LUMAWISE Motion Programmable

NOTE
All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters [and inches]. Unless otherwise specified, dimensions have a tolerance of ±0.10 and angles have a tolerance of ±2°. Figures and illustrations are for identification only and are not drawn to scale.

Document Sections

1 INTRODUCTION

The TE Connectivity LUMAWISE Motion Programmable offers motion sensing and luminaire dimming control, including day/night operation, in a Zhaga D4i-certified platform. The updated feature set, allows configurability by the customer to configure the light levels and day/night operation into customer settable preferences. The sensor detects motion over a given area. The product is available with a rectangular detection pattern (30m x 6m field of view when mounted at 5m height) and a circular detection pattern (30m x 24m when mounted at 5m height). The LUMAWISE Motion Programmable can be operated either as a standalone dimming controller, or in concert with a D4i-certified Type A controller for connected applications.

1.1 Applications

The LUMAWISE Motion Programmable is suitable for use in pedestrian walkway, parking, or other outdoor lighting applications which can benefit from the added security and energy savings of a motion-activated luminaire.

1.2 Solution Overview

Figure 1 shows typical application scenarios where the LUMAWISE Motion Programmable is intended to be deployed. This diagram and the terminology in Table 1 are used throughout this document to describe functionality, capabilities, and suggested design practice. Use this information to facilitate inquiries and correspondence.

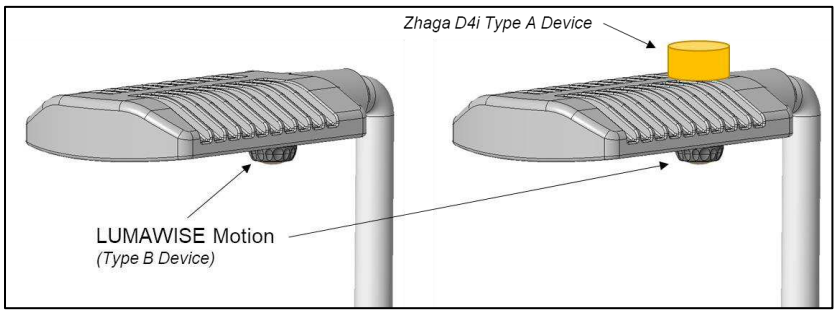


Figure 1. LUMAWISE Motion Typical Application Scenarios –
Standalone Operation or Operation with Type A Device

1.3 Terminology

Table 1. Terminology

Term/Acronym	Meaning
ANSI	American National Standards Institute
DALI (IEC 62386)	Digital Addressable Lighting Interface, as defined by IEC-62386
- Part 101 - Part 102 - Part 103 - Part 303	DALI – General Requirements – System Components DALI – General Requirements – Control Gear DALI – General Requirements – Control Devices DALI – Particular Requirements – Input Devices – Occupancy Sensors
D4i	DALI For IoT: An extension of the DALI-2 certification program intended to enable IoT-ready luminaires
NEMA	National Electrical Manufacturers Association
Zhaga / Book 18	Standard publication detailing the interface used by LUMAWISE Motion Programmable. “Book 18” defines the physical geometry of the receptacle and connector, and provides pin/signal definitions for the interface.

2 REFERENCE MATERIAL

2.1 Revision Summary

Date	Revision Description
February 2024	Rev 3 – Update section 10

2.2 Customer Assistance

Product Base Part Number X-2444029-Y and Product Code K796 are representative of the LUMAWISE Motion Programmable. Use of these numbers will identify the product line and help to locate product and tooling information when visiting www.te.com, speaking to your local representative, or calling the product information number.

2.3 Drawings

Customer drawings for product part numbers are available from www.te.com. Information contained in the customer drawing takes priority.

2.4 Datasheet

The Datasheet provided at www.te.com offers general information about the product.

2.5 Specifications

See Product Specification 108-160457 for a full list of specifications, product performance, and test results. For information regarding the Book 18 mating receptacle see application spec 114-133074.

3 FUNCTIONAL OVERVIEW

Figure 2 shows a block diagram of the functional blocks of the LUMAWISE Motion Programmable. The core functions of the product include:

- Zhaga Book 18 compliant mounting interface.
- DALI 2 certified, D4i recognized communication as a Type B device with Application Controller.
- Infrared motion detection for direct luminaire control or feedback to a compatible Type A device.
- Ambient light sensor for day/night operation.
- Intelligent calibration functions to compensate for downward facing lighting conditions.
- Configurability via the DALI bus using DALI-2 memory bank locations
    - Configurable settings for light level and lamp on-time
    - Configurable day/night lux level operation modes

Each of these functions, as well as interface and usage considerations, are detailed in the following sections.

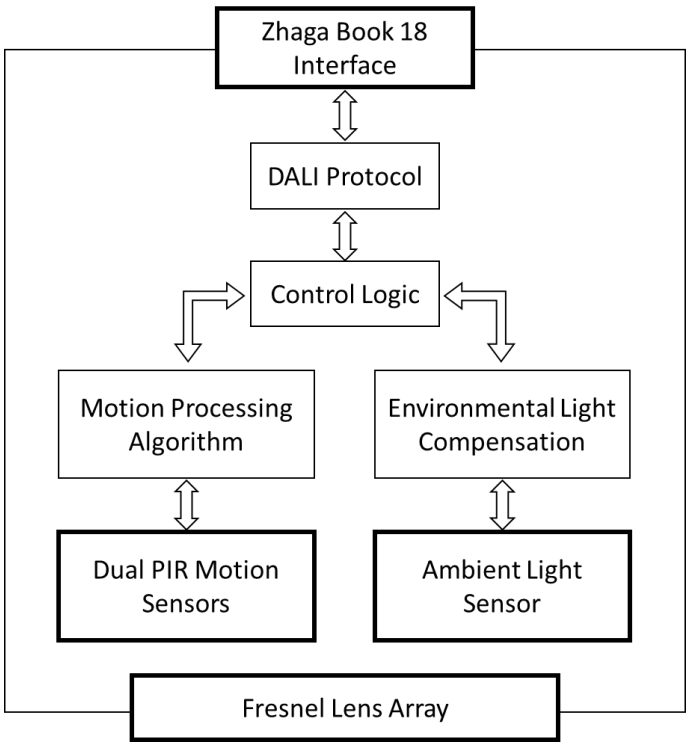


Figure 2. LUMAWISE Motion Functional Block Diagram

3.1 Safety

The LUMAWISE Motion Programmable is a fully enclosed device, which should not be powered except when mated with an appropriately wired Book 18 receptacle. Normal ESD precautions should be followed when handling the device unmated.

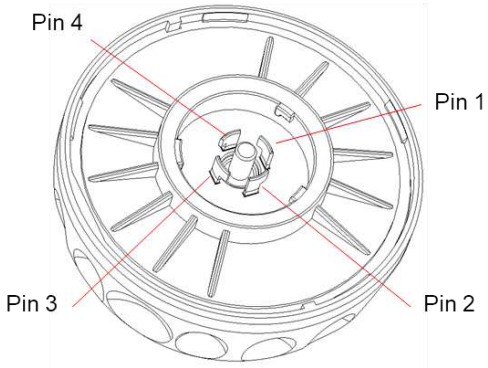
3.2 Environmental

The LUMAWISE Motion Programmable is rated for operation in ambient temperatures from -40°C to 65°C.
Ingress protection is rated to IP66.
Impact protection is rated to IK07.

For further information on environmental qualification refer to 108-160457.

3.3 Electrical Interface

The LUMAWISE Motion Programmable includes a Zhaga Book 18 compliant mounting interface. Though Pins 2 and 3 are assigned polarity according to the Zhaga Book 18 standard, the product includes built-in rectification on these bus lines such that the product is polarity insensitive.



Pin 1	NC
Pin 2	DALI -
Pin 3	DALI +
Pin 4	NC

Figure 3 - Interface and Pinout

3.4 Power Supply

The LUMAWISE Motion Programmable is powered by the DALI bus and current consumption is less than 46 mA in accordance with the relevant standards. During normal operation the LUMAWISE Motion Programmable will consume 6-8 mA, with brief peaks of approximately 25 mA during bus communication.

CAUTION

Like all DALI devices, LUMAWISE Motion communicates by applying brief short circuits to the applied power (DALI) bus. It is critical that only DALI-2 certified bus supplies, or other power supplies with current limiting according to relevant DALI standards, be used. ***Use of the LUMAWISE Motion with a non-current limited power supply e.g., a 24V Auxiliary Supply or a Battery, will result in damage to the sensor rendering it inoperable.***

3.5 Power-On Sequence

On any application of power, either initial startup or after a power cycle, the LUMAWISE Motion Programmable will execute a standard power-on routine. The sequence of the power-on sequence varies based on whether the device is used in a Type B – Standalone configuration or used in combination with a Type A Device.

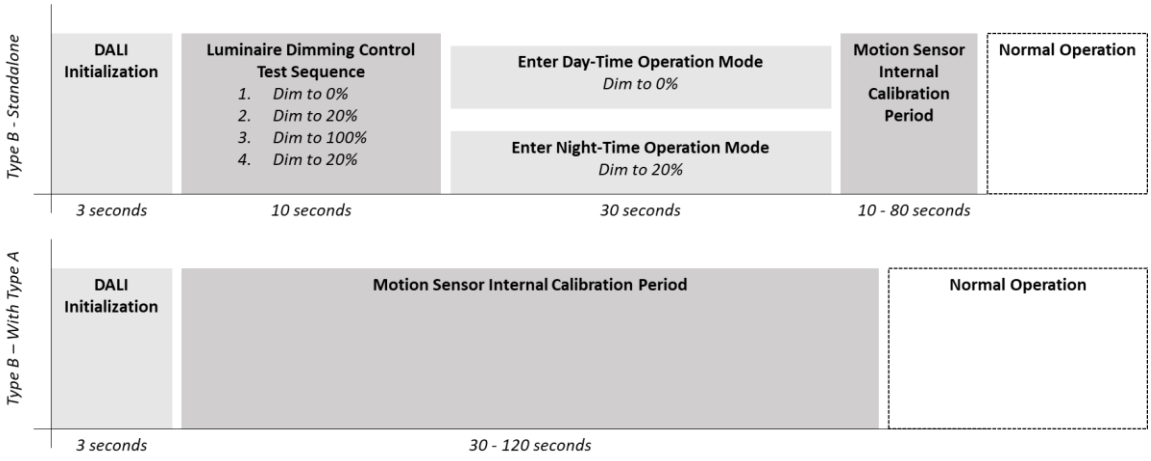


Figure 4. LUMAWISE Motion Power-On Sequence

When in a Type B – Standalone configuration, the LUMAWISE Motion Programmable will turn the luminaire on and off, as well as adjust the dimming percentage, as part of a normal light sensor calibration routine. The device then enters a motion sensor calibration mode, which may take up to 120 seconds depending on environmental conditions. After the startup and calibration routines are complete, the device will enter normal operation mode.

4 DALI OPERATION

4.1 Sensor Instance

The sensor input of the LUMAWISE Motion Programmable is assigned to a DALI instance. Instances are identified via a type and a number. For this device, instance number is '0' and instance type is '3' Motion detection. The LUMAWISE Motion is defined as a movement sensor.

4.2 Identification Procedure

To trigger the identification method, IDENTIFY DEVICE can be sent via DALI commands. The identification procedure is triggered and visible on the DALI bus by sending DAPC 0 and DAPC 254 commands. This also controls the streetlight connected on the system.

4.3 Application Controller Arbitration

The LUMAWISE Motion Programmable works as a standalone Type B Device, but also in conjunction with a Type A Device. The arbitration method according DALI Part 351 prevents forward frame transmissions from the application controller when a Type A and Type B device are connected in one system.

The LUMAWISE Motion Programmable transmits QUERY APPLICATION CONTROLLER ENABLED on the following times:

- *within 30 s ± 3 s after a power cycle, and*
- *repeating 15 minutes ± 1.5 minutes after the application controller previously transmitted such a query, and*
- *if location 0x07 contains 0xFF: 10 s ± 1 s after reception of a 16-bit or 24-bit forward frame that did not originate from this application controller or increased to ensure at least 10 s ± 1 s have elapsed since the previous transmission of such a query.*

This arbitration method shall prevent further forward frame transmissions from the application controller, except for the above query, according to the value in location 0x07:

- *Bank 201, location 0x07 = 0x00: arbitration disabled, forward frames from the application controller not disabled by the arbitration method.*
- *Bank 201, location 0x07 = 0xFE: arbitration enabled, forward frames from the application controller disabled by the arbitration method.*
- *Bank 201, location 0x07 = 0xFF: arbitration enabled, forward frames from the application controller not disabled by the arbitration method.*

NOTE
Failure of the Type A device to properly implement Application Controller Arbitration per Part 351 can result in unstable system performance including DALI packet collision and bus contention.

4.4 Using LUMAWISE Motion Programmable with a Type A Device

When used in combination with a D4i certified Type A device, the LUMAWISE Motion Programmable acts as an occupancy sensor according to the relevant DALI standards. Regardless of ambient light level, the device will report changes in occupancy status, as indicated by observed motion, to the DALI bus. Operation of the LUMAWISE Motion Programmable when in this mode is dictated by the requirements of IEC 62386-303.

In cases where a Type A controller wishes to directly access sensor data from the LUMAWISE Motion Programmable during operation, sensor data stored in DALI MB2 can be queries. See section 4.6 for details.

4.5 Using LUMAWISE Motion Programmable as a Standalone Type B Device

When used without a Type A controller, the LUMAWISE Motion Programmable operates as a standalone Type B device. In the mode the device is capable of full day/night and dimming control of the connected D4i-certified LED driver, based on integrated light and motion sensors. Luminaire light output is controlled via broadcast DAPC commands and is scaled according to a Logarithmic transfer function as defined in IEC 62386-102 Section 9.3.

The light output levels are configurable via the DALI bus, similar as the desired on-time of the light. Further details on the operation of the light sensing and motion sensing functions can be found in sections 5, 6 and 7.

4.6 DALI Memory Banks

LUMAWISE Motion Programmable implements DALI Memory Banks accessible via bus commands and queries. MB0, MB1, MB2, and MB201 are implemented according to the requirements of IEC 62386, including the standard locations for information such as GTIN and Identification Number (Part Number). In addition to standard memory bank values, MB2 is used to store operational parameters and sensor readings for the LUMAWISE Motion Programmable. The table below provides a summary of these.

Table 2 - DALI Memory Banks – Selected Locations

MB0 Address	Content
0x03…0x08 0x0B…0x12	GTIN [MSB] … GTIN [LSB] (Expected value according to variant) ID Number [MSB] … ID Number [LSB]
	X-2444029-1 **(Programmable)** *GTIN: 8720627309622* *ID: 24440291*
MB2 Address	**Content**
0x00	*(DALI Reserved)* Address of last accessible memory location
0x01	*(DALI Reserved)* Indicator Byte
0x02	*(DALI Reserved)* Lock Byte
0x03	PIR 0 Status (0 = No Motion, 1 = Motion, 2 = Sensor Error)
0x04	PIR 1 Status (0 = No Motion, 1 = Motion, 2 = Sensor Error)
0x05…0x08	Lux sensor reading x10 [LSB] … Lux sensor reading x10 [MSB]
0x09…0x0A	Temperature sensor °C x10 [LSB] … Temperature sensor °C x10[MSB] *Temperature formatted as twos complement e.g., 0xFF64 = -14.5°C*
0x0B…0x13	Operational Parameters (not intended for modification by end user)
0x14	Light Output % - Low Level *Nighttime light output without motion. 0x64 = 100% (>0x64 is set to 100%)*
0x15	Light Output % - High Level *Nighttime light output during motion event. 0x64 = 100% (>0x64 is set to 100%)*
0x16	Light Output % - High Temperature Mode *Nighttime light output in High Temperature Mode. 0x64 = 100% (>0x64 is set to 100%)*
0x17	Lamp On Time *Lamp high-output time during motion event from 0x00 to 0xFF in 5 second increments. (0x01 = 5 seconds, 0xF0 = 20 minutes)*
0x18	Turn On Level *Dusk transition light level in lux from 0x0A to 0xF5 (10 to 245 lux)*
0x19	Turn Off Level *Dawn transition light level in lux from 0x0A to 0xF5 (10 to 245 lux)*

NOTE
When used in combination with a D4i-certified Type A device, the LUMAWISE Motion Programmable does not control the luminaire dimming level and therefore cannot perform system light sensor calibration. Lux readings taken from MB2 when in this operating mode will not compensate for luminaire contribution to environmental light level.

4.7 Part Number

The base Part Number X-2444029-Y is available upon request with different factory-programmed settings of operational parameters as described above. Regardless of factory settings, the customer can configure the desired light output and on-times by modifying these parameters as described in the sections above. The Programmable LUMAWISE Motion is available with a rectangular pattern lens: 2444029-Y or with a circular pattern lens: 3-2444029-Y.

4.8 Typical Bus Activity

Typical bus activity, in the form of DALI bus traffic, depends on which mode of operation (Type B Standalone or with Type A Controller) is being used. The table below lists common bus traffic initiated by the LUMAWISE Motion Programmable in either mode.

Table 3 - Typical Bus Activity

Type B with Type A Controller		
Bus Activity	**Hex**	**Frequency**
Query Application Controller Enabled	0xFF FE 3D	Within 30 seconds of power up and approximately once per 15 minutes
MS Event 8 – Vacant (No Movement)	0x86 80 08	After HOLD TIMER expires with no motion observed
MS Event 11 – Occupied (Movement)	0x86 80 0B	If VACANT and motion is detected
Type B Standalone		
Bus Activity	**Hex**	**Frequency**
Query Application Controller Enabled	0xFF FE 3D	Within 30 seconds of power up and approximately once per 15 minutes
MS Event 8 – Vacant (No Movement)	0x86 80 08	After HOLD TIMER expires with no motion observed
MS Event 11 – Occupied (Movement)	0x86 80 0B	If VACANT and motion is detected
DAPC Commands	0xFE ##	As needed to implement dimming and on/off control of luminaire in response to motion events or day/night control

In addition to these items, the LUMAWISE Motion Programmable will respond to any commands and queries issued onto the bus by another device in a manner consistent with the requirements of IEC 62386.

4.9 DALI Command Support and Operation

The LUMAWISE Motion is fully DALI-2 and D4i certified, meaning it supports the full list of queries, commands, and operating modes relevant to a Type B Movement Sensor. Supported commands include those which may alter or disable core functions of the LUMAWISE Motion, either temporarily or permanently.

Some commands, such as modifying the HOLD TIMER, can be reset using DALI in-built reset commands. Other changes, such as disabling application controller arbitration or disabling instances, are not reset by the DALI reset command and must be reversed explicitly to restore normal operation. Care should be exercised when modifying LUMAWISE Motion operating modes via DALI commands to ensure performance is not compromised.

When using the LUMAWISE Motion with a Type A Device, the device should be DALI-2 and D4i certified to ensure maximum compatibility.

5 MOTION SENSOR OPERATION

The LUMAWISE Motion Programmable includes a proprietary PIR and optical lens configuration, specially tailored for streetlighting and pedestrian walkway applications. This section describes the performance and related functionality of the motion sensor system.

PIR motion sensor effective range depends on many factors, including ambient temperature, size of the moving object, temperature of the moving object, distance, and speed. Representative detection diagrams, indicative of performance in typical application settings, are shown below.

5.1 Detection Area: Rectangular Pattern 2444029-Y

The effective motion detection range for the LUMAWISE Motion Programmable with the rectangular lens is approximately 30m x 6m when mounted at 5m height above the ground, 30m x 10m when mounted at 8m height above the ground, and 36x12m when mounted 12m above the ground. This motion detection area has been specially designed to meet the needs of pedestrian path and cycleway applications, providing greater range and sensitivity along the illuminated path while ignoring motion in the adjacent areas.

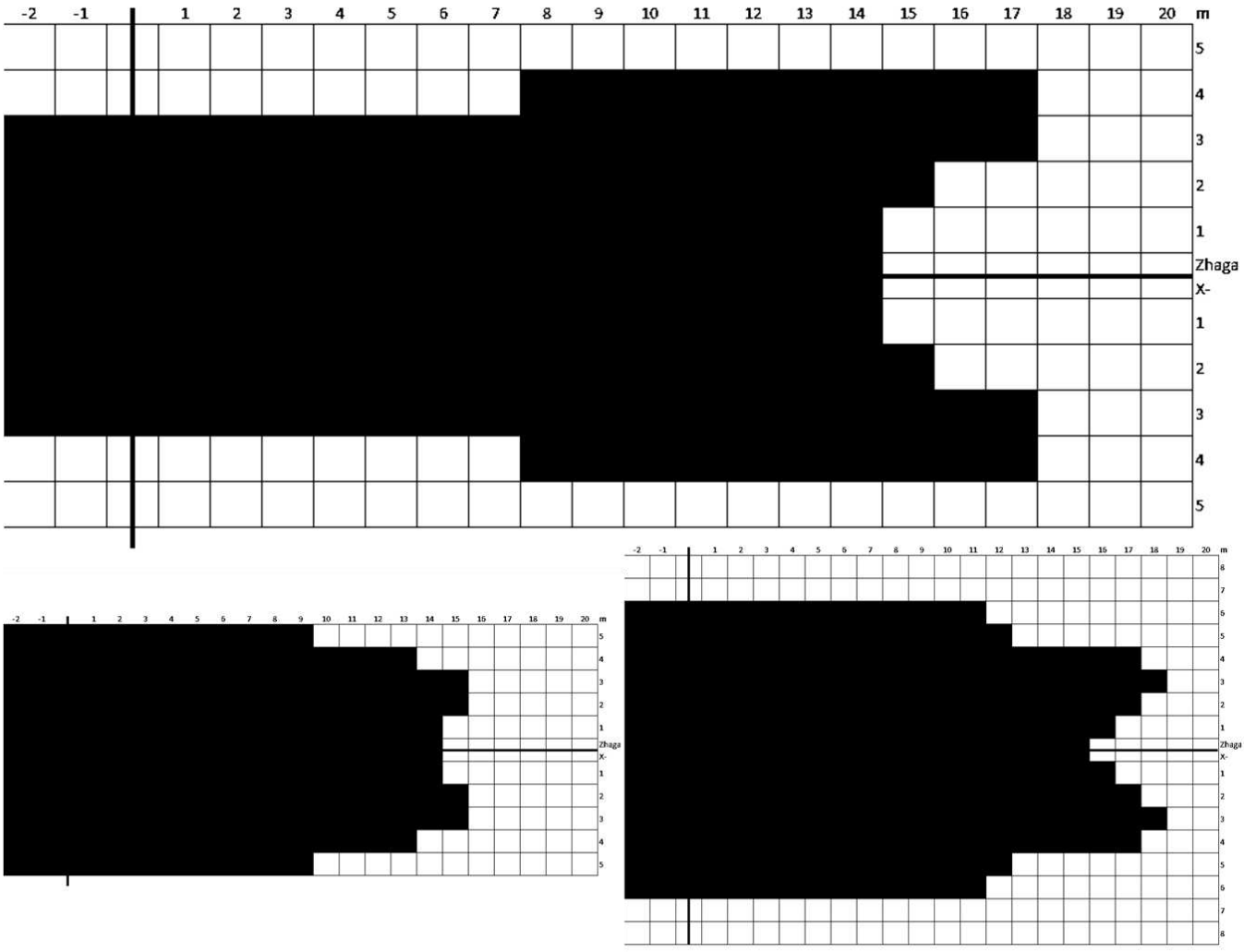


Figure 5 - Representative Motion Detection Performance, Rectangular
Positive X Hemisphere Shown – Symmetrical Performance about Y Axis
5m mounting height (top)
8m mounting height (bottom left),
12m mounting height (bottom right)

5.2 Detection Area: Circular Pattern 3-2444029-Y

The effective motion detection range for the LUMAWISE Motion Programmable with the circular lens is approximately 30m x 24m when mounted at 5m height above the ground, 32m x 34m when mounted at 8m height above the ground, and 28x28m when mounted 12m above the ground.

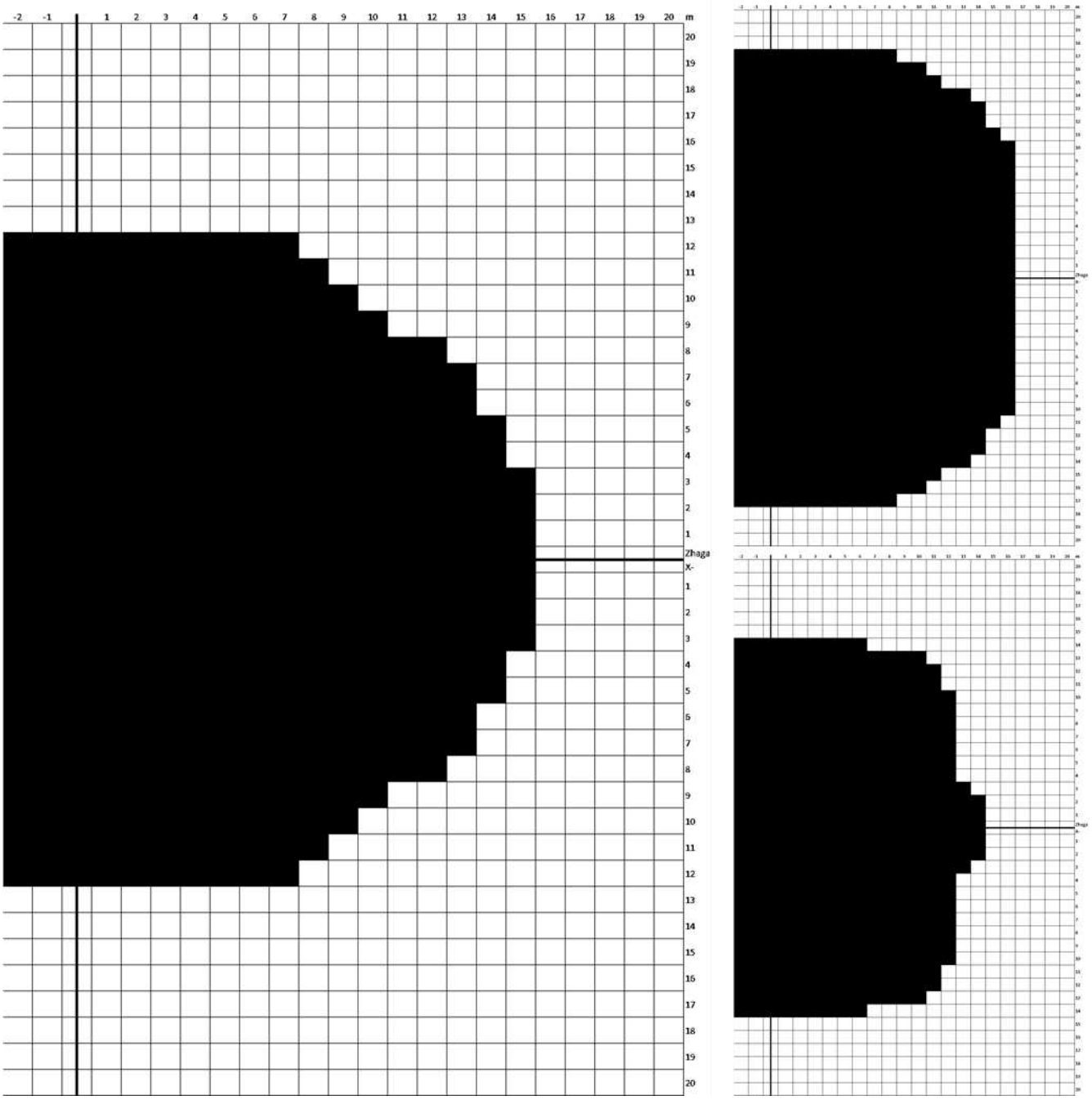


Figure 6 - Representative Motion Detection Performance, Circular
Positive X Hemisphere Shown – Symmetrical Performance about Y Axis
5m mounting height (left)
8m mounting height (top right),
12m mounting height (bottom right)

5.3 Motion Event Timing – LUMAWISE Motion Programmable with a Type A Device

When used in combination with a Type A device, the LUMAWISE Motion Programmable publishes transitions in occupancy status to the DALI bus immediately upon detection of motion or expiration of the HOLD TIMER. The IEC 62386-303 standard defines the default value of *tHold* as 90, which corresponds to 900 seconds or 15 minutes, meaning the LUMAWISE Motion Programmable will publish a VACANT status only after 15 minutes have passed without a motion event.

If higher frequency reporting is desired, the value of *tHold* can be modified according to the procedure defined in Part 303.

Other standard commands, such as CANCEL HOLD TIMER and CATCH MOVEMENT may also be used.

5.4 Motion Event Timing – LUMAWISE Motion Programmable as a Standalone Type B Device

In addition to publishing the Occupancy Status events described in section 5.2, the LUMAWISE Motion Programmable can also assume direct control of the luminaire driver when operating as a Standalone Type B Device. The device implements this control through the use of DAPC commands issued in response to motion events, or time elapsed without motion.

Figure 7 below shows the standard dimming profile for a motion event, with Lamp On Time set to the default value of 0x18 (120s). If additional motion is observed while the luminaire is set to 100%, the T_{on} timer is reset.

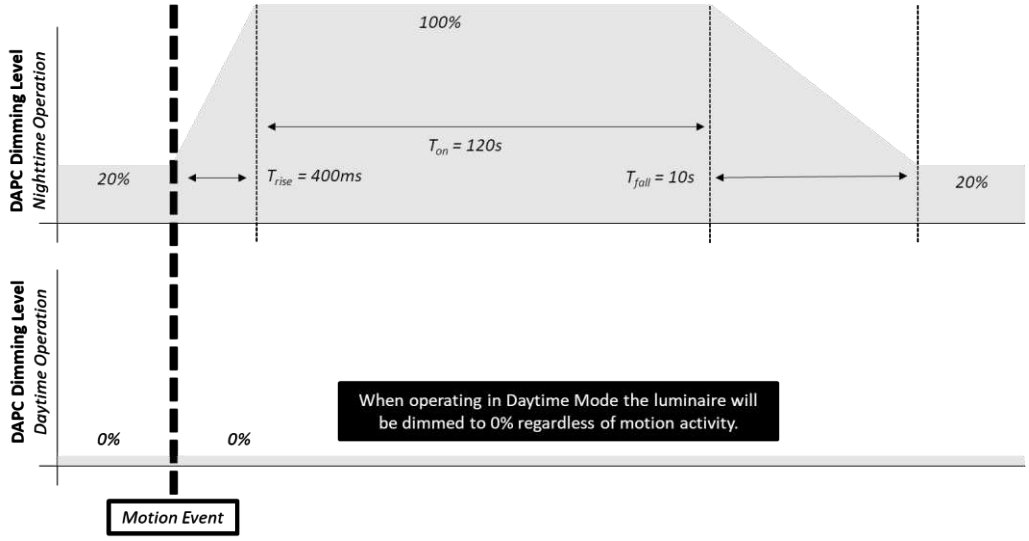


Figure 7 - Luminaire Control Timing for Motion Events

Timing for Occupancy Status Events published to the DALI bus can be set independently of Lamp On Time by setting the HOLD TIMER value in the DALI memory banks.

Note that when the LUMAWISE Motion is operating in Daytime mode, no dimming commands will be sent to the luminaire regardless of motion activity. This behavior should be considered when evaluating the product in laboratory conditions with high ambient light levels.

5.5 Adjustable Motion Blocking Mask

A Motion Blocking Mask, with one open 90° quadrant, is sold as an accessory. See TE p/n: 2396399-1. Mask can be assembled to the Sensor Module in 90° indexed increments, to block out an area not requiring motion detection. Mask can be snapped onto Sensor Module and retained by latches. If further customization of sensitive area is needed, quadrants of the motion blocking mask can be broken away by the user.

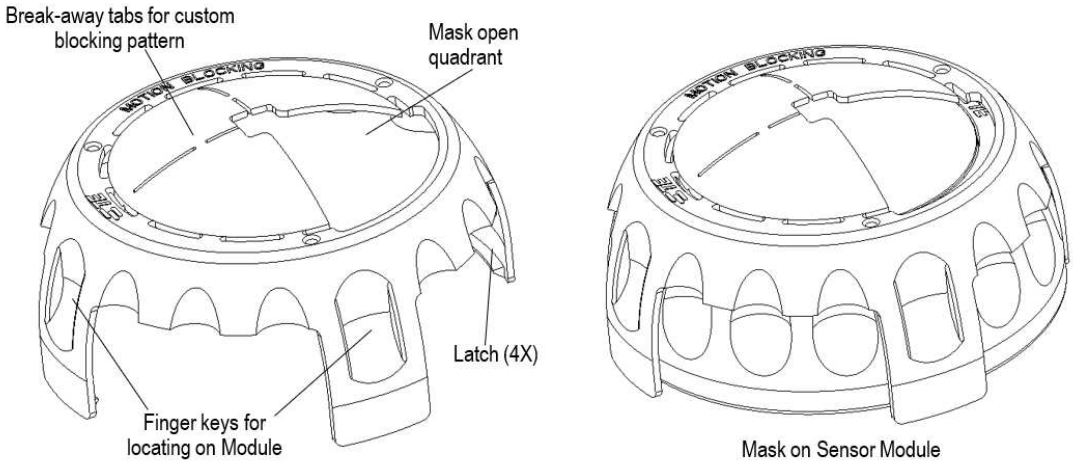


Figure 9 - Motion Blocking Mask

5.6 Environmental Considerations (High Ambient Temperature)

Since the motion detection functionality is based on passive infrared (PIR) sensing, the LUMAWISE Motion Programmable is subject to the same environmental considerations and limitations inherent to PIR. In environments where the background ambient temperature is very high, the relative differential between motion targets (typically human body temperature) and the background is diminished to the point where the likelihood of missed motion events increases.

In order to avoid the situation where a motion event is missed and insufficient illumination is provided to the passerby, the LUMAWISE Motion Programmable will enter a High Temperature mode when the onboard temperature sensor measures above 32°C. In this mode the Luminaire will be dimmed to 50% continuously during Nighttime operation, with no change in response to motion events.

6 LIGHT SENSOR OPERATION

The LUMAWISE Motion Programmable includes an integral ambient light sensor, allowing the device to serve as a standalone photocontrol for active day/night control of the attached luminaire. When operating with a Type A device, the integral photo sensor readings are not used.

6.1 Day / Night Operation Modes

The LUMAWISE Motion Programmable has two primary operation modes: Daytime Mode and Nighttime mode. These modes dictate how the device responds to motion events as described in Figure 7. Transitions between Daytime Mode and Nighttime Mode are dictated by readings from the onboard light sensor.

The product has a default operation method with an *Inverse Ratio* control, which can be used for added energy savings. It has a Turn On threshold of 35 Lux and a Turn Off threshold of 18 Lux. An 8 Lux hysteresis band is used, as shown in the figure below. The Turn On and Turn Off values can be configured for any other desired day/night behavior using the procedures described in Chapter 7. The 8 lux hysteresis cannot be modified.

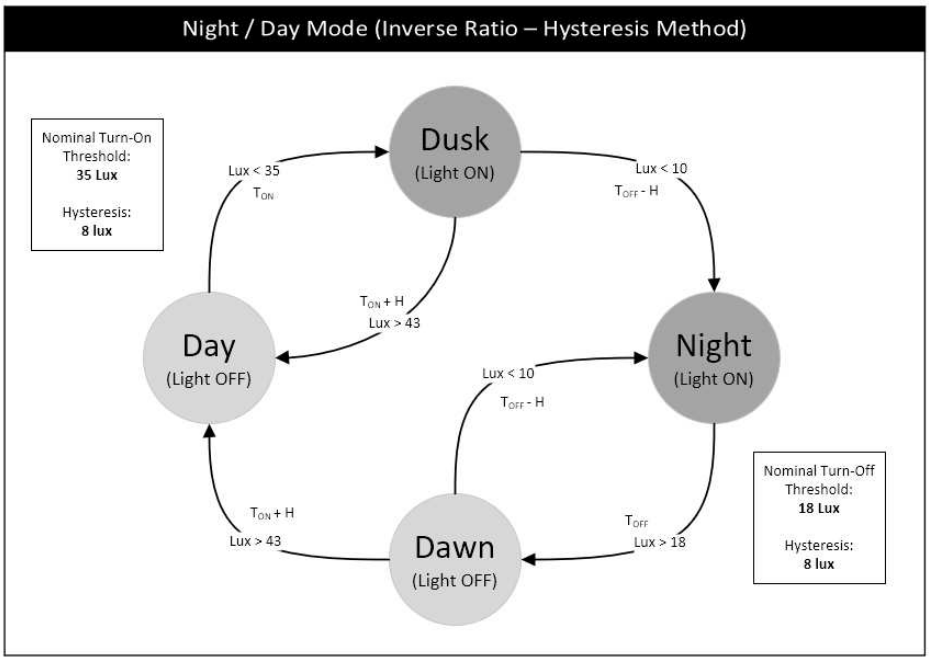


Figure 10 - Inverse Ratio Operation and Hysteresis

To configure another operation method, the Turn On and Turn Off parameters can be set individually:

- To implement a *Conventional Ratio* control, Turn On Level should be lower than Turn Off, with at least a difference of 8 Lux (This is the built-in Hysteresis).
- For a *1:1 Ratio,* an operating mode can be set where Turn On and Turn Off Levels are configured at the same level.

During Daytime operation, the LUMAWISE Motion Programmable will continue to report motion events in the form of occupancy status changes. However, motion detection sensitivity, and therefor effective motion detection range, is automatically reduced during Daytime to reduce the incidence of false positive events.

6.2 Dynamic Environmental Calibration

Outdoor luminaires implementing day/night control are typically controlled by a top-mounted light sensor or photocell, which allows the photocell to record ambient light conditions with limited influence from the luminaire itself or other environmental factors such as reflections or street-level illumination.

The LUMAWISE Motion Programmable includes proprietary compensation techniques which allow it to perform as an effective ambient light sensor for day/night control, despite being downward facing, by removing the

contribution of the attached luminaire from critical measurements. This compensation is dynamic and responds to changes in the installed environment over time, accounting for variables like increased road surface reflectivity as a result of repaving, installation of new structures nearby, sustained weather conditions such as snow or ice, or luminaire output brightness changing throughout its lifetime.

The device will not begin storing measured compensation factors until it has been installed with power connected for greater than 1 hour, allowing for functional check and evaluation of the unit before install without fear of contaminating the relevant environmental measurements.

The built-in compensation function cannot remove the effect of external light sources like nearby shop windows or other luminaires, but standard time delays and hysteresis prevent unnecessary day/night transitions in response to transient light conditions.

6.3 Influence of a Mask on Light Sensor Readings

The motion blocking mask PN 2396399-1 is opaque to infrared light and therefor disables motion sensing in the blocked regions. The mask is transparent to visible light, and as such should not have a significant impact on the function of the built-in light sensor. There is some risk, however, of minor light attenuation which would manifest as slightly earlier turn on times in the evening and slightly later turn off times in the morning.

6.4 Daytime False Positive Reduction

The LUMAWISE Motion includes a highly sensitive motion detection algorithm intended to maximize detection range during nighttime operation. When operating in daytime mode as described in Figure 9, LUMAWISE Motion automatically reduces motion detection sensitivity in order to prevent false-positive motion events caused by the interference of infrared intensive natural sunlight. The LUMAWISE Motion will continue to detect motion and publish occupancy events to the DALI bus when operating in daytime mode, but the detection range will be reduced.

This false-positive rejecting feature is implemented both in Standalone Mode as well as when used with a Type A device.

7 CONFIGURE PARAMETERS VIA THE DALI BUS

The LUMAWISE Motion Programmable includes an extended feature to configure output settings via the memory bank of the DALI bus.

7.1 DALI Memory Bank Programming

For writing data to the DALI Memory Bank, the memory bank writing must be enabled first. Data is available in Memory Bank Location 2 and default commands shall look like: WRITE MEMORY LOCATION (DTR1, DTR0, data). Please see an example below.

ENABLE WRITE MEMORY		
Bus Activity	**Hex**	**Description**
ENABLE WRITE MEMORY	0xFF FE 15	Send twice with settling time of 14110 us
DTR1	0xC1 31 02	DALI Memory Bank 2
DTR0	0xC1 30 02	Memory Bank Location Byte 2
WRITE MEMORY LOCATION	0xC1 20 55	Data hex 0x55 (decimal 85) enables writing to memory bank location
Returns **data** as answer		
WRITE COMMAND		
Bus Activity	**Hex**	**Description**
DTR1	0xC1 31 02	DALI Memory Bank 2
DTR0	0xC1 30 {##}	Memory Bank Location
WRITE MEMORY LOCATION	0xC1 20 {##}	Data hex 0x##
Returns **data** as answer		

7.2 Parameters to be Programmed

The parameters which can be set are available in DALI Memory Bank 2.

MB2 Address	Content	Default (decimal, hex)
0x14	Light Output % - Low Level *Nighttime light output without motion. 0x64 = 100% (>0x64 is set to 100%)*	*20% (20dec, 0x14)*
0x15	Light Output % - High Level *Nighttime light output during motion event. 0x64 = 100% (>0x64 is set to 100%)*	*100% (100dec, 0x64)*
0x16	Light Output % - High Temperature Mode *Nighttime light output in High Temperature Mode. 0x64 = 100% (>0x64 is set to 100%)*	*50% (50dec, 0x32)*
0x17	Lamp On Time *Lamp on-time used from 0x00 to 0xFF. 0x01 = 5 seconds increment*	120s (24dec, 0x18)
0x18	Turn On Level *Light level in lux from 0x0A to 0xF5*	35 lux (35dec,0x23)
0x19	Turn Off Level *Light level in lux from 0x0A to 0xF5*	18 lux (0d18, 0x12)

For example, the following commands are needed for a system where the LUMAWISE Motion Programmable acts as a standalone Type B device by having the luminaire on a maximum output level of 80% and an ON Time of 10 minutes.

ENABLE WRITE MEMORY		
Bus Activity	**Hex**	**Description**
ENABLE WRITE MEMORY	0xFF FE 15	Send twice with settling time 14100 us
DTR1	0xC1 31 02	DALI Memory Bank 2
DTR0	0xC1 30 02	Memory Bank Location Byte 2
WRITE MEMORY LOCATION	0xC1 20 55	Data hex 0x55 (decimal 85) enables writing to memory bank location
Returns **0x55 (dec 85)** as answer		
WRITE COMMAND Light Level High to 80%		
Bus Activity	**Hex**	**Description**
DTR1	0xC1 31 02	DALI Memory Bank 2
DTR0	0xC1 30 15	Memory Bank Location 0x15
WRITE MEMORY LOCATION	0xC1 20 50	Data hex 0x50
Returns **0x50 (dec 80)** as answer		
WRITE COMMAND Turn ON Level to 10 minutes (600 seconds)		
Bus Activity	**Hex**	**Description**
DTR1	0xC1 31 02	DALI Memory Bank 2
DTR0	0xC1 30 17	Memory Bank Location 0x17
WRITE MEMORY LOCATION	0xC1 20 78	Data hex 0x78
Returns **0x78 (dec 120)** as answer		

NOTE
Turn ON level command is available from 5 seconds to 1275 seconds (~21 minutes) in steps of 5 seconds.

7.3 Default Operation

The LUMAWISE Motion Programmable can be used with default parameters by resetting the DALI Memory Bank 2. The command RESET MEMORY BANK (DTR0) must be transmitted. Before resetting the memory bank, it must be ensured that the ENABLE WRITE MEMORY is still valid.

ENABLE WRITE MEMORY		
Bus Activity	**Hex**	**Description**
ENABLE WRITE MEMORY	0xFF FE 15	Send twice with settling time 14100 us
DTR1	0xC1 31 02	DALI Memory Bank 2
DTR0	0xC1 30 02	Memory Bank Location Byte 2
WRITE MEMORY LOCATION	0xC1 20 55	Data hex 0x55 (decimal 85) enables writing to memory bank location
Returns **0x55 (dec 85)** as answer		
RESET MEMORY BANK (DTR0)		
Bus Activity	**Hex**	**Description**
DTR0	0xC1 30 02	DALI Memory Bank 2
RESET MEMORY BANK (DTR0)	0xFF FE 11	Send twice with settling time 14100 us

For default operation, the Memory Bank 2 should be disabled for writing again. The write operation can be disabled by resetting the lock byte back to 0xFF. Example placed below.

DISABLE WRITE MEMORY		
Bus Activity	**Hex**	**Description**
DISABLE WRITE MEMORY	0xFF FE 15	Send twice with settling time of 14110 us
DTR1	0xC1 31 02	DALI Memory Bank 2
DTR0	0xC1 30 02	Memory Bank Location Byte 2
WRITE MEMORY LOCATION	0xC1 20 FF	Data hex 0xFF (decimal 255) enables writing to memory bank location
Returns **data** as answer		

8 CUSTOMER SYSTEM TESTING CONSIDERATIONS

LUMAWISE Motion Programmable is designed to work reliably in the field, in a variety of installation scenarios and with minimal configuration or commissioning effort required on behalf of the installer or system designer. This is achieved through the use of environmentally reactive dynamic compensation techniques, as described in sections 5 and 6.

Laboratory testing of the LUMAWISE Motion Programmable, or other artificial installation scenarios, must adequately consider these features dictate operation of the device in order to prevent unexpected behavior or incorrect interpretation of experimental results.

8.1 Using the LUMAWISE Motion Programmable in an artificially lit environment

As described in Section 5.4, the LUMAWISE Motion Programmable will not attempt to control the attached luminaire via DAPC commands when operating in Daytime mode, and motion detection sensitivity will be reduced. If a user wishes to evaluate motion sensing performance by observing control of a luminaire or by monitoring DALI bus activity the device must be tested in a low ambient light environment such that the device is operating in Nighttime Mode. Refer to Section 6.1.

8.2 Monitoring DALI Bus Activity

For evaluation and debugging of DALI bus activity, the use of a bus monitor device is recommended.

The LUMAWISE Motion Programmable has been tested for compatibility with the Lichtvision ProbitLab2 IEC 62386 test platform as well as other commercially available “DALI Bus Sniffer” products.

8.3 Characterizing Motion Sensor Response

While DAPC commands will not be issued when operating in Daytime mode, Occupancy Status updates will be published to the DALI bus in either Daytime or Nighttime modes. If characterization of motion sensor response is needed in an artificially lit environment, a DALI bus sniffer or other controller may be used to send CATCH MOTION or CANCEL HOLD TIMER commands.

These commands can be used to instruct the LUMAWISE Motion Programmable to publish an Occupancy Event to the bus on the next detected motion event, regardless of HOLD TIMER status.

The DALI bus sniffer may also query the Memory Bank 2 addresses corresponding to PIR status for real-time reporting on motion activity or using the QUERY INPUT VALUE command.

9 ENCLOSURE AND MECHANICAL CONSIDERATIONS

9.1 Material

The base housing and cover are made of UL 94V-0, UV f1 rated thermoplastic. Power contacts are made of brass with tin plating on entire contact.

9.2 Storage

A. Shelf Life

The product should remain in the shipping containers until ready for use to prevent deformation to components. The product should be used on a first in, first out basis to avoid storage contamination that could adversely affect performance.

B. Chemical Exposure

Do not store product near any chemical listed below as they may cause stress corrosion cracking in the material.

Alkalies	Ammonia	Citrates	Phosphates Citrates	Sulfur Compounds
Amines	Carbonates	Nitrites	Sulfur Nitrites	Tartrates

9.3 LUMAWISE Motion Programmable Sensor Module Mounting

A. With the LUMAWISE Endurance S/S2 receptacle mounted to the luminaire per TE Connectivity application spec 114-133074 for the LUMAWISE Endurance S/S2 Connector System the LUMAWISE Motion Programmable Sensor Module can be mounted.

NOTE
Care must be taken to acknowledge the X-axis directional mark (see figure 1) on the final mounted LUMAWISE Motion Programmable Sensor Module is in the correct orientation based on the requirements of the installation and the detection diagrams shown in Section 5.

B. Align the Module over the mounted receptacle. Based on polarizing features on each, the Module can only be installed in one position. Lightly rotate the Module until you feel the alignment keys and the blades align to the proper location. After alignment, push downward until the Module is bottomed on the receptacles mating face. Then complete mating by rotating Module with downward pressure while twisting in a clockwise direction. The Module or Sealing Cap will lock into position with an audible 'click'. To un-mate, gently push down and reverse the aforementioned mating process. See Figure 10.

CAUTION
When in field use it is important that a receptacle is mated to the specified a module assembly. The receptacle by itself is not a sealed device and would allow moisture to enter the luminaire.

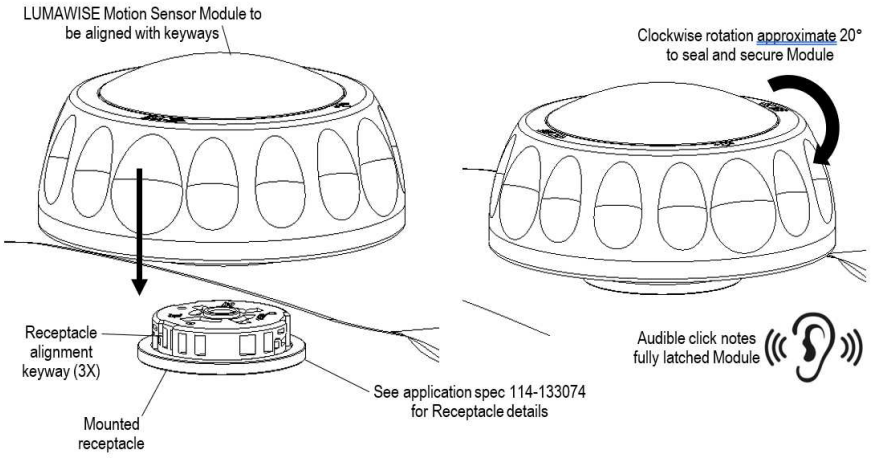


Figure 11 - Mounting the device

9.4 Handling

The LUMAWISE Motion Programmable Sensor Module is a self-contained unit with power contacts preinstalled; therefore, take precautions to not bend or damage the contacts prior to mating unit to receptacle. Care must be taken to not damage or deform the lens.

9.5 Replacement and Repair

The contacts and housings are not repairable. DO NOT use a LUMAWISE Motion Programmable device with damaged or defective contacts and/or housings. If damaged, replace the module with a new one.

10 QUALIFICATION

LUMAWISE Motion Programmable is component listed by Underwriters Laboratories, Inc. in File E66375, Volume 9, and has been investigated to CSA International by UL.

LUMAWISE Motion Programmable has been evaluated to EN-61347-1 and EN-61347-2-11 by Intertek and is included in CB certificate SE-108291M1.

Reference DALI Alliance Product ID 5534 for information on D4i certification.

11 TOOLING

No tooling is required for the use of this product.

12 VISUAL AID

The illustration below shows a typical application of LUMAWISE Motion Programmable Sensor Module. This illustration should be used by production personnel to ensure a correctly applied product. Applications which DO NOT appear correct should be inspected using the information in the preceding pages of this specification and in the instructional material shipped with the product or tooling.

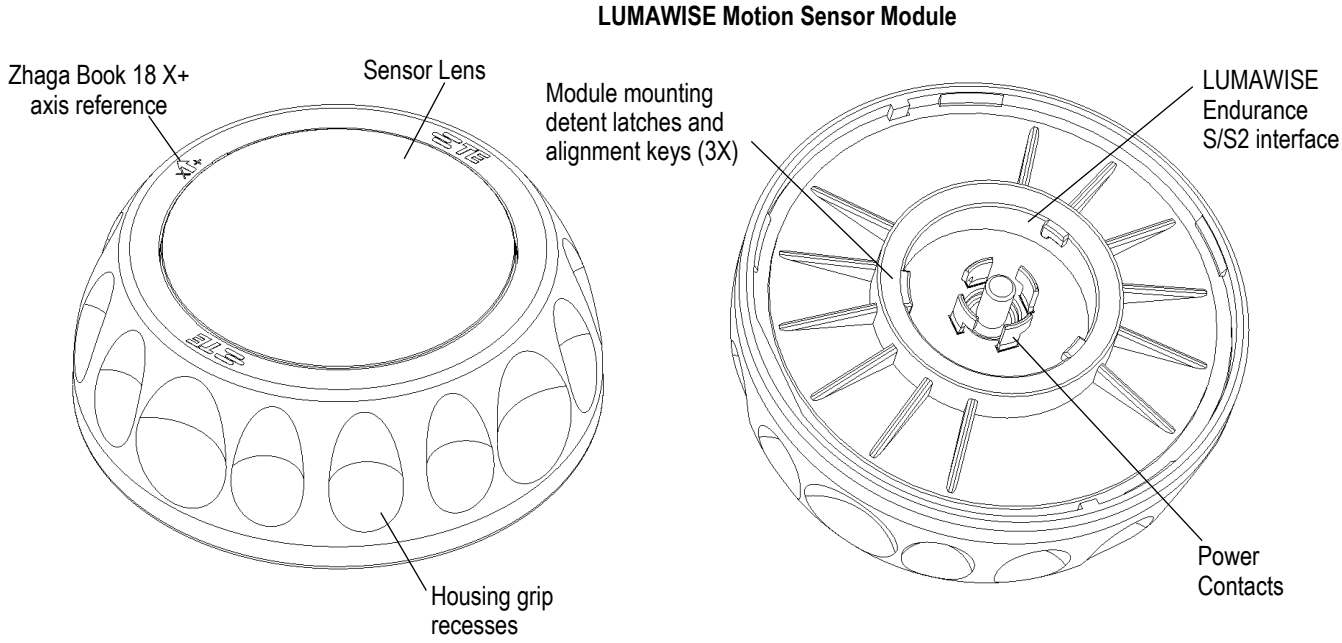


Figure 12 - Visual Aid