



Technical application guide

DEXAL LED drivers

Light is OSRAM

OSRAM

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Please note:

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1 Introduction

LED drivers with DEXAL interface enable the easy and seamless connection of sensors and RF modules as well as the bidirectional exchange of data – opening up entirely new application options. Smart networks can be set up conveniently because the drivers feature an open interface which ensures compatibility with numerous wireless light management systems.

With a DEXAL driver, luminaire manufacturers can not only cover different wireless solutions, but also have lower system costs compared to a mains-powered RF module. Fewer components are required, the installation space inside the luminaire is reduced and both luminaire approvals and final production tests become easier. The integration of sensors also enhances the value of the luminaire. In addition, DEXAL offers a particularly low stand-by power consumption.

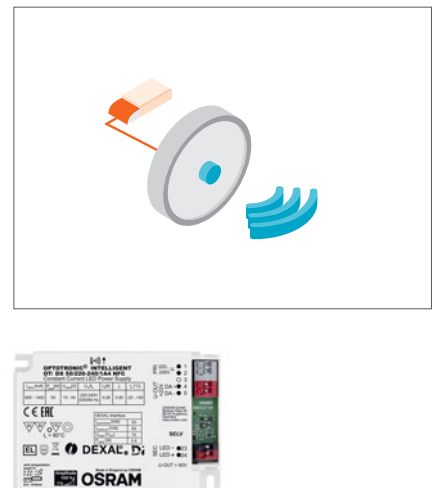
For additional information on DEXAL, visit www.osram.com/dexal

2 DEXAL LED driver family

For indoor applications, LED drivers with DEXAL interface are the centerpiece of a digital ceiling that connects luminaires with integrated sensors and RF modules to set up a radio-based network. DEXAL supplies RF modules and sensors with power and enables the bidirectional data exchange inside the luminaire. On demand, the RF module transmits the data to the management system where it is processed and analyzed. This standardized connection interface allows completely new possibilities for the integration of different subsystems within buildings and thereby for their automated and optimized use.

For outdoor and industrial applications, the DEXAL interface is a future-proof solution. In addition to the powered DALI interface, the OSRAM OPTOTRONIC Outdoor LED driver family offers a 24V DC supply for larger power consumers such as radar sensors or wide-range RF modules. This additional luminaire interface is standardized in Zhaga Book 18, allowing the development of luminaires that are compatible with numerous system components. When setting up a wireless network, each luminaire can be used as a network node for a smart urban infrastructure. Even in case of upgrades or new wireless technology standards, the luminaires can be adapted at any time – without complete luminaire replacement.

Application spectrum

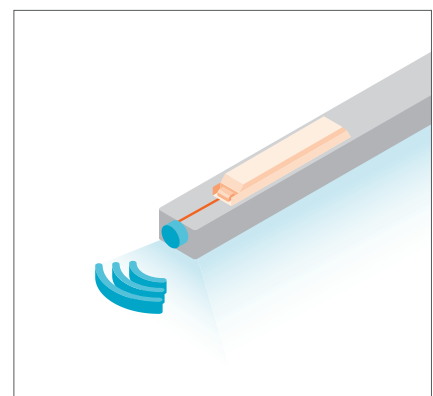
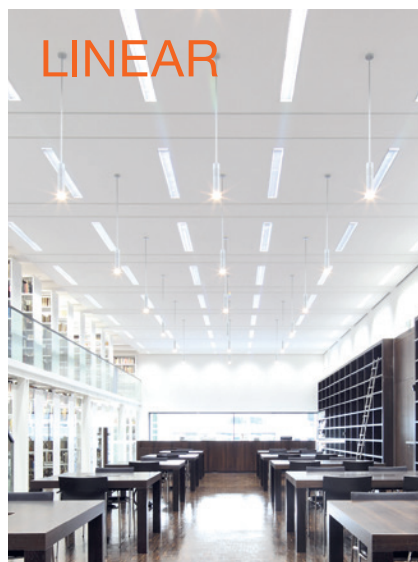


Downlights and recessed ceiling spotlights for buildings with interconnected luminaires

Create optimized network solutions with compact luminaires and benefit from our DEXAL Compact LED drivers to seamlessly integrate them into a wirelessly connected building architecture – in offices, shops or educational institutions.

Connected luminaires for linear lighting systems

The slim DEXAL Linear LED drivers fit perfectly into small recessed or pendant luminaires. Digitally connected luminaire systems in office buildings are the infrastructure for endless possibilities of wide-ranging IoT applications (Internet of Things).

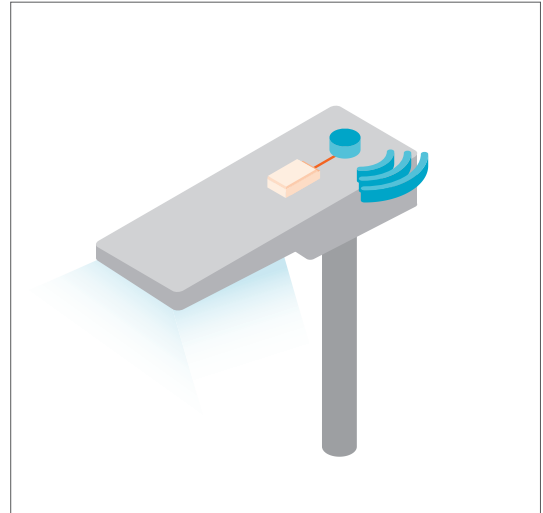


STREET



Today's street lighting is ready for a smart city infrastructure

In the future, a connected infrastructure will play an even more important role in urban lighting. Already today, DEXAL Outdoor LED drivers allow the design of luminaires with the Zhaga Book 18 interface, thus breaking new ground with unprecedented levels of efficiency, flexibility and innovation.

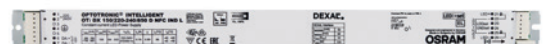
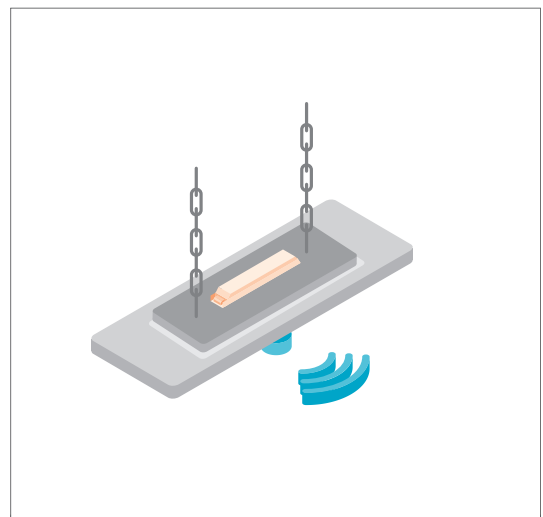


Efficient connection in industrial and production areas

Whether in warehouses, logistics centers or production facilities: Our DEXAL Outdoor and DEXAL Industry LED drivers for high-bay and trunking systems enable highly efficient high-bay luminaire systems, opening up entirely new dimensions – not only in terms of energy consumption, quality of light and variability, but also in communication.



INDUSTRY



3 DEXAL interface

DEXAL is a bidirectional, digital interface that combines a power supply for fixture peripherals and communication capabilities on a two-wire bus. DEXAL LED drivers provide essential performance data related to the luminaire via their DEXAL interface.

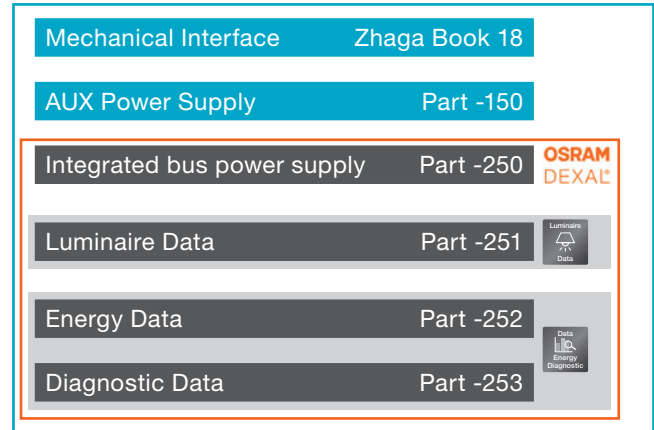
The underlying technology of DEXAL is the DALI technology as defined in IEC 62386-102:2009 (Digital Addressable Lighting Interface – General Requirements).

The DEXAL interface (Generation 2) complies with the DiiA specifications DALI Part -250 to DALI Part -253. Part -250 defines the electrical specification of the DALI bus power supply for external sensors and controllers. The OSRAM feature “Luminaire Data”, which corresponds to Part -251, gives the OEM customers the possibility to store their own luminaire data, e.g. luminaire ID, input power, light output and color rendering index in DEXAL LED drivers. The OSRAM feature “Energy and Diagnostic Data”, combines Part -252 and Part -253 for energy reporting as well as diagnostics and maintenance purposes. These data can be used for predictive maintenance and asset tracking purposes. DEXAL Outdoor LED drivers support luminaires according to Zhaga Book 18. This specification defines the mechanical and electrical interface.

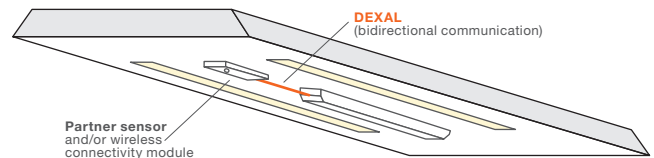
The provision of a 24V AUX Power Supply complies with the requirements of the DiiA specification DALI Part -150.

The figure on the right shows the overview of how the OSRAM features are linked to DiiA standards and Zhaga Books.

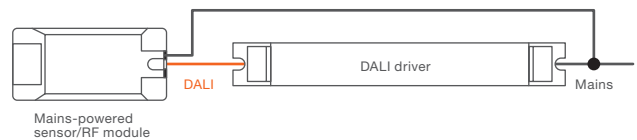
Optimized overall system based on open standards



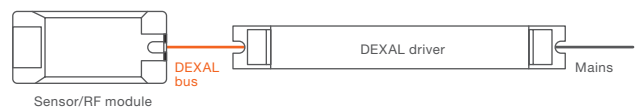
DEXAL driver applications:



Standard luminaire



DEXAL luminaire



4 Electrical design-in

The integrated DALI bus power supply of a DEXAL LED driver provides a guaranteed supply current of at least 53 mA. To ensure a reliable communication, the input peak current of the control peripheral (DEXAL sensor or RF module) shall be limited to 46 mA whenever the transmitter (DALI interface) of the control peripheral is not short-circuiting the DEXAL bus for communication purposes. If further DALI devices are connected to the bus, their input current also has to be considered. During DEXAL bus communication, the available average current may drop to 50 % (this means 23 mA for a single DEXAL LED driver). The total maximum DEXAL bus supply current shall not exceed 250 mA (according to IEC 62383-101). The total current is calculated by summing up all maximum DEXAL bus currents provided by all connected devices. Up to two (Gen. 1) or four (Gen. 2) of these drivers with activated DEXAL bus power supply unit can be connected. Please check the product datasheets of the connected components in advance, regarding how many DEXAL drivers are supported and regarding the declared input current consumption (peak/average). Any connection of DEXAL LED drivers of different generations is not allowed.

Disabling the DEXAL bus power supply for applications with more than one DEXAL driver is not recommended, since this could cause failures in case of a replacement of drivers supply. In case a standard DALI LED driver (without integrated bus power supply) or a DEXAL LED driver with disabled bus power supply is connected to a DEXAL bus, a peak current demand of 2 mA and an average current demand of 1 mA has to be considered.

Dexal Power Supply Unit



The polarity of the DALI/DEXAL bus terminals shall be considered as indicated on the equipment (DA+/DA-).

Concerning the possible length of the cable for the DEXAL bus, please see the datasheets of the DEXAL drivers.

To set up a DEXAL system, all devices connected to the DEXAL bus need to be considered.

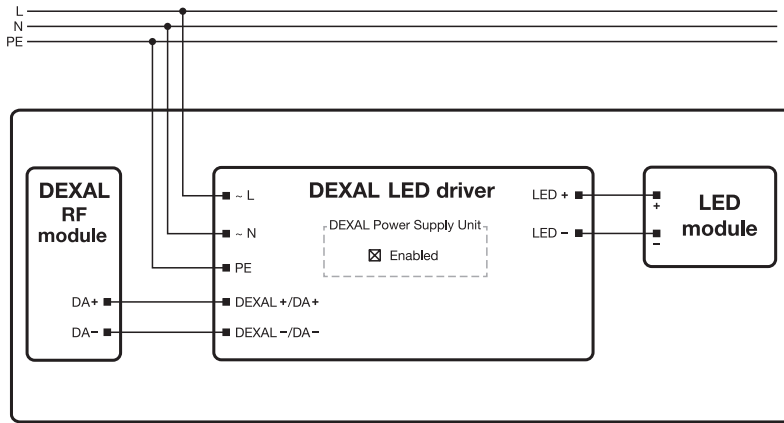
DEXAL (D4i) bus requirements

Maximum allowed DEXAL bus supply current:	250 mA
Maximum input peak current of a control peripheral in non-communication mode:	46 mA
Average input current of a control peripheral during communication:	23 mA

OSRAM DEXAL (D4i) LED driver specifications from the D4i standard

Minimum guaranteed DEXAL bus supply current of a single driver:	53 mA (Generation 2)
Maximum DEXAL bus supply current of a single driver:	62 mA (Generation 2)

Set-up example 1: One DEXAL (D4i) LED driver and one DEXAL (D4i) RF module



In order to grant a good communication and functionality on the D4i bus, the following must be considered:

- (1) D4i bus current generated by the LED driver must be lower than 250 mA.
- (2) Peak peripheral input current must be lower than 46 mA.
- (3) Average peripheral input current must be less than 23 mA.

Practical example with one active DEXAL (D4i) bus power supply and one D4i RF module:

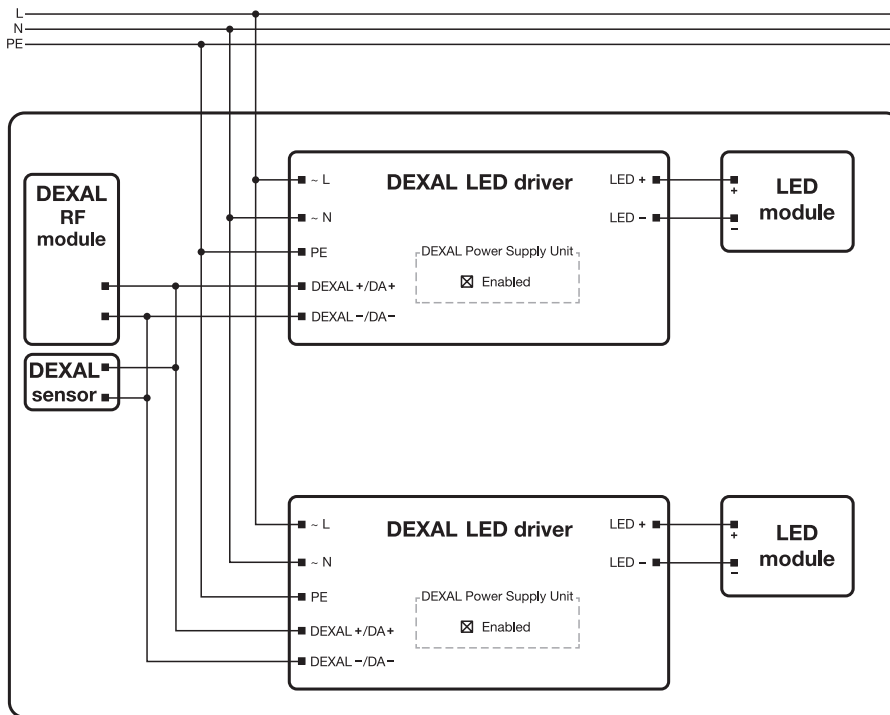
RF module: $I_{peak} = 45 \text{ mA}$
 $I_{avg} = 20 \text{ mA}$

- (1) 1 x D4i LED driver current is 62 mA which is less than the limit of 250 mA.
- (2) Peak RF module input current is 45 mA which is less than the limit of 46 mA.
- (3) Average RF module input current is 20 mA which is less than the limit of 23 mA.

All the criteria are fulfilled. The configuration is permitted.

Result: Passed

Set-up example 2: Two DEXAL (D4i) LED drivers, one DEXAL (D4i) RF module and one DEXAL (D4i) sensor



In order to grant a good communication and functionality on the D4i bus, the following must be considered:

- (1) D4i bus current generated by the LED driver must be lower than 250 mA.
- (2) Peak peripheral input current must be lower than 46 mA for each driver with DEXAL-D4i-enabled bus.
- (3) Average peripheral input current must be less than 23 mA for each driver with DEXAL-D4i-enabled bus.

Practical example 2A: One active DEXAL (D4i) bus power supply, one deactivated DEXAL (D4i) power supply and one D4i RF module

D4i RF module:	I_{peak} : 45 mA
	I_{avg} : 20 mA
D4i sensor:	I_{peak} : 7 mA
	I_{avg} : 5 mA
LED driver (disabled bus power supply):	I_{peak} : 2 mA
	I_{avg} : 1 mA

- (1) 1 x D4i LED driver current is 62 mA which is less than the limit of 250 mA.
- (2) Peak RF module input current is 45 mA + 7 mA + 2 mA = 54 mA, which exceeds the limit of 46 mA.

Not all the criteria are fulfilled. The configuration is **not** permitted.

Result: Failed

Practical example 2B: Two active DEXAL (D4i) bus power supplies, one D4i RF module

D4i RF module:	I_{peak} : 45 mA
	I_{avg} : 20 mA
D4i sensor:	I_{peak} : 7 mA
	I_{avg} : 5 mA
LED driver (enabled bus, therefore no longer in the calculation):	I_{peak} : 0 mA
	I_{avg} : 0 mA

- (1) 2 x D4i LED driver current is 2 x 62 mA = 124 mA, which is less than the limit of 250 mA.
- (2) Peak RF module input current is 45 mA + 7 mA = 52 mA which is lower than the limit of 2 x 46 mA = 92 mA.
- (3) Average peripheral input current is 20 mA + 5 mA = 25 mA which is lower than 2 x 23 mA = 46 mA.

All the criteria are fulfilled. The configuration is permitted.

Result: Passed

5 DALI/DEXAL bus power supply (DALI PS 100 LI)

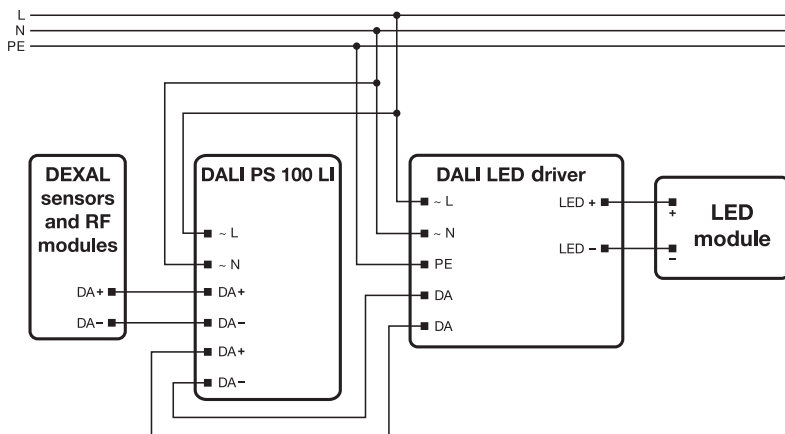
The DALI Power Supply Unit (DALI PS 100 LI) brings DEXAL functionality to any DALI system, in case the connected DALI LED drivers support the DiiA specifications Parts -251, -252 and -253.

A possible application for the DALI Power Supply Unit is when LED drivers provide no bus power supply (e.g. OTi DALI Tunable White LED drivers). Alternatively, when higher supply currents are necessary, the DALI PS 100 LI is an ideal solution.

Note:

It's not permitted to connect more than one DALI PS 100 LI to the DALI bus.

Set-up example 3: Standard DALI LED driver enabled for DEXAL operation with a DALI PS 100 LI



6 Data structure and management

With the DEXAL interface, sensors and RF modules from numerous providers can be supplied with power and data can be made available to downstream systems. The RF module transmits the data to the management system, where it is processed and analyzed. The standardized interface ensures the compatibility of the luminaires with numerous system components.

DEXAL Generation 2 drivers comply with the DiiA specifications which can be downloaded from the DiiA website: www.digitalilluminationinterface.org/specifications/download.html

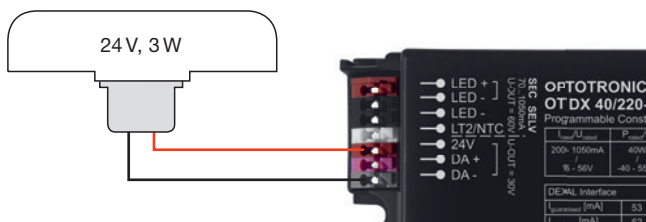
Our DEXAL drivers provide data on the operation and energy consumption of the luminaire. In Generation 2, additional information about the luminaire can be stored and the data model corresponds to the current DiiA specifications. With the Generation 2 devices, the data can also be recalled via the Tuner4TRONIC software.

All features of the LED drivers as well as the creation of an electronic type label for your luminaire (luminaire information according to DiiA specification DALI Part -251) can be programmed with the Tuner4TRONIC software. The driver configuration and the data stored in the driver can be protected by the Configuration Lock with the Tuner4TRONIC software. By default, the luminaire, energy and diagnostic data are not protected. Specific information such as energy reports as well as diagnostic and maintenance data can also be read out with this software. The Tuner4TRONIC software can be downloaded for free from www.osram.com/t4t.

The partner program “Works with OSRAM DEXAL” on our website at www.osram.com/dexal provides a list of system components being tested with DEXAL LED drivers by our DEXAL partners.

7 Additional features of DEXAL Outdoor LED drivers

For outdoor applications, sensors and LMS controllers with a demand for a higher supply power are used. Therefore, in addition to the internal DEXAL bus power supply, the DEXAL Outdoor LED drivers are equipped with a 24 V AUX Power Supply providing up to $3W_{avg}/6W_{pk}$.



Wiring schematic of an outdoor controller/sensor

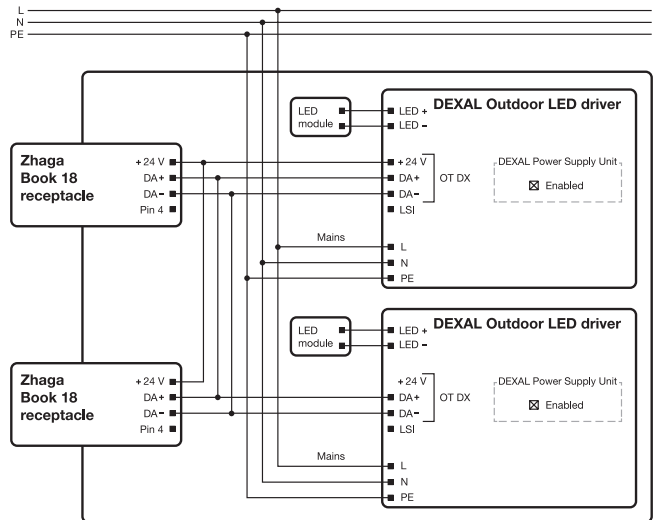
The 24V power supply of DEXAL Outdoor LED drivers complies with the DiiA specification DALI Part -150, which defines the electrical characteristics of the AUX Power Supply.

Zhaga Book 18 receptacle

The socket is electrically and mechanically defined in the Zhaga Book 18 (see <https://www.zhagastandard.org/books/book18/>).

Contact	Assignment
1	+24 V power supply
2	Negative pole for the protocol (contact 3) [e.g. DA-] Ground for +24 V power supply (contact 1) Ground for LSI (contact 4)
3	Positive pole for the protocol [e.g. DA+]
4	LSI (Logical Signal Interface) for future use. Shall not be connected acc. to Book 18.

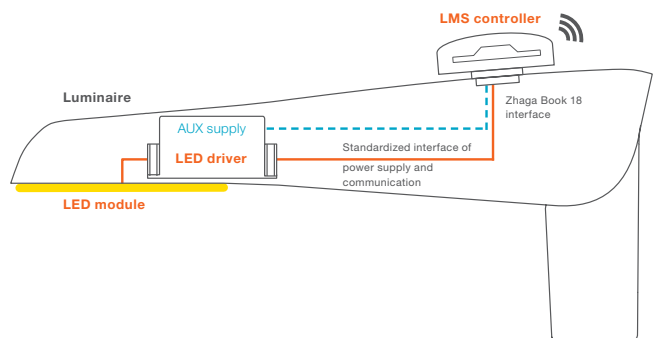
Relation between the contact number of the receptacle and the designated assignment



Wiring schematic of two DEXAL LED drivers, two LED modules and two Zhaga receptacles for a connectivity-ready luminaire

System architecture of a networked luminaire

With a DEXAL driver, the internal luminaire design can be significantly improved in terms of adding smart components such as sensors, RF transceivers and LMS controllers.



Please note:

- Multiple AUX power supplies shall not be connected in parallel
- The total cable length between a DEXAL driver interface and a DEXAL node shall not exceed 3m.

8 OSRAM nomenclature of features



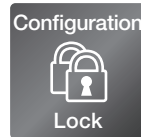
Data for predictive maintenance of luminaires and energy efficiency optimization

LED drivers with this feature offer additional operation and status information that exceeds what is currently offered by the DALI standard (such as energy consumption, power, operating time or overvoltage). Such data enable predictive maintenance as well as accelerated and more efficient lighting services. Moreover, it makes the light management system intelligent. The data can also be visualized with the Tuner4TRONIC software.



Luminaire Data with electronic type label

In order to make light management systems intelligent in terms of service and predictive maintenance, they need basic information about the connected luminaires (model, power, service life etc.). During production, the luminaire manufacturer can store these data in the LED driver, and the light management system can recall these data in the installation.



Configuration Lock

This feature is an advancement of OEM Key, which allows controlling the access rights for individual features within the LED driver via Tuner4TRONIC software and assigning different rights to the luminaire manufacturer, to the service team and to the general user. Assigning user rights also allows offering “light as a service” while maintaining total control over who may change what within the device or luminaire.

Disclaimer

Due to technical reasons, the provided data of the LED driver have usual limitations regarding accuracy and reliability based on the current state of art and technology and are only meant as clue and aid for diagnostic purposes. Therefore, OSRAM shall not be liable for the accuracy and reliability of the provided results including any incorrect data or their incorrect technical interpretation due to the current state of technology.

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