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# Technical application guide

## EINSTONE module

Light is OSRAM

**OSRAM**

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**Please note:**

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# 1 Introduction

## 1.1 System overview

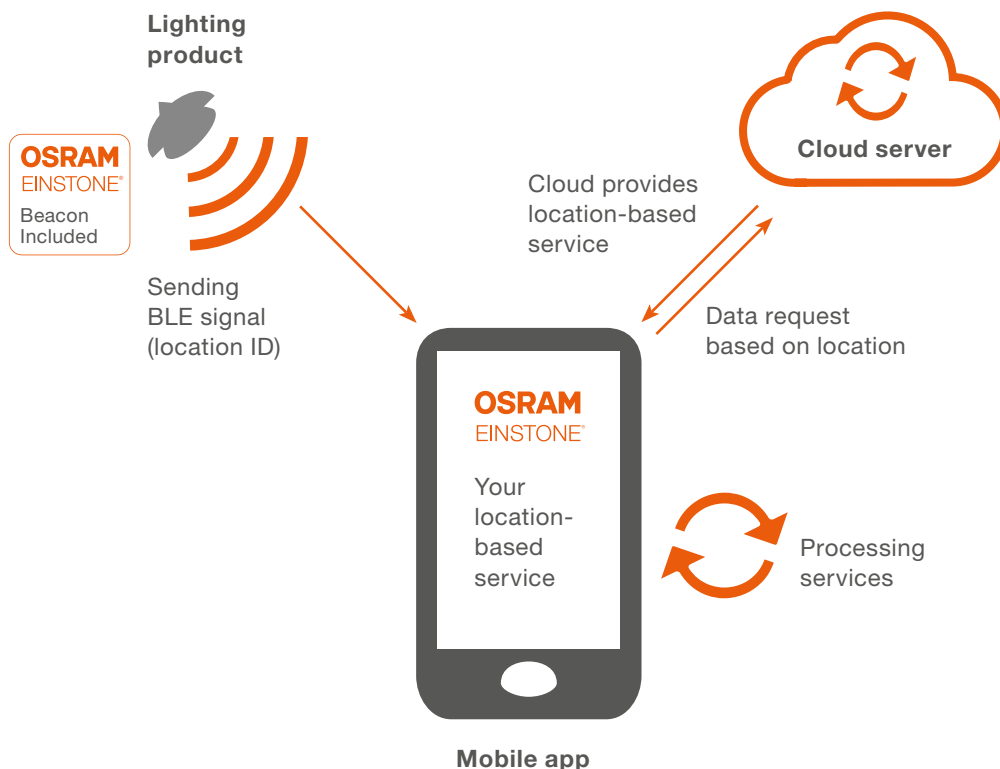
OSRAM EINSTONE connects the real and the digital world using transmitter units known as beacons. Intelligent EINSTONE beacons provide the basis for implementing a whole range of location-based services in indoor facilities, such as navigation, customer loyalty programs and more.

OSRAM EINSTONE combines beacon technology with lighting infrastructures. Permanently supplied with power, EINSTONE beacon modules provide a stable and secure solution. This also ensures an ideal placement of the beacons and reduces maintenance (and the associated costs) to an absolute minimum.

Beacons work with Bluetooth low energy (BLE). This technology is used for transmitting data over short distances. Furthermore, it is designed for low energy consumption and costs. BLE communication consists of small packets of data, so-called “advertisements”. These packets can be collected by mobile devices such as smartphones or tablets and used for a variety of digital services.

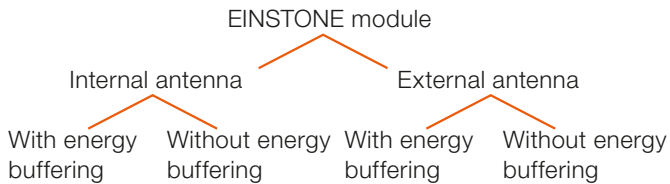
Functional overview:

- The lighting system transmits signals that are used to determine the location
- Mobile devices determine the user’s exact position using an app
- The information related to the location is available in the app



### 1.2 Versions

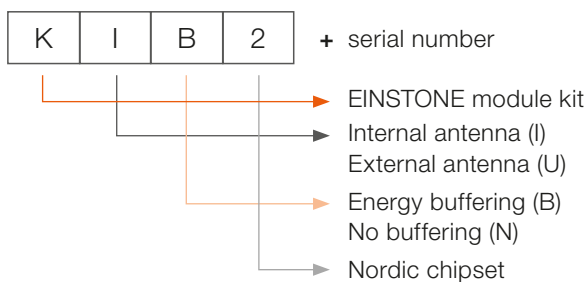
There are four types of the EINSTONE module. First, you can choose between versions with an internal or external antenna and, second, if you need energy buffering for times with no power supply, you can select the suitable version for your application.



### 1.3 Nomenclature

Each product has a unique product identifier consisting of four characters, followed by a serial number with eight digits.

Depending on the antenna and energy buffer, there are four options of the product code.



### 1.4 Features

The module can be configured with the EINSTONE Beacon Configurator, which is available for Android smartphones. Please send us an e-mail to [einstone@osram.com](mailto:einstone@osram.com) if you would like to use the EINSTONE Beacon Configurator app and the corresponding user guide. You can configure up to five non-connectable beacon signals with independent settings such as advertising interval and transmitting power. These beacon signals can be set as different standards:

- iBeacon
- Eddystone URL (Physical Web™)
- Eddystone UID
- AltBeacon

Thus, the EINSTONE module can be configured optimally to meet your needs.



## 2 Mechanical considerations

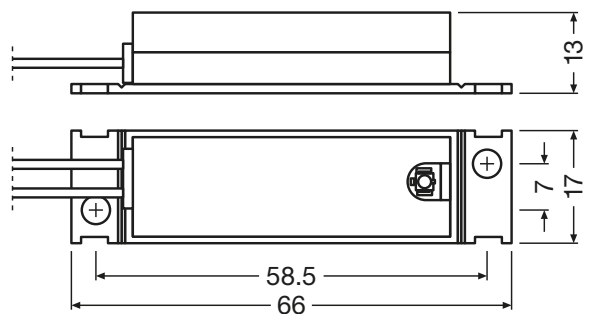
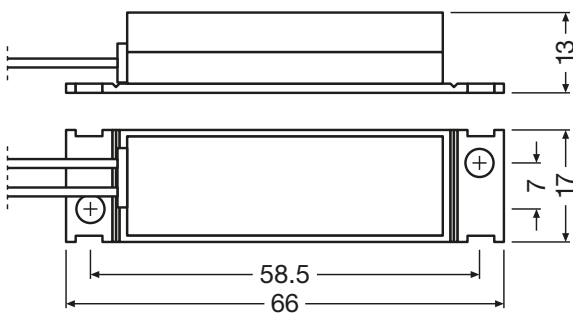
### 2.1 Housings

The following images show the two different housings for the EINSTONE module with internal (left) and external antenna (right).



### 2.2 Dimensions

The dimensions of the EINSTONE module with internal (left) and external antenna (right) are depicted in the following drawings.



All figures in mm

### 2.3 Mounting instructions

Please read the following notes before mounting the module:

- For optimal results, the EINSTONE module should not be mounted at heights exceeding 3 m.
- The service is strongly influenced by human bodies as the spectrum of Bluetooth is the same as the resonance frequency of water. Thus, an installation at a height lower than 2 m can lead to deterioration of the signal.
- The areas surrounding the EINSTONE module should be free of metal parts as these can limit the performance of the antenna.
- A closed metal housing can totally disable transmission. Do not place the external antenna directly on metal.
- The best results for indoor navigation are achieved when the modules are distributed widely across the room or building.
- The mounting of EINSTONE modules for other applications (e.g. proximity marketing) depends on the particular local conditions.

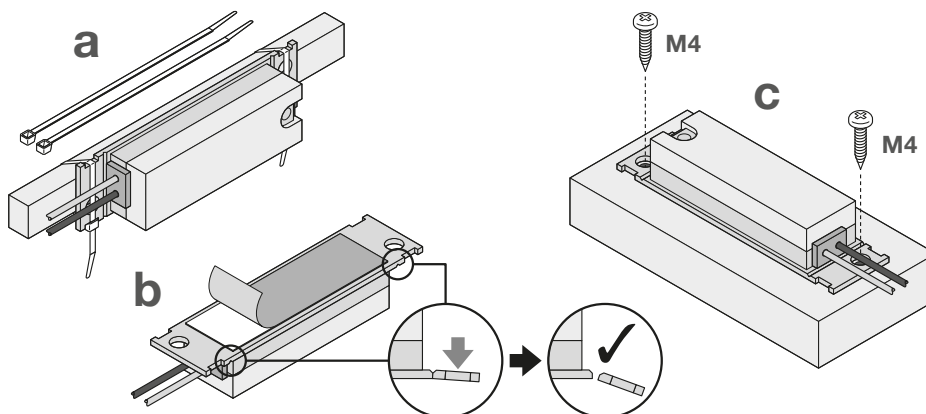
For further information and support for installation planning, please contact the EINSTONE team at [einstone@osram.com](mailto:einstone@osram.com).

The housing of the EINSTONE module is designed to be mounted with cable ties **(a)**, adhesive tape **(b)** or screws **(c)**.

**(a) Cable ties:** Please use the designated channels in the housing to mount the EINSTONE module with cable ties.

**(b) Adhesive tape:** Using the provided double-faced adhesive tape, it is recommended to clean the surfaces of the EINSTONE module as well as the object on which it should be mounted. You can remove the wings on the side at the predetermined breaking points to reduce the size of the housing.

**(c) Screws:** The housing is equipped with holes for M4 screws. Do not use countersunk bolts for mounting the EINSTONE module.



**Attention:** The integration of the EINSTONE module into a luminaire requires a new certification. This includes, for example, an electromagnetic compatibility test.

## 3 Electrical considerations

### 3.1 Basics

The EINSTONE module has two-wire connection cables with a length of 25 cm and colored sides for polarity indication (red for +, black for -).

The module is designed to be connected to a constant-voltage source. The connection to a constant-current driver or a dimmable source can lead to limited or no functionality.

### 3.2 Power supply

	Minimum	Maximum
Input voltage	5V DC	60V DC

### 3.3 Battery endurance (e.g. KIB2 version)

Beacon signals	1	5
Advertising interval	100ms	100ms
Transmitting power	0 dBm	+4 dBm
Average current consumption (at 5 V)	5.43 mA	6.13 mA
Power consumption	< 1 W	< 1 W
Battery buffer time	140h (5.8 days)	40h (1.7 days)

### 3.4 Bluetooth low energy

The physical layer of the EINSTONE module is based on Bluetooth low energy (BLE) technology. Within a spectrum of 2402 to 2480 MHz, the EINSTONE module transmits its data in a range of -24 to +4 dBm.

The interval of the advertising packets can be set from 50 to 2000 ms.

The typical line-of-sight range is 5 to 30 m, depending on the set transmitting power.

### 3.5 External antennas

The versions for external antennas have a micro coaxial connector (e.g. IPEX, AMC, MHF) on board. To connect the antenna, apply light pressure to the **center** of the connector to avoid damage due to skew.

Special tools, e.g. Hirose U.FL-LP-IN, can be used for insertion while U.FL-LP-N-2 can be applied to carefully remove the antenna.

**Attention:** The connector is designed for a few couplings only.

### 3.6 Tested antennas

- Taoglas FXP74
- Taoglas FXP75
- Antenova SR4W030

The external antennas from Taoglas are designed to be mounted on acrylonitrile butadiene styrene (ABS) with a minimum thickness of 2 mm. Antenova's SR4W030 can be directly placed on metal. Please contact OSRAM for further information.

# 4 Environmental considerations

## 4.1 Ingress protection

The completely closed housing of the versions with an internal antenna guarantees an ingress protection of IP65. Thus, they can be installed in dusty or wet environments. The housing of an EINSTONE module with external antenna provides an ingress protection of IP20, which means that it is protected against the intrusion of foreign solid objects with a diameter of over 12.5 mm.

## 4.2 Temperature

<b>Maximum case temperature (t<sub>c</sub>):</b>	50 °C
<b>Storage temperature (t<sub>s</sub>):</b>	-20...65 °C
<b>Ambient temperature (t<sub>a</sub>):</b>	-20...45 °C

## 4.3 Humidity

The module is resistant to a relative humidity between 5 % and 85 %.



# 5 Norms and standards

Electrical safety:	Class III
Ingress protection:	EN 60529: Degrees of protection provided by enclosures (IP Code): <ul style="list-style-type: none"> <li>- Internal antenna: IP65</li> <li>- External antenna: IP20</li> </ul>
Flammability of plastics:	UL 8750 Class 2/UL 94 850 °C glow wire test
Approval:	CE conformity: <ul style="list-style-type: none"> <li>- 2014/53/EU (RED)</li> <li>- 2011/65/EU (RoHS)</li> </ul> Further guidelines: <ul style="list-style-type: none"> <li>- EN 62479: Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)</li> <li>- EN 62368-1: Audio/video, information and communication technology equipment – Part 1: Safety requirements</li> </ul>
Radio frequency:	Electromagnetic compatibility and radio spectrum matters (ERM): <ul style="list-style-type: none"> <li>- ETSI 301-489-1 – Part 1: Common technical requirements</li> <li>- ETSI 301-489-17 – Part 17: Specific conditions for broadband data transmission systems</li> </ul>
Environmental influences:	Shock and vibration: <ul style="list-style-type: none"> <li>- EN 60068-2-27 – Part 2-27: Tests – Test Ea and guidance: Shock</li> <li>- EN 60068-2-64 – Part 2-64: Tests – Test Fh: Vibration, broadband random and guidance</li> </ul>

## Disclaimer

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