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# **DALI-2: Standardized, interoperable components and smart luminaires**

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1. Introduction, key facts & benefits
2. DALI-2 certification process
3. IEC 62386 overview, including new DiiA specifications
4. New DiiA specifications for components of smart luminaires
5. Next steps
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**D**igital **A**ddressable **L**ighting **I**nterface

- **World-wide standard** for lighting control communications
- Technically managed in the open standard **IEC 62386**
- Driven by Digital Illumination Interface Alliance (DiiA)
- Ensures **Interoperability** through **testing, certification** and **registration** with **trademark** use
- **Control, configuration & querying** of devices
- **Individual, group & broadcast addressing** to any DALI device
- DALI and DALI-2 trademarks owned by  Digital Illumination Interface Alliance

- **Technical limits**
  - max. 64+64 addresses per DALI subnet
  - max. 300 m cabling (between furthest-apart devices)
  - max. 250 mA bus power supply
- **Digital benefits**
  - Robust communication
  - Addressing: individual (64+64), groups (16/32) and broadcast (all)
  - Changes via software
  - Two-way communication (feedback)
- **Cabling benefits**
  - Standard 2-core cable (1.5 mm<sup>2</sup>)
  - Polarity free & free wiring topology
  - DALI power and data on same pair of wires



Currently, the standard describes **three basic types** of devices:

- **Control gear**

- These are normally directly connected to the lamp, providing it with power



- **Control devices (two basic types:)**

- Application controllers
- Input devices



- **Bus power supplies**

- Provide typically 16 V, up to 250 mA to power the bus.



# DALI – key facts – control devices

- Control devices are new to the DALI-2 standard (IEC 62386-103). There are two types:

- **Application controllers**

- The “brains” of the system.
- Use information from any source, make decisions and can send commands to the control gear.



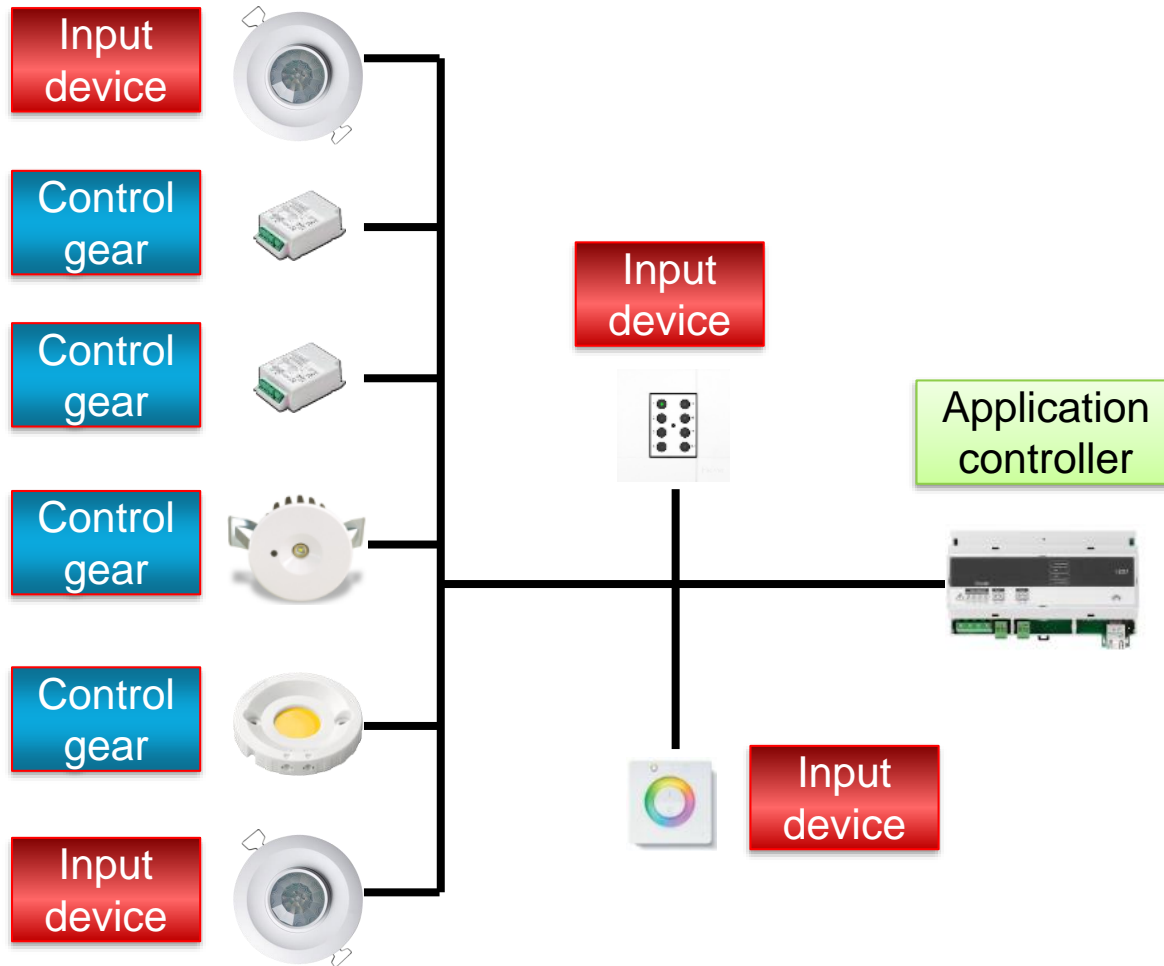
- **Input devices**

- Fairly simple devices that provide information to the system.
- Examples include push-buttons, sliders, occupancy sensors, and light sensors.



- The following page shows **one example of a system** including control devices.

# DALI – key facts – example system



- Control gear
- Input devices (control devices)
- Application controller (control device)

## Note:

- Systems can contain more than one application controller.
- A bus power supply is required, either separate or integrated with an existing device.

- **Certification**

- Required for DALI-2 products.
- DALI-2 is the second version of the IEC 62386 standards.



- **Registration**

- Required for DALI version-1 products.
- Limited to control gear (there are no DALI version-1 control devices).





# DiiA certification – process

- **Test the product**



- Self-tested using the approved tester and the official test sequence software.
- Alternatively: use a DiiA accredited test-house.

- **Submit product information and test results**

- This is done through the member's DiiA website account.

- **Verification by DiiA**

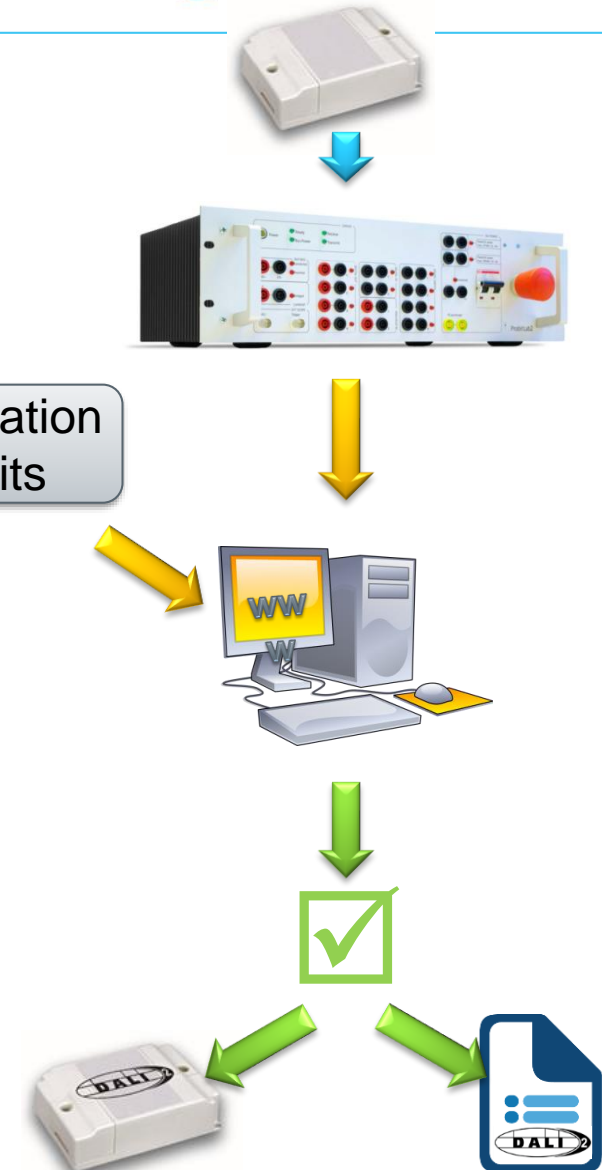


- Test results and product information is checked.

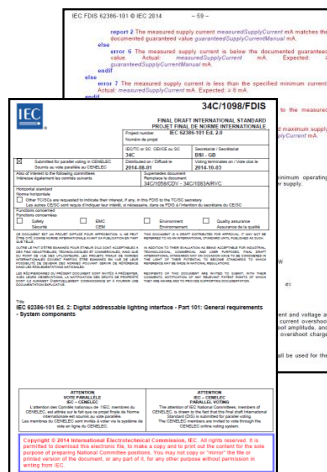
- **Trademark use:**



- The DALI-2 trademark may be applied to the product and product literature.
- The product is automatically included in the public database.



- Many existing IEC 62386 parts for:
  - Control gear
  - Control devices
  - Bus power supplies
- Several IEC parts are in progress



## IEC 62386 standard

Red text = DALI-2 versions published

**Part 101: General requirements – System components**

**Part 102: General requirements – Control gear**

Part 104: General requirements – Wireless and alternative wired systems **In progress**

**Part 103: General requirements – Control devices**

Parts 2xx: Particular requirements for control gear

Part 105: General requirements – Firmware update **In progress**

Parts 3xx: Particular requirements for control / input devices

- Published:**
- Part 201: Fluorescent lamps
  - Part 202: Self-contained emergency lighting
  - Part 203: Discharge lamps (excluding fluorescent lamps)
  - Part 204: Low voltage halogen lamps
  - Part 205: Supply voltage controller for incandescent lamps
  - Part 206: Conversion from digital signal into DC voltage
  - Part 207: LED modules
  - Part 208: Switching function
  - Part 209: Colour control
- For Parts 207, 202 and others, DiIa adapts DALI version-1 test sequences for use with DALI-2.

- Published:**
- Part 216: Load referencing
  - Part 217: Thermal gear protection
  - Part 218: Dimming curve selection
  - Part 221: Load shedding
  - Part 222: Thermal lamp protection
  - Part 224: Integrated light source
- In progress:**
- Part 219: Power measurement
  - Part 220: Centrally-supplied DC emergency operation
  - Part 223: Light-output compensation over lifetime
  - Part 225: Colour Tc
  - Part 226: Colour xy

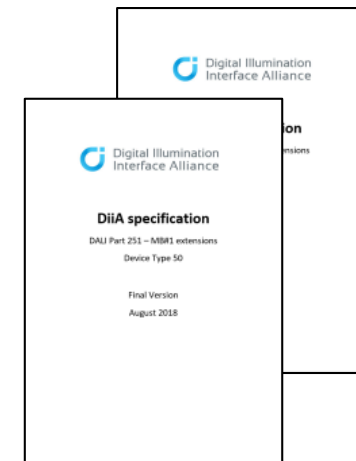
- Published:**
- Part 301: Push buttons
  - Part 302: Absolute input devices
  - Part 303: Occupancy sensors
  - Part 304: Light sensors
  - Part 332: Input control devices - Feedback
  - Part 333: Manual configuration
- In progress:**
- Part 307: Relative input devices
- Future part:**
- Part 305: Colour sensor

Updated: June 2018

For latest version, see: [www.digitalilluminationinterface.org/dali/standards.html](http://www.digitalilluminationinterface.org/dali/standards.html)

# New DiiA Specifications

- Several new specifications have been developed by the DiiA
- For use in smart luminaires, and products attached to smart luminaires
- **Specifications:**
  - DiiA part 250 – Integrated Bus Power supply
  - DiiA part 251 – Memory bank 1 extension (luminaire data)
  - DiiA part 252 – Energy reporting
  - DiiA part 253 – Diagnostics and Maintenance
  - DiiA AUX – Auxiliary power supply
  - Additionally, one further part is currently under development
- **Collaborations:**
  - DiiA plans to give these specifications (parts 250-253) to the IEC 62386 working group (WG11).
  - DiiA also has collaboration with Zhaga and ANSI C137.



- **DiiA part 250 – Integrated Bus Power supply:**
  - For control gear
  - Includes:
    - Integrated DALI bus power supply
      - Suitable for powering sensors or communication modules in a luminaire
    - Memory bank:
      - Current ratings can be read
      - PSU can be enabled or disabled – allowing use in systems with multiple bus PSUs

- **DiiA part 251 – Memory bank 1 extension:**
  - For control gear
  - Memory bank describes luminaire information, including:
    - Supply power and voltage ratings
    - Light output, including CCT/CRI ratings
    - Light distribution type
    - Luminaire colour
    - Text luminaire identification/descriptions

- **DiiA part 252 – Energy reporting:**
  - For control gear
  - Includes:
    - Active energy and power
    - Apparent energy and power (optional)
    - Load side energy and power (optional)

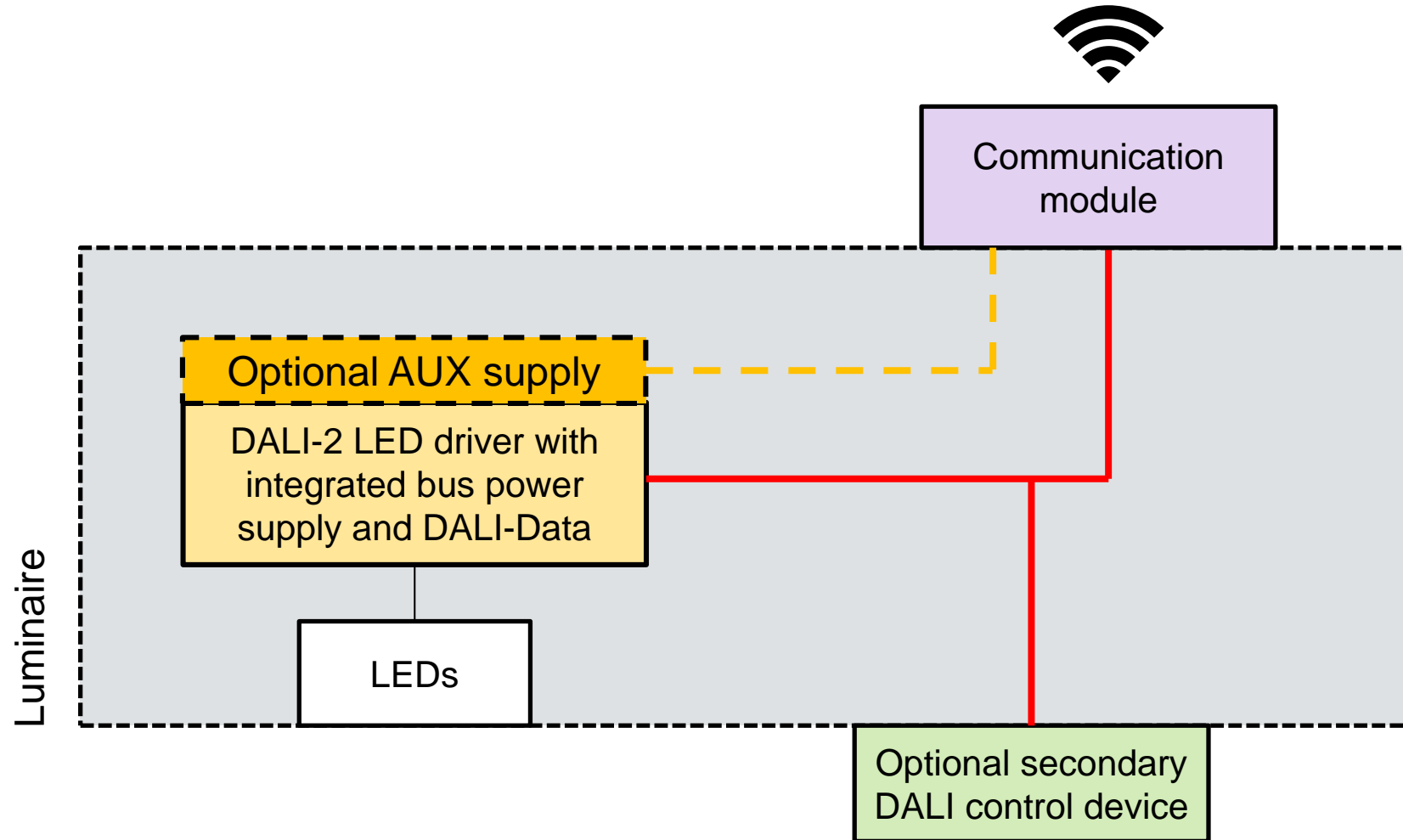
- **DiiA part 253 – Diagnostics & Maintenance:**
  - For control gear
  - Includes:
    - Failure conditions
      - Various control gear failure conditions
      - Various lamp failure conditions
    - Counters for each failure type
    - Control gear information:
      - Operating time, start counter, supply voltage and frequency, power factor, temperature and output current.
    - Light source information:
      - Operating voltage, current, temperature, light source start counter, light source on time

- **DiiA specification AUX power supply:**
  - Can be integrated in control gear
  - 24V PSU, 3W average power, 6W pulse capability
  - Intended to supply external sensor or communication modules
    - For example, Zhaga book 18 socket used on outdoor luminaires/street lights
  - Designed for to supply outdoor wireless communications transceivers that require high power pulses during transmission



# New DiiA Specifications – Smart luminaires

- Example of a smart luminaire:



- **Development of test sequences**
  - Allowing DiiA members to self-test or use an accredited test-house
  - The existing test system will be used where possible (25x parts)
- **Extension of the DALI-2 certification process**
  - New tests will make it possible for control gear with the new 25x and AUX PSU parts to be included in the DiiA certification program for DALI-2.
- **Certification for luminaires and sensor/communication modules**
  - Requirements being developed
  - Collaboration with Zhaga on certification and marking.

- **DALI-2**

- **All components** of a lighting control system are already included in standardisation:
  - Control gear, control devices and bus power supplies
- **DALI-2 certification** already includes these components
  - Certification is being extended to include new input devices, as well as the new 25x parts



- **Smart luminaires**

- Several new DiiA specifications have been developed:
  - DiiA parts 250, 251, 252, 253 and “AUX power supply”
  - Provides luminaire data, power-, maintenance- and diagnostic- information, as well as a 24V PSU
- For control gear and control devices in outdoor and indoor luminaires
- Collaborations with Zhaga and ANSI C137

