

D4i

Driver Wiring Requirements

A technical guide to 3-core, 4-core, and 5-core connections for **D4i** luminaires



D4i Driver wiring explained

D4i is a technology primarily aimed at outdoor and connected luminaires. It extends DALI so the intelligence lives inside the fixture rather than relying on a wired lighting control system. A D4i driver stores and reports its own data over the same bus. The D4i standard also defines how in-fixture energy and diagnostic data is carried across the bus, which is why it's common in streetlighting and other connected-luminaire applications.

SUMMARY

With D4i drivers, the DALI bus cable is not used outside of the luminaire itself.

The driver provides its own bus power supply and supplies a feed to the control device mounted on the fitting. The mesh network is then wirelessly connected based on the type of node installed. There is no bus network to distribute via physical cables, each luminaire only needs a standard 240v AC supply.

1. D4i: What Changes at the Luminaire

D4i is an extension of the DALI-2 certification program. D4i LED drivers have a mandatory set of features related to power-supply requirements and smart-data capabilities.

Smart D4i luminaires establish an ideal platform for IoT based systems, capable of gathering information from on-board D4i sensors, and providing data for performance monitoring, asset management, predictive maintenance and many other tasks.

Communication and data exchange between fixtures via an external network based on the technology selected by the client, and this is where D4i control devices with wireless communication capabilities have established a consistent and uniform system.

2. Understanding 5-core DALI Wiring

In a conventional hard-wired DALI installation, five cores are connected to every fitting: Active, Neutral and Earth, plus DA1 and DA2. Because DALI control conductors are not SELV, they must be mains-rated and treated as live, which is precisely why they were allowed to share a sheath with the mains cores in the first place, and why 5C DALI flex became standard practice.

Those two control cores exist to do two jobs: Carry data back to a central DALI controller and reach a DALI bus power supply sitting somewhere on the network. Every DALI line needs one. Remove the need for both jobs and the two cores have nothing left to do.

D4i combines all the benefits of DALI without needing those extra “2 cores”, as they are integrated within the fixture and the connection to the system is via the smart node.

Figure 1: D4i wiring methodology

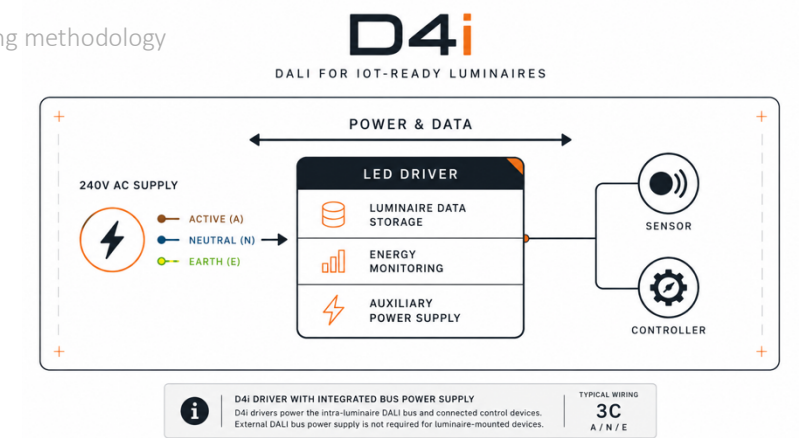
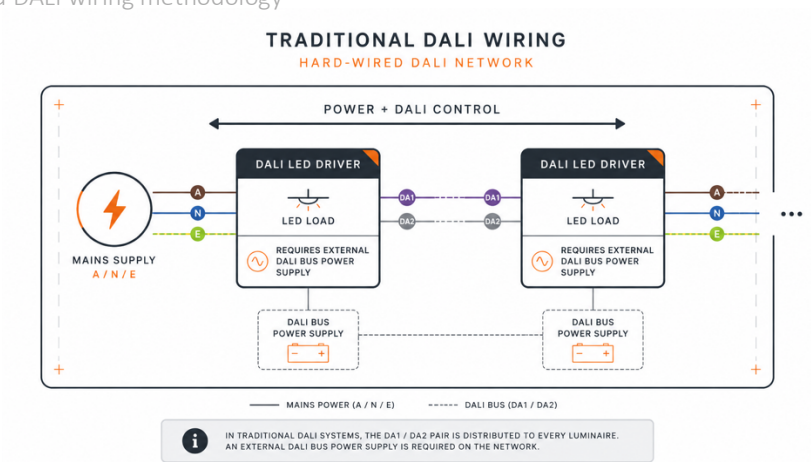


Figure 2: Standard DALI wiring methodology



3. SIDE BY SIDE

	Traditional wired DALI	D4i luminaire + wireless node
Cable to each luminaire	5C — A, N, E + DA1, DA2	3C — A, N, E
DALI bus power supply	Separate bus PSU required on the network commonly mounted within the electrical distribution board	Built into every driver (DiiA Part 250)
Sensor / node power	Either connected to the DALI bus directly with or without a 240v supply. In some cases, a separate ethernet bus is required	24 V AUX from the driver (Part 150) via the D4i connector
Where the DALI pair runs	Throughout the building or site, back to a central controller	Contained within the luminaire entirely. No terminations are required
Commissioning	At the controller, with the bus physically in place	Wirelessly usually from a web browser or associated mobile application
Adding additional luminaires	Extend the bus, termination of new control cable	Energise the 240v supply, commission and add to the mesh network

4. WHEN YOU STILL NEED 5-CORE

The controls industry still widely uses 5 core cabling and associated systems. This is required if the design uses luminaire-mounted . D4i drivers are still DALI-2 devices, and they behave like DALI-2 devices when you wire them that way. Run 5C where:

- The design calls for a hard-wired DALI-2 network back to a central application controller, wall panel or BMS head-end.
- You are extending or retrofitting into existing DALI infrastructure that is already in place and commissioned.
- Scenes, schedules or interlocks are held centrally rather than in the luminaire-mounted nodes.
- DALI addressable emergency (Part 202) fittings share the line and are monitored centrally.
- Site conditions make a reliable wireless mesh doubtful — heavy structure, long spans between fittings, or areas where radio is restricted.

One caution for wired designs: the driver's integrated supply is intended for its own control device, not to power other people's gear across a shared bus. On an inter-luminaire network, size and enable bus power deliberately within the 250 mA limit, or fit a dedicated bus PSU. Do not assume a line of D4i drivers will simply power itself.

5. What the D4i Driver Provides

D4i is the DALI Alliance (DiiA) extension of DALI-2 for luminaires. It does not replace DALI-2, but rather it adds a set of mandatory parts on top of it, and three of them matter here:

- Part 250 — Integrated Bus Power Supply: Mandatory on every D4i driver. The driver supplies the power requirement to the DALI bus itself; no external power supply is required. Total bus current on any DALI line remains capped at 250 mA; a typical D4i driver contributes in the order of 60 mA, and its supply can usually be enabled or disabled where multiple PSUs are present.
- Part 150 — 24V Auxiliary Supply: This feature is optional in the driver specification however most D4i drivers have this feature enabled. The key benefit in practice is for higher-draw control devices such as wireless network lighting controllers. This feature removes the separate low-voltage supply and the extra conductors that used to come with a sensor node.
- Part 351 — Luminaire-Mounted Control Devices: Defines the node that is connected into the luminaire, either in a Zhaga Book 18 socket outdoors, or on an internal connector. The four-pin interface carries the DALI pair and the 24V AUX, and the node itself holds the intelligence and the radio technology.

Parts 251, 252 and 253 are also mandatory, and give your luminaire some specific metrics that are expected: Energy and Diagnostics data reported back over the nominated wireless connection method, useful for maintenance reporting.

6. COMMON QUESTIONS

Can I still use my existing 5C infrastructure with D4i drivers?

Yes. D4i is built on DALI-2, so the drivers work on a conventional wired bus. No driver is essentially excluded, the choice is about how you want to control the installation, not about compatibility.

Do I still need a DALI bus power supply?

No. This is built-in within the luminaire and the associated driver. For a wired inter-luminaire network you still need bus power, either from a dedicated PSU or by deliberately enabling driver supplies within the 250 mA maximum rating.

Does the sensor or node need its own 24 V supply run to it?

No. The 24 V auxiliary supply comes from the driver through the D4i or Zhaga Book 18 connector. That is the change that removes the extra conductors a sensor used to require.

If there is no control cable, how do the luminaires talk to each other?

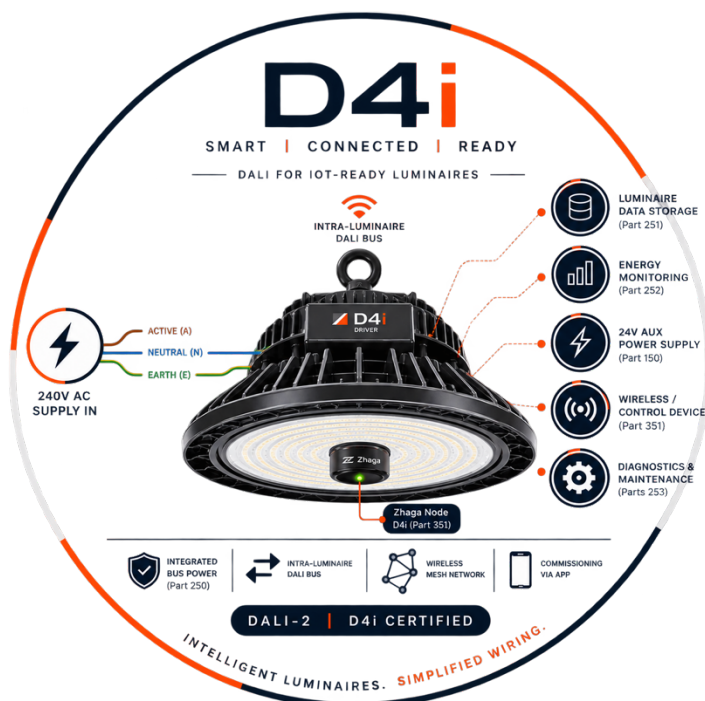
Through the wireless node on each fitting, typically a Bluetooth mesh. Each luminaire is a node on that mesh; commissioning, grouping and scene setting are done from an app or web browser platform.

Is D4i just another name for DALI-2?

No. DALI-2 is the underlying standard. D4i is a certification layer on top of it that makes the integrated bus supply and the data reporting mandatory and standardises the luminaire-mounted control device. Every D4i driver is DALI-2; not every DALI-2 driver is D4i.

What cable should I specify, then?

For a D4i and wireless-node design, 3C to each luminaire (A, N, E), or 4C where you need separate switching or an emergency Active. Once the control strategy is nominated with the specifier, a wireless solution via a node is commonly nominated.



About this note:

Prepared by SAL Commercial as general technical guidance. Specification parts and figures referenced are those published by the DALI Alliance (DiiA) for D4i and Zhaga-D4i. All installations must comply with AS/NZS 3000 and the relevant driver and luminaire manufacturer instructions; confirm bus loading, cable selection and control strategy against the specific products and design for your project.

For project-specific advice, contact your SAL Commercial representative.