OEM Design-in Guide

Luxon IoT Node Outdoor

Zhaga Version

Version 1.3

www.nedap-luxon.com

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1 General information

1.1 Introduction

The Luxon IoT Node Outdoor features a cost-effective, brand independent solution to create connected and wirelessly controllable LED fixtures for outdoor applications. The node differentiates from other products on the market by its extended functionality, such as performance monitoring and remote diagnostics of LED fixtures by means of a cloud based light management system. The Luxon IoT Node Outdoor complies with all major LED driver interfaces such as Active DALI, DALI and 1-10V dim-to-off.

In this OEM design-in guide you will find the information how to design-in the Luxon IoT Node Outdoor into a luminaire and information about how to do the end-off-line test during manufacturing. For more information or support pls. contact our OEM Technical Support and Product Manager Richard Hogenkamp at richard.hogenkamp@nedap.com.

The Luxon IoT Node Outdoor complies with EMC and safety requirements as stated in the specifications, see chapter 8.

Benefits in a nutshell

- Standardized Zhaga book 18 connector
- Cost-effective solution to create internet connected and wirelessly controlled luminaires
- Compatible with Active DALI, DALI or 1-10V dim-to-off LED drivers
- Control of up to 4 drivers in one luminaire
- DALI power supply integrated to control up to 4 DALI LED drivers
- Large RF range
- Easy to integrate, easy to connect
- Temperature sensor integrated
- Support of Nedap motion sensor 12m and 3rd party motion sensors
- Twilight switch integrated
- Over the air (OTA) programming to upgrade the Luxon new features

Typical applications for the Luxon IoT Node Outdoor are parking lot, parking garages, outdoor area lighting, wall packs and walkways.

Typical Application: Parking Lot

1.2 Warnings and instructions

- Read the design guide completely before design-in the Luxon IoT Node Outdoor.
- Do not connect mains voltage to the terminals of the Luxon IoT Node Outdoor.
- Make sure the Luxon IoT Node Outdoor is operated within the technical limitations of the specification, see chapter 8.
- Make sure the IoT node RF antenna is not covered or obstructed by metal for the best RF communication.
- Make sure the Zhaga connector is always covered either with a Luxon IoT node Outdoor or protective cap.
- Make sure to perform an end-of-line test during production to test all the functions of the luminaire with integrated Luxon IoT node Outdoor Zhaga. See chapter 6 for more information.

1.3 Package content

Description	Units per packaging
Luxon IoT Node Outdoor	96 pcs
Quick Install Guide	1

Luxon IoT Node Outdoor

Quick Install Guide

Note: Do not remove any labels from the devices. These labels contain important information.
The minimum order quantity is 4 pcs.

1.4 Shipping and storage

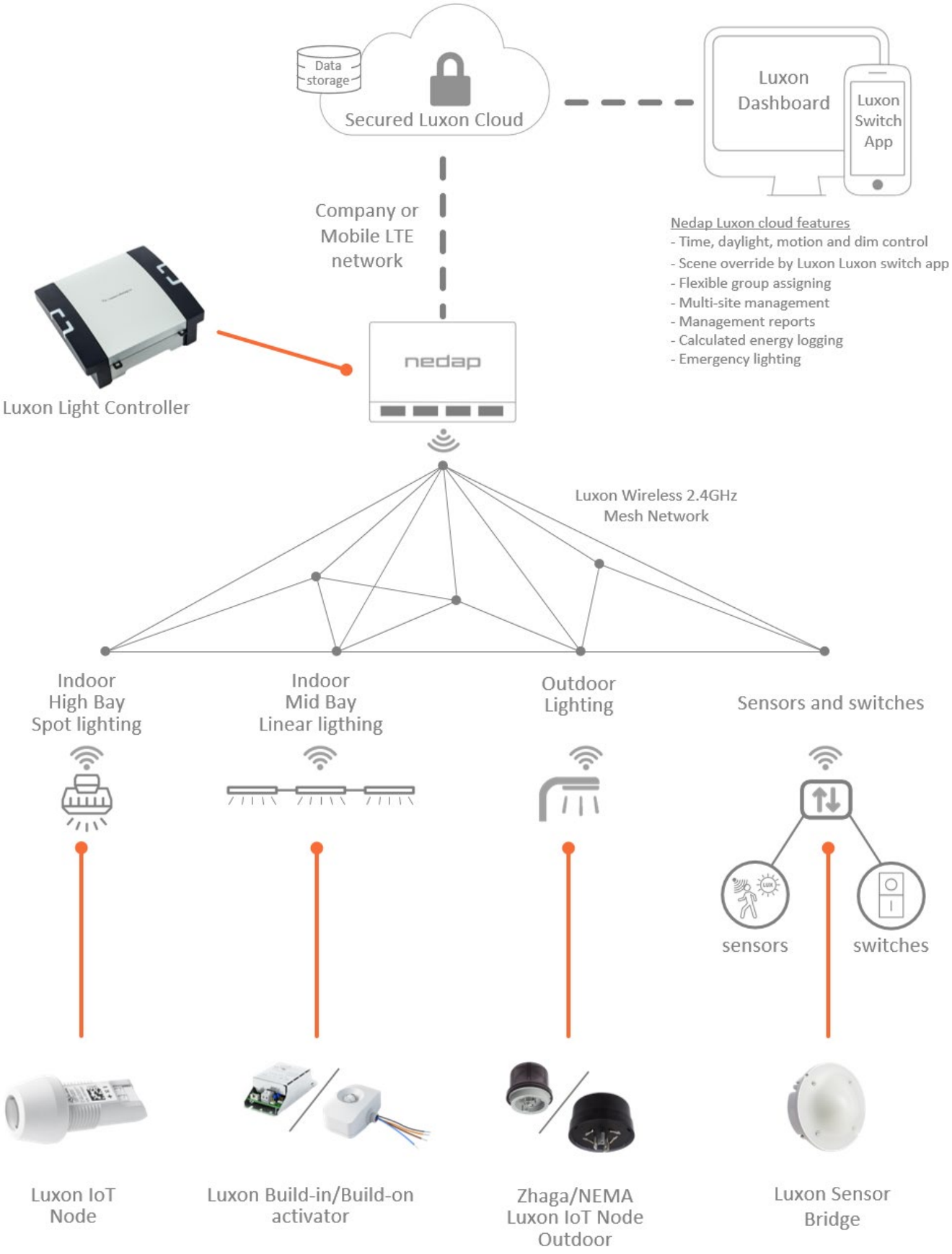
Description	Packaging dimensions (h x w x d) [mm/inch]	Packaging weight [kg/lbs]	Storage temperature
Luxon IoT Node Outdoor Multiple Packaging (96 pcs)	275 x 510 x 340 / 10.8 x 20.1 x 13.4	4.4 / 9.7	20°C to +70°C / -40°F to 158°F
Luxon IoT Node Outdoor Single Packaging (1 pc)	125 x 125 x 110 / 4.92 x 4.92 x 4.33	0.18 / 0.40	20°C to +70°C / -40°F to 158°F

- Store the boxes in a dry place

1.5 Waste disposal

The local government authority must be consulted for instructions regarding waste processing of the Luxon IoT Node Outdoor.

2 Luxon system overview



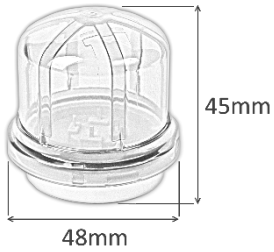
3 Product Information

3.1 Product range

Description	Part number
Luxon IoT Node Outdoor	9986979

3.2 Mechanical dimensions

In the picture below the dimensions of the Luxon IoT Node Outdoor are shown.



3.3 Zhaga base pinning

The Luxon IoT Node Outdoor has 4 pins connected according to the Zhaga standard.

Bottom view Zhaga base

Pin	Type
1	+24Vdc supply input
2	DALI - / Dim-
3	DALI + / Dim+
4	Sensor input

3.4 LED indicator

Below we explain the functionality of the green led before and after commissioning when the Luxon IoT node in powered up.
The Luxon IoT node is factory default not commissioned.
With the Luxon floorplanner the Luxon IoT node outdoor need to be commissioned to assign the node to the Luxon Light Controller (LLC).

Green LED functionality before commissioning
1: Green led quick flashing (10Hz) : Self-test of 1 second
2: Green led slow flashing (0.5Hz): Addressing DALI Drivers; In case of 1-10V drivers, this phase is skipped.
3: Green led on: Driver initialization ready and no failures

Green LED functionality after commissioning
1: Green led quick flashing (10Hz) : Self-test of 1 second
2: Green led on for 1 second and then turns off.

The red LED starts flashing red to indicate a failure. This failure could be:
A: No control mode (Active DALI, DALI or 1-10V dim-to-off) is detected due to incorrect wiring or a defective driver.
B: A driver status error occurred due to defect in driver, driver load or wiring.
C: An overcurrent on the D+/1-10V control line occurred, due to connecting a power supply to the control line.

3.5 Temperature sensor

The Luxon IoT Node Outdoor has a built-in temperature sensor which can be requested the Luxon light management system. The range of the temperature sensor is -40°C/-40°F to +100°C/+212°F, however in normal operation the maximum internal temperature is 80°C/176°F.

3.6 Lux sensor

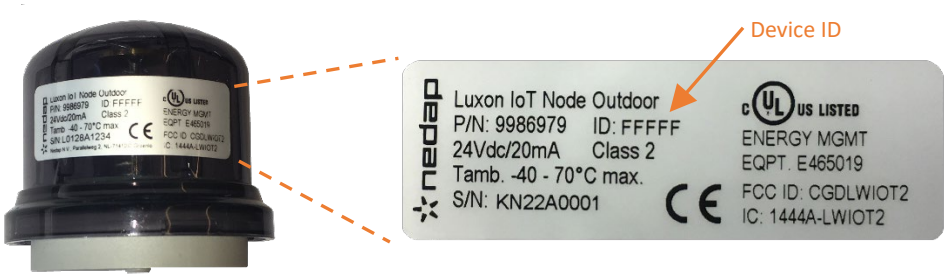
The Luxon IoT node outdoor has an integrated light sensor to measure lux values from 0 to 1000 lux. The lux sensor will be used in the future to support twilight switch functionality.

3.7 Motion sensor input

The Luxon IoT Node Outdoor supports motion sensors with a 0-10V, OC (open collector) or potential free contact interface, see chapter 5.4 for more information and supported sensors.

3.8 Device ID

To communicate to every single device in the mesh network, every Luxon IoT Node Outdoor has an unique device ID. See the image below where you can find the device ID on the Luxon IoT Node Outdoor.



4 Compatible LED drivers

The Luxon IoT Node Outdoor can control up to 4 drivers within one luminaire. The control interface can be either Active DALI, DALI or 1-10V dim-to-off mode. The Luxon IoT Node Outdoor determines the interface control mode automatically by measuring supply voltage and dimming interface voltage of the connected driver(s). For possible drivers see Luxon Portal: https://portal.nedap-luxon.com

Nedap Light Controls offer a service to evaluate your luminaire after integration of the Luxon IoT Node Outdoor to prove the compatibility with the Luxon Light Management system. We recommend to make a luminaire available for evaluation.

4.1 LED drivers with an Active DALI interface

In Active DALI mode, the Luxon IoT Node Outdoor is powered by the Active DALI driver through the dimming interface. DALI communication is used to control the driver via the same dimming interface, which is polarity sensitive.
Up to four drivers can be controlled by connecting their DALI ports in parallel.

All Philips/Signify Xitanium SR and Osram DEXAL® drivers are compatible with the Luxon IoT Node Outdoor.

Wiring diagram 1: Active DALI application with Luxon IoT Node Outdoor

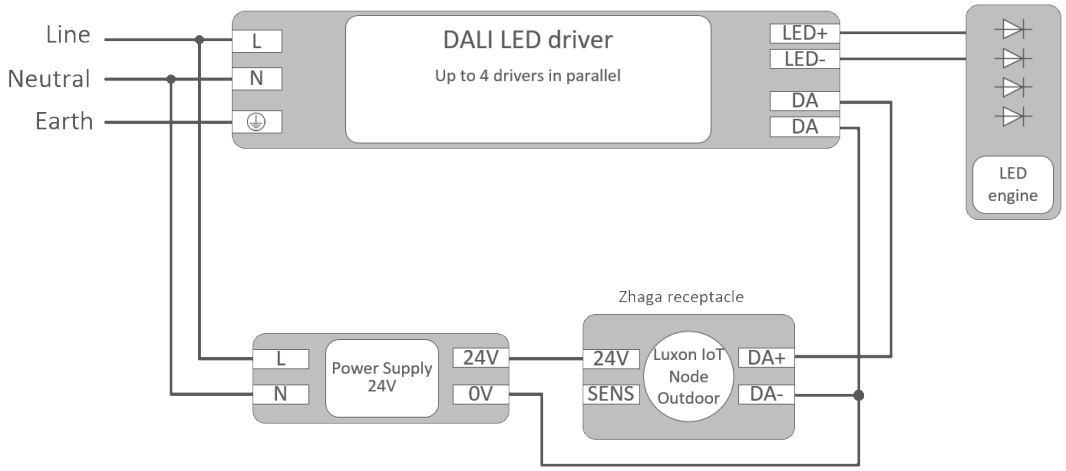
Note: Each Active DALI driver provides approximately 50mA of current on the DALI bus. It is recommended to turn on only two DALI power supplies to ensure proper communication of up to 4 LED drivers in parallel. To turn off the DALI power supply, use the appropriate programmer. (See Philips/Signify or Osram Digital Systems website)

4.2 LED drivers with a DALI interface

In DALI mode, power the Luxon IoT outdoor by a 24Vdc supply voltage. The Luxon IoT Node Outdoor provides the DALI bus voltage and communication through the dimming port to DALI drivers. The DALI output is polarity sensitive although most drivers do not have a polarity sensitive DALI port. Up to four drivers can be controlled by connecting the dimming ports in parallel.

DALI driver requirements:

- All IEC 62386 compliant DALI drivers are compatible with the Luxon IoT Node Outdoor. One driver or auxiliary power supply needs to supply 24V to the Luxon IoT Node Outdoor; (Power consumption IoT node: 250mW) See also chapter 5.5 about auxiliary power supplies.
- Note that driver manufacturers do not always implement all DALI commands i.e. query status.
- Please make sure the 24V supply voltage remains available in the 'OFF' status

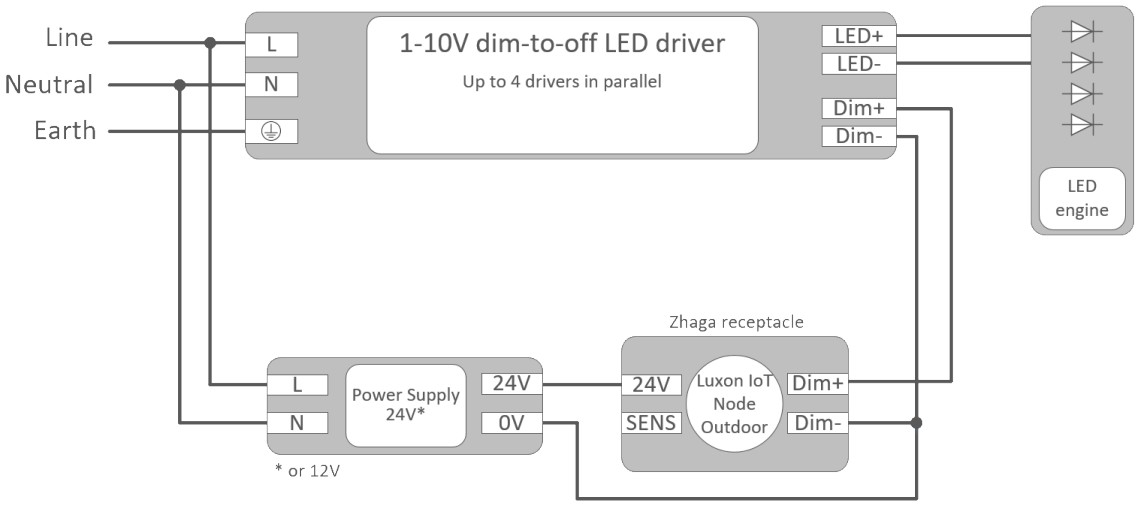


Wiring diagram 2: DALI application with Luxon IoT Node Outdoor

4.3 LED drivers with a 1-10V interface

In 1-10V mode, the dimming voltage range is from 1 to 10V, the output can be set to 0V to switch the LED driver off. The LED driver need to support dim-to-off functionality for this feature. The IoT node supply voltage must be 12Vdc or 24Vdc.

All 1-10V drivers according to the IEC 60929 / ANSI C82.11 annex A standard with internal or external 12Vdc or 24Vdc auxiliary supply and dim-to-off functionality (see required threshold level in the specification) shall be compatible with the Luxon IoT Node Outdoor.



Wiring diagram 3: 1-10V dim-to-off application with Luxon IoT Node Outdoor

1-10V driver requirements:
- One driver needs to supply 12V or 24V to the Luxon IoT Node Outdoor; (Power consumption IoT node: 250mW)
- Please make sure the auxiliary voltage remains available in the 'OFF' status
- All drivers needs to have dim-to-off functionality.

Note:
- For some drivers the control wires have to be considered as basic isolated signals.
- If the 1-10V driver does not support an auxiliary voltage, an auxiliary power supply can be used. See chapter 5.5.

5 Design-in considerations

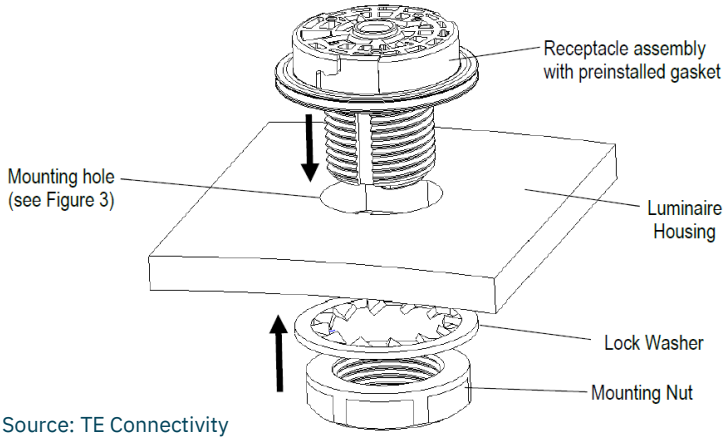
5.1 Receptacle mounting

TE connectivity is one of the suppliers of the Zhaga receptacle. Below you will find the basic information out of the application specification of TE connectivity.

TE connectivity part number
2213858-1

5.1.1 Mounting

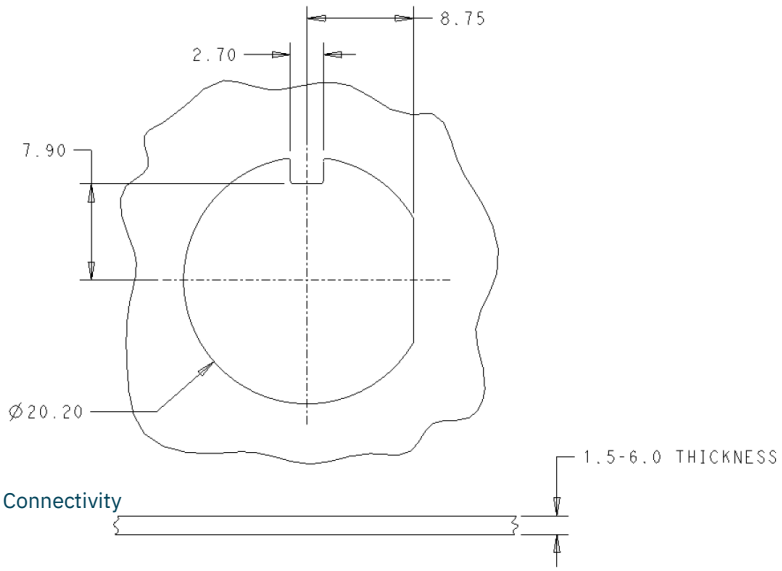
Receptacle can be used on a luminaire housing thickness between 1.5mm to 6.0mm.
Torque mounting nut within the range of 1.8 to 2.4 N-m using a 27mm hex socket. See Figure below.



Source: TE Connectivity

5.1.2 Mounting Hole Pattern

The recommended mounting hole is shown in Figure below.



Source: TE Connectivity

5.1.3 Sealing Cap

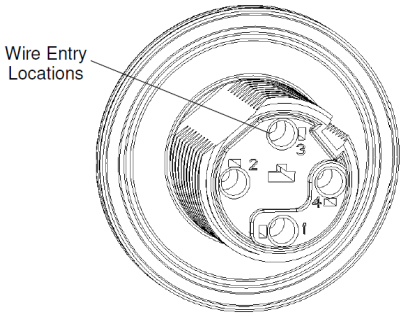
In case the IoT node is not mounted during installation, make sure a sealing cap of TE connectivity will be used to maintain the IP rating of the luminaire.

Colour	TE connectivity part number
Dark Gray	2213795-1
Light Gray	2213795-2

5.2 Wire connections

5.2.1 Wire locations

The receptacle is wired on the bottom side of the assembly; access from the inside of the luminaire. Wire entry locations are labeled 1, 2, 3, and 4, see picture below.

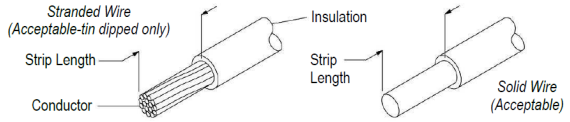


Pin	Type
1	+24Vdc supply input
2	DALI - / minus
3	DALI + / 0-10V
4	Sensor input

Source: TE Connectivity

5.2.2 Wire selection and preparation

The receptacle assembly will accept 16 thru 20AWG solid and 18 thru 20AWG stranded tin-dipped copper wire only.
The table in Figure xx provides wire selection for the Poke-In Connectors.
The maximum cable length from the receptacle to the driver and motion sensor is 3 meter.



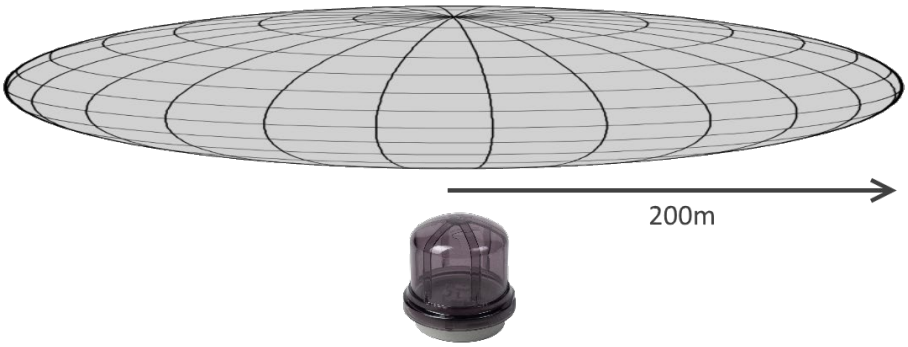
RECOMMENDED WIRE			
WIRE SIZE	WIRE TYPE	INSULATION DIAMETER	STRIP LENGTH
16AWG	SOLID	Ø2.95 MAX Ø1.90 MIN	11.0±1.0
18AWG	SOLID		
	STRANDED (TIN-DIPPED)		
20AWG	SOLID		
	STRANDED (TIN-DIPPED)		

Source: TE Connectivity

For more detailed information of the Zhaga book 18 receptacle, see application specification of TE connectivity on the website: https://www.te.com/usa-en/about-te/news-center/lumawise-endurance-s.html

5.3 Position and RF performance

The RF radiation pattern of the Luxon IoT Node Outdoor is directed mainly in one direction as showed is the picture below.

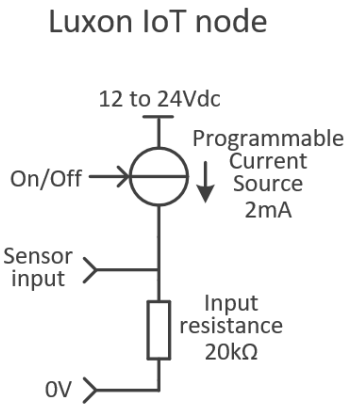


Requirements to give the antenna the best possible free 360° RF communication performance:
- Avoid metal parts close to the antenna.
- Mount the Luxon IoT Node Outdoor pointing downwards or upwards for optimal RF performance.
- Avoid large horizontal oriented metal parts within 75mm or 3” measured from the center of the antenna.

5.4 Supported motion sensors

The Luxon IoT Node Outdoor sensor input is a universal sensor input for the Nedap motion sensor and several third party motion sensors.

The sensor input is compatible with sensors which have an analog 1-10V interface, an open collector output or potential free low current relay contacts. The sensor input has an ON/OFF programmable current source of 2mA maximum.



5.4.1 Luxon motion sensor

The Luxon motion sensor is an PIR high bay 12m / 39ft motion sensor which can be easily connected to the Luxon IoT Node Outdoor without an auxiliary supply. This sensor is IP65 and can be universally used indoor and outdoor.
A masking set can be ordered separately.

Description	**Part number**
Luxon Motion Sensor 12m/39ft universal mount	9984526
Lens Mask Set	4605675

The Luxon Motion Sensor shall be connected as shown in diagram A by using appropriate wire connectors.
The Luxon Motion Sensor cable shall not be lengthened.

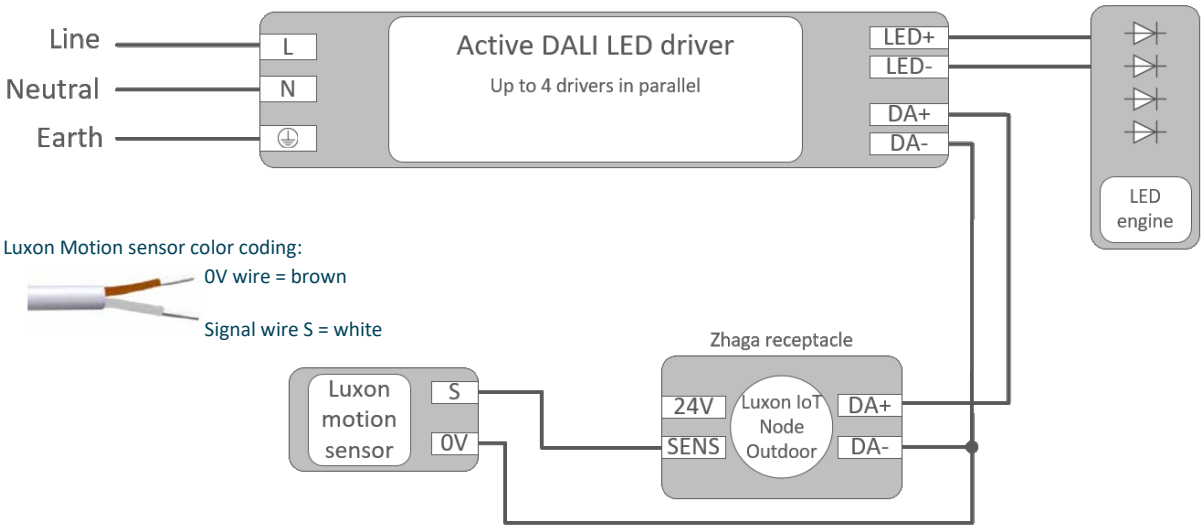


Diagram A: Connecting a Luxon motion sensor

The white wire of the Luxon Motion Sensor is connected to the sensor input of the Luxon IoT Node Outdoor.
And the brown wire to the 0V of the Luxon IoT Node Outdoor.

5.4.2 Third party motion sensors

Third party motion sensors shall be connected as shown in diagram B. Note that third party sensor requires a 12V or 24V external supply voltage, either from the LED driver or from an auxiliary power supply, see chapter 5.5. In case of a sensor with programmable time delay settings make sure they are set to the lowest value, either by factory default (preferred) or by hand or using a programming device. Also disable the sensor light dependent switch if applicable.

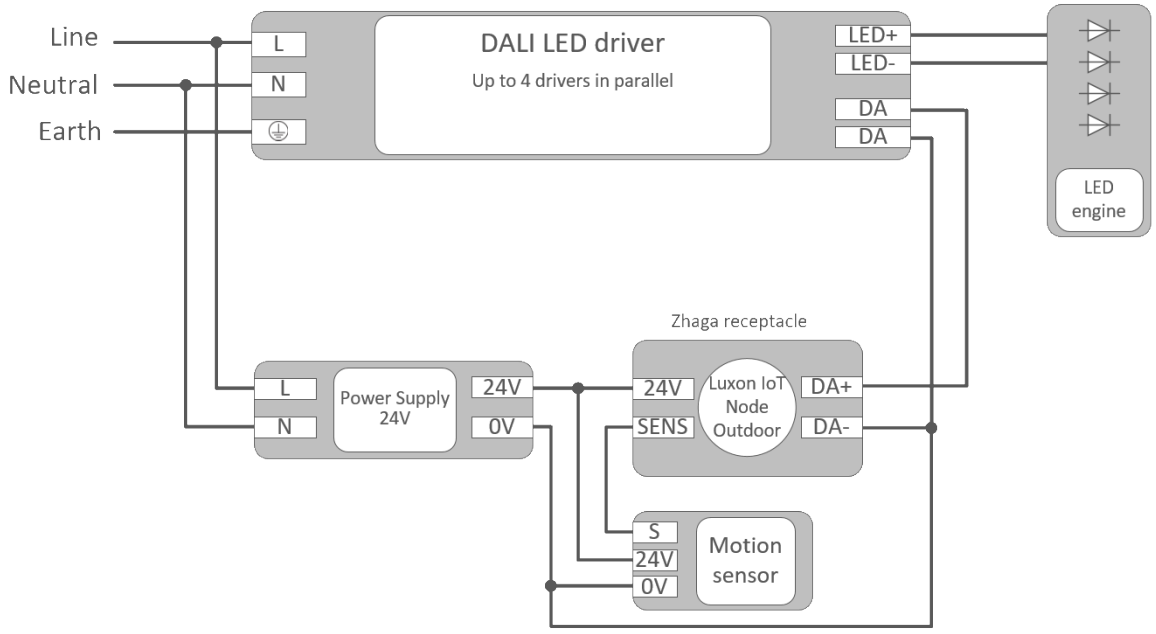


Diagram B: Connecting a third party motion sensor

Sensor interface output requirements

1: Is case of an open collector output or potential free relay low current contact.

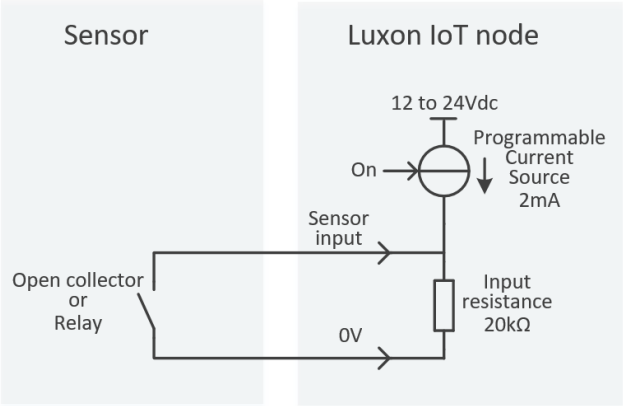


Figure 1: Sensor output switching to 0V.
Maximum IoT node current: 2mA max.

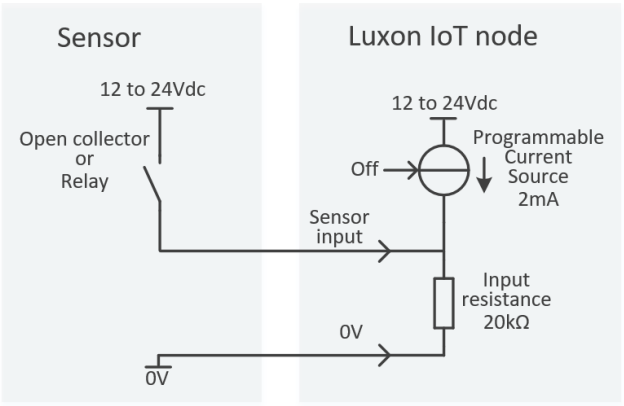
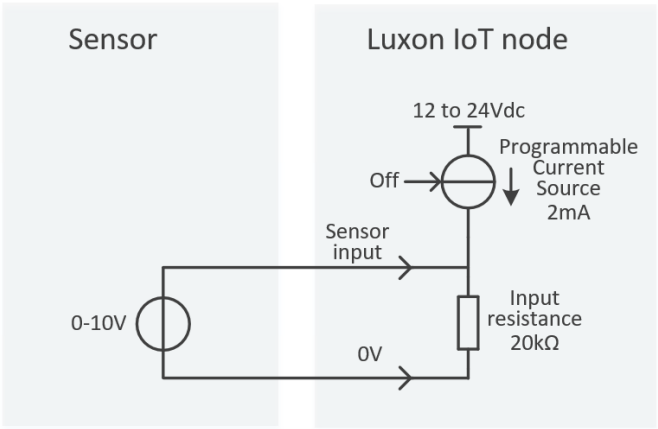


Figure 2: Sensor output switching to 12 to 24Vdc

2: In case of an analog 0-10V sensor output voltage.

- Maximum Luxon IoT node sensor input voltage: +28Vdc
- Input resistance Luxon IoT node sensor input: 20kΩ



Safety notes
If the sensor is supplied from mains directly, the sensor signal output shall be SELV or Basic isolated.

Released compatible sensors
For an overview of compatible sensors and wiring diagrams and settings, please refer to portal.nedap-luxon.com.
When you are using other sensors we recommend a final compatibility check by Nedap Light Controls with a sample provided to Nedap Light Controls in Groenlo Holland.

5.5 Auxiliary Power Supply

To power the Luxon IoT Node Outdoor and / or third party sensors, an auxiliary power supply can be used in cases that the LED driver has no auxiliary power supply available or has no active DALI port like Philips SR or Osram Dexal.

In this chapter , the Luxon IoT Node Outdoor power supply requirements are shown followed by additional requirements for auxiliary power supplies and location of compatible 24V power supplies.

Requirements Power Supply

In the table below the power supply requirements for the Luxon IoT node Outdoor are specified.

Control Interface	Voltage (V)	Min. operating Current (mA)	Max. operating Current (mA)	Inrush Current (mA)
1-10V	12 or 24V ± 10%	6	20	50
DALI	24V ± 10%	6	20	50

Additional Requirements Auxiliary Power Supply

In case the IoT node is used without sensor, the table above shall be used to find the power supply output specification. In case an additional sensor is used:
- its operating voltage range shall correspond with the chosen value for the Luxon IoT Node Outdoor (12 or 24V)
- its current shall be added to the current for the IoT node to obtain the total operating supply current

Other supply requirements to be considered:
-minimum load specification of 6mA or less
-the maximum Ta or Tc shall not be exceeded
-evaluate if output derating is required in case of high operating temperature
-the supply lifetime shall match the luminaire lifetime
-the mains surge protection level shall match the luminaire protection level
-some power supplies require a mains fuse
-the input mains voltage range shall match

Compatible 24V Auxiliary Power Supplies

For an overview of electrical compatible auxiliary power supplies, please refer to portal.nedap-luxon.com.

5.6 Product responsibility

The Luxon IoT Node Outdoor is designed for Luminaires with an Zhage book 18 receptacle. Safe and reliable operation requires that the end-product complies with the relevant standards and regulations. The manufacturer of the end-product remains responsible for the quality and performance of the luminaire with the Luxon IoT Node Outdoor in compliance with the contents of this OEM Design Guide as well as for the total system in the market. The ratings in the specifications of the Luxon IoT Node Outdoor shall not be exceeded when it is used in the actual operating conditions.

6 Luminaire End-Of-Line test

To test a luminaire with the integrated Luxon IoT Node Outdoor, Nedap can supply two different test tools.
If you do not have a computer available you will need to use the “Luxon wireless OEM test unit” otherwise you can test your luminaire with the “Luxon wireless control tool”.
In case you want to test an integrated motion sensor, use the “Luxon wireless control tool”.

6.1 Luxon Wireless Control Tool

With the Luxon Wireless Control Tool you can test and demonstrate the functionality of your luminaire with integrated Luxon IoT Node Outdoor plugged on. You can select a luminaire and switch it on and off and dim to a level between 10% and 100%.
You can also retrieve luminaire information about the operation mode (Active DALI, DALI, 1-10V dim-to-off), internal temperature, operating hours and more. You need a Windows based laptop and Luxon wireless USB key to use this tool. See our partner portal to download the software and user manual.

Ordering information Luxon Wireless USB key
Part number: 8014990

6.2 Luxon Wireless OEM Test Unit

With the Luxon Wireless OEM test unit you can check the wireless communication and the correct wiring of the mains and control wires of the luminaires in your production line.
You can control (switch on/off and dim) the luminaire manually by simply connect and operate with two switches. The control interface can also be connected to your automated production test tool.

You only need this test unit (no laptop or other peripherals needed) to control a luminaire. See the manual delivered together with the test unit how to connect it and control your luminaire. Required switches are not included.

Ordering information Luxon Wireless OEM test unit
Part number: 9984968

7 Compatible Luxon Software

Software	Version
Floorplanner	4.9.0 or higher
Luxon Light Controller (LLC)	2.17.3.3620 or higher

In case your software version is lower than indicated above, contact Nedap customer support at:
EUROPE: support-europe@nedap-luxon.com
AMERICAS: support-americas@nedap-luxon.com

8 FCC and ISED Declarations

Compliance statement (part 15.19)
This device complies with part 15 of the FCC Rules and to RSS210 of Industry Canada.
Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

Déclaration Conformité
Cet appareil se conforme aux normes RSS exemptés de license du Industry Canada.
L'opération est soumis aux deux conditions suivantes
(1) cet appareil ne doit causer aucune interférence, et
(2) cet appareil doit accepter n'importe quelle interférence, y inclus interférence qui peut causer une opération non pas voulu de cet appareil.

Warning (part 15.21)
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RF Exposure (OET Bulletin 65)
To comply with FCC RF exposure requirements for mobile transmitting devices, this transmitter should only be used or installed at locations where there is at least 20cm separation distance between the antenna and all persons.

Luxon IoT Node Outdoor

Use cases

Luxon wireless control of outdoor luminaires for parking lots, area lighting, wall packs and walkways

Features

- Cost-effective solution to create internet connected and wirelessly controlled luminaires
- Philips SR, Osram Dexal, DALI and 0-10V ready
- Small dimensions
- Standard Zhaga interface
- Luxon Cloud compatible
- Easy to install
- Integrated lux and temperature sensor
- Motion sensor input
- OTA programming

Nedap Luxon Cloud features:

- Time, daylight, motion and dim control
- Direct motion sensor control
- Flexible group assigning
- Multi-site management
- Management reports
- Calculated energy logging

Design-in guide available via:
portal.nedap-luxon.com

Request login details for portal via:
info@nedap-luxon.com

Product models

- See ordering information

Specifications

Input voltage	Via Active DALI interface e.g. SR or Dexal 24Vdc when used with 0-10V/DALI interface (and 12Vdc when used with 0-10V)
Control interface	Control of up to 4 drivers ACTIVE DALI: Philips Xitanium SR or Osram DEXAL® PASSIVE DALI: Dali supply integrated 8mA Require aux supply 24V ANALOG 1-10V: Max. sink current: 8mA Dim-to-off threshold 0.3V Required aux. supply 24V or 12V
Wireless technology	Luxon wireless | Zigbee and Bluetooth ready
Operating ambient temperature	-40°C to +70°C / -22°F to 158°F
Storage temperature	-25°C to +70°C / -4°F to 158°F
RF frequency	2.45GHz (default)
RF power	Max. 10dBm
RF range	200m / 656 ft (free line of sight)
Power usage node	< 250mW
Standby power	< 1W on luminaire level, incl. SR driver
Motion sensor input	Universal motion sensor input for sensor with - Open collector output - 0V to 24V output - LSI compatible interface
Lux sensor	Integrated, range 50 - 1000 lux
Temperature sensor	Integrated, range -40°C to +100°C / -40°F to 212°F
Lifetime	10 years
Failure Rate	< 0.2% / year
EMC approvals	CE, FCC
Safety approvals	CE, UL
Ingress protection	IP65 and IP66 when mounted
Glow wire test level	850°C
Mechanical impact	IK09
Connections	Standard Zhaga Book 18, see connections on next page
Mounting	Flexible mounting position, upwards and downwards; Integrated single gasket that seals to both luminaire and module. Twist lock mount to minimize assembly time
Led Status Indicator	Green/red
Color	Transparent smoke

Luxon

Connected Light Management

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