Introducing DALI and the DALI Alliance
The DALI Alliance

The global lighting-industry organization for the Digital Addressable Lighting Interface (DALI)

We are also known as the Digital Illumination Interface Alliance (DiiA)
Regular members
DALI: The basics

- DALI® is the industry-standard protocol (language) for bi-directional, digital communication between lighting-control devices.
  - Dedicated to lighting, with a rich feature set

- DALI is derived from the open, global standard IEC 62386.

- DALI-2™ is the certification program based on the latest version of the DALI protocol.
  - Driven by the DALI Alliance (DiiA)
  - Ensures interoperability through testing and certification

- DALI, DALI-2, D4i and DALI+ trademarks controlled by the DALI Alliance (DiiA)
DALI product brands

- DALI®
  - Self-testing and registration (no third-party verification)
  - Control gear only

- DALI2®
  - Certification, backed by rigorous testing & verification
  - All product types

- DALI+™
  - Part of DALI-2 certification, with compulsory feature set
  - Enables smart, connected luminaires
  - LED drivers and luminaire-mounted control devices
  - New certification programs for DALI over wireless and/or IP-based carriers
  - First is DALI+ with Thread (in progress)
  - All product types

DALI version-1 registration ended April 2022
DALI-2 certification: Overview

- DALI-2 certification indicates **multi-vendor product interoperability**
- **Rigorous and detailed testing**, followed by **verification** of test results
- Allows **trademark use**
- Products are **traceable** in the Product Database
  - [www.dali-alliance.org/products](http://www.dali-alliance.org/products)

- DALI Alliance drives DALI-2 certification
  - First DALI-2 products (LED drivers) certified in September 2017
  - Ongoing addition of new features and new products types

- DALI Alliance creates DALI-2 Test Procedures
  - Test Sequence software is provided to members
  - Members can perform testing, or use accredited test houses
Key features of DALI-2

- Focuses on multi-vendor interoperability, backed by DALI-2 certification.
- Extends to all devices in a lighting-control system, including input devices (e.g. sensors) and application controllers.
- Designed for backwards-compatibility with older DALI systems.
- More features and clearer specifications.
- More detailed and comprehensive testing requirements.
D4i overview

• D4i is an extension of DALI-2 certification
• D4i components have a compulsory set of features
  – Based on power-supply and data specifications from Diia
• All D4i LED drivers provide luminaire, energy & diagnostics data
• D4i enables DALI inside intelligent, IoT-ready luminaires
  – Other D4i implementations are also permitted
• D4i simplifies addition of sensors and communication devices to luminaires
• D4i enables plug-and-play interoperability when combined with a
  connector system
  – e.g. Zhaga Books 18 & 20 or NEMA/ANSI C136.41
## Product Database

- Product Database ([www.dali-alliance.org/products](http://www.dali-alliance.org/products)) contains all certified (DALI-2 and D4i) and registered (DALI version-1) devices
- Allows users to check that devices are certified
- Results can be filtered by brand, product type, DALI features and more

### DALI-2 certified products
- Fully tested, independently verified
- • Control gear
  • Application controllers
  • Input devices
  • Bus power supplies
  • Aux power supplies

### D4i certified products
- Fully tested, independently verified
- • LED drivers
  • Luminaire-mounted control devices

### Registered DALI version-1 products
- Self-declaration of test results, no verification
- Closed to further registrations
- • Control gear only
Organization
The DALI Alliance

- The DALI Alliance is an open, global consortium of lighting companies that aims to grow the market for lighting-control solutions based on DALI.

- Also known as Digital Illumination Interface Alliance

- More than **300 members** worldwide
  - Industry leaders in lighting and control
  - Full list on our [website](#)

- Membership allows certification or registration of products:
  - More than 2,700 **DALI-2 certified products**
  - More than 1,600 DALI version-1 registered products

- Membership allows **trademark use**
  - Logos and word trademarks: DALI, DALI-2, D4i and DALI+
Members and DALI-2 certified products

- DALI-2 LED drivers (Aug 2017)
- DALI-2 application controllers (Aug 2018)
- DALI-2 input devices (June 2019)
- D4i LED drivers (Nov 2019)
- D4i control devices (Dec 2020)
DALI Alliance member benefits

- Two membership classes: **Regular** & **Associate**
- **Community** registration is free for luminaire makers

- All members (**Regular & Associate**) can:
  - Certify products (DALI-2, D4i, DALI+)
  - Receive test-sequence software
  - Use DALI Trademarks (according to usage rules)

- In addition, **Regular members** can:
  - Participate in Work Groups
  - Influence future developments
  - Have access to draft specifications, progress reports etc
  - Participate in interoperability test events (Plugfests)

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www.dali-alliance.org/membership/benefits.html
DALI market

- Very large installed base of projects, spanning three decades
  - See our website for case studies and winners of the DALI Lighting Awards

- From small installations to major infrastructure projects
  - e.g. Crossrail in London, New York City Transit and Beijing Airport

- DALI is “the largest wired digital open protocol in the world for lighting.”
  - Pål Karlsen, Omdia, LED Professional May/June 2020 issue, Link

- “Open protocols will be the growth winners over the next few years in smart lighting and connected controls.”
  - Ibid

- “DALI is the largest segment for smart lighting, with 15% CAGR expected over the next 5 years”
  - Global Smart Lighting Market research report, Link
DALI Lighting Awards 2021

- Expo 2020 Dubai, UAE
- Doha Metro, Qatar
- Kühne + Nagel, Germany
- The Londoner, UK
- Regent's Crescent, UK
- The Spine, UK
- Overpass in Xi’an, China
- Warwick University, UK
DALI Lighting Awards 2022

• Deadline: December 2, 2022
• Entry requirements and submission form: www.dali-alliance.org/awards2022
## DALI trademarks and logos

- All wordmarks and logos shown here are Trademarks in various countries in the exclusive use of DiiA. Full details here: [www.dali-alliance.org/trademarks](http://www.dali-alliance.org/trademarks)
- Trademarks (logos and wordmarks) may be used by DiiA members ONLY.
- DALI devices can use Trademarks only if they are visible on our website
  - Does not apply to luminaires

<table>
<thead>
<tr>
<th>Trademark</th>
<th>Description</th>
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</table>
| DALI®       | • Used on DALI version-1 registered products  
              • Used to show membership of DiiA                                    |
| DALI-2®     | • Used on DALI-2 certified products only                                       |
| D4i™        | • Used on D4i certified products only                                         |
| DALI+        | • Used on (future) DALI+ certified products only                             |

* * Word Trademarks apply regardless of font, style or other properties.
Key technical features
DALI: The basics

The internationally-standardized protocol for digital communication between lighting-control devices

- Digital
  - Two-way communication and exchange of data between lighting-control devices

- Addressable
  - DALI devices are individually addressable

- Lighting
  - DALI is dedicated to lighting, with a rich feature set
DALI protocol: Key features

DALI enables:

• **Control, configuration & querying** of DALI devices over a 2-wire bus
  – DALI power and data on same pair of wires

• **Individual, group & broadcast addressing** to any DALI device

• Recall of pre-programmed scenes

• Flexible reconfiguration using software

• Each DALI subnet has a maximum of **64+64 addresses**
  – 64 control gear (e.g. LED drivers) AND 64 control devices (e.g. sensors)

• Robust digital communication

• Two-way data exchange and feedback
DALI protocol: Commands and scenes

- Commands allow control, configuration and querying of DALI devices.

<table>
<thead>
<tr>
<th>Command type</th>
<th>Examples</th>
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</table>
| Control      | • start a fade to a defined light output level  
               • recall scenes  
               • turn the lights off |
| Configuration| • change the fade time  
               • change the light level stored in a scene |
| Query        | • ask what the current light output level is  
               • ask whether there is a lamp failure |

- Commands can be addressed to individual devices, to a group of devices, or broadcast to all devices. This makes communication very efficient.
- Scenes allow fast and efficient recall of light levels across the system.
  - Each item of control gear has 16 scenes. A single GO TO SCENE command instructs all the lights, or any combination of the lights, to go to individually pre-defined levels and/or colours.
DALI systems: Wiring and bus power

- DALI uses a **2-wire bus** for communication (commands/data)
  - **Power and data** on the same pair of wires

- DALI bus must be powered to allow communication
  - **250 mA max.** bus power supply
  - Same pair of wires also supplies **bus-powered devices** e.g. sensors, push-buttons

- **Standard 2-core cable** (1.5 mm²) can be used
- **Maximum 300 m** cabling recommended (between furthest-apart devices)

- **Polarity-free & free wiring topology** is allowed
  - Bus wiring can use daisy-chain or star connections, or combinations of these
  - A closed loop should not be used
Wired DALI lighting-control system example

- **Application controller with bus power supply**
- **Emergency lighting control gear**
- **Occupancy & light sensor (input device)**
- **LED driver**
- **LED lamp**
- **Luminaire**
- **Gateway, router, hub or interface**
- **Network, backbone or building management system**

*Each DALI subnet can have 64 control gear AND 64 control devices*
DALI-2 certification & specifications
DALI-2 certification

Overview and comparison with DALI version-1

**DALI version-1 registration**
- Successful test for compliance
- Register product with DiiA
- Using latest DALI version-1 Test Sequences
- Only possible for control gear
- No verification step for DALI version-1 registration
- Informed member
- Product listed in DiiA online database
- Product can display DALI version-1 logo

**DALI-2 certification**
- Successful test for compliance
- Submit results to DiiA
- Using latest DALI-2 Test Sequences
- Results verified by DiiA
- Success
- Failure
- DALI-2 certification granted
- Product can display DALI-2 logo
DALI-2 certification

Overview and comparison with DALI version-1

**DALI version-1 registration**

- DALI version-1 registration ended on April 17, 2022
  - All registered products will remain visible in the Product Database

**DALI-2 certification**

- Successful test for compliance
- Using latest DALI-2 Test Sequences
- Submit results to DiiA
- Results verified by DiiA
  - Success
    - DALI-2 certification granted
    - Product can display DALI-2 logo
  - Failure
    - Inform member
- Product listed in DiiA online database
- Product can display DALI version-1 logo

DALI version-1 registration ended on April 17, 2022
All registered products will remain visible in the Product Database.
DALI-2 test specifications

- Created by the DALI Alliance to enable DALI-2 certification
- Based on:
  - Individual Parts of IEC 62386
  - DiiA Specifications
- Maintained and updated by the DALI Alliance, with input from Plugfest events
The DALI Alliance organizes interoperability test events (Plugfests) for members, which enable validation and further improvement of DALI-2 Test Procedures.
Testing procedures for DALI-2 are much more detailed and comprehensive than for DALI version-1, and are reviewed and updated as required.
DALI Alliance works closely with IEC

- DiiA participates in the **IEC work group WG 11** of TC 34.
- **WG 11 develops and maintains IEC 62386**, the international DALI standard.
- DiiA provides **Clarifications and Recommendations** to WG 11, which are used by IEC in future updates of IEC 62386.
- **DiiA Specifications** are provided to IEC to be incorporated into IEC 62386.

**IEC 62386 Standard (multiple Parts)**

**DiiA Specifications provided to IEC for inclusion in IEC 62386**

**DiiA feedback & amendments provided to IEC**

**DiiA Specifications (e.g. Parts 25x)**

**DALI-2 test specifications**
The DALI Alliance creates DALI-2 tests based on individual Parts of IEC 62386, as well as DiiA Specifications, enabling DALI-2 certification.
## DiiA Specifications

### Published DiiA Specifications:
[www.dali2.org/specifications/download.html](http://www.dali2.org/specifications/download.html)

<table>
<thead>
<tr>
<th>Category</th>
<th>Name</th>
<th>Published</th>
<th>DALI-2*</th>
<th>D4i*</th>
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<tbody>
<tr>
<td><strong>Power Supply Specifications</strong></td>
<td>DALI Part 150 – AUX Power Supply</td>
<td>v1.1, Oct 2019</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td><strong>Data Specifications for LED Drivers</strong></td>
<td>DALI Part 251 – Memory Bank 1 Extension (luminaire data)</td>
<td>v1.1, Oct 2019</td>
<td>✓</td>
<td>✓</td>
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<tr>
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<td>DALI Part 252 – Energy Reporting (energy data)</td>
<td>v1.1, Oct 2019</td>
<td>✓</td>
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<td>DALI Part 253 – Diagnostics &amp; Maintenance (diagnostics data)</td>
<td>v1.1, Oct 2019</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td><strong>Specifications for Control Devices</strong></td>
<td>DALI Part 351 – Luminaire-mounted Control Devices</td>
<td>v1.0, Oct 2019</td>
<td>✓</td>
<td>✓</td>
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<td><strong>Connectivity Specifications</strong></td>
<td>Part 104 Changes &amp; Additions</td>
<td>v1.01, April 2021</td>
<td>n/a</td>
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<td>Part 341 – Bluetooth Mesh to DALI Gateway</td>
<td>v1.01, April 2021</td>
<td>**</td>
<td>n/a</td>
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<tr>
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<td>Part 342 – Zigbee to DALI Gateway</td>
<td>v1.01, April 2021</td>
<td>**</td>
<td>n/a</td>
</tr>
</tbody>
</table>

* Availability of DALI-2 and D4i certification

** In progress
DALI data specifications

- Data for enhanced asset management & performance monitoring
- Data storage in DALI memory banks, with standardized format & locations

DALI Part 251 – Luminaire Data
- Information about the luminaire (e.g. ID code, light output, CCT & CRI, light distribution etc) can be stored in the control gear
- Enables asset management

DALI Part 252 – Energy Reporting
- Provides real-time power & energy usage for control gear

DALI Part 253 – Diagnostics & Maintenance
- Operating data for control gear and lamps, including failure conditions, run-time data
- Enables predictive maintenance

These specifications are available from DiiA, and are also included in ANSI C137.4
DALI-2 certification: Parts available

Part 101: General requirements – System components

Part 102: General requirements – Control gear
- Part 202: Self-contained emergency
- Part 205: Incandescent lamp dimmer
- Part 206: Conversion to DC (0/1-10 V)
- Part 207: LED drivers
- Part 208: Switches and relays
- Part 209: Colour control

- Part 250: Integrated bus power supply
- Part 251: Luminaire data
- Part 252: Energy data
- Part 253: Diagnostics data

Part 103: General requirements – Control devices
- Part 301: Push buttons
- Part 302: Absolute input devices
- Part 303: Occupancy sensors
- Part 304: Light sensors
- Part 351: Luminaire-mounted control devices

In progress:
- Part 341: Bluetooth Mesh to DALI Gateway
- Part 342: Zigbee to DALI Gateway

Current status: [www.dali-alliance.org/dali2/status.html](http://www.dali-alliance.org/dali2/status.html)
Wired DALI lighting-control system example

Each DALI subnet can have 64 control gear AND 64 control devices

Network, backbone or building management system

Gateway, router, hub or interface

Push-button input device

Luminaire

LED lamp

LED driver

Occupancy & light sensor (input device)

Emergency lighting & signage

Emergency lighting control gear

Wired DALI bus

Application controller with bus power supply

DALI subnets

DALI Alliance presentation
Certified DALI-2 LED drivers are available from a large number of suppliers.

LED driver with DALI-2 tunable white colour control

D4i-certified LED driver

www.dali2.org/products
DALI-2 application controllers, bus power supplies

- DALI-2 single-master application controllers, with integrated bus power supplies
- DALI-2 standalone bus power supply
- DALI-2 multi-master application controller

www.dali2.org/products
DALI-2 input devices

DALI-2 input device (push-button switch)

DALI-2 occupancy and light sensor

DALI-2 push-button coupler

www.dali2.org/products
Luminaires

- Community registration is free of charge for luminaire makers
- Enables DALI Trademark use for qualifying luminaires
- DALI Alliance does not offer certification of luminaires

- **DALI-2 luminaires** contain DALI-2 certified components from members
- **D4i luminaires** meet the requirements in “D4i Certification and Trademark Use”
- **Zhaga-D4i luminaires** are certified by Zhaga & listed in the Zhaga product database
Certified D4i and Zhaga-D4i products

D4i control device

D4 LED driver

Zhaga-D4i control device and luminaires
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Thank you!!