

# D4i Certification, DiiA Specifications & Zhaga-D4i



# D4i – Overview

- D4i is a certification program for interoperable DALI devices that enable smart, connected luminaires
  - 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 intra-luminaire DALI
  - Other D4i implementations are also permitted
- D4i luminaires are smart and IoT-ready
  - D4i simplifies addition of sensors and communication devices (NLCs) to luminaires
- D4i enables plug-and-play interoperability when combined with a connector system
  - e.g. Zhaga Book 18 & 20 or NEMA/ANSI C136.41



# DiiA Specifications

# DiiA Specifications – Overview



- DALI Alliance creates new specifications that define additional DALI features and functions
  - Building on the IEC 62386 international standard
- DiiA Specifications are added to DALI-2 certification
- DiiA Specifications will be transferred to IEC
  - For publication as new Parts of IEC 62386



Published DiiA Specifications:

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

# DiiA Specifications



Published DiiA Specifications:

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

Category	Name	Published	DALI-2*	D4i*
Power Supply Specifications	<b>DALI Part 150</b> – AUX Power Supply	v1.1, Oct 2019	✓	✓
	<b>DALI Part 250</b> – Integrated Bus Power Supply	v1.1, Oct 2019	✓	✓
Data Specifications for LED Drivers	<b>DALI Part 251</b> – Memory Bank 1 Extension (luminaire data)	v1.1, Oct 2019	✓	✓
	<b>DALI Part 252</b> – Energy Reporting (energy data)	v1.1, Oct 2019	✓	✓
	<b>DALI Part 253</b> – Diagnostics & Maintenance (diagnostics data)	v1.1, Oct 2019	✓	✓
Specifications for Control Devices	<b>DALI Part 351</b> – Luminaire-mounted Control Devices	v1.0, Oct 2019	✓	✓
Connectivity Specifications	<b>Part 104</b> Changes & Additions	v1.01, April 2021	n/a	n/a
	<b>Part 341</b> – Bluetooth Mesh to DALI Gateway	v1.01, April 2021	**	n/a
	<b>Part 342</b> – Zigbee to DALI Gateway	v1.01, April 2021	**	n/a

\* Availability of DALI-2 and D4i certification

\*\* In progress

# DALI power-supply specifications



## DALI Part 250 – Integrated Bus Power Supply

- For control gear (e.g. LED drivers) with an integrated DALI bus power supply (PSU)
  - Suitable for powering some devices – such as sensors – on the DALI bus
- 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

## DALI Part 150 – AUX Power Supply

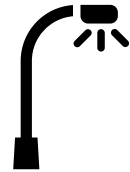
- 24V DC power supply
- Can be built into control gear, or designed as a stand-alone product
- Provides 3W average, 6W peak. Suitable for devices with higher-power requirements
  - e.g. City-wide wireless transceivers
- For D4i certification of LED drivers, Part 150 is optional

# DALI data specifications



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

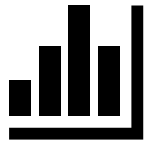
## Luminaire Data



### 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

## Energy Data



### DALI Part 252 – Energy Reporting

- Provides real-time power & energy usage for control gear

## Diagnostics Data

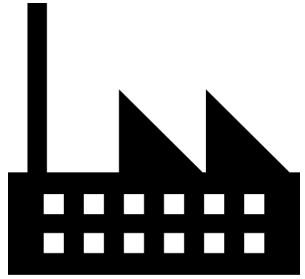


### DALI Part 253 – Diagnostics & Maintenance

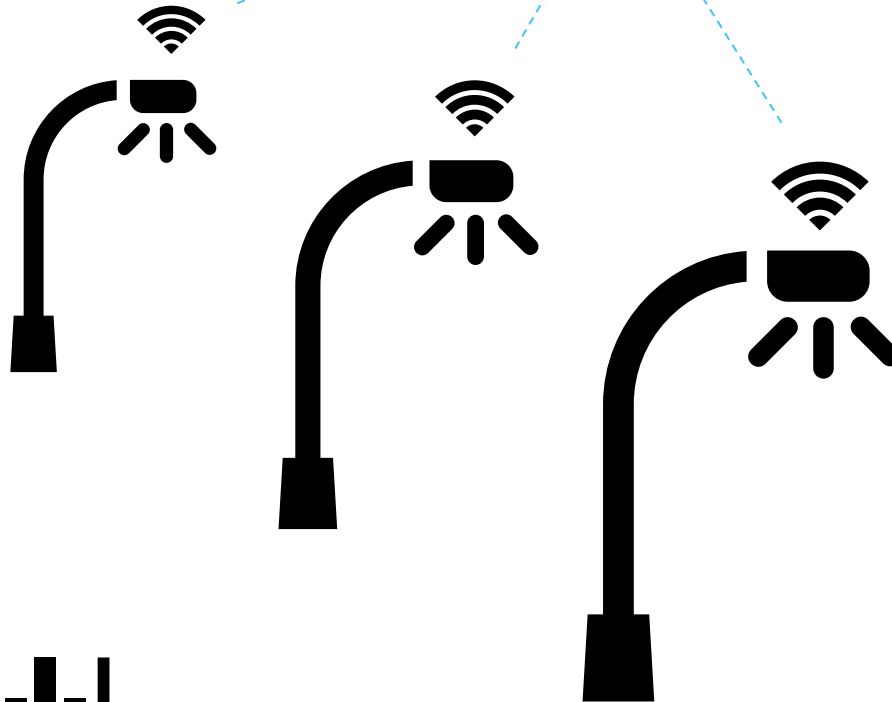
- Operating data for control gear and lamps, including failure conditions, run-time data
- Enables predictive maintenance

These specifications are available from DiiA, and are also included in ANSI C137.4

# Using DALI data



**In the factory:**  
Luminaire data is programmed into drivers



**During operation:**  
**Performance monitoring**

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



**In the field:**

## Automated commissioning

- When installed, luminaires can automatically transfer data to a 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



- **DALI Part 351 – Luminaire-mounted Control Devices**
- Part 351 specifies four types of control device (types A-D)
  - Covering both indoor and outdoor applications
  - Including devices such as wireless network lighting controllers (NLCs), photocells (light sensors), movement sensors and timers
- Control devices can be bus-powered or externally powered (e.g. by AUX supply)
- Specification includes:
  - Requirements for power consumption
  - A mechanism to arbitrate between multiple application controllers
  - A memory bank definition for multi-master devices
- Part 351 is mandatory for D4i certification



# D4i certification

# D4i certification – Overview

- D4i certification is an extension of DALI-2 certification, with mandatory features
- The D4i certification program is driven by the DALI Alliance
- D4i LED drivers must include:
  - Integrated bus power supply (Part 250)
  - Luminaire, energy & diagnostics data (Parts 251-253)
- D4i control devices must implement Part 351
- Certified D4i devices are listed on the DALI Alliance website



More details on D4i: [www.dali-alliance.org/d4i](http://www.dali-alliance.org/d4i)

# D4i certification and trademarks

- Detailed requirements for D4i certification are explained in the document “**D4i Certification and Trademark Use**”
  - Available from the [DiiA website](#)
- D4i certification enables the use of the **D4i trademarks**
  - 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](#)



# Control gear: DALI-2 and D4i certification

- **Parts 250-253 are mandatory for D4i certification** of LED drivers
  - Products must also meet the requirements in “D4i Certification and Trademark Use”
- These DiiA Specifications are **optional for DALI-2 certification**
  - DALI-2 control gear can implement any combination of DALI Data Parts (251-253) and Part 250
  - Check the product database
- Other features (e.g. Part 209 colour-control) are optional for both DALI-2 and D4i

Specification	Name	DALI-2 requirement	D4i requirement*
DALI Part 150	AUX Power Supply (integrated)	Optional	Optional
DALI Part 250	Integrated Bus Power Supply	Optional	<b>Mandatory</b>
DALI Part 251	Luminaire Data	Optional	<b>Mandatory</b>
DALI Part 252	Energy Data	Optional	<b>Mandatory</b>
DALI Part 253	Diagnostics Data	Optional	<b>Mandatory</b>

\* D4i certification is only open to LED drivers, and Part 207 is also mandatory

# D4i certification by product type

Product type	Requirements for D4i certification	Testing
<b>LED drivers</b>	<p>D4i certification is available for LED drivers that:</p> <ul style="list-style-type: none"> <li>• Implement <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
<b>Control devices</b>	<p>D4i certification is available for control devices that:</p> <ul style="list-style-type: none"> <li>• Implement <b>Part 351</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
<b>Luminaires</b>	<p>Certification of luminaires is not offered. D4i trademark use is allowed on luminaires that:</p> <ul style="list-style-type: none"> <li>• Meet the requirements in “<b>D4i Certification and Trademark Use</b>”</li> </ul>	n/a
<b>Standalone AUX power supplies</b>	<p>DALI-2 certification is available for products that:</p> <ul style="list-style-type: none"> <li>• Implement <b>Part 150</b></li> </ul>	Tests are manual and do not use the ProbitLab2

# ANSI C137.4-2021 standard

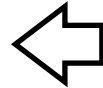
- Closely aligned with D4i family of specifications
- DALI Alliance represented on C137 committee, which developed the standard

	DiiA Specification	D4i certification requirement	Included in ANSI C137.4	
			2019	2021
LED Drivers	DALI Part 150 – AUX Power Supply	Optional	✓	✓
	DALI Part 250 – Integrated Bus Power Supply	Mandatory	✓	✓
	DALI Part 251 – Luminaire Data (Memory Bank 1)	Mandatory	✓	✓
	DALI Part 252 – Energy Data	Mandatory		✓
	DALI Part 253 – Diagnostics Data	Mandatory		✓
Control Devices	DALI Part 351 – Luminaire-mounted control devices	Mandatory		✓

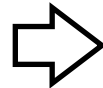
# How does D4i compare with the ANSI standard?



D4i certification by the DALI Alliance



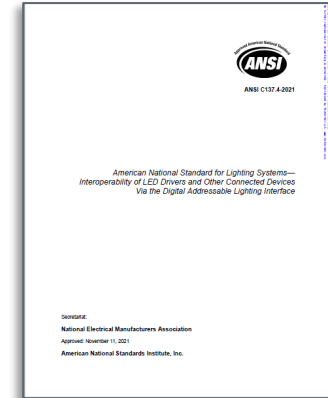
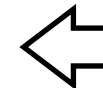
Products compliant with ANSI C137.4-2021 may be eligible to apply for D4i certification



D4i-certified control devices meet ANSI C137.4-2021 requirements



D4i-certified LED drivers meet ANSI C137.4-2021 requirements (see below)



**ANSI C137.4-2021 standard**



Conditions: If D4i driver has an integrated AUX power supply, then it must be rated Class-2 or equivalent. Additional requirements apply if D4i driver implements one of these ANSI C137.4-2021 options:

- 2W AUX power supply
- Logic Signal Input (LSI)



# D4i implementations

# D4i for intra-luminaire DALI

- D4i is particularly suitable for intra-luminaire DALI applications
  - Intra-luminaire DALI refers to a DALI bus that connects LED drivers and control devices inside an individual luminaire.
  - Other D4i implementations are permitted, provided that power-supply restrictions are observed
- D4i enables intra-luminaire DALI for smart, IoT-ready luminaires:
  - D4i takes care of power-supply requirements, to simplify the addition of control devices such as sensors or communication nodes
  - Smart D4i LED drivers inside the luminaire have the capability to store and report a wide range of luminaire, energy and diagnostics data in a standardized format.
- D4i is compatible with socketed connector systems:
  - e.g. NEMA/ANSI C136.41 and Zhaga Book 18

# D4i enables smart, connected luminaires

## Smart 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 or bridges 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 (e.g. Zhaga-D4i)
  - Allows addition and replacement of modules for sensing and communication
  - Luminaires easily upgraded to keep pace with rapid developments in digital networking technology

# Luminaires: Data and power

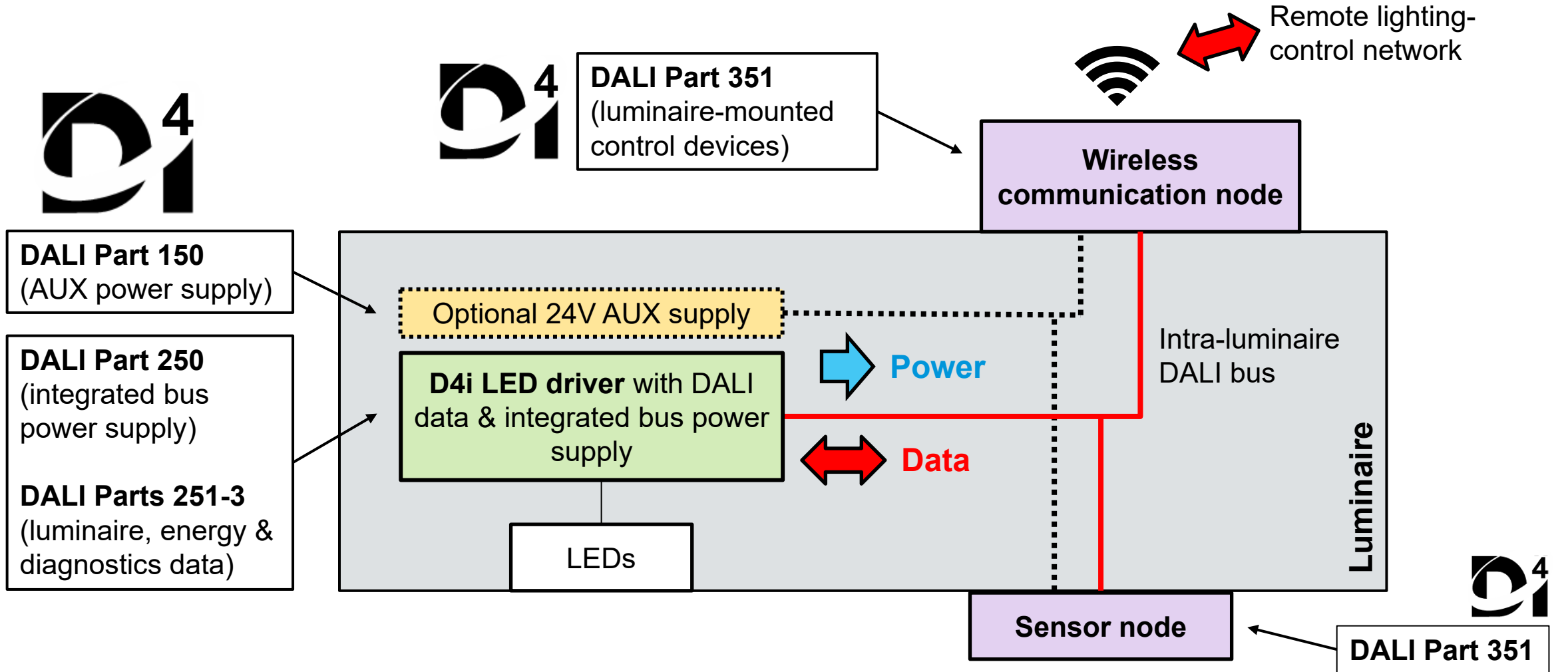
## **POWER** – D4i takes care of **power-supply requirements** inside luminaires:

- 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 example: Two-node outdoor luminaire

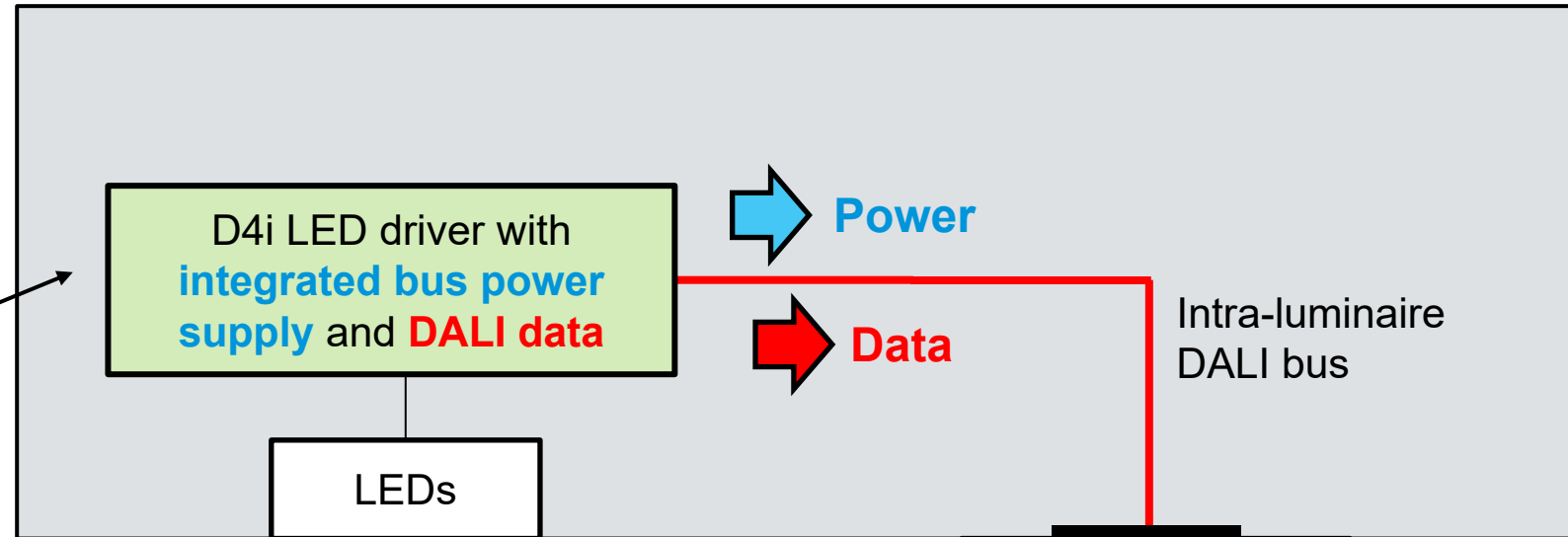


# D4i example: Indoor luminaire



**DALI Part 250**  
(integrated bus power)

**DALI Parts 251-3**  
(luminaire, energy & diagnostics data)

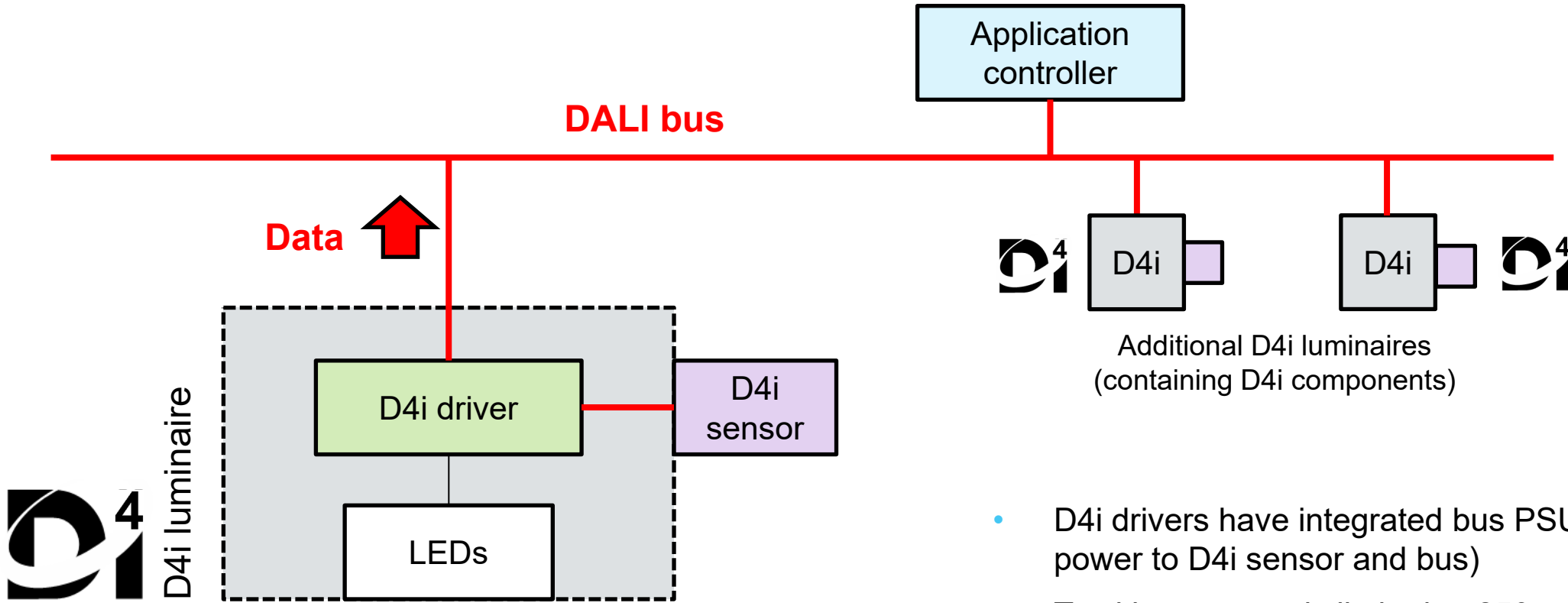


Luminaire



**DALI Part 351**  
(luminaire-mounted control devices)

# D4i example: Connected D4i luminaires



- D4i drivers have integrated bus PSU (provides power to D4i sensor and bus)
- Total bus current is limited to 250 mA
- D4i driver can store & report luminaire, energy and diagnostics data (Parts 251-253)

# Zhaga-D4i



# Zhaga-D4i certification

A joint certification program based on complementary specifications

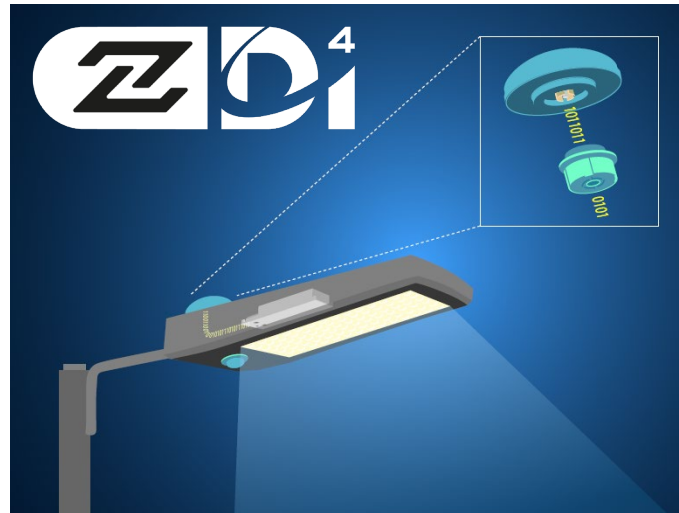


**Specifications from DiiA  
enabling D4i certification**

**Book 18 & Book 20  
specifications from Zhaga**



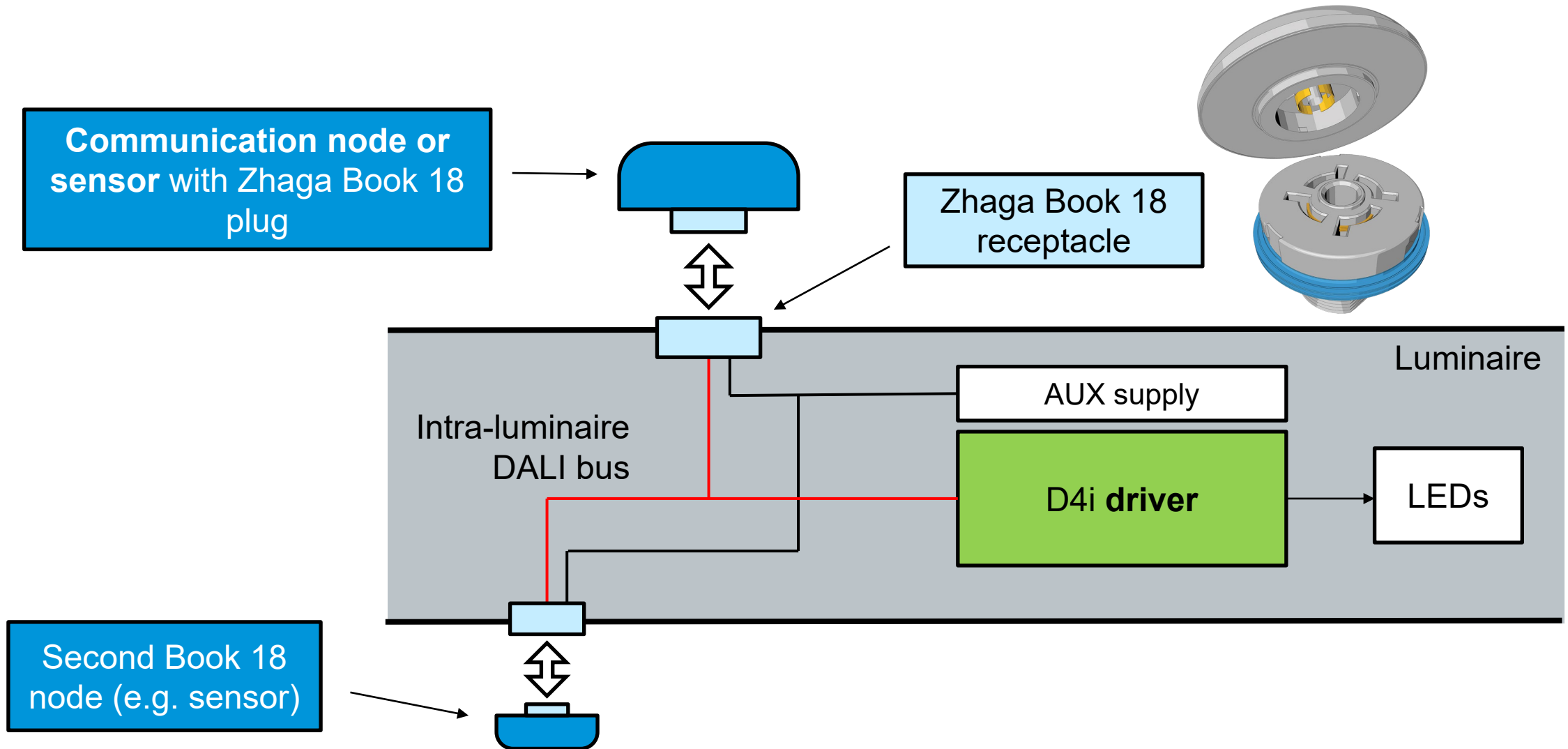
**DALI Part 250:** Integrated bus power supply  
**DALI Part 251:** Luminaire data  
**DALI Part 252:** Energy data  
**DALI Part 253:** Diagnostics data  
**DALI Part 351:** Luminaire-mounted control devices  
**DALI Part 150:** AUX power supply



**Book 18 for outdoor:**  
**Book 20 for indoor:**

- Mechanical interfaces
- Electrical pin assignment (Book 18)
- Electrical connectors (Book 20)
- References to D4i specs for power & control, and luminaire tests

# Outdoor luminaire with Zhaga receptacles



# D4i and Zhaga–D4i certification

DALI Alliance members

Zhaga members

LED driver

D4i  
certification  
→

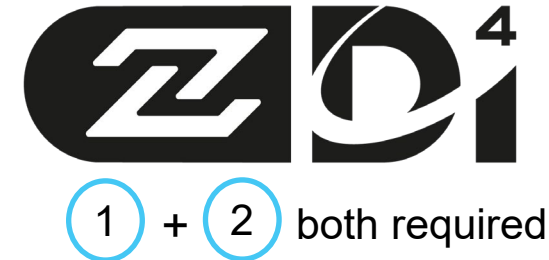


Control device

1  
D4i  
certification  
→



2  
Zhaga  
certification  
→



Luminaire

Trademark  
usage



Zhaga  
certification  
→



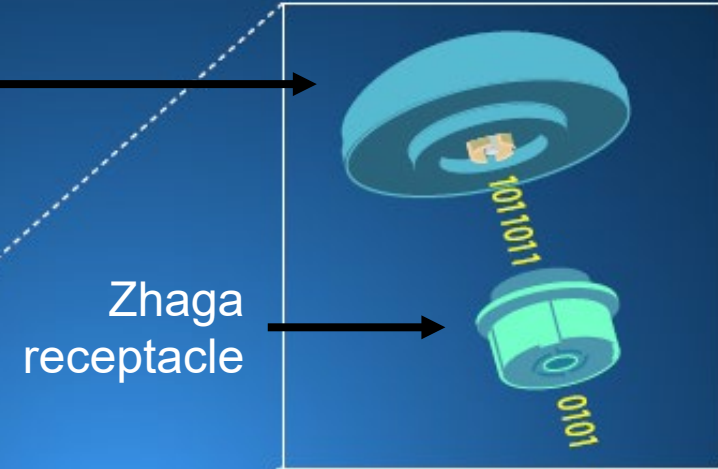
Connector

Zhaga  
certification  
→

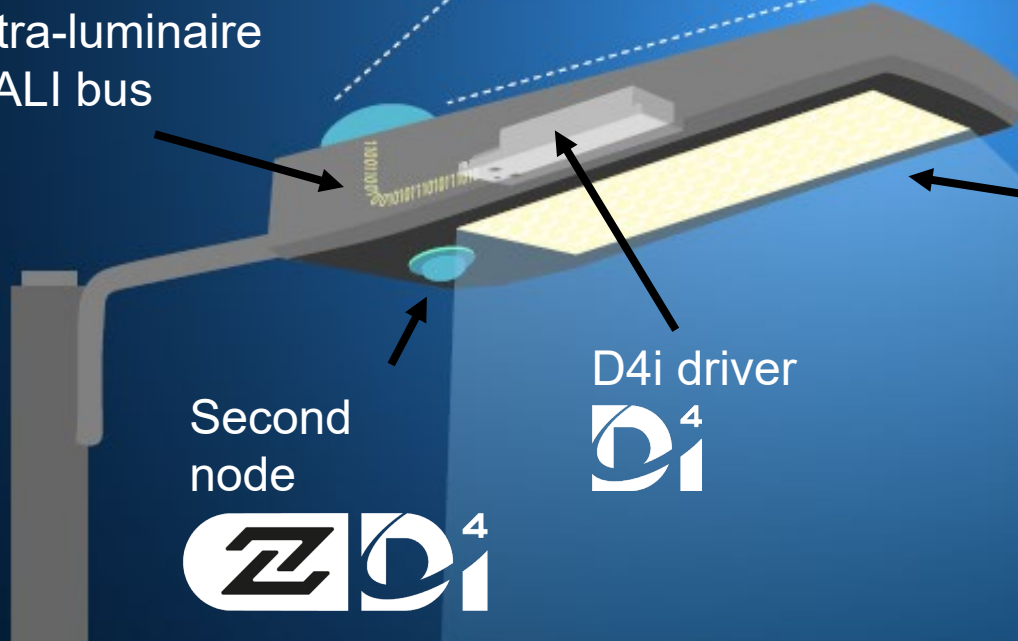


# Zhaga-D4i certification for outdoor luminaires

Zhaga-D4i node  
(sensor and/or wireless communication node)



Intra-luminaire DALI bus



Zhaga-D4i luminaire (outdoor)



Second node



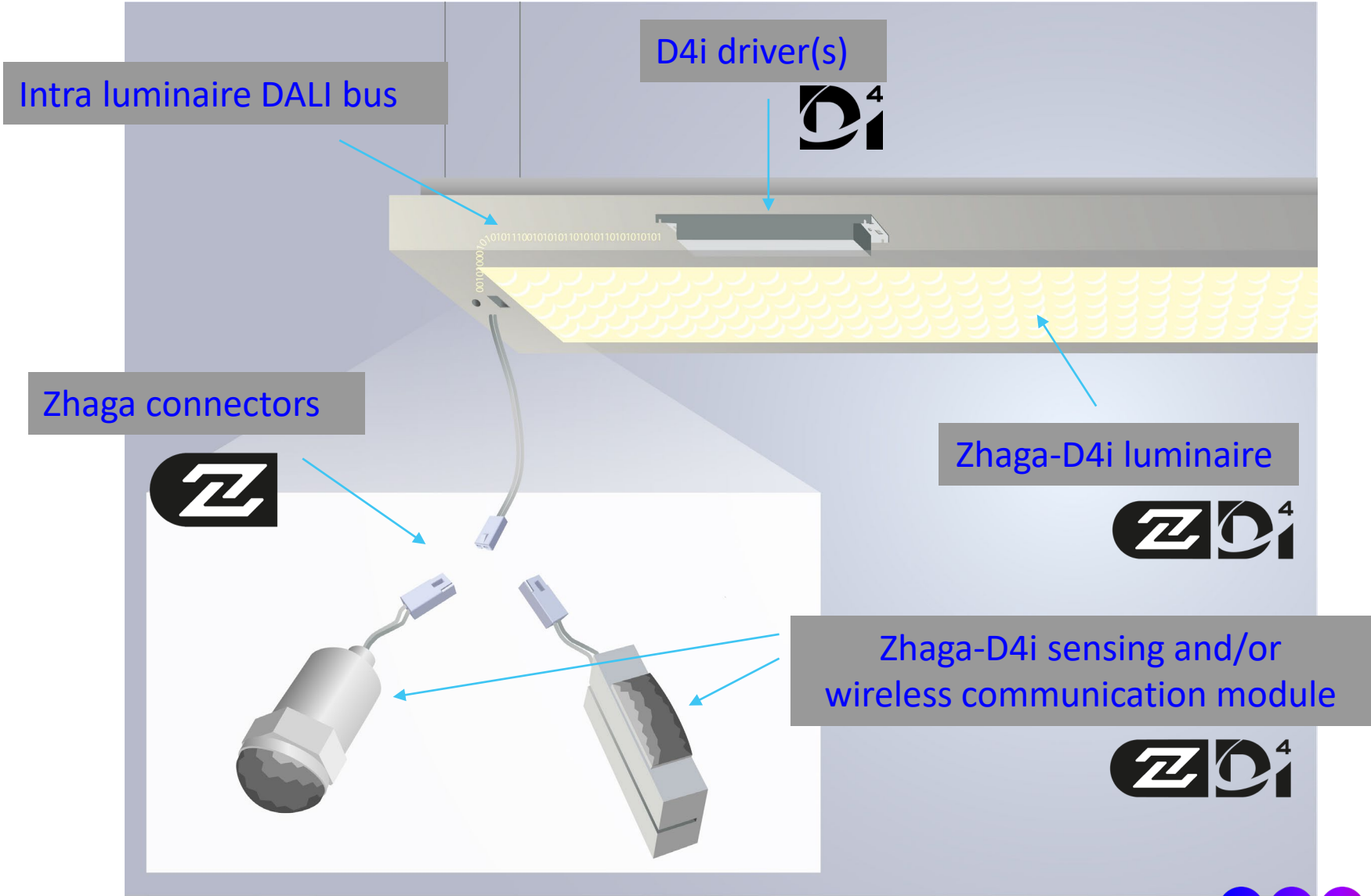
D4i driver



Alliance



# Zhaga-D4i certification for indoor luminaires



# Zhaga-D4i certification

- Zhaga-D4i certification (Book 18 or Book 20) is available for:
  - Luminaires
  - Control devices (nodes)
- Zhaga-D4i certified products are listed on the [Zhaga website](#)
- Zhaga-D4i certification is available to Zhaga members
- For control devices:
  - First step is D4i certification; only available to DiiA members
  - D4i-certified products are listed on the [DiiA website](#)
- The Zhaga logo and the D4i logo are separate logos with separate trademarks. Usage is controlled by Zhaga and DiiA, respectively.



Zhaga-D4i luminaires:  
(top) Luma Gen2 from Signify  
(bottom) Izylum from Schröder

# More information

- DiiA specifications – [www.dali-alliance.org/specifications/download.html](http://www.dali-alliance.org/specifications/download.html)
- D4i overview and FAQs – [www.dali-alliance.org/d4i](http://www.dali-alliance.org/d4i)
- D4i certification – [www.dali-alliance.org/d4i/certification.html](http://www.dali-alliance.org/d4i/certification.html)
- Zhaga-D4i – [www.dali-alliance.org/zhaga-d4i](http://www.dali-alliance.org/zhaga-d4i)
- DALI product database – [www.dali-alliance.org/products](http://www.dali-alliance.org/products)
- Zhaga product database – [www.zhagastandard.org/products.html](http://www.zhagastandard.org/products.html)

Contact the DALI Alliance – [www.dali-alliance.org/contact](http://www.dali-alliance.org/contact)

