

# D4i: Standardization and Certification for Intra-luminaire DALI

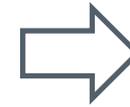


April 2020



# D4i specifications for intra-luminaire DALI

- D4i brings standardization to intra-luminaire DALI
  - D4i extends DALI-2 by adding a specific set of features
- D4i enables intra-luminaire DALI for smart luminaires by:
  - Taking care of power-supply requirements
  - Providing Luminaire, Energy and Diagnostics data
- D4i certification enables D4i logo use
  - Indicates interoperability of luminaires, LED drivers and control devices such as sensors and wireless transceivers
- D4i is aligned with the new ANSI C137.4 standard.
- D4i is compatible with socketed connector systems:
  - e.g. NEMA/ANSI C136.41 and Zhaga Book 18



**Intra-luminaire DALI** refers to a DALI bus inside an individual luminaire. The bus connects the LED driver(s) with any DALI-2 control devices such as sensors or application controllers.

D4i on the DiiA website:

[www.dali2.org/d4i](http://www.dali2.org/d4i)

Download specifications:

[www.dali2.org/specifications/download.html](http://www.dali2.org/specifications/download.html)

D4i products:

[www.dali2.org/products](http://www.dali2.org/products)

# D4i enables smart, connected luminaires



- Intelligent luminaires:
  - D4i drivers store and report important data relating to luminaire, light source and driver
  - D4i sensors collect environmental inputs
- Connectivity:
  - D4i simplifies addition of wireless gateways to luminaires
    - Two-way communication between the DALI-enabled luminaire and the external lighting-control network
    - Stand-alone luminaires operate as IoT/network nodes
- Future-proofing:
  - D4i enables socketed systems
    - Allows addition and replacement of modules for sensing and communication
    - Luminaires easily upgraded to keep pace with rapid developments in digital networking technology

# D4i: Power and Data

**POWER** – D4i takes care of **power-supply requirements** inside luminaires:

- D4i drivers with on-board bus power supply
  - Power available for DALI bus and some control devices
- D4i includes 24V auxiliary (AUX) power supply for higher-power requirements
  - e.g. city-wide wireless transceivers
- Eliminates components, simplifies designs, compatible with socketed systems

**DATA** – D4i includes LED drivers with **smart data** capabilities:

- D4i drivers can store and report data for:
  - Enhanced asset tracking
  - Performance monitoring (energy usage, diagnostics & maintenance)
- Data storage in DALI memory banks
  - Standardized format & locations
- Benefits include automated commissioning, asset tracking, accurate point-of-use billing, predictive maintenance etc

# D4i power-supply specifications



- **DiiA Part 250 – Integrated Bus Power Supply**
  - For control gear with an integrated DALI bus power supply:
    - Suitable for powering some devices—such as sensors—in a luminaire
  - Memory bank:
    - Current ratings can be read
    - PSU can be enabled or disabled – allowing use in systems with multiple bus PSUs
  - For D4i certification, Part 250 must be included, with the bus PSU enabled by default.
  
- **DiiA Part 150 – AUX Power Supply**
  - 24V DC power supply
  - Can be built into control gear, or designed as a stand-alone product
  - Provides 3W average, 6W peak
  - Suitable for devices with higher-power requirements
    - e.g. City-wide wireless transceivers

# Data specifications for LED drivers



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



**Luminaire Data**



## DiiA Part 251

- Includes luminaire supply power & voltage, light output, CCT & CRI, light distribution, luminaire colour and other luminaire data.



**Energy Data**



## DiiA Part 252

- Active energy/power, apparent energy/power, load-side energy/power



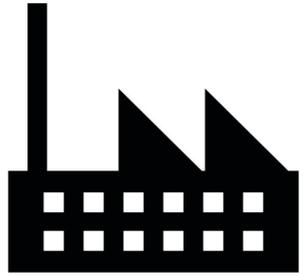
**Diagnostics Data**



## DiiA Part 253

- Failure conditions for control gear and lamps, including counters.
- 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.

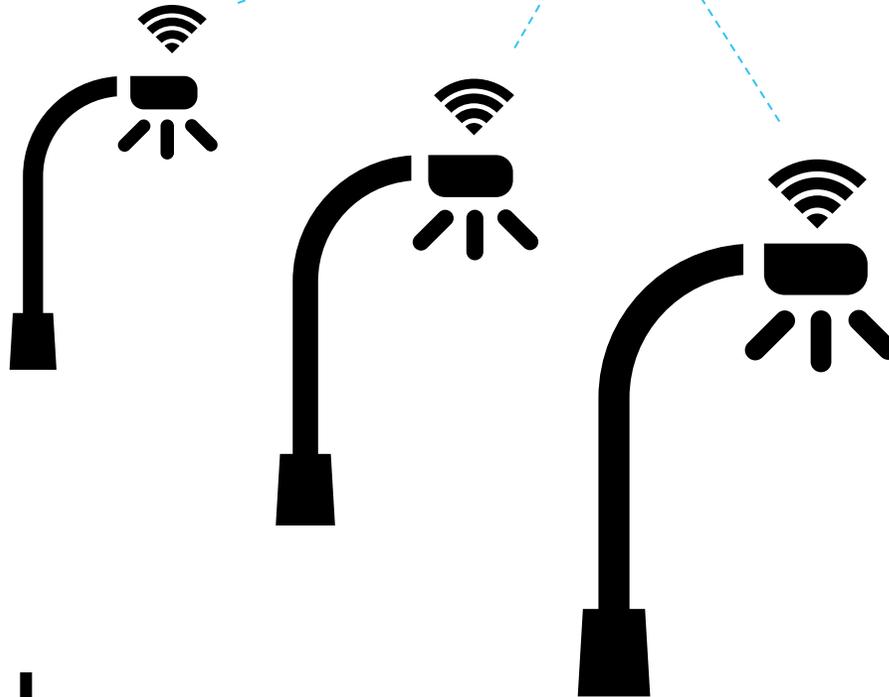
# Smart Data for outdoor lighting



In the factory:  
Luminaire data is  
programmed into  
drivers.



Network



During operation:  
**Performance monitoring**

- Energy usage data can be used e.g. for accurate billing.



In the field:

## **Automated commissioning**

- When installed, luminaire automatically transfers data to remote network.
- Reduces human error, saves installation time and cost.
- Operator has a full map of asset information.

During operation:

## **Predictive maintenance**

- Diagnostics data allows network operator to anticipate need for maintenance.
- Repair team has knowledge of location and type of fixture



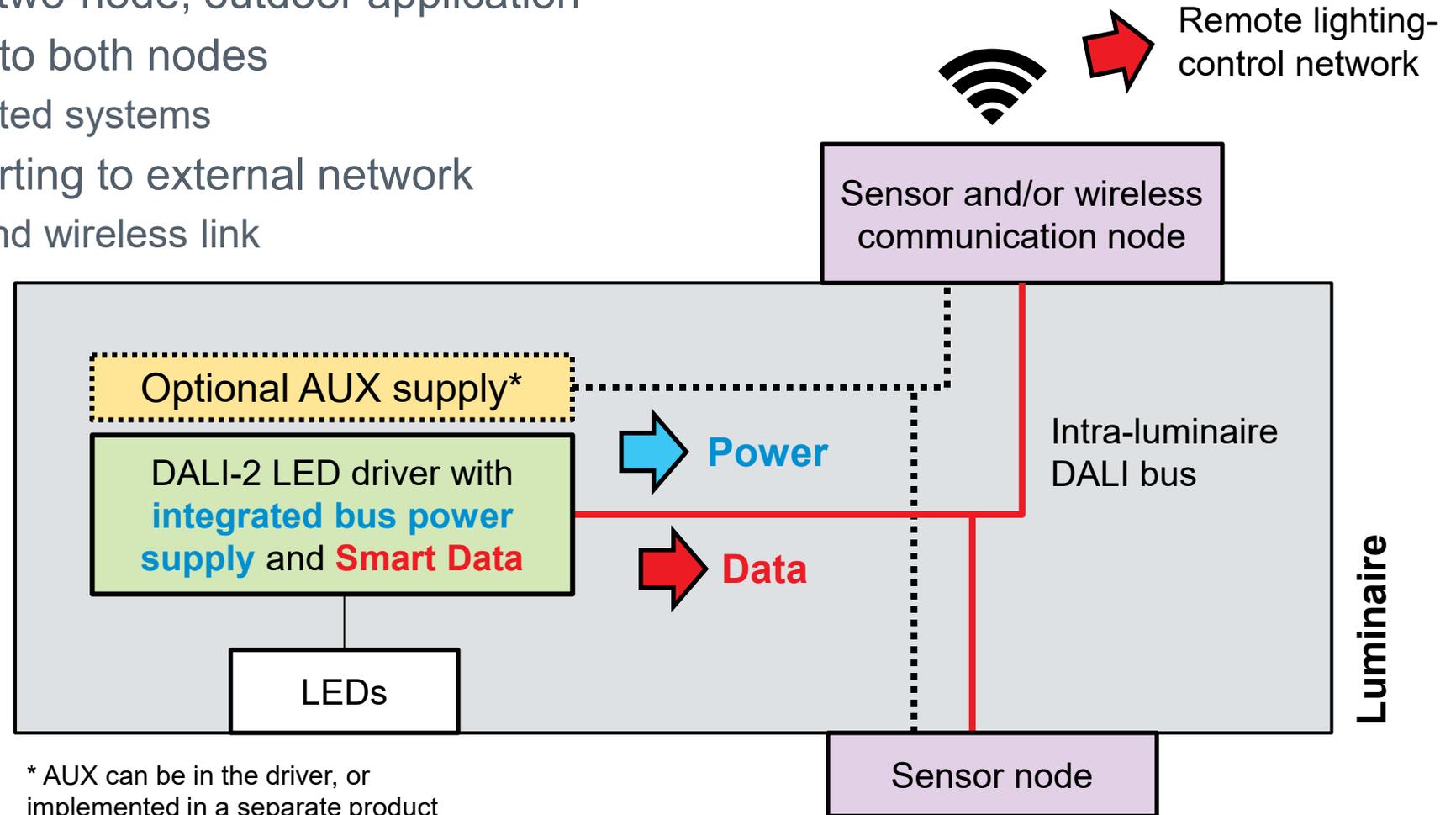
# Part 351 for control devices



- **DiiA Part 351 – Luminaire-mounted control devices**
  - Examples: Sensors, wireless communication nodes with a DALI gateway
- Control devices can be bus-powered or externally powered (e.g. by AUX supply).
- Part 351 specifies four types of control device (types A-D)
- Specification includes:
  - Requirements for power consumption
  - A mechanism to arbitrate between multiple application controllers
  - A memory bank definition for multi-master devices

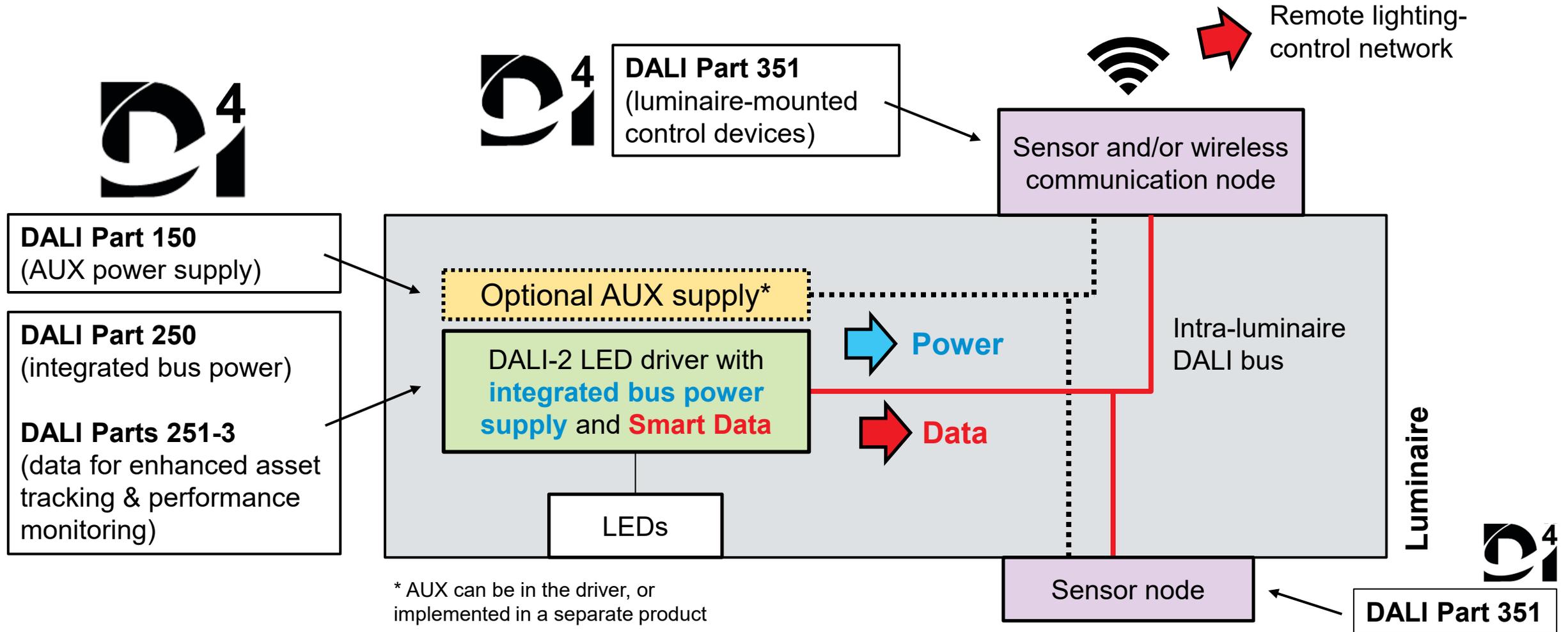
# Intra-luminaire DALI

- Example shows two-node, outdoor application
- Power available to both nodes
  - Supports socketed systems
- Smart Data reporting to external network
  - Via DALI bus and wireless link



\* AUX can be in the driver, or implemented in a separate product

# D4i specifications



# D4i specifications



- The following D4i specifications are available from the [DiiA website](#):

Specification	Name	Version
DiiA Part 150	AUX Power Supply	v1.1, Oct 2019
DiiA Part 250	Integrated Bus Power Supply	v1.1, Oct 2019
DiiA Part 251	Memory Bank 1 Extension (Luminaire Data)	v1.1, Oct 2019
DiiA Part 252	Energy Reporting	v1.1, Oct 2019
DiiA Part 253	Diagnostics & Maintenance	v1.1, Oct 2019
DiiA Part 351	Luminaire-mounted Control Devices	v1.0, Oct 2019



- The following document is also available:

DiiA Requirements	Version
D4i Certification and Trademark Use	v1.1, Apr 2020

# D4i certification and trademarks

- D4i is a new certification program from DiiA, launched in November 2019
- D4i certification is available for:
  - LED drivers
  - Stand-alone AUX power supplies
- Control devices will be added later
- Detailed requirements for D4i certification are explained in the document “**D4i Certification and Trademark Use**”
- D4i certification enables the use of the **D4i logo trademark**
  - Currently on LED drivers only
  - The D4i logo and wordmark are trademarks in various countries in the exclusive use of DiiA
  - D4i certification and trademark use is available for DiiA members only
  - D4i luminaires can also use the D4i trademarks
- D4i-certified products are listed in the DiiA product database
  - See [www.dali2.org/products](http://www.dali2.org/products)



# D4i certification by product type

D4i product type	Requirements for certification	Testing
LED drivers	D4i certification is <u>now available</u> for products that: <ul style="list-style-type: none"> <li>• Implement all of <b>Parts 250</b> and <b>Parts 251-253</b></li> <li>• Optionally implement <b>Part 150</b></li> <li>• Meet the requirements in “<b>D4i Certification and Trademark Use</b>”</li> </ul> 	Testing is an extension of DALI-2, using ProbitLab2
Standalone AUX power supplies	D4i certification is <u>now available</u> for products that: <ul style="list-style-type: none"> <li>• Implement <b>Part 150</b></li> </ul> 	Tests are manual and do not use the ProbitLab2
Luminaires	Certification of luminaires is not currently offered. <ul style="list-style-type: none"> <li>• D4i Trademark use allowed on luminaires meeting the requirements in “<b>D4i Certification and Trademark Use</b>”</li> </ul>	n/a
Control devices	Certification is not currently available. Will be available later for products that: <ul style="list-style-type: none"> <li>• Implement <b>Part 351</b></li> </ul>	Testing is an extension of DALI-2, using ProbitLab2

# ANSI C137.4-2019 standard

- New ANSI C137.4-2019 standard is aligned with D4i
  - “**American National Standard for Lighting Systems—Digital Interface with Auxiliary Power**”
  - See [DiiA News](#)
- DiiA is represented on the C137 committee, which developed the new standard.

DiiA specifications	Relationship with ANSI standard
DiiA Part 250 – Integrated Bus Power Supply	Included in ANSI C137.4-2019
DiiA Part 150 – AUX Power Supply	
DiiA Part 251 – Memory Bank 1 Extension (luminaire data)	
DiiA Part 252 – Energy Reporting	Expected to be included (by reference) in future version
DiiA Part 253 – Diagnostics & Maintenance	
DiiA Part 351 – Luminaire-mounted control devices	

