PHILIPS

Sensors

EasySense

SNH21x MC

Design-in Guide

Single, **cost-effective luminaire control**

Philips EasySense SNH21x MC

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Introduction

EasySense SNH21x

This document is provides necessary information to design this product into a luminaire and configure it to suit specific applications. This design-in guide covers sensor functionality, mechanical mounting, wiring details, application notes and frequently asked questions.

For sensor datasheet specifications, additional information and/or support, please consult your local Philips sales representative or visit the following site: www.philips.com/easysense

Warnings and Instructions

- The EasySense SNH21x MC is a Sensor Ready (SR) industry sensor and therefore must be used together with a Philips Xitanium SR LED driver or Xitanium SR Bridge.
- Do not apply mains power directly to the sensor.
- Do not cover the sensor during operation or mount the sensor recessed.
- External infrared sources can have a negative impact on occupancy detection.
- Ensure that the sensor area defined for occupancy detection is not blocked by any obstacles. Misalignment of sensor might influence occupancy detection and daylight regulation.
- Make sure that the sensor, especially the occupancy detection lens, is not damaged during shipment and handling.
- The EasySense sensor application area is an indoor industrial environment - such as warehouses, assembly sites, or cold storage area. Such application areas should be normally ventilated. The EasySense sensors have no protection against aggresive chemicals.
- Make sure the EasySense sensor Zigbee/Bluetooth antenna is not covered by metal for proper RF communication.

EasySense Introduction

EasySense SNH21x MC

The EasySense SNH21x MC is the ideal solution for per-luminaire control of smart luminaires. It combines occupancy sensing, daylight harvesting and task tuning in a single package for easy OEM luminaire assembly.

These sensors operate with the established D4i open standard digital interface to make a simple two-wire connection between sensor and driver, thus eliminating the need for multiple components and auxiliary devices. The result is a cost-effective and easy-to-design-in solution ideal for energy-savings. An intuitive app called Philips MasterConnect allows for quick and easy commissioning via Bluetooth along with configuration during and after installation.

The SNH21x MC allows luminaires to be grouped with each other for occupancy sharing (i.e., luminaires within a group can be programmed to remain at prescribed light levels so long as occupancy is detected anywhere in the group) and daylight depending light regulation.

All the features are described in detail in the subsequent sections.

Product Characteristics

EasySense SNH21x MC contains multiple functions in one housing and uses two wires to connect with an SR driver. The following image shows the primary functions included in the sensor:

environment (warehouses, assembly areas, cold stoarge areas, etc.) in normally ventilated areas, the temperature range being -30°C to 65°C. EasySense SNH21x MC has no protection against aggressive chemicals. The sensor is normally mounted to a luminaire and can go up to mounting height of 16m.

Zigbee and Bluetooth Low Energy (BLE)

The RF antenna allows luminaire to luminaire wirless communication via IEEE 802.15.4 wirless protocol with radio frequency: 2400-2483.5MHz. The antenna area as shown above (also in Figure 12) should not be covered by metal and should be exposed to free air to ensure there is sufficient range.

Product Characteristics (continued)

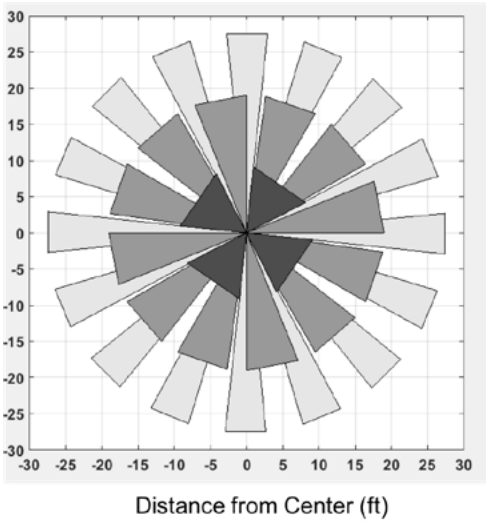

Figure 1 - Top coverage pattern of EasySense SNH211MC.

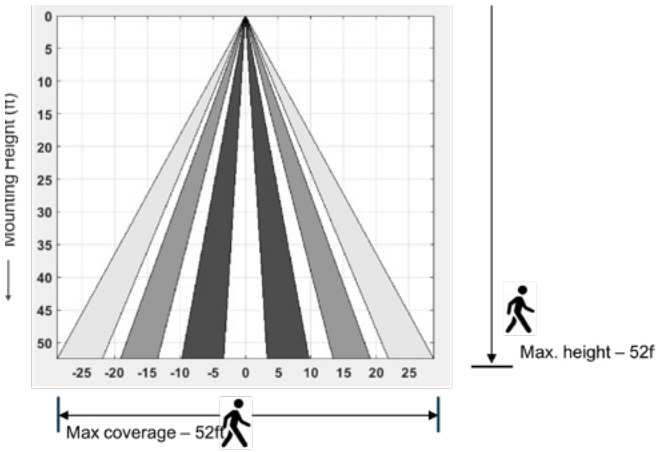

Figure 2 - Side coverage pattern of EasySense SNH211MC at height of 16m.

Motion Detector

The occupancy sensor is a PIR (Passive Infrared) sensor that detects movement with a circular cross-area under an angle of X = 30° and Y = 30°. This PIR sensor has 3 concentric rings to help detect movement - the innermost with 4 facets, the middle with 12 facets and the outermost with 16 facets.

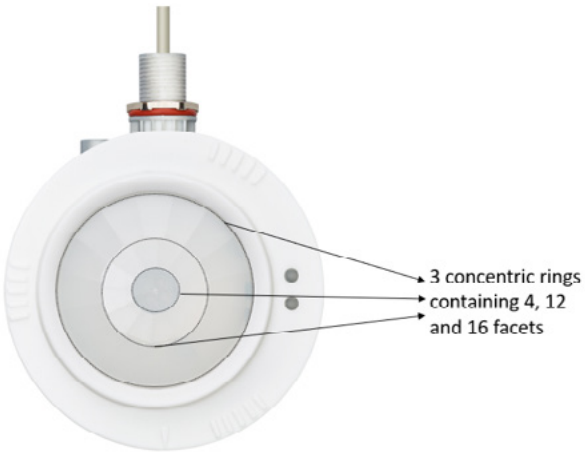

Figure 1 and Figure 2 show the top and side view of the occupancy coverage based on NEMA test, an industry standard.
In the side view, it is visible that coverage ratio of mounting height: diameter at ground level is at maximum 1:1. For example, if the mounting height is 12m, the maximum diameter coverege is 12m.

Disclaimer:

1. In these plots, the white areas are blind spots and the detection is based on subject's motion. An idle subject may not continue to trigger occupancy detection once the hold time expires.
2. As PIR based sensing works on temperature difference between the subject and the ground level, the occupancy detection could vary due to clothing and size of subject.

Product Characteristics (continued)

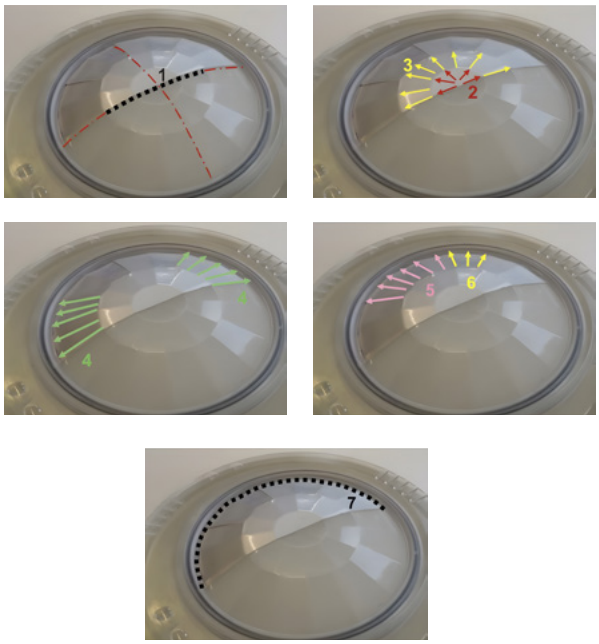

Figure 3 - Placement of light shield.

Lens Shield

An adhesive shield (half circle) is available with the product to minimize the occupancy coverage. To work with the shield, first determine the area on PIR lens that you would like to cover with the lens shield. Cut the shield, if needed.

Remove the carrier and align the center of the shield with the center point of the lens. To minimize air bubbles, only the black dotted line must contact the PIR lens. (1) Start sticking from center and then move outwards; follow the sequence as shown by red, (2) yellow, (3) green, (4) pink, (5) and yellow, (6) arrows. Finally, rub the outer edge of the shield according the black dotted line (7).

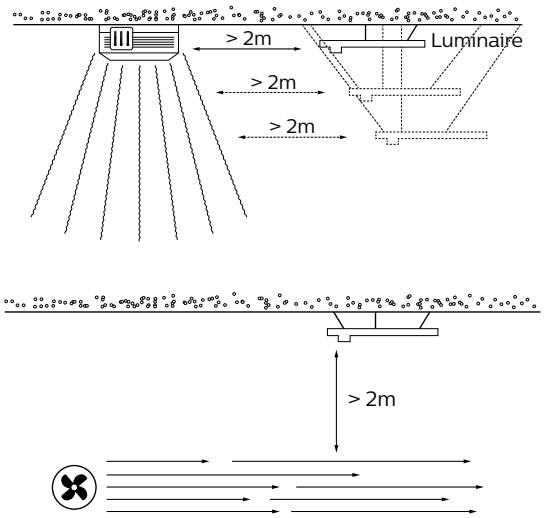

Figure 4 - Required distances to air vents.

Warning:

To avoid false triggers, place heat radiating devices outside of the monitoring cone and avoid drafts (e.g. from ventilators or heating systems).
EasySense SNH21x MC with motion detector enabled must be mounted more than 2 meters away from air vents in all directions, see figures on the left.

Product Characteristics (continued)

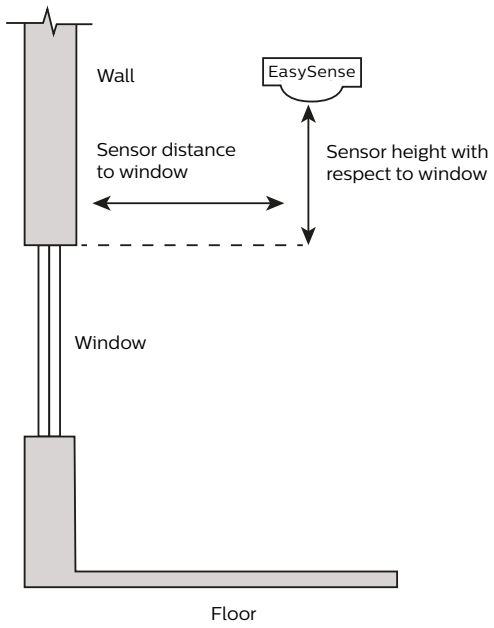

Figure 5 - Sensor placement.

Light Sensor

The light sensor measures the total amount of light with an opening angle of 10° whereas PIR has 27°, all calculated from normal. The following aspects should be observed during installation:

- Minimum distance from the window - refer below graph
- Prevent light reflection from outside entering the sensor (for example sunlight reflection from a car/truck bonnet) as this will lead to incorrect light regulation.

As a guideline the formula 0.174 x H can be used to calculate the minimum distance between the window and sensor whereby H is the height measured from the bottom of the window to the sensor.

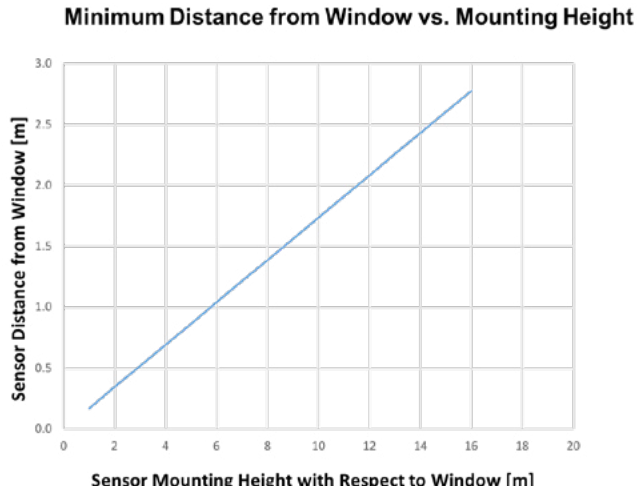

Figure 6 - Sensor horizontal distance from window vs. vertical sensor mounting height from window sill.

Luminaire light that directly hits the sensor (like in figure 7) can compromise its function. Therefore the EasySense sensor should be placed outside of the light cone emitted by the luminaire.

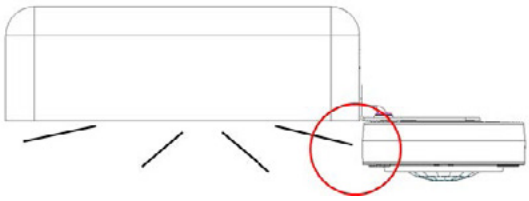

Figure 7 - Luminaire light hitting the sensor.

Daylight Regulation and Calibration

When daylight-based light regulation is enabled, the light output of a luminaires is dimmed in the presence of daylight. For full control of light levels in the working area it is recommended to calibrate the lighting in the application.

Daylight Regulation Without Calibration

When daylight-based control is switched on and no calibration is performed, the light output approximately to 150 lux times the value set for the Eco-on level. If the Eco-on level os set to 80% for example, the light output from the luminaire adjusts to approximately 120 lux in the working area.
The sensor does not read lux levels in the working area directly but measures the amount of reflected light that it captures. In the presence of daylight the sensor keeps the detected level constant by adjusting the light output of the luminaire.
The reflective properties of the surfaces in the field of view of the sensor, e.g. light or dark floors, impact the amount of light that is directed towards the sensor and consequently influence the luminaires light ouput and actual lux levels in the working area.
In case the reflective properties of objects below the luminaires of a room vary, the luminaires can show different light output, even in absence of daylight. Luminaires above dark surface areas emit more light than those above light areas.

Daylight Regulation With Calibration

Any time after configuration a calibration routine can be initiated. When the calibration routine is run the light level adjusts to the full light output (given by the operating current of the luminaire) times the percentage value set for the Eco-on level.
In a dark environment all luminaires configured with the same Eco-on level show the same light output, independent of the reflective properties of surfaces below the luminaires.
The individual sensors store the dark reading of the daylight sensor and keep the value constant in the presence of daylight by adjusting the light output of the luminaires.
All luminaires react individually on the amount of daylight in the field of view of their sensor.

How To Set The Light Level:

- Disable daylight regulation in the MasterConnect App.
- In a dark environment adjust the output current of the luminaire and the Eco-on value for the required lux value in the working area. It is recommended to measure the value with a lux meter.
- Place the smartphone at the center of the working area. Enable daylight regulation in the app again and press "Calibrate Daylight Sensor." Leave the room.
- To calibrate, the light output of the luminaires first goes to a low level and to a high level before it regulates to the set light level.

Warning:

Make sure no objects are blocking the sensor's view and no surface reflection changes occur in the sensor's view during calibration. For example, do not position a forklift truck in the sensor view area during calibration.

Mechanical Design-in

EasySense for High Bay is intended to be mounted to a standard 1/2″ knockout available on the luminaire itself or a junction box. A washer and locknut are included with the sensor for this purpose. An OEM can develop custom brackets to attach to the top surface of the sensor in case the sensor needs to be mounted to a curved/non-flat surface. Mounting screws are provided with the sensor for this purpose. These screws are matched to the thickness of the plastic sensor housing. In case other screws are used, ensure that they do not protrude through the sensor plastics. Also make sure that the view of the sensor is not blocked anywhere by the luminaire or the bracket to avoid loss of functionality.

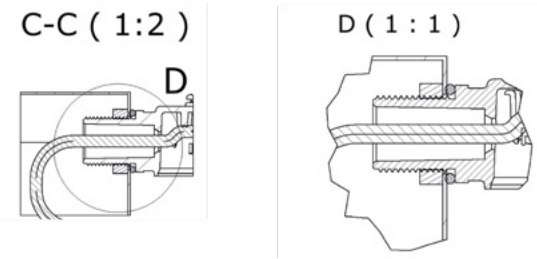

Figure 8 - Assembling sensor onto a knockout.

Mechanical Design-in (continued)

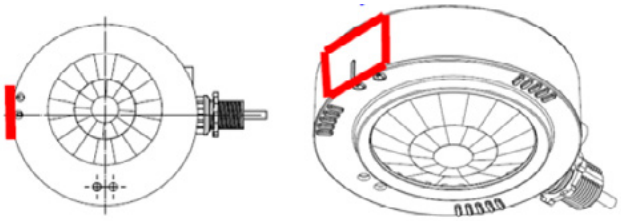

Figure 9 - EasySense RF Antenna position

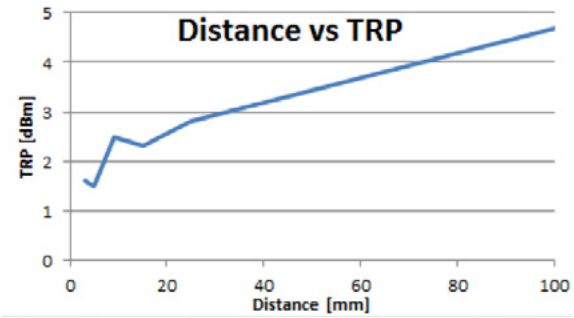

Figure 10 - TRP as a function of distance

Zigbee RF Signal Performance Recommendations

If a luminaire has a flat surface at the mounting location as shown below, the sensor can be installed without the need for an extra bracket; a knock-out must be available in such cases.

In general every dB drop reduces fixture to fixture distance by 1 meter. Figure 10 gives one reference measurement for Total Radiated Power (TRP) vs, distance from one side metal wall.

Wiring

Wire to Wire Connection

SNH211MC includes 18AWG wires, 60cm in length with 8mm strip length. A wire to wire connection can be made with connectors or wirenuts suitable for 18AWG solid wire.

The whire strip length in case of a wire to wire connection is connector dependent.

Wire to Driver Connection

A connection between the sensor and the driver should be made according to local practices. The SR/DA input wires of the EasySense for High Bay are not polarized for fixtures using one driver and ons sensor, and therefore can be connected, without taking care of polarity, to the SR/DA output of the driver - SR/DA+ and SR/DA- terminals. It is recommended to keep wire distance from sensor to driver less than 50 feet. Polarity must be maintained when connecting multiple drivers to one sensor.

The wire strip length in case of sensor to driver connection is approximately 8mm.

EasySense with Multiple Philips Xitanium SR LED Drivers (1:N Application)

When multiple drivers are used in a single luminaire, they can be controlled with a single sensor.

It is also possible to use one sensor to control multiple luminaires that need to be operated at the same level. In this case DALI drivers need to be connected to the sensor via an SR-bridge.

If a single sensor is connected to drivers in different luminaires without an SR bridge, the total cable length must not exceed 15 meters. 2-4 of the drivers must have SR power supply enabled.

EasySense sends commands to all connected drivers (using DALI broadcast command); it does not have capabilities for addressing individual drivers. The light commands are sent as a broadcast commands, so occupancy-/daylight-based lighting control and task tuning operate the same on all connected drivers. The readout of energy information from the driver will not function. Energy readout of multiple drivers is planned for future sensor FW generations.

FAQ

Is EasySense a DALI sensor?	EasySense cannot be used as a DALI input device in a DALI network with another DALI controller. EasySense (SNH212 MC) is an SR/D4i certified controller device with built-in sensors. It only works with Xitanium SR/D4i certified drivers or SR Bridges that use DALI protocol for communication.
Can I use one sensor with multiple luminaires?	Yes. Please refer EasySense with Multiple SR Drivers (1:N Application) section.
Can I use multiple sensors with a single driver?	No, EasySense is not intended to be used in a multi-master mode. In the typical 1:1 sensor to driver connection, a (single) EasySense is the master and an SR Driver is the slave. Adding multiple sensors on SR bus can lead to bus conflict and undesired functioning of the sensors.
Does EasySense make sense if I only want to do occupancy sensing?	Yes. Most occupancy sensors run on high voltage or require an extra power pack, adding cost and complexity. Typical wallplate-style occupancy sensors - while mass produced and inexpensive - vary in performance by use case since the viewing angle from a wall is less than ideal. Also, the relay-free operation of EasySense makes it inherently more reliable.
Is EasySense "failsafe"?	Unlike traditional occupancy sensors. EasySense does not have a mechanical relay. This is a benefit of Philips SR LED drivers, as on/off is done relay-free within the driver. Devices with mechanical relays should be designed so that relay failure results in "lights on." If an SR driver does not see a digital signal from a device for a long period of time (e.g., loose connection, sensor failure), the driver goes to full programmed output.
What are the differences between SNH21x MC and the predecessor SNH200?	SNH21x MC is commissioned via Bluetooth using Philips MasterConnect app, while SNH200 is commissioned via infrared with a dongle and Philips Field Apps. SNH21x MC does not have zone linking like SNH200 but shares occupancy between individual lights like SNH21x MC. Configuration via MultiOne is not possible. In contrast to SNH200, during commissioning lights don't dim down until the group is closed.

Contact Details

Product Information:
www.philips.com/easysense

Or contact your local Philips sales representative.

Disclaimer

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PHILIPS

Sensors

EasySense

SNH212 MC

EasySense SNH212 MC is the ideal solution for per-fixture control of luminaires for high bay applications. It combines occupancy sensing, daylight harvesting, and task tuning in a single package for easy assembly in OEM luminaires or installation in the field. EasySense sensors operate with the established Philips Xitanium SR LED driver standard to make a simple two-wire connection between the sensor and the driver, thus eliminating the need for multiple components and auxiliary devices. The result is a cost-effective and easy-to-design-in solution ideal for energy savings. An intuitive app makes configuration and commissioning during and after installation fast and easy using the Philips MasterConnect app.

EasySense SNH212 MC is D4i certified. In addition to Advance Xitanium SR drivers, SNS21H MC can also be used with D4i certified LED drivers from other manufacturers. It is also Zigbee certified. This enables interoperability within larger systems that include Zigbee certified components and gateways.

EasySense SNH212 MC is commissioned and configured via the Bluetooth available on modern smartphones. The sensors do not require gateways, network connections, or dashboards. The sensors in the group communicate to each other via Zigbee for simple area-based control. It is an uncomplicated means to achieve energy savings in industrial high bay applications while maintaining aesthetics in the space.

EasySense SNH212 MC

Commercial Product Name	Order Code
EasySense SNH212 MC	SNH212 MC

Features

- Out-of-the-box light regulation with preset sensor parameters
- Groups/networks up to 120 lights
- Occupancy sensing, daylight harvesting and task tuning in one device
- Compact size, 2-wire connection
- Operates with Advance Xitanium SR drivers or D4i certified drivers and qualified wireless switches
- Tunable White with Advance FlexTune SR driver
- Simple grouping of luminaires to a wire-less switch with Philips MasterConnect App.
- Selection of luminaires using a list based on BLE or pointing with standard flashlight.
- Configuration of sensor parameters – at group, zone or single light level
- Simple room level energy reporting with CSV file saved on the phone

Benefits

- Combines functionality to reduce need for multiple components
- Fits into existing and new-design luminaires
- Quick task tuning in the field to optimize light levels, color temperature and power
- Enables multiple modes such as manual-on/auto-off or manual on/off
- Cost-effective solution for energy savings
- 5-year limited system warranty with Advance Xitanium LED drivers
- Configuration and commissioning from the floor
- Compatibility with qualified gateways

Applications

- Warehouses
- Assembly areas
- Cold storage

EasySense SNH212 MC

Specifications

Ordering Information	
Order Code	SNH212 MC
Full Product Name	EasySense SNH212 MC
12NC	929003416413
Carton Quantity	10 pcs
Physical Information	
Overall Dimensions	Refer to drawing
Housing (Luminaire Hole)	M20 threaded nipple for ½" knockout
Net Weight per Piece	185gm / 6.5oz
Color	Light gray housing (RAL 7035), translucent cover
Wiring	(2) 18AWG wires, unpolarized; 60cm length; 8mm strip length
Electrical Information	
Input Voltage	Powered by D4i/SR driver low voltage interface
Nominal Current Consumption	9.5mA at 15V (average)
Nominal Power Consumption	140mW (average)
Standby Power	<1W at fixture level including driver standby power
Activation	Sensors regulate light output out of the box with default settings
Occupancy Sensing	
Type	Passive infrared (PIR)
Occupancy based control	Enable/Disable. Enabled by default.
Occupancy Mode	Auto-on/auto-off; Manual-on/auto-off ; Manual-on / manual-off
Group/Zone Occupancy Sharing	Enabled/disabled
Group/Zone Lighting Behavior	Background level/Eco-on level
Eco-On Level	1% - 100%
Hold Time	2 - 100 minutes
Viewing Angle	±27°
Background Light Level	1% - 100%
Prolong Time	2 minutes - 100 minutes, or infinite
Grace Fading	1 second - 25 seconds
Response Time/Fading to Switch On/Off	1 second
Daylight Sensing	
Daylight based control	Enabled/disabled. Default Enabled with target light level of "~150lux X Eco-ON%"
Calibration	Selectable. Light Level calibrated to "Max light output from fixture X Eco-ON%"
Viewing Angle	+/- 10°
Task Tuning	
Full Light Setting	0% - 100%
Tuneable White	With FlexTune SR driver, default factory setting: 4000K

Continued on next page.

1. View limited warranty at https://www.signify.com/en-us/support/warranties

EasySense SNH212 MC

Specifications (continued)

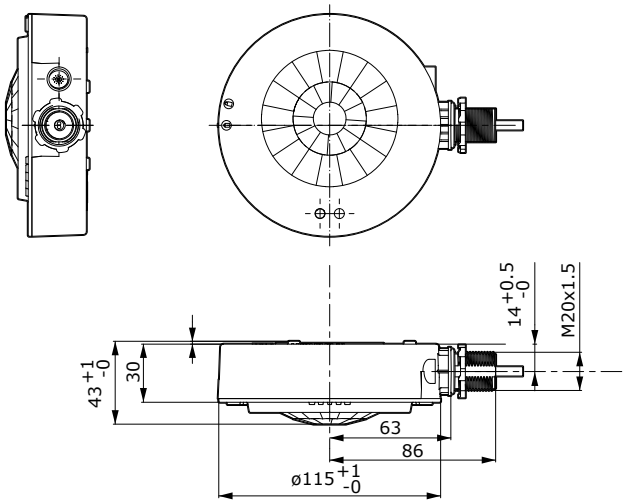
Environment & Approbation	
Operating Ambient Temperature Range	-30°C to +65°C
Ingress Rating	Tested for compliance to IP65 by Dekra
Operating Humidity	20% to 85% relative humidity, non-condensing
Storage Temperature	-30°C to +85°C
Max Case Temperature (Tcase)	+65°C
Agency Approbations	UL, cUL. FCC ID: 2AGBWSHM2, IC : 20812-SHM2
Warranty	5 years
Digital Interface	Xitanium SR/D4i. To be used only with LED drivers with class 2 DA outputs limited to less than 15 Watts
Other	
Wireless Protocol	Zigbee, IEEE 802.15.4, Bluetooth Low Energy
Encryption	AES-128
Energy Reporting	Group/Room level using Philips MasterConnect App, report saved as CSV file on the smartphone
No. Drivers per Sensor	4 max. (limited to 1 driver per sensor to support Engery Reporting)
Max Distance Switch-to-First Sensor	50ft/15m line-of-site
Max Distance Sensor-to-Sensor	50ft/15m line-of-sight
No. Sensors per Group	120 max.
No. of Zones per Group	15 max.
No. Switches per Group/Sensor	15 max per group, 5 max per zone
Mounting Height	16.4 to 52.4ft / 5m to 16m
Field Configuration	MasterConnect app via Bluetooth

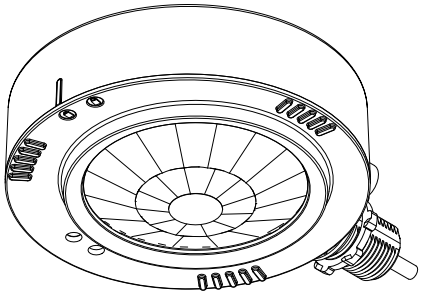
Driver Compatibility

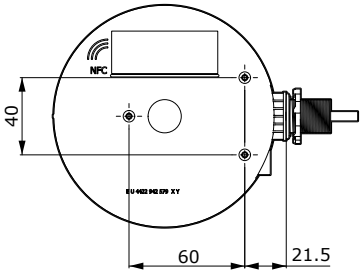
EasySense SNH212 MC is compatible with Xitanium SR drivers from Signify and D4i certified LED drivers from other manufacturers.
To find the SR driver that fits your application needs and for product specifications, please visit www.signify.com/xitaniumsr.

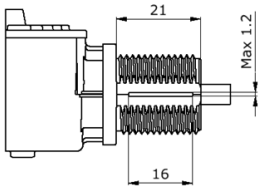
EasySense SNH212 MC

Sensor Dimensions (mm)





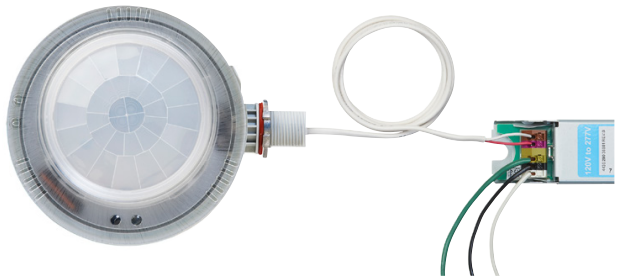




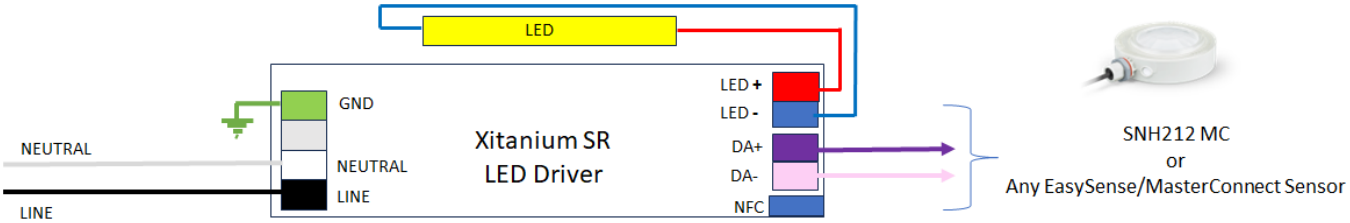
Rim on one side of thread

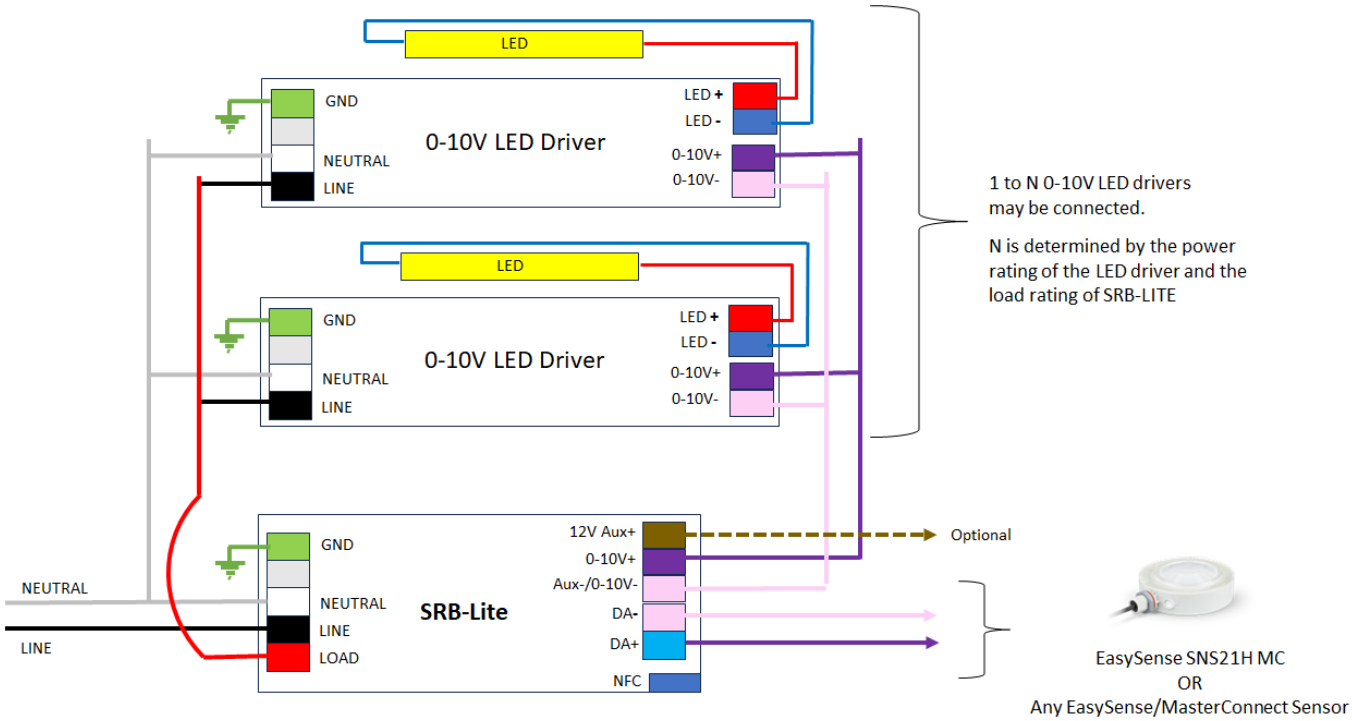
EasySense SNH212 MC

Wiring Diagram



Note: This diagram depicts the sensor wires connected to a Xitanium SR Driver using the driver's connector. To connect to a Xitanium SR driver with leads, use suitable 18AWR solid wire wirenuts.





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Occupancy Sensing

Based on 16m (52ft) mounting height

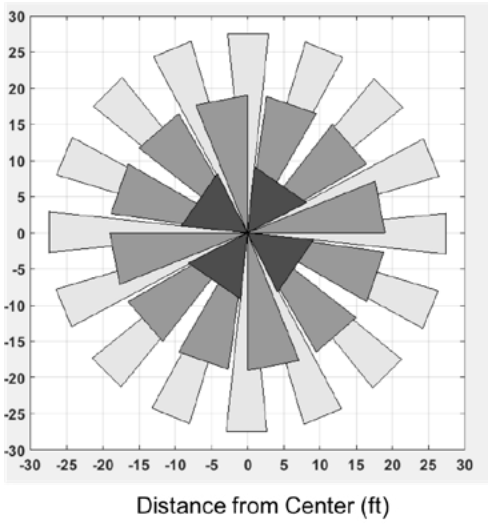
Occupancy sensing detection patterns

The plots below show the top and side view of the occupancy coverage based on NEMA test, an industry standard.
In the side view, it is visible that coverage ratio of mounting height: diameter at ground level is at maximum 1:1. For example if the mounting height is 12m, the maximum diameter coverage is 12m.

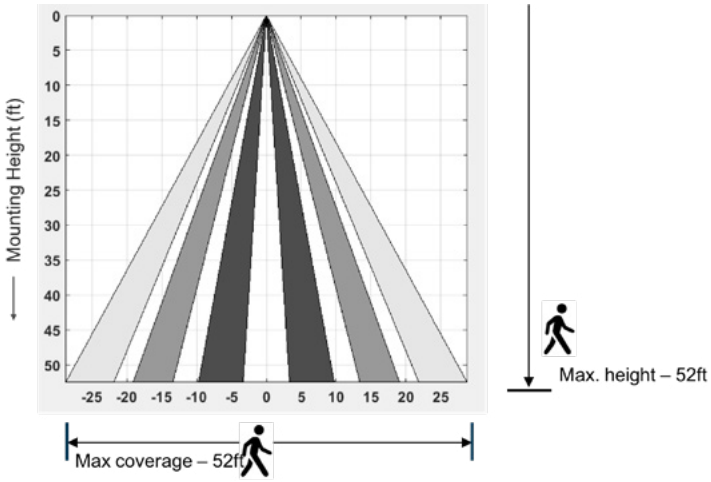
Disclaimer:

1. In these plots, the white areas are blind spots and the detection is based on subject's motion. An idle subject may not continue to trigger occupancy detection once the hold time expires.
2. As PIR based sensing works on temperature difference between the subject and the ground level, the occupancy detection could vary due to clothing and size of subject.

Top coverage



Side coverage

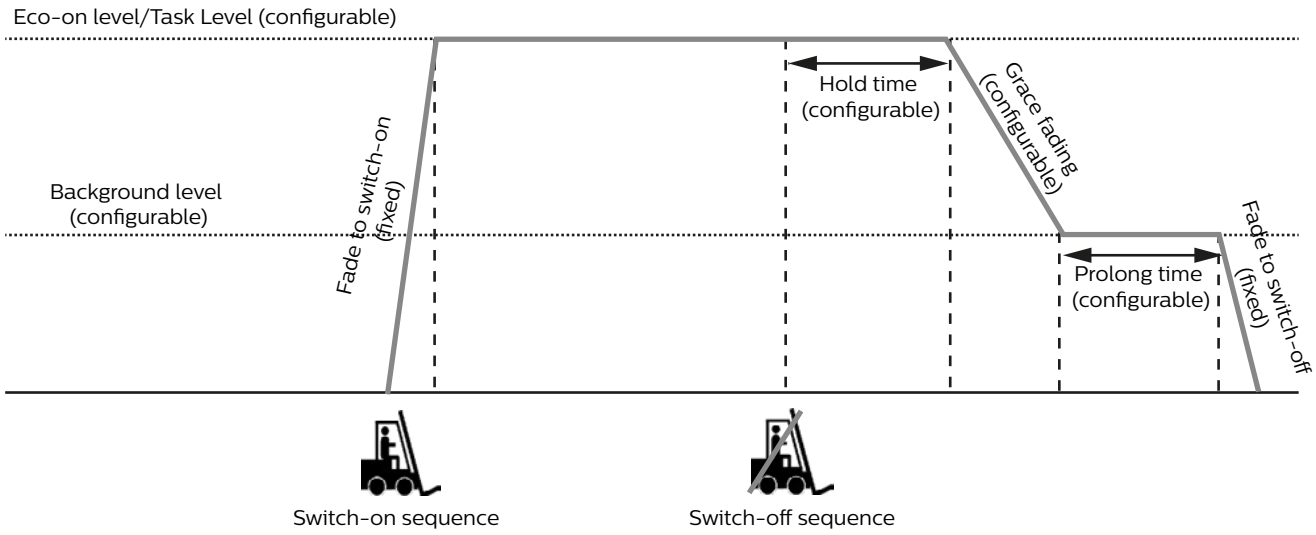


Warning:

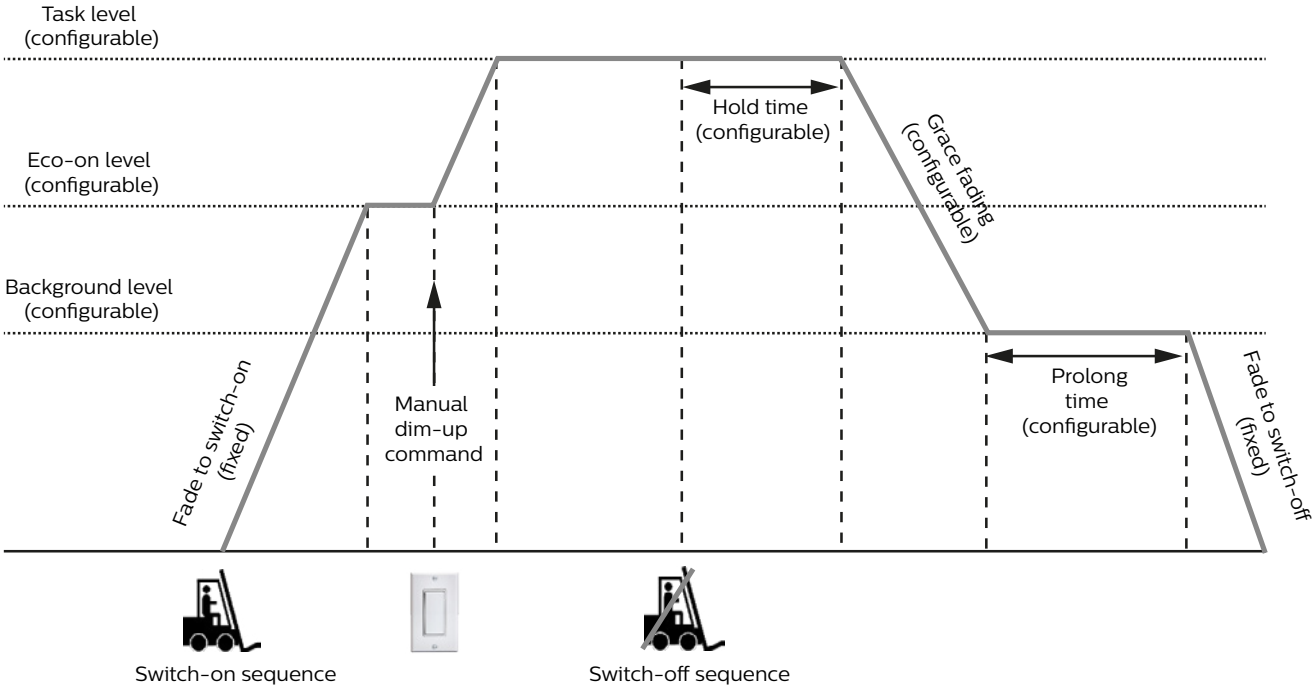
Place heat radiating devices outside of the monitoring cone.
Avoid drafts (e.g. from ventilators or heating systems).

Occupancy Sensing (continued)

Full-On Sequence (Default)
Eco-On Level = Task Level



Partial-On Sequence (Configurable)
Eco-On Level < Task Level



EasySense SNH212 MC

Daylight sensor

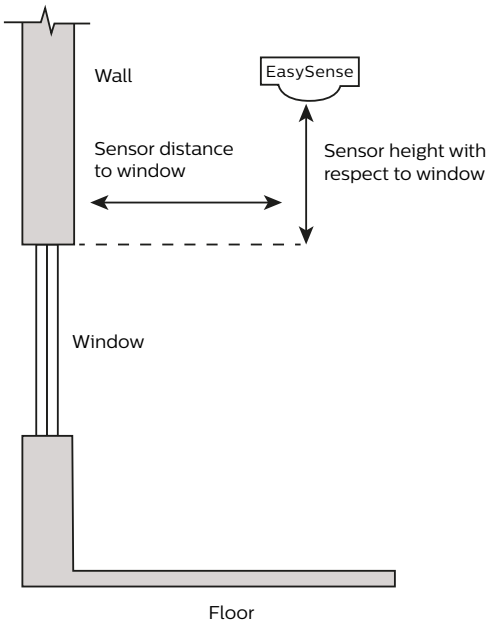
The light sensor measures the total amount of light with an opening angle of 10 degrees whereas the PIR has an angle of 27 degrees, all calculated from normal.

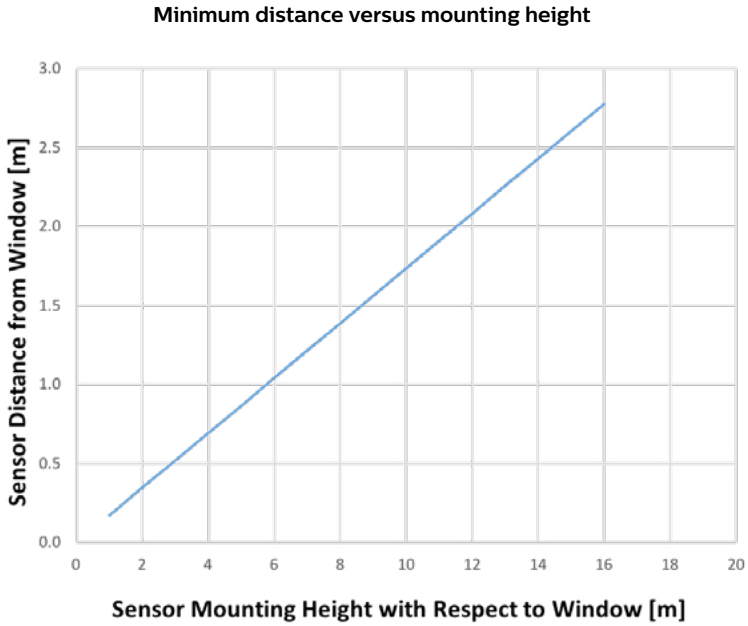
The following aspects should be observed during installation:

- Minimum distance from the window (see graph below)
- Prevent light reflections from outside entering the sensor (for example sunlight reflection on a car bonnet) as this will lead to incorrect light regulation.

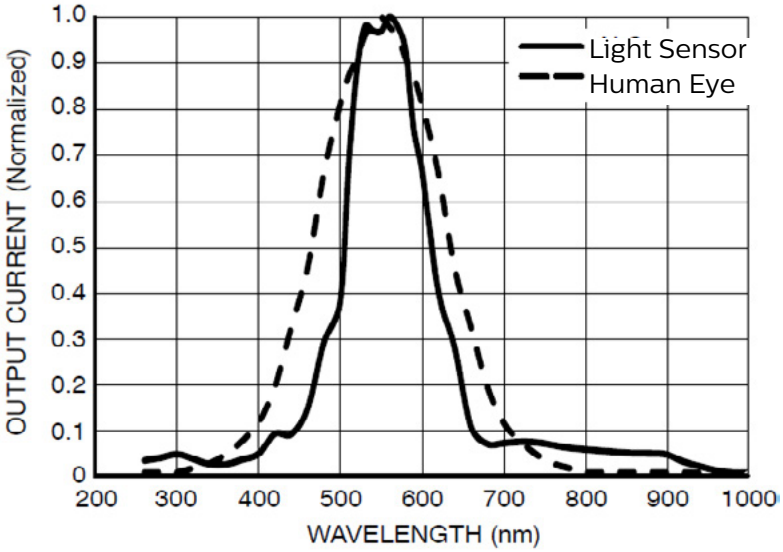
As a guideline the formula 0.174 x H can be used to calculate the minimum distance between the window and sensor whereby H is the height from the bottom of the window to the ceiling.

Photosensor spatial response



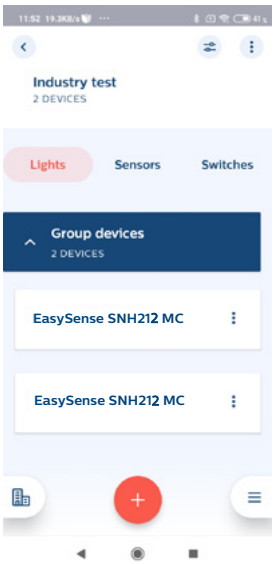


Photosensor spectral response



EasySense SNH212 MC

Philips MasterConnect app



EasySense parameters can be commissioned and configured with the Philips MasterConnect app.

This app allows grouping of luminaires and adding switches along with easy configuration of EasySense parameters.

Download Philips MasterConnect app from the Google Play Store or the Apple App Store. For details see the app manual on our website:

https://www.usa.lighting.philips.com/products/lighting-components/masterconnect

Default Factory Settings

Occupancy based control	Enabled
Daylight based control	Enabled
Occupancy Mode	Auto-on/off
Group/Zone Occupancy Sharing	Enabled
Zone Occupancy Sharing	Disabled
Group/Zone Lighting Behavior	Background level
Field Task Tuning	100%
Eco-On Level	100%
Background Light Level	20%
Hold Time	10 minutes
Prolong Time	10 minutes
Grace Fading	10 seconds
Fade to Switch-On	1 second (fixed value)
Fade to Switch-Off	1 second (fixed value)

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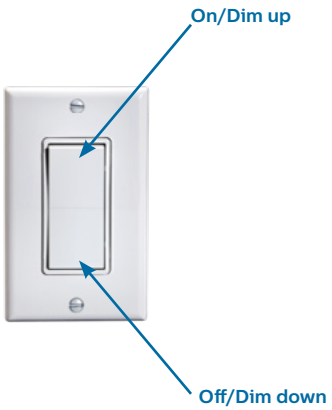
Compatible Wireless Switches

Two examples are given below. For the latest list of compatible switches please refer to the Philips MasterConnect website: https://www.usa.lighting.philips.com/products/lighting-components/masterconnect

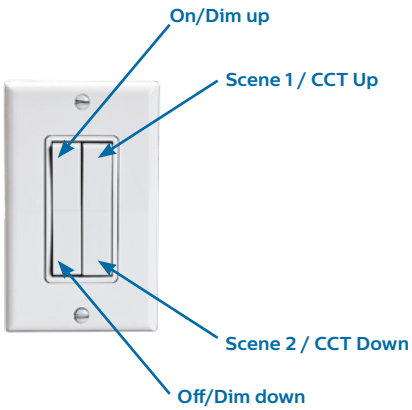
Manufacturer	Model	Style
Illumra	ZBT-S1AWH	Single Rocker Self Powered
	ZBT-S2AWH	Dual Rocker Self Powered

- Manufacturer's Product Information Links:
  - Illumra (www.illumra.com/easysense)

Single-Rocker Functions (typical switch shown)



Dual-Rocker Functions (typical switch shown)



FCC Radiation Exposure Statement
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment must be installed and operated with a minimum distance 20cm between the radiator and your body.

ISED Radiation Exposure Statement
This equipment complies with ISED RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment must be installed and operated with a minimum distance 20cm between the radiator and your body.
Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20cm de distance entre la source de rayonnement et votre corps.
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