



DALI-2

Are you compliant?

With the DiiA updating and releasing new parts to the DALI certification program, the need to keep up-to-date on what is happening and where the standard is heading is more important than ever. The DALI standard (IEC 62386) represents a benchmark in lighting control and this standard sets the tone of power and control for the whole of the lighting industry.



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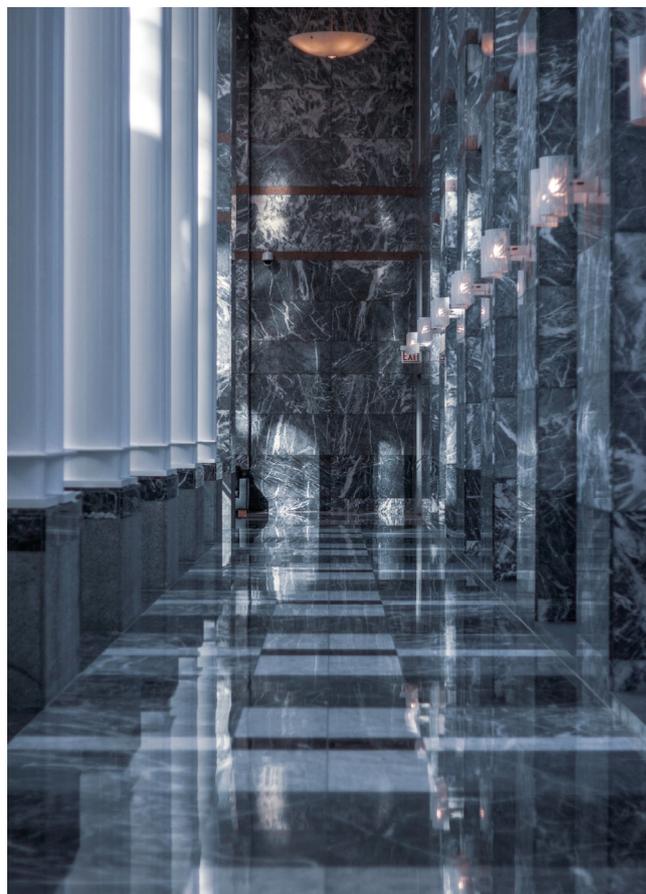
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Introduction

The key to unlocking the potential of any lighting application is the control system, particularly where customers are demanding greater functionality and integration of technology. To achieve the right mix of functionality and integration, an effective lighting control system must be specified. This allows spaces to be created with dynamic uses and properties as well as exploiting the best of the technology currently available in this field; automated dimming and colour control can be used to change the mood of a room and the dynamics of a zone or group of zones according to purpose, time of day, natural daylight, occupancy or other factors. Effective controls are also capable of significantly reducing energy consumption within the lighting system.

While there are plenty of case studies where connected lighting is forming part of a wider Internet of Things (IoT) application and further value is being recognised from lighting infrastructure and controls, this article focusses on a specific lighting control protocol and its impact on lighting particular applications.

DALI is going through an aggressive schedule of improvements to bring the protocol in line with user demands and technology potential. In this article, we explore some of the most recent developments.



What is DALI?

DALI (Digital Addressable Lighting Interface) is a standardised protocol for bi-directional communication between lighting control products with a 2-wire bus used for communication (commands/data) as well as for power to some devices. Commands allow control, configuration and querying of the products and can be addressed to individual devices, to a group of devices, or broadcast to all devices, while Scenes allow fast and efficient recall of settings across the system.



The DALI protocol was first drafted in the late 1990s and has undergone several revisions during its evolution, currently resulting in version 2 of the DALI standard IEC 62386, which is known as DALI-2.

The key principle of DALI is interoperability, and DALI-2 aims to help fill the gaps in the original standard.

Why DALI?

Standardised in IEC 62386, DALI is a dedicated communication protocol for lighting control which enables easy specification and installation of scalable and flexible lighting networks. Each DALI device can be assigned a separate address, allowing digital control of individual devices. Furthermore, the DALI devices can also be programmed to operate in groups. This provides excellent flexibility since

the lighting systems can be reconfigured by software reprogramming.

The digital nature of DALI allows two-way communication between devices, so a device can report a failure, answer a query about its status, or provide other information. Wiring is relatively simple; DALI power and data is carried by the same pair of wires, without the need for a separate bus cable.

DALI compliant vs DALI compatible

There are a lot of DALI devices on the market today which are not DALI compliant and are only DALI compatible.

Essentially this means the manufacturer has used parts of the DALI standard and embedded those parts into their product but have not had the product tested against the DALI standard through official testing methodologies and may not be a member of the DiiA.

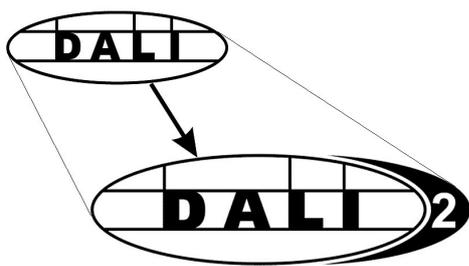
This DALI compatibility does not always extend to full DALI operation and interoperability, depending on how the manufacturer has implemented DALI. What this means is that those DALI compatible only products may not work correctly with other, DALI compliant devices, depending on what parts of the DALI standard have or have not been observed.

DALI compliant devices will have the official DALI logo on them. However, if in doubt it is possible to check the authenticity of that logo by searching for that manufacturer on the DiiA website. All manufacturers who use the DALI

logo on their products must be a member of the DiiA and for DALI-2, have the products themselves listed on its website. Therefore, if you have a product with the DALI logo but the manufacturer is not on the DiiA members list, you may have compatible devices which may not adhere to all of the parts of the DALI standard and could cause immediate or latent issues within a DALI system.

You can find an up to date list of all the DiiA members here:

www.digitalilluminationinterface.org



DALI version 2

DALI-2 brings new functionality to DALI lighting control systems by standardising devices such as application controllers and inputs while also promising improved interoperability.

The term refers to version 2 of IEC 62386, the international DALI standard. The standard itself has multiple parts, and not all of these are currently published as version 2. One of the key differences between DALI-2 and version 1 of IEC 62386, which has been in use for many years, is the incorporation in DALI-2 of control devices. These include application controllers and input devices of different types.

The first parts of the DALI-2 standard were published some time ago now, and more parts are being added regularly. However, the DALI-2 certification program by DiiA is now up and running and facilitating the approval of the first tranche of DALI-2 certified products.

The original DALI logo is used widely throughout the lighting industry to indicate products that are compliant with version 1 of the DALI standard. This logo usage will continue in the short term. However, DALI version-1 compliance testing is based on self-declaration by manufacturers, which means that the test results are not independently verified. For this reason, there can be interoperability issues for DALI version-1 products from different manufacturers.

In contrast, DALI-2 certification involves a verification step, in which the test results are checked to confirm that the correct tests have been carried out, and that the results are all successful.

Compatibility of DALI and DALI-2

Basically, the same commands are used for DALI and DALI-2, so DALI-2 devices are backwards compatible and can be easily integrated in conventional DALI systems.

It is also possible to use DALI devices in new DALI-2 systems, however the additional functions from DALI-2, of course, cannot be used.



Interoperability

DALI-2 certification promises significantly improved interoperability between DALI devices. The DALI-2 test sequences — the parameters for testing on approved test equipment — are much more detailed than for the previous DALI iterations and fill in many of the gaps that have known to cause interoperability problems in the past.

With this improved interoperability, the use of DALI-2 certified products should now result in far fewer issues and better control in the quality and functionality of certified products.

Each device with DALI-2 logo is tested for compatibility with standardised test equipment and certified by the DiiA. Confirmation is listed in the product database of the DiiA where you will be able to search and identify all verified DALI-2 products that have gone through this process:

www.digitalilluminationinterface.org/products

Parts of the standard and test sequences

This is quite an important factor in the latest generation of DALI products. The DALI standard (IEC 62386) is divided into parts and each part has a unique set of test sequences

for compliance testing. Testing can be carried out either by a manufacturer (assuming they have invested in the correct test equipment) or by a test house. In either case, test results are independently verified by DiiA before DALI-2 certification is granted. Let's look at some of the most relevant parts for the standard (both current and projected):

The DALI-2 certification program began with parts 101 and 102 of IEC 62386, which contain general requirements for system components and control gear, respectively (along with part 207 for LED modules). These parts set out specific requirements for control gear for LED modules, meaning that most of the first batch of certified DALI-2 products were LED drivers.

Test sequences for part 209, covering colour control, are already in progress. Once added to the DALI-2 program, LED drivers that can control the colour output of an LED lamp or luminaire will be available through a standardise dformat within the DALI system. To achieve this, the LED drivers will need to adhere to parts 101 and 102 (general), part 207 (LED drivers), and part 209 (colour control).

Control devices

DALI-2 includes control devices (Part 103 and Parts 3xx) for the first time. Test sequences for part 103 – general requirements for control devices – are now being developed. These will be joined by parts 301–304, which will enable certification of various input devices; for example, part 303 covers occupancy sensors, and part 304 covers light sensors. Future parts are also planned, such as part 305, which cover colour sensing devices.

Control devices can be separated into application controllers and input devices, although both device types can be incorporated in the same product. Application controllers are the brains of a DALI system; they gather information, make decisions and send commands to control gear and other devices. Application controllers can be single masters – where only one is allowed on the DALI bus – or they can be multi-masters. Input devices provide information to the DALI system, and usually operate by sending a message on the DALI bus to indicate a change in state or measurement value. All input devices are multi-masters; examples include push-buttons, light sensors and occupancy sensors.

Colour control

Colour control of lamps and luminaires has many applications; in office, commercial and public space, it can enable the optimisation of colour temperature of white lighting (e.g. human-centric lighting). In high-end architectural or retail projects, it can be used as mood lighting and scene-setting or to aid with promotion/marketing. DALI colour control is already covered by part 209 of IEC 62386, which defines four colour types, however, IEC has plans to separate the two most popular types into separate parts for ease of use. These are XY chromaticity, which allows selection of a colour within the CIE 1931 chromaticity diagram, and colour temperature (Tc), which allows selection of the correlated colour temperature with reference to the black-body line.

Commonly referred to as DT8 DALI drivers, these LED Drivers comply to part 209 (colour control) and have between 2 and 6 colour channels to allow for colour control against the standard part 209 structure.



Wireless DALI

IEC has recently issued a pre-release version of part 104 of IEC 62386 which is based on replacing the lower layers of the protocol stack that are currently described in the system part (101) of IEC 62386. Part 104 currently includes the choice of one of four different underlying communication protocols, namely:

- Bluetooth® Mesh
- VEmesh™
- Distributed PLC bus (DPB)
- User datagram protocol (UDP)

Bluetooth Mesh and VEmesh are wireless protocols allowing for mesh connectivity in a system. The latter is a proprietary technology from Virtual Extension (a DiiA member), which is licensed to other companies.

DPB is a proprietary version of PLC, or Power Line Communication, which uses the existing supply wiring for the communications signal.

UDP is related to Internet Protocol (IP), and can be wired (Ethernet) or wireless (WiFi), among other possibilities.

Conclusion

For the lighting designer, the new additions to DALI offer added support for colour control, covering both RGB and colour temperature. This increased colour control gives many more options in how they can control the light to deliver more efficient, attractive and impactful designs.

For a systems integrator, DALI-2 offers interoperability and efficient system design with quality and performance control standardised across different manufacturers/devices with added benefits of simplified commissioning, maintenance and modifications.

However, arguably it is the end-user that has the biggest win with the progression of the DALI standard. As well as the benefits identified above, a correctly specified and installed DALI control system should allow for better integration of lighting as a technology, more control and information feedback from the system and greater access to the performance and customisation characteristics which can be achieved with the existing and emerging breakthroughs in lighting.

Keep connected

At Bright Green Connect we are constantly monitoring the market to keep up to date with technology. Keeping our customers connected with the right level of control is important to us. To find out more visit:

www.brightgreenconnect.com