphasized throughout the document is interoperability. Through certification programs managed by the DALI Alliance, products from different manufacturers can work together reliably, eliminating vendor lock-in and giving designers and specifiers greater flexibility.

The publication also highlights how DALI has evolved far beyond traditional wired lighting control. Two major developments—DALI-2, D4i, and the newer DALI+—extend the ecosystem into smart building and IoT environments. DALI-2 improves interoperability and enables advanced diagnostics and monitoring capabilities, while D4i introduces standardized luminaire-level data, energy reporting, and operational monitoring. DALI+ further expands the protocol into wireless and IP-based networks, making DALI increasingly relevant for modern connected buildings.

Another major theme is flexibility and scalability. The document explains that DALI systems can be installed using simple two-wire, non-polarity-sensitive wiring and support different wiring topologies such as daisy-chain or star configurations. This simplifies installation, reduces errors, and lowers costs. Additionally, DALI systems can scale from small projects to large facilities controlling thousands of luminaires. The example of Zayed International Airport demonstrates DALI's ability to manage highly complex lighting infrastructures.

Energy efficiency and sustainability are also presented as major advantages. DALI systems support daylight harvesting, occupancy sensing, dimming, and predictive maintenance, helping reduce energy consumption and extend luminaire lifetimes. Diagnostic functions allow maintenance teams to proactively identify failures and optimize system performance, contributing to circularity and long-term sustainability goals.

The document further explores DALI's role in improving lighting quality and user well-being. Through precise intensity and color control, DALI enables Human-Centric Lighting (HCL) applications that support circadian rhythms and adapt lighting conditions to different activities and environments. Examples include healthcare facilities, educational institutions, fitness centers, hospitality, and office environments, where lighting can dynamically respond to occupancy, daylight availability, and user needs.

Finally, the guide emphasizes future-proofing. Because DALI is based on open global standards and continues to evolve through developments like DALI+, it remains adaptable to future technological and regulatory changes. Certification programs, rigorous testing, interoperability, and backward compatibility make DALI a secure investment for long-term lighting infrastructure projects.

10 Most Important Takeaways

- DALI is a globally standardized lighting control protocol based on IEC 62386.
- Bi-directional communication enables real-time monitoring and diagnostics.
- DALI-certified products ensure interoperability across manufacturers.
- DALI-2 enhances interoperability and advanced system functionality.
- D4i enables luminaire-level data, diagnostics, and IoT integration.
- DALI+ expands DALI into wireless and IP-based smart building networks.
- Simple two-wire, non-polarity-sensitive wiring reduces installation complexity.
- DALI systems are highly scalable—from small rooms to large infrastructure projects.
- Energy-saving features include dimming, occupancy sensing, and daylight harvesting.
- DALI supports Human-Centric Lighting and future-proof smart building strategies.

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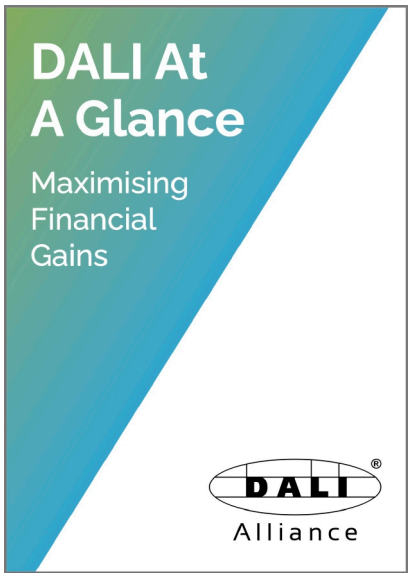
DALI at a Glance – Maximising Financial Gains



The document "DALI At A Glance – Maximising Financial Gains" presents DALI not simply as a lighting control technology, but as a strategic business tool that improves operational efficiency, sustainability, and long-term asset value in modern buildings. The publication is primarily aimed at building owners, developers, investors, facility managers, and decision-makers who are evaluating smart building technologies from a financial and operational perspective.

A central message throughout the document is that lighting should no longer be viewed as a passive utility, but rather as an intelligent infrastructure component capable of generating measurable business value. Traditional analogue lighting systems are described as inefficient, expensive to maintain, and difficult to adapt to evolving building requirements. In contrast, DALI-based systems provide smart, data-rich lighting control that enables automation, real-time diagnostics, predictive maintenance, and seamless integration with wider building management systems.

The document explains that DALI is a globally standardized protocol under IEC 62386 and supported by the DALI Alliance certification ecosystem, ensuring interoperability between manufacturers. This open, standards-based approach avoids vendor lock-in and guarantees long-term flexibility and supply chain stability. DALI-certified products can work together reliably across different projects and future expansions, making DALI particularly attractive for large-scale or long-life infrastructure investments.

A major focus is placed on financial return and energy efficiency. Features such as daylight harvesting, occupancy sensing, automated dimming, and zoned lighting control significantly reduce energy usage and operating costs. At the same time, DALI systems provide detailed operational and diagnostic data, enabling predictive maintenance and reducing downtime and maintenance expenses. According to the document, this combination of energy savings and operational efficiency results in rapid ROI and improved long-term financial performance.

The publication also highlights DALI's role in supporting sustainability and regulatory compliance. Buildings equipped with DALI systems are better positioned to meet standards such as WELL, LEED, BREEAM, and the upcoming European Energy Performance of Buildings Directive (EPBD). DALI contributes to ESG goals by reducing energy consumption, supporting circularity through backward compatibility, and extending luminaire lifetimes. Furthermore, DALI systems can integrate air quality sensors and other smart building technologies, contributing to healthier and more efficient indoor environments.

Another key advantage described is flexibility. DALI systems allow spaces to be reconfigured through software programming rather than physical rewiring, reducing renovation costs and disruption. DALI+ extends this flexibility further by enabling wireless and IP-based communication. This makes DALI particularly suitable for dynamic environments such as offices, educational facilities, industrial spaces, and retrofit projects.

The document supports its arguments with several real-world case studies demonstrating measurable financial gains. Examples include Manchester Airport, which achieved an 89% reduction in energy costs at Terminal 3, Hartmann International in Germany with a 60% energy reduction, and Georgia Power in the USA, where DALI-enabled smart street lighting doubled installation capacity while saving millions in labour costs. These examples illustrate how DALI delivers operational savings, scalability, and long-term value across different applications.

10 Most Important Takeaways

- DALI transforms lighting from a utility into a strategic business asset.
- Open standards and certification ensure interoperability and avoid vendor lock-in.
- Daylight harvesting and occupancy sensing significantly reduce energy costs.
- Real-time diagnostics enable predictive maintenance and lower operating expenses.
- DALI systems support ESG goals and green building certifications.
- DALI simplifies reconfiguration of spaces without costly rewiring.
- DALI+ enables wireless and IP-based lighting infrastructures.
- Smart luminaires can collect operational, occupancy, and environmental data.
- Future-proofing and backward compatibility protect long-term investments.
- Real-world projects demonstrate strong ROI and measurable financial savings.

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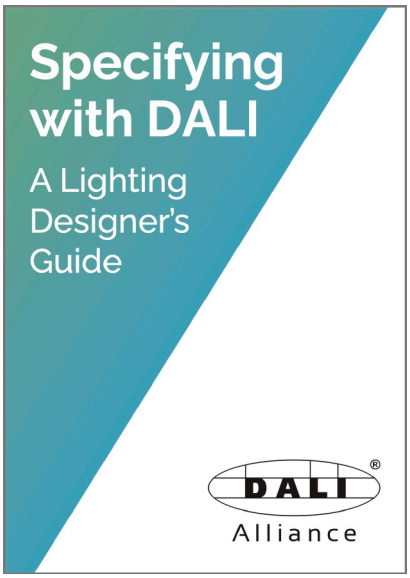
Specifying with DALI – A Lighting Designer's Guide



The document "Specifying with DALI – A Lighting Designer's Guide" is a comprehensive technical and strategic guide developed by the DALI Alliance to help lighting designers, consultants, engineers, and specifiers understand how to design, specify, and implement modern DALI-based lighting control systems. The guide explains both the technical foundations and the practical benefits of DALI technologies, particularly DALI-2, D4i, Zhaga-D4i, and DALI+, while emphasizing interoperability,

flexibility, energy efficiency, and future scalability.

The guide begins by explaining the fundamentals of the Digital Addressable Lighting Interface (DALI), a globally standardized protocol under IEC 62386 that enables intelligent communication between lighting components. DALI systems consist of application controllers, input devices, luminaires, control gear, bus power supplies, and a two-wire communication bus. One of the major strengths of DALI is its simplified and flexible wiring topology, allowing daisy-chain, star, tree, and line configurations while reducing installation errors because the system is largely polarity-insensitive.

A key theme throughout the document is the superiority of DALI over traditional analogue systems such as 0–10V controls. DALI offers precise dimming, scene control, scalability, interoperability between manufacturers, diagnostic capabilities, easier maintenance, and integration with building automation systems. The system supports up to 64 control gear devices and 64 control devices per subnet, enabling flexible grouping and scene programming through software instead of physical rewiring.

The document strongly promotes DALI-2 certification over older DALI version-1 products. DALI-2 introduces verified interoperability, certified testing, advanced dimming performance, support for sensors and application controllers, real-time diagnostics, colour control, and bidirectional communication. DALI-2 systems support dynamic lighting strategies using occupancy sensors, daylight harvesting, tunable white lighting, RGBWAF colour control, and xy chromaticity control for highly accurate lighting reproduction. These capabilities make DALI-2 suitable for retail, hospitality, museums, offices, healthcare, entertainment venues, and smart buildings.

Another major focus is DALI Data functionality, which enables luminaires and LED drivers to provide real-time operational, energy, and diagnostic information. The guide explains how luminaire data, energy reporting, and diagnostics can improve predictive maintenance, asset management, compliance reporting, and energy optimization. This transforms lighting systems into data-driven infrastructure capable of supporting sustainability goals and operational efficiency.

The guide also covers advanced technologies including D4i, Zhaga-D4i, and DALI+. D4i introduces luminaire-level lighting control with integrated power supplies and data reporting, particularly useful for smart city and IoT applications. Zhaga-D4i adds standardized plug-and-play interfaces for sensors and communication modules. DALI+ expands the DALI protocol into wireless and IP-based networks, enabling scalable smart building integration without losing DALI's core functionality and interoperability.

Finally, the document provides detailed guidance for specifying DALI systems, including application controllers, input devices, luminaires, emergency lighting, power supplies, dimming requirements, colour control, scalability, energy monitoring, and compliance considerations. It stresses the importance of using certified products listed in the DALI Product Database to ensure interoperability and future-proof system performance. Overall, the guide positions DALI as a flexible, intelligent, scalable, and future-ready lighting ecosystem suitable for modern smart building applications.

10 Most Important Takeaways

- DALI is an internationally standardized lighting control protocol under IEC 62386.
- DALI-2 certification ensures interoperability, reliability, and verified testing.
- DALI supports flexible wiring topologies with simplified installation.
- Up to 64 control gear and 64 control devices can operate on one DALI subnet.
- DALI enables advanced dimming, scene control, and dynamic lighting strategies.
- DALI-2 supports sensors, occupancy detection, daylight harvesting, and colour control.
- DALI Data enables predictive maintenance, diagnostics, and energy monitoring.
- D4i and Zhaga-D4i prepare lighting systems for IoT and smart city integration.
- DALI+ extends DALI into wireless and IP-based smart building networks.
- Using certified products from the DALI Product Database is essential for compatibility and future scalability.

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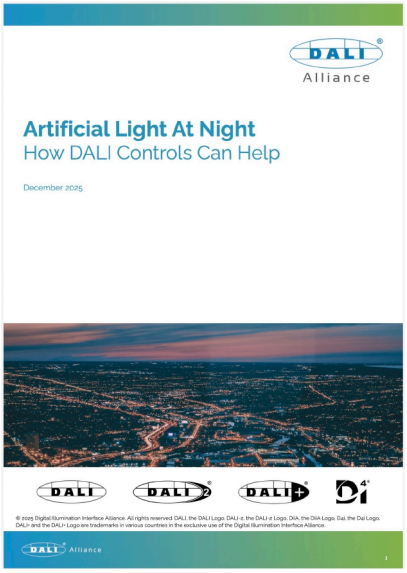
Artificial Light at Night – How DALI Controls Can Help



The document "Artificial Light At Night – How DALI Controls Can Help" explains the growing environmental and social concerns caused by excessive artificial lighting during nighttime and highlights how DALI-based lighting control systems can provide a balanced solution. The paper recognizes that artificial light is essential for modern society, supporting safety, economic activity, transportation, public spaces, and social life after dark. However, poorly designed or uncontrolled lighting installations create significant problems such as skyglow, glare, light trespass, unnecessary energy consumption, and ecological disruption. Wildlife species including insects, birds, bats, and sea turtles depend on natural day-night cycles, and excessive artificial light can interfere with feeding, migration, and habitat behavior.

The document emphasizes that the solution is not simply turning lights off, but designing smarter lighting systems that provide only the required amount of light, exactly where and when it is needed. Advanced DALI, DALI-2, D4i, and Zhaga-D4i lighting control technologies enable precise dimming schedules, occupancy sensing, daylight sensing, automated switching, and remote management. These systems reduce unnecessary illumination during low-use periods while maintaining public safety and comfort. The guide positions intelligent lighting controls as a practical, scalable strategy to reduce carbon emissions, improve energy efficiency, protect ecosystems, and create safer, greener nighttime environments.

10 Most Important Takeaways

- Artificial light at night is essential for modern life but can create environmental harm when uncontrolled.
- Poor outdoor lighting contributes to skyglow, glare, and light trespass.
- Excessive nighttime lighting negatively affects wildlife and ecosystems.
- Unnecessary lighting increases energy waste, carbon emissions, and operating costs.
- The goal is balanced lighting — enough light for safety and functionality, but no more than necessary.
- Smart lighting controls are more effective than simply switching lights off.
- DALI is a globally standardized lighting control protocol under IEC 62386.
- DALI-2 and D4i systems support precise dimming, automation, diagnostics, and scene control.
- Zhaga-D4i luminaires enable plug-and-play sensors, motion detection, and daylight sensing.
- Intelligent DALI lighting systems support safer cities, lower emissions, reduced light pollution, and better environmental protection.

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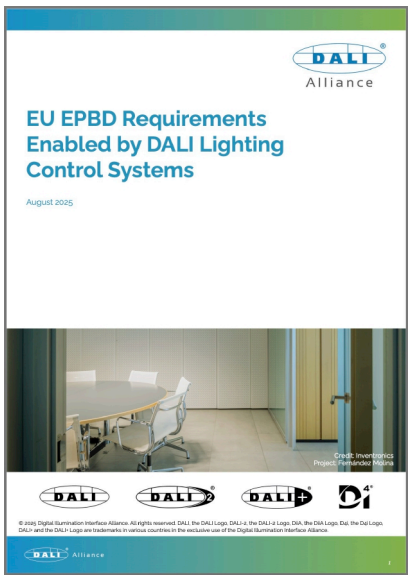
EU EPBD Requirements Enabled by DALI Lighting Control Systems



The document "EU EPBD Requirements Enabled by DALI Lighting Control Systems" explains how modern DALI-based lighting control technologies support compliance with the revised European Union Energy Performance of Buildings Directive (EPBD) 2024. The directive aims to reduce the carbon footprint of Europe's building sector through stricter energy efficiency requirements, smarter building technologies, and improved indoor environmental quality. Buildings account for around 40% of EU energy consumption, making intelligent building automation systems (BACS) increasingly important.

The publication highlights that lighting control systems based on the DALI standard meet EPBD requirements in several areas, including energy monitoring, diagnostics, interoperability, occupancy detection, and indoor environmental quality monitoring. DALI systems enable continuous logging and optimization of energy use while supporting communication between multiple technical building systems. The document also explains upcoming deadlines for mandatory automatic lighting controls in non-residential buildings.

Special attention is given to DALI-2, D4i, and DALI+ certified products. DALI-2 ensures interoperability and efficient wired lighting control systems, while D4i enables smart luminaires with integrated sensors, energy monitoring, and wireless communication modules. DALI+ extends DALI into wireless and IP-based environments, simplifying retrofits and renovations.

5 Most Important Takeaways

- EPBD 2024 introduces stricter energy efficiency requirements for buildings.
- DALI systems support BACS requirements including monitoring, diagnostics, and interoperability.
- Automatic lighting controls with occupancy detection will become mandatory in many non-residential buildings.
- D4i and DALI+ enable smart, wireless, and retrofit-friendly lighting systems.
- DALI technologies help buildings achieve sustainability, energy-saving, and smart readiness targets.

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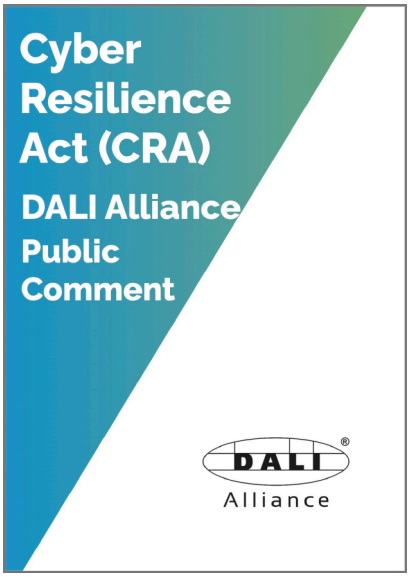
Cyber Resiliance Act (CRA) - DALI Alliance Public Comment



The document "Cyber Resilience Act (CRA) – DALI Alliance Public Comment" outlines the impact of the European Union's Cyber Resilience Act on DALI-based lighting products. The CRA is a broad cybersecurity regulation covering products with digital components, including wired connectivity solutions, making it relevant for DALI systems. While the regulation entered into force in December 2024, its main requirements will apply from December 2027.

The CRA aims to improve cybersecurity standards, protect consumers and businesses from cyber threats, and ensure that manufacturers provide security updates and product support. The DALI Alliance recommends that compliance be assessed at the level of the complete product rather than individual DALI components. Manufacturers are therefore expected to conduct comprehensive risk assessments and determine whether their products meet CRA requirements.

According to the DALI Alliance, most wired DALI-2 and D4i products are expected to present a low cybersecurity risk. However, products incorporating wireless communication, Ethernet connectivity, DALI+, or certified gateways may require additional assessment and compliance measures. The document highlights the increasing importance of cybersecurity within connected lighting and smart building systems.

5 Most Important Takeaways

- The CRA applies to products with digital elements, including DALI systems.
- Main compliance requirements take effect in December 2027.
- Manufacturers must assess cybersecurity risks for the complete product.
- Most wired DALI-2 and D4i products are expected to have low cybersecurity risk.
- DALI+, gateways, and wireless-connected products may require additional compliance measures.

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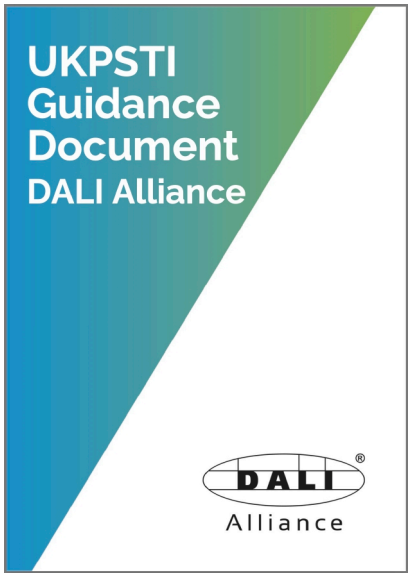
UKPSTI Guidance Document



The document "UKPSTI Guidance Document" from the DALI Alliance provides guidance on how the UK Product Security and Telecommunications Infrastructure (UKPSTI) regulations apply to connected lighting products and DALI-based systems. The document focuses on cybersecurity requirements for products that can connect to networks or the internet, helping manufacturers and stakeholders determine whether their products fall within the scope of UK legislation.

A key element is the decision flowchart, which explains when a product is likely "in scope" under UKPSTI. Products that are internet-connectable or network-connectable using IP protocols are likely covered by the regulation. This specifically includes DALI+ products, wired DALI products with wireless interfaces, and DALI products connected through IP-based systems. Traditional wired-only DALI systems without IP connectivity may fall outside the regulation, although some cases remain application-dependent.

The document also outlines essential cybersecurity obligations for products within scope. These include the prohibition of default passwords, implementation of a vulnerability disclosure policy, transparency regarding software update periods, and a formal statement of compliance accompanying the product. Overall, the guide highlights the increasing importance of cybersecurity and compliance within connected lighting and smart building ecosystems.

5 Most Important Takeaways

- UKPSTI focuses on cybersecurity requirements for connected products.
- DALI+ and IP-connected DALI systems are likely within regulatory scope.
- Products must avoid default passwords for improved security.
- Manufacturers should implement vulnerability disclosure policies.
- Clear software update commitments and compliance statements are required.

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Radio Equipment Directive (RED) - DALI Alliance Guide

The document "Radio Equipment Directive (RED) – DALI Alliance Guidance" provides guidance on how the European Radio Equipment Directive (RED) applies to wireless and connected DALI products. The document focuses particularly on cybersecurity and risk mitigation requirements for lighting products that include wireless communication interfaces.

According to the guidance, several DALI technologies are expected to fall within the scope of RED, including DALI+ with Thread, Bluetooth-to-DALI gateways, Zigbee-to-DALI gateways, and other DALI products containing wireless interfaces. The document explains that risk analysis under RED will likely require cybersecurity mitigation measures, and it recommends following EN18031, the harmonized standard under RED, as an appropriate compliance approach.

The publication highlights that DALI+ with Thread benefits from Thread's built-in security methods while also providing additional communication security options. Similarly, Bluetooth Mesh and Zigbee security mechanisms support gateway products based on these wireless technologies. The document stresses that only the DALI-related parts of products are covered by DALI Alliance guidance, while non-DALI components may require additional treatment and compliance considerations. Overall, the document reflects the increasing importance of cybersecurity, wireless communication security, and regulatory compliance in connected lighting and smart building systems.

5 Most Important Takeaways

- RED applies to wireless and connected DALI products.
- DALI+, Bluetooth Mesh, and Zigbee gateway products are likely in scope.
- Cybersecurity risk analysis and mitigation are required.
- EN18031 is recommended as the harmonized compliance standard.
- Thread, Bluetooth Mesh, and Zigbee provide built-in security mechanisms for DALI systems.

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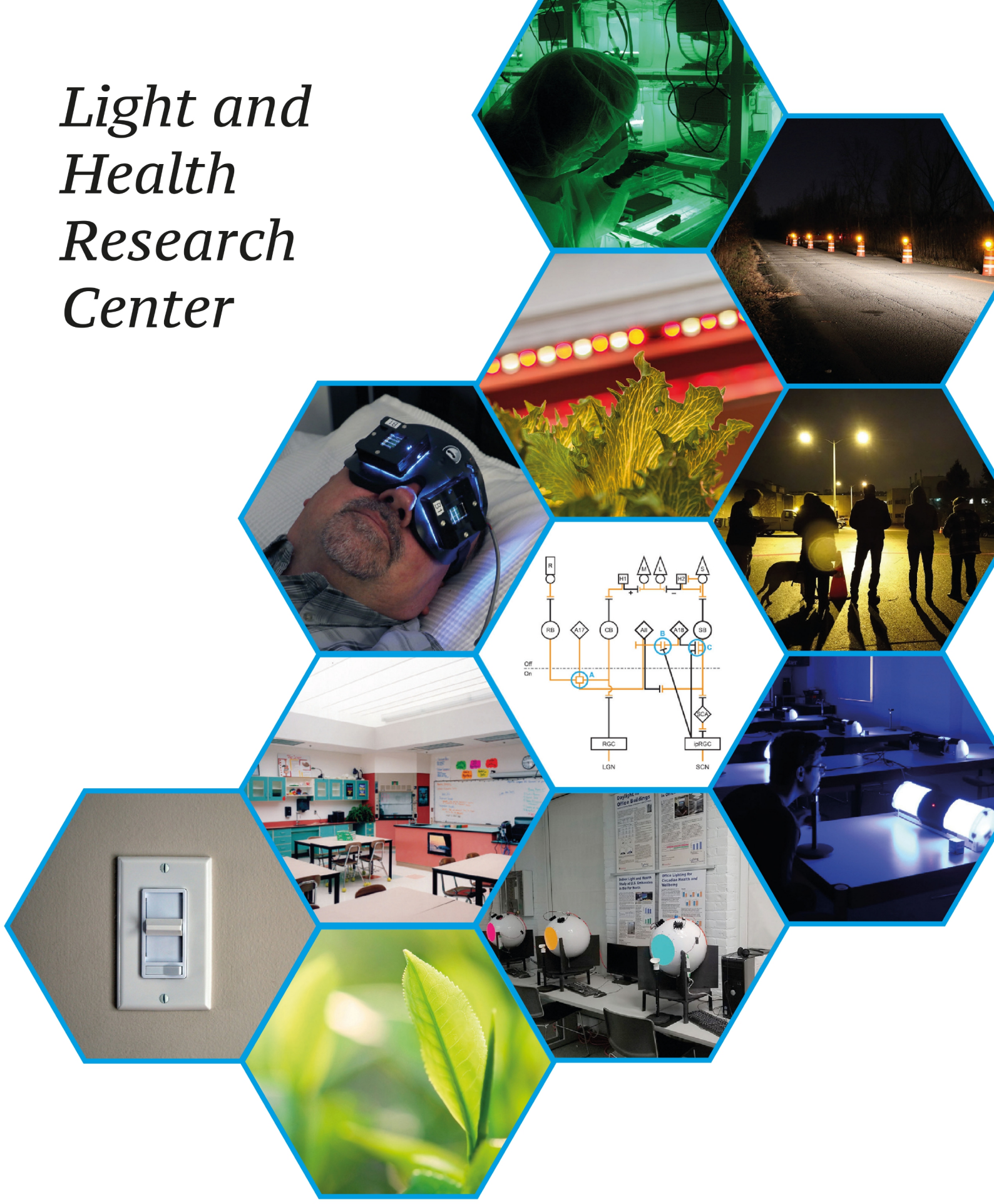
Light and Health Research Center



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CIE – Turning Research into Best Practice

Peter Thorns CEng FCIBSE FSLL, CIE Vice-President Standards

In professional life and practice we have a number of tiers of requirements that dictate and guide our actions;

- **Laws and directives, which are legal requirements that must be complied with,**
- **Standards and codes, that may or may not be legal requirements (depending upon whether they are written into law),**
- **Guidelines and recommendations.**

Each of these requirements comes from different sources and are formulated by differing sets of people, frequently to achieve different outcomes.

Laws and directives are from legislators (which may be different levels of governments within a country, or regional governments such as the European Union) aimed at controlling parameters such as product or system safety or efficiency.

Standards are from international, regional and national standardization bodies such as ISO/IEC, CEN/CENELEC, DIN, BSI, ANSI, CSA or AFNOR. These are produced by national experts and undergo a formalized development and approval process. They also aim for product safety but cover a much wider brief such as how a product is used in application, or how metrics are measured in a standardized and repeatable way. Standards may also be produced by organizations formally recognized as experts in a particular subject area, either internationally such as CIE by ISO and IEC, or nationally such as NEMA by ANSI.

Recommendations and guidelines may come from standardization bodies but also come from professional societies, such as LiTG, CIBSE, AFE, or trade associations such as LightingEurope, ZVEI, FEEI or LIA. They generally complement standards as the language used in standards is very formalized with specific words having defined meanings. For example, “shall” is a requirement (normative) whereas “should” is more of a suggestion (informative). This can lead to documents that are not intuitive to read and contain requirements but little advice. Recommendations and guidelines do not have these content or language constraints and discuss requirements and concepts in more natural language that is generally easier to understand.

A special case is commercial labels/marks. Whilst these are not standards in the formal sense of the word, they define requirements necessary to allow an industry recognized label or mark to be used, for example WELL or BREEAM in terms of buildings, or UL for products and systems.

But the question is, on what body of knowledge are these documents and requirements based? There is existing and new research and current practice of course, but how is this information sifted and organized into a coherent body of information?

Within lighting, a major source of this knowledge is the International Commission on Illumination - also known as the CIE from its French title, the Commission Internationale de l’Eclairage. The CIE is devoted to worldwide cooperation and the exchange of information on all matters relating to the science and art of light and lighting, color and vision, photobiology and image technology. It was originally formed in 1900 as the International Commission on Photometry (CIP) and has been known as the CIE since its restructuring in 1913.

The CIE is the global authority on the subject matter of light and lighting. It works with the International Commission for Weights and Measures (CIPM) to maintain the SI system for photometry and radiometry and is recognized by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) as an international standardization body.

The CIE cooperates with many of the organizations mentioned previously through memorandums of understanding, liaisons, and other working relationships.

The CIE has six scientific Divisions, each responsible for different subject areas;

- Vision and color,
- Physical measurement of light and radiation,
- Interior environment and lighting design,
- Transportation and exterior applications,
- Photobiology and photochemistry,
- Image technology.

Members of these divisions are experts in their fields and contribute to the process of producing new information and organizing existing research into dependable and usable knowledge.

Research findings tend to come from a variety of different sources, such as academia, professional or research institutions, industry and governments. Re-

https://cie.co.at

search findings are generally published in academic or professional journals, or presented at conferences, such as CIE Mid-Term Meetings and Quadrennial Sessions. This helps to provide a wide body of knowledge from many perspectives and backgrounds. However, it also produces findings that frequently have diverse goals, differing experimental methods, varying metrics, dissimilar test subjects, varying standards of reporting, and inconsistent and sometimes conflicting results.

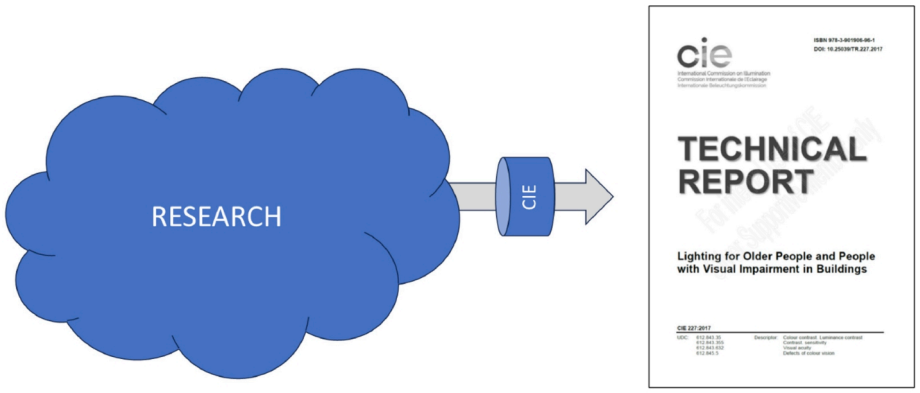
It is also useful to direct research efforts to address more urgent topics in a coordinated way, as opposed to having much research scattered across diverse topics. Therefore, guidance is necessary to try to direct research efforts, and the CIE produces its Research Strategy to help in this.[7] This defines overarching themes, for example towards inclusive and equitable lighting, and also topical themes, for example measuring, modelling, perceiving and reproducing color. Other documents such as CIE 218:2016 *Research Roadmap for Healthful Interior Lighting Applications*, or CIE 254:2024 *A roadmap toward basing CIE colorimetry on cone fundamentals* give guidance on the state of knowledge and the way ahead. The CIE also provides guidance on how to report results, for example in CIE 213:2014 *Guide to Protocols for Describing Lighting*, to try to harmonize how experimental results are documented, allowing meaningful comparison.

Collating relevant research, sifting it and making sense of it requires experts who not only understand the topic under consideration, but also the basis of research to identify what results do, and do not, mean, where they are valid and which situations are outside the boundary conditions of the findings. This is part of the CIE process to achieve consensus on what we know, what we do not know, what we can apply, and what more we need.

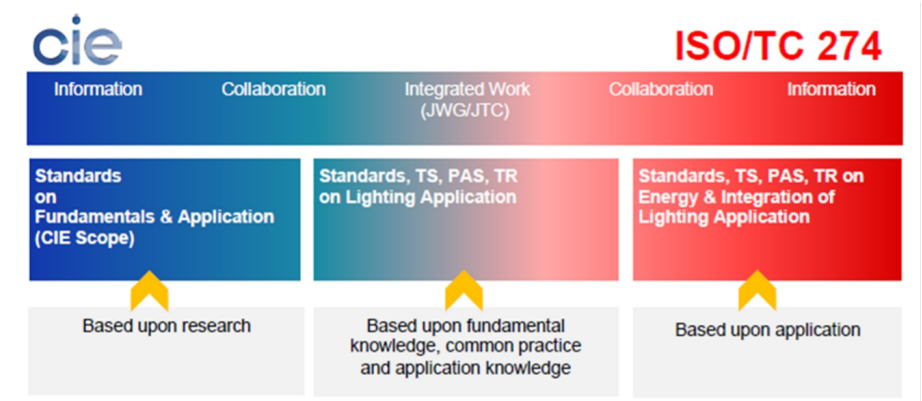
The output from this will generally be a Technical Report, documenting knowledge and experience within a specific field of lighting, with recommendations as to how this should be used by interested parties at large. CIE Technical Reports may be, and have been translated in a wide range of languages. A Technical Report would usually be a necessary preliminary to a CIE or joint CIE/ISO/IEC International Standard. Examples are ISO/CIE 8995-1:2025 *Light and lighting – Lighting of workplaces – Part 1: Indoor* and the ISO/CIE 11664 series on colorimetry. Several CIE publications have been directly adopted as ISO or

[7] https://www.cie.co.at/research-strategy/research-strategy-2023-2027

Overview of types of organizations, with scope and representative examples.



The role of CIE in producing consensus driven authoritative information.



Schematic showing the relationship between the CIE and ISO/TC 274.

IEC standards, but the CIE also produces standards in its own right, such as CIE S 026:2018 *System for Metrology of Optical Radiation for ipRGC-Influenced Responses to Light*.

CIE publications may also be the basis for national or regional standards. For example EN 12464-1 *Light and lighting - Lighting of work places - Part 1: Indoor work places* references 17 CIE publications, EN 13032-4:2015+A1:2019 *Light and lighting - Measurement and presentation of photometric data of lamps and luminaires - Part 4: LED lamps, modules and luminaires* references 14 CIE publications and ANSI/IES RP-46 *Recommended practice: Supporting the physiological and behavioural effects of lighting in interior daytime environments* references 9 CIE documents.

The CIE has an especially close relationship

with ISO, specifically ISO/TC 274, through a Partner Standards Developing Organization agreement (PSDO).

The CIE and ISO/TC 274 work collaboratively. Whenever a new work item is considered by either organization it is discussed in the Joint Advisory Group (JAG) which coordinates work across the organizations. The JAG has representatives of both the CIE and ISO/TC 274 and decides a proposed course of action. Either a subject;

- is purely a CIE or ISO/TC 274 topic, and only one organization does the work,
- is of interest to both organizations but one organization takes the lead in the work whilst the second organization participates,
- is of interest to both organizations and the work is actioned jointly and equally through a joint working group.

So, the CIE produces the fundamental knowledge which may either result in a CIE standard or technical report, but the ability to move that knowledge into ISO standards flows more smoothly due to this close collaboration. And equally beneficially, ISO/TC 274 may request the CIE to perform some work if missing information is identified within CIE areas of expertise.

"Standards are not just about compliance; they are the bridge between cutting-edge research and practical application, ensuring that the latest advancements in lighting technology benefit everyone, from industry professionals to end users."

PETER THORNS.

ISO/IEC/CIE standards are frequently then adopted at a regional or national level via a series of agreements between standards bodies. Whilst standards, codes and guidelines are essential for the fair and free movement of goods and trade, and for ensuring safe and healthy products and places, they are built upon the strong foundations of international consensus. And for lighting this is led by the CIE. ■

Glossary

AFE – Association Française de l'Eclairage, the French lighting association.
AFNOR - Association Française de Normalisation, the French National Standards Body.
ANSI – American National Standards Institute.
BREEAM – UK Building Research Establishment's Environmental Assessment Method.
BSI – British Standards Institution, the UK National Standards Body.
CEN - Committee Europeen de Normalisation, the European Committee for Standardization.
CENELEC - Comité Européen de Normalisation Electrotechnique, the European Committee for Electrotechnical Standardization.
CIBSE - Chartered Institution of Building Services Engineers, UK.
CSA – CSA Group, formerly known as the Canadian Standards Association.
DIN – Deutsches Institut für Normung, the German National Standards Body.
FEEI – Fachverband der Elektro- und Elektronikindustrie, the Austrian association for the electrical and electronics industry.
IEC – International Electrotechnical Committee, international organization for the preparation and publication of international standards for all electrical, electronic and related technologies.
ISO - International Organization for Standardization.
LIA – Lighting Industry Association, UK trade association for the lighting industry.
LightingEurope – European trade association for the lighting industry.
LiTG – Deutsche Gesellschaft für Licht-Technik + LichtGestaltung, German lighting technology society.
NEMA – USA National Electrical Manufacturers Association.
UL – Underwriters Laboratories.
WELL – The International WELL Building Institute.
ZVEI – Zentralverband Elektrotechnik- und Elektronikindustrie, German electro and digital industry association.

Peter Thorns CEng FCIBSE FSLL,
CIE Vice-President Standards.

Peter Thorns has worked in Thorn Lighting and Zumtobel Group since 1985 where he has had a number of roles including electronics research and development, manufacturing, software development, photometry, optical design and lighting applications. He is the current Vice-President Standards for the CIE, chair of ISO/TC 274, and is involved in a large number of ISO, CEN and BSI committees.

He is the chair of the UK Lighting Industry Association Building Regulations Technical Committee and of the LightingEurope working group on Value of Light. He is a Chartered Engineer, a Fellow of CIBSE and the SLL, and an associate editor of the academic journal Lighting Research and Technology.

For additional information, please visit https://cie.co.at.

International Commission on Illumination
Commission Internationale de l'Eclairage
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World Premiere in Light: Bartenbach Unveils the Sky Dome and a New “World of Light”

Bartenbach

Bartenbach 7.0 introduced a groundbreaking digital artificial sky, immersive lighting environments, and a next-generation platform for lighting research, simulation, and experience.

When Bartenbach GmbH officially opened its redesigned headquarters in Wattens, Austria, the company did far more than unveil a renovated workspace. Under the title “Bartenbach 7.0,” the internationally renowned lighting specialist introduced a new era of immersive lighting technology and unique research possibilities — highlighted by the world premiere of the Bartenbach Sky Dome, the world’s first fully digital artificial sky for the simulation of natural lighting conditions.

The opening event marked a strategic milestone for the company, combining architecture, research, engineering, and experiential lighting into a single integrated environment. The newly revitalized “Quartier am Brandgut,” formerly known as the Swarovski Business Building, was transformed into a customized innovation hub dedicated entirely to the future of light.

According to Bartenbach CEO Helmut Guggenbichler, the vision behind Bartenbach 7.0 extends far beyond a conventional office or showroom concept. “We are creating a place where light can be experienced holistically — emotionally, functionally, and scientifically,” he explained during the opening ceremony.

The Sky Dome: A Digital Artificial Sky at an Unprecedented Scale

At the center of attention during the event was the new Bartenbach Sky Dome, a highly advanced immersive lighting and simulation environment designed to reproduce natural daylight conditions with exceptional realism. The system replaces Bartenbach’s previous artificial sky installation, whose aging technology and physical dimensions no longer met the demands of modern simulation and visualization workflows.

Technically, the Sky Dome represents one of the most sophisticated lighting simulation systems currently realized in the industry. The installation features approximately 2.2 million multicolor LED points with a 6.9 mm pixel pitch, delivering luminance levels of up to 20,000 cd/m² and horizontal illuminance values reaching 60,000 lux. The system operates with advanced 4-channel RGBW LED technology, achieving a color rendering index of CRI 90+ and enabling highly natural light reproduction.

With a maximum power consumption of 120 kW, the Sky Dome is capable of simulating the complete natural daylight spectrum, including dynamic solar movement, changing weather conditions, and varying atmospheric environments.

What makes the concept particularly unique is its hybrid role as both a high-power photometrically calibrated lighting system and a fully immersive 360-degree visualization platform. Real and virtual environments can be projected simultaneously, allowing architectural projects to be geo-referenced anywhere in the world. Designers and researchers can instantly transition between lighting conditions in cities such as New York, Munich, or Tokyo while simulating different times of day and weather scenarios in real time.

Beyond visualization, the Sky Dome also functions as a powerful research platform for studying perception, spatial experience, and human responses to light. The system enables highly realistic testing scenarios for architecture, lighting design, and environmental psychology, opening new possibilities for both scientific research and customer presentations.

World of Light: From Showroom to Immersive Knowledge Platform

Alongside the Sky Dome, Bartenbach also introduced the new World of Light, an immersive lighting environment developed as an interactive platform for customers, architects, designers, and partners.

Unlike traditional showrooms, the World of Light combines technical education, emotional experience, and application-based lighting demonstrations within a single environment. Visitors can explore multiple ceiling and lighting typologies, daylight and artificial lighting concepts, acoustic integration, and advanced luminaire systems.

Among the showcased systems are:

- Fluid – large-scale ceiling constructions with integrated LFO lighting elements creating exceptionally calm and homogeneous illumination
- Loop – demonstration systems showcasing various beam angles and optical distributions within one lighting platform
- Liva – an experimental ceiling concept integrating indirect RBW lighting lines
- Ticel – metal grid ceiling systems with integrated lighting points and indirect

RGB lighting for premium architectural applications
- Magnetic track systems – highly flexible, glare-controlled lighting solutions with acoustic integration and interchangeable components

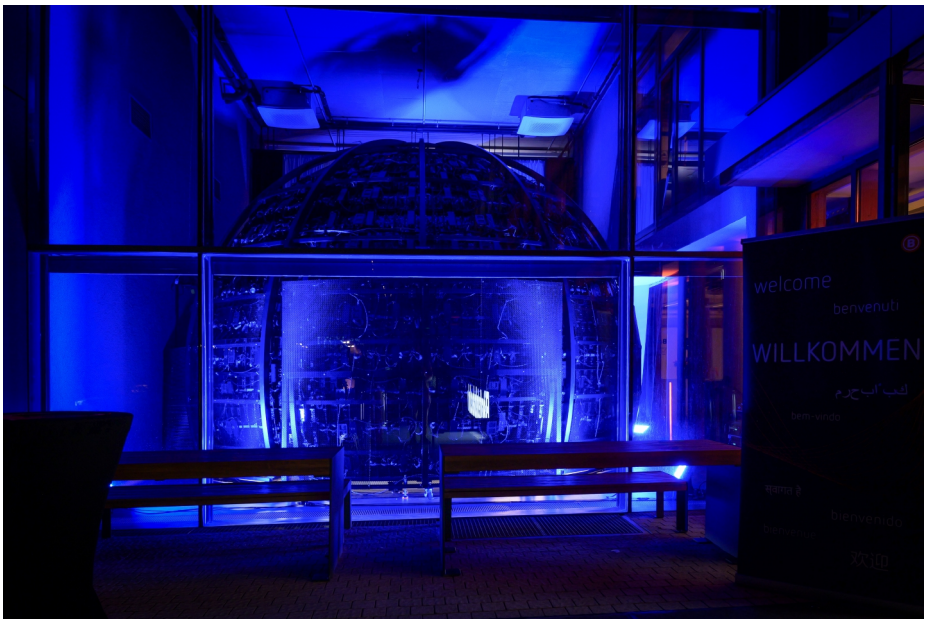
The World of Light is designed exclusively for customers and partners, positioning the facility as both an innovation center and a collaborative platform for future lighting concepts.

Lighting as an Emotional and Scientific Medium

With Bartenbach 7.0, the company demonstrates how lighting is increasingly evolving from a purely technical discipline into a multidimensional experience that integrates architecture, perception, health, and digital simulation.

The combination of advanced optical engineering, immersive visualization, and scientifically based lighting design reflects a broader industry transformation toward human-centric, data-driven, and emotionally engaging environments.

By merging research, simulation, and experiential presentation into one integrated platform, the new Sky Dome and World of Light establish Bartenbach not only as a lighting design leader, but also as a global innovation driver at the intersection of architecture, technology, and human perception. ■



Bartenbach

www.bartenbach.com

IALD Enlighten Europe 2026 – Brings Global Lighting Design Leaders to Paris

LED professional Editors

The International Association of Lighting Designers (IALD) announced that registration is now open for IALD Enlighten Europe 2026, the premier boutique conference for architectural lighting professionals. The event will take place from 17 to 19 June 2026, in Paris, France, bringing together the European lighting design community for three days of professional development, networking, and industry collaboration.

© IALD Enlighten Europe 2025.

Founded in 1969, the International Association of Lighting Designers (IALD) is an internationally recognized organization supporting lighting design professionals.

With members worldwide, the IALD champions the advancement of lighting design as both an art and a science, advocating for the power of light to transform environments and experiences.

"Paris, the 'City of Lights,' provides the perfect setting for our professional community to gather, learn, and take inspiration," said Christopher Knowlton, IALD Chief Executive Officer. "IALD Enlighten Europe 2026 will bring together the brightest minds in the industry for meaningful discussions that will shape the future of architectural lighting design."

Intimate by Design

IALD Enlighten Europe 2026 features dozens of top-tier educational sessions that bridge Creativity, Commerciality, and Collaboration—the three pillars of successful lighting design practice. Registration is intentionally capped below 400 attendees to facilitate meaningful connections and thought-provoking discussions among industry peers.

The conference serves the full spectrum of lighting professionals, including designers, architects, engineers, manufacturers, and suppliers. Developed by lighting designers, for lighting designers, the event benefits attendees through in-depth discussions, relationship-building, and networking opportunities rarely found at trade shows or larger industry gatherings.

Educational Excellence

Sessions at Enlighten Europe 2026 will be led by leading practitioners and thought leaders in architectural lighting design. The conference agenda challenges traditional thought, identifies emerging trends, and motivates attendees to advance the profession. Topics span the latest developments in lighting controls and systems integration, artificial intelligence and emerging technologies, health and well-being, and sustainability.

"The principles of peer-to-peer mentorship are built into these conferences," said Carla Wilkins, IALD, CLD, President of the IALD Board of Directors. "We learn at all stages from those with the most relevant guidance, regardless of hierarchical norms. Whether you're at the start of your career or an established professional, attending IALD Enlighten Europe will leave you feeling more informed, inspired, and prepared to harness the power of light."

Registration Information

For complete conference details, including venue information, agenda, speakers, and registration, visit iald.org/ee26.

More information on the IALD and its advocacy for the lighting design profession and the global community is available at iald.org. ■

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Good Light Group

The Good Light Group is an international non-profit organisation promoting the use of biologically effective light, indoors and outdoors, for better sleep, mood and overall health. We collaborate with leading researchers, architects, lighting designers, engineers and lighting companies to bring evidence-based daylight solutions into everyday environments.

Learn more or join us: **info@GoodLightGroup.org**

PREVIEW*
July/Aug 2026 | LpR 116

Human Centric Lighting

LED professional Review (LpR), July/August 2026, will focus on the evolving field of Human-Centric Lighting (HCL) and its growing impact on the design of healthy, productive, and sustainable environments. This issue will explore how advances in lighting science, controls, and connected technologies are enabling lighting solutions that support human well-being, circadian rhythms, visual comfort, and overall quality of life. It will highlight emerging research, standards, technologies, and practical applications across workplaces, education, healthcare, hospitality, and residential settings. In addition, we will present a curated selection of innovative projects and solutions that demonstrate the potential of Human-Centric Lighting in real-world environments.

* *Subject to change without notice.*

DEADLINES | LpR 116

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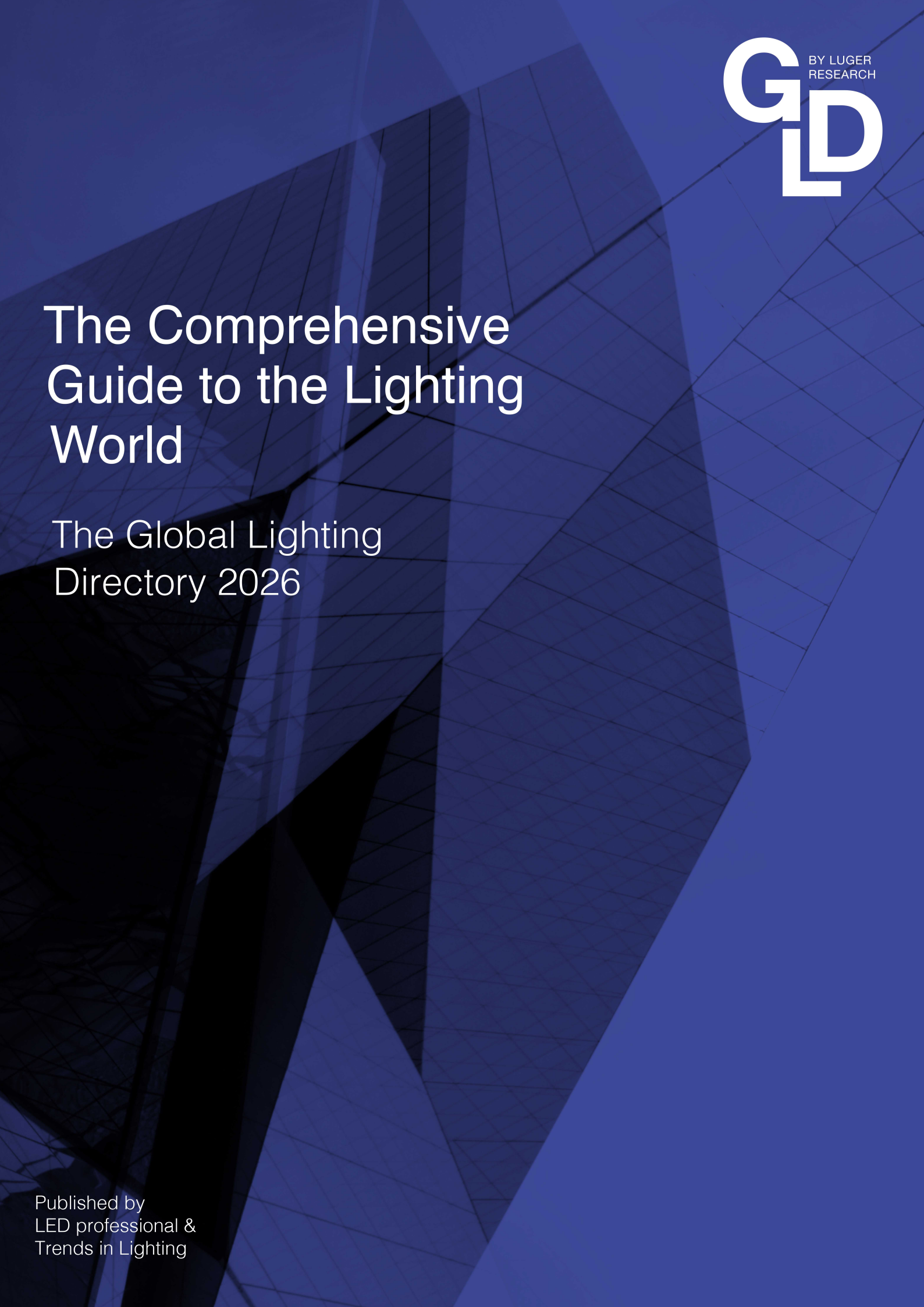

BY LUGER RESEARCH

The Comprehensive Guide to the Lighting World

The Global Lighting Directory 2026

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Main Topic in Our Next Issue

Human-Centric Lighting

Showcase in LpR #116

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