

DALI-2 and D4i Certifications Add Features and Benefits

How new standards are defining a new form of smart lighting control

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DALI (Digital Addressable Lighting Interface) protocol is a mainstream dedicated protocol for digital lighting control that enables the easy installation of robust, scalable and flexible lighting networks. The protocol, or language, is based on bi-directional digital communication between lighting-control products. The same pair of wires is used for both communication (sending commands/data) and for supplying power to some devices.

DALI enables precise control, configuration and querying of devices on the DALI bus. Communication is robust, due to the digital nature of DALI, and is also bi-directional, enabling feedback. Commands can be addressed to individual devices, or to a group of devices, or can be broadcast to all devices. This makes communication very efficient.

Each DALI subnet has a maximum of 64+64 addresses, meaning that 64 control gear (e.g. LED drivers) AND 64 control devices (e.g. sensors or application controllers) can be connected on the same



DALI bus. DALI allows flexible reconfiguration of groups using software, rather than via rewiring, while “out-of-box” operation is also possible for simpler networks. The use of pre-programmed scenes allow fast and efficient recall of light levels across the system. Also, the dimming curve for DALI control gear is standardised and tested, which provides device-to-device consistency in light output. DALI also specifies methods for colour control. And, importantly, DALI also includes emergency lighting, allowing periodic, automated self-testing, which is a legal requirement in many countries.

DALI-2: the next generation of DALI

Building on the long-established

benefits of DALI, the DALI-2 certification programme has many new improvements especially in terms of scope, application scenarios, and product certification.

DALI-2 refers to the latest version of IEC 62386, the international DALI standard. Compared with DALI version-1, DALI-2 includes more features and more product types, and has a strong focus on product interoperability.

For the first time, DALI-2 brings standardization to control devices such as sensors and other input devices, as well as application controllers, which are the “brains” of a DALI system. Control devices were not included in the original DALI version.

DALI-2 incorporates much more detailed and rigorous testing requirements, which ensure that products from different suppliers are able to work together. To support this interoperability promise, DiiA introduced the DALI-2 certification program, which includes verification of test results before certification is granted. DiiA organizes regular test events (Plugfests) to enable validation and further improvement of the DALI-2 test procedures.

Compared with DALI version-1, DALI-2 includes clearer specifications for control-gear features such as timing, fading, power-on and start-up, as well as new features such as extended fade times. DALI-2 is designed for backwards compatibility, so DALI-2 control gear can be used in older systems.

DALI-2 making waves with D4i boost

Last year, DiiA introduced DALI-2 certification of sensors and other input devices, which was a key milestone. Also, DiiA's Technical and Certification Work Group (T&C WG) made strong progress in a number of other areas via its many subgroups. For example, additional new features such as colour control have been added to the scope of DALI-2 certification.



Figure 1: Examples of certified DALI-2 products

The programme now specifically incorporates tunable white of LED drivers, enabling human-centric lighting that mimics changes in natural light during the day.

Additionally, the DALI-2 certifica-

tion was extended with the D4i specifications for LED drivers and control devices. D4i is aimed principally at intra-luminaire DALI, where DALI-2 devices are connected by a DALI bus inside the luminaire. D4i specifies LED driv-

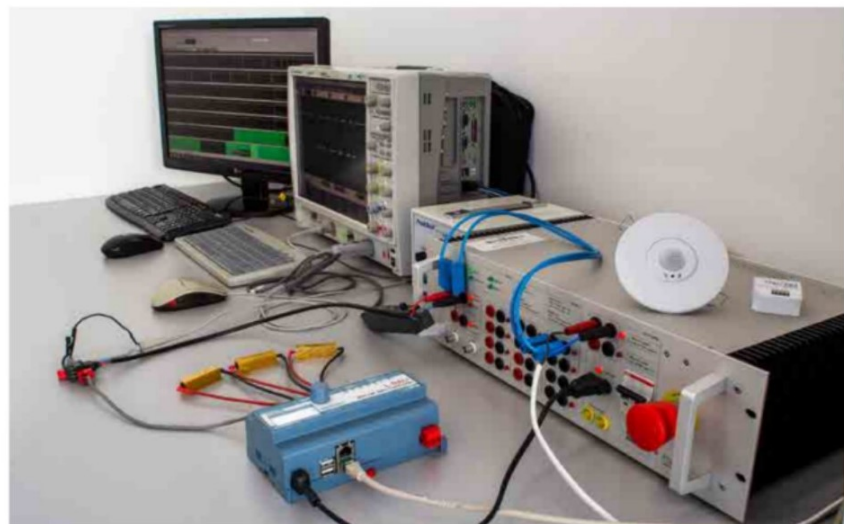


Figure 2: Typical set-up for DALI-2 testing, showing a DALI-2 application controller (centre) and a ProbitLab2 tester from Lichtvision Engineering (right). Image courtesy of LOYTEC Electronics GmbH.



ers with Smart Data capabilities; such devices can store and report data related to the light source, driver and luminaire, for enhanced asset tracking and performance monitoring.

D4i also takes care of the power-supply requirements for the DALI bus and for control devices such as sensors or wireless communication devices that are attached to the luminaire. D4i is already proving extremely beneficial for street-lighting applications and city-wide lighting networks. Also, DiiA is working closely with the Zhaga Consortium to combine D4i luminaires with Zhaga connectors, enabling plug-and-play interoperability of luminaires, sensors and communication nodes.

Moreover, the new D4i specifications enable data-rich luminaires that can function as intelligent nodes in the IoT. All D4i-certified drivers and control devices are also DALI-2 certified. Such products can optionally carry either the D4i logo or the DALI-2 logo, or both.

DALI alliance formed with Zigbee

DiiA is committed to address different options for combining wireless communication links with DALI lighting control. The organisation is working to bring further standardization and system interoperability to the IoT luminaires space. With no one wireless protocol solely dominating smart building network infrastructure, DiiA is developing partnerships with all

of the leading players to provide choice for different application scenarios.

In April 2020, DiiA and the Zigbee Alliance announced they are collaboratively developing specifications for a gateway that delivers translation between Zigbee and DALI “languages”.

Gateways will combine a Zigbee transceiver with wired DALI terminals, and could be a stand-alone device or housed within a luminaire or another device. A cooperative certification programme once completed will enable manufacturers of gateways, luminaires and other lighting devices to verify compliance with the specifications.

While the DALI protocol provides the lighting-control commands, the gateway enables connectivity with Zigbee-enabled devices, for example in building management systems. By blending reliable, cost-effective, low-power wireless Zigbee technologies with DALI’s proven digital lighting control, smart lighting projects can deliver new levels of optimization.

During the same month, the concept of “Wireless DALI” and broader interoperability has been further boosted through a partnership announced with Thread, a membership organisation that backs a wireless mesh networking protocol, based on the universally supported Internet Protocol (IP) and built using open and proven standards. Thread’s low-power,

secure, and self-healing wireless mesh network will effectively serve as a complementary communications channel to transmit DALI’s lighting-control commands.

Together, DiiA and Thread will implement protocols for commissioning and operating devices in lighting and building networks. These will include credential delivery, service discovery and network management. For Thread, the collaboration advances its core commitment to the convergence of IoT with IP as the foundation, and the expansion of smart solutions both in the home and offices.

Looking ahead, DiiA is also eyeing specifications for DALI over Bluetooth mesh, as well as developing a standardized gateway between Bluetooth and DALI. A cooperative agreement with the Bluetooth Special Interest Group (Bluetooth SIG) is imminent. Watch this space for more details.

In summary, with its specific focus on lighting, and its rich feature set, DALI-2 is the world’s only open standard for lighting control. With unrivalled DALI-2 interoperability, the lighting industry gains further confidence in multi-vendor consistency and reliability. Moreover, DALI-2 enables lighting systems that are robust, scalable, cost-effective, reliable and flexible.

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