DEVELCO
PRODUCTS

Motion Sensor
## The ultimate solution to monitoring the status of your house

The Motion Sensor from Develco Products lets you detect everything with only one device. The Motion Sensor can detect occupancy, light & temperature. Place the battery powered Motion Sensor on a table or shelf, or use the mounting screws and place it flat on the wall, flat on the ceiling or in the corner.

Key features are:

- Occupancy sensor
- Alarm sensor - IAS Zone
- Light sensor
- Temperature sensor
- ZigBee Home Automation 1.2 certified

Occupancy, light and temperature detection

With the wireless Motion Sensor, you will be able to set lights to turn on and off as you come and go. Moreover, Motion Sensor also includes a temperature sensor, which together with motion sensing, enables to regulate room temperature as people come and go.
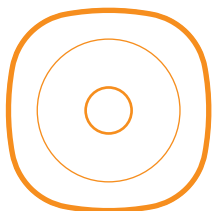
Multiple functions
Long battery lifetime
Occupancy and alarm sensor in one

The occupancy sensor is PIR based and is able to sense movement up to 6 meters from where the sensor is placed. The sensor includes two logical outputs - one for occupancy with high sensitivity and one for alarm with a lower sensitivity.

The wireless protocol is ZigBee, meaning that the Motion Sensor can be integrated with other ZigBee based systems for smart home, energy control, healthcare, or home security.

www.develcoproducts.com

Motion Sensor - Technical specifications

General

Dimensions (W x H x D)	82 x 82 x 28 mm
Color	White
Power supply	Battery: CR123, exchangeable
	Battery life: 3 years, reporting every 2 minutes
	Battery level and low battery warning can be reported
Radio	Sensitivity: -92 dBm Output power: +3 dBm**(EU)**
Environment	Operation temperature 0 to +50°C
	IP class: IP30

Functions

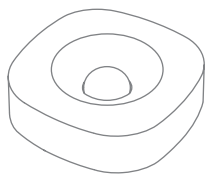|	
Occupancy & alarm sensor	Sensitivity range: 6 m
	View angle: 45° up/down, left/right
	Off-time: configurable 2 s - 65,000 s
	Two trigger levels: one for occupancy and one for alarm
Light sensor	Resolution: dark, light, bright
	Sample time: config.: 2 s -65,000 s
	Reporting: configurable
Temperature sensor	Range: 0 to +50°C
	Resolution: 0.1°C (accuracy ± 0.5°C)
	Sample time: config.: 2 s -65,000 s
	Reporting: configurable

Communication

Wireless protocol	ZigBee Home Automation
	ZigBee end-device

Certifications
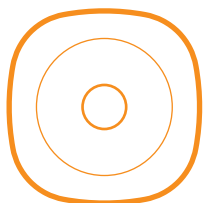
	Conforming to CE, RoHS and REACH directives
	ZigBee Home Automation 1.2 certified

Motion Sensor

INSTALLATION MANUAL
Version 2.6

Product description

The Motion Sensor from Develco Products can detect occupancy, movement, light and temperature. Place the battery powered Motion Sensor on a table or shelf, or use the mounting screws and place it flat on the wall, flat on the ceiling or in the corner.

The Motion Sensor can be integrated with other ZigBee based products for smart home, smart energy, healthcare and building management.

The Motion Sensor can detect movement at a distance of up to 6 meters.

Precautions

· Do not remove the product label as it contains important information.

· Do not place the Motion Sensor close to a heating/cooling source, as it may activate the temperature sensor.

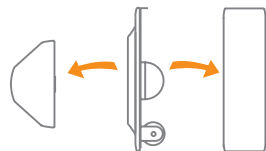· Do not place the Motion Sensor in direct sunlight or bright light.

· Avoid placing the Motion Sensor close to electromagnetic fields.

· Do not paint the sensor.

Getting started

1. Remove the magnetic mounting base and open the casing of the sensor.

2. Insert the battery respecting the polarities
3. The Motion Sensor will start searching (up to 15 minutes) for a ZigBee network to join.
4. Make sure that the ZigBee network is open for joining devices and will accept the Motion Sensor.
5. While the Motion Sensor is searching for a ZigBee network to join, the LED flashes red.

6. When the LED stops flashing, the Motion Sensor has successfully joined the ZigBee network.
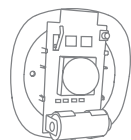

Placement

· Place the sensor indoors at a temperature between 0-50°C.

· Its angle of detection from above, the sides and below must be 45°.

· The Motion Sensor must be placed in a location with a clear view of the monitored area and the windows.

· The distance from the Motion Sensor to a fireplace or a stove must be at least four meters.

· Most favourable placement of the Motion Sensor is in a corner of the room, closest to the ceiling, as the Motion Sensor reacts optimally to crosswise movement.

· The Motion Sensor must be reachable for battery testing and maintenance.
· Place the sensor free of curtains and other obstacles.
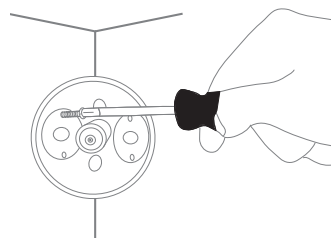
Mounting

MAGNETIC BASE

1. Detach the sensor from the magnetic mounting base by pulling it away.
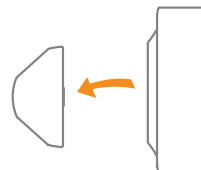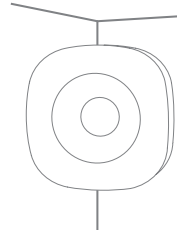

2. Use the magnetic mounting base to mark the screw holes on the corner of the ceiling or a wall.

3. Use enclosed screws and plugs to install the mounting base on the marked place.
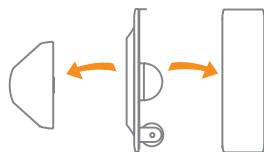

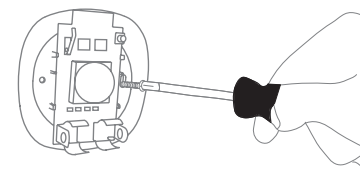4. Attach the sensor to magnetic mounting base.

FIXED MOUNTING WITH SCREWS

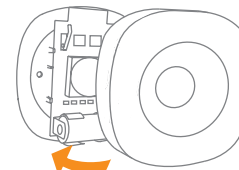1. Remove the magnetic mounting base and open the casing of the sensor.

2. Use the sensor part with holes to mark the screw holes on a flat ceiling or a wall.

3. Use enclosed screws and plugs to install the mounting base on the marked place.
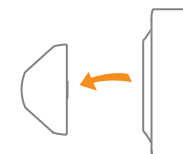

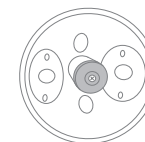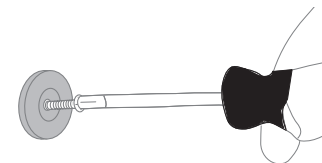4. Attach the front cover to the sensor.

MAGNET

1. Detach the magnetic mounting base from sensor by pulling it away.
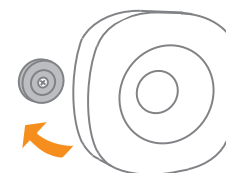

2. Unscrew the small magnet from the mounting base.
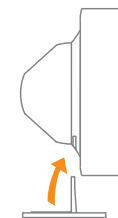

3. Screw the magnet on a ceiling or a wall.

4. Attach the sensor to the magnet.

STAND

1. Insert the plastic stand in the opening on the back of the sensor as shown on the drawing.

2. Place the standing sensor on the shelf or on a desk.

Resetting

Resetting is needed if you want to connect your Motion Sensor to another gateway, or if you need to perform a factory reset to eliminate abnormal behaviour.

STEPS FOR RESETTING

1. Detach the sensor from the magnetic mounting base and/or open the casing.
2. Check that the battery is inserted correctly.
3. Press and hold the menu button until the red LED starts to flash.

4. Release the button during flashing.
5. Resetting process is complete when the red LED starts to blink every second.

Fault finding

· In case of a bad or weak signal, change the location of the Motion Sensor. Otherwise you can relocate your gateway or strengthen the signal with a smart plug.

· If the search for a gateway has timed out, a short press on the button will restart it.

Battery replacement

CAUTION: RISK OF EXPLOSION IF BATTERIES ARE REPLACED BY AN INCORRECT TYPE. DISPOSE OF THE BATTERIES IN ACCORDANCE WITH INSTRUCTIONS.

CAUTION: When removing cover for battery change - Electrostatic Discharge (ESD) can harm electronic components inside

1. To replace the battery, detach the Motion Sensor from the mounting base and open the casing.
2. Replace the battery respecting the polarities. The Motion Sensor uses 1xCR123 battery.
3. Close the casing of the sensor.
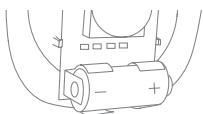
Other information

• ZigBee operation frequency 2.4GHz
• Max. RF output Power +3 dBm

Disposal

Dispose the product and battery properly at the end of life. This is electronic waste which should be recycled.

FCC statement

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

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and receiver.
• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
• Consult the dealer or an experienced radio/TV technician for help.

This device complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. The antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

This device complies with part 15 of the FCC Rules. 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.

CE certification

The CE mark affixed to this product confirms its compliance with the European Directives which apply to the product and, in particular, its compliance with the harmonized standards and specifications.

IN ACCORDANCE WITH THE DIRECTIVES

• Radio equipment directive 2014/53/EU
• RoHS Directive 2011/65/EU

Other certifications

• ZigBee Home Automation 1.2 certified.

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Distributed by Develco Products A/S
Olof Palmes Allé 40
8200 Aarhus
Denmark

T00000048

Motion Sensor – MOSZB-130

Technical manual

Revised 20.12.2017

Content

RoHS $C\,\epsilon$

1   Cautionary notes

Develco Products A/S reserves the right to make changes to any product to improve reliability without further notice. Develco Products A/S does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under patent rights or the rights of third parties.

2 Features

2.1 Motion Sensor – MOSZB-130

The device enables you to detect movement and light as well as measuring temperature.

The sensor is battery powered and can be mounted in four different ways: flat on the wall, flat on the ceiling, in the corner (using a 45˚ bracket), or standing (on a shelf, table, or similar).

The sensor has 3 ZigBee end points, one for each sensor. The Occupancy end point contains 2 logic modules that combines' Occupancy with temperature and light sensor. Each end point can be used separately. Standard ZigBee ZCL "Configure Reporting" on change and on time is supported.

2.1.1 IAS Zone

The IAS Zone sensor is PIR based, sensing moving objects up to 6 meters from the sensor. The off-time is adjustable remotely via ZigBee. The end point is configured as Home Automation profile „IAS Zone". The IAS Zone End point is less sensitive than the Occupancy sensor endpoint. Therefore if the device is used as an alarm sensor the IAS Zone end point shall be used.

2.1.2 Occupancy

The occupancy sensor is PIR based, sensing moving objects up to 6 meters from the sensor. The off-time is adjustable remotely via ZigBee. The end point is configured as Home Automation profile „Occupancy Sensor".

2.1.3 Light

The light sensor is a low-accuracy sensor reporting light level. The end point is configured as Home Automation profile „Light Sensor".

2.1.4 Temperature

The temperature sensor measures temperature with a resolution of 0.1˚C. The end point is configured as the Home Automation profile „Temperature Sensor".

2.2 Key features

Key features are:

- Alarm Sensor – IAS Zone
- Temperature sensor
- Occupancy sensor
- Light sensor
- ZigBee OTA cluster for firmware upgrades
- ZigBee HA 1.2 Certified application profile
- Communication based on DevCom07 ZigBee Module.
- RoHS compliant according to the EU Directive 2002/95/EC.
- Standard ZigBee Home Automation security and stack settings are used.

3   Endpoints

The device implements the following standard HA devices on different end points.

3.1   ZigBee Device Object (ZDO)

- End point number 0x00
- Application profile Id 0x0000
- Application device Id 0x0000
- Supports all mandatory clusters

3.2   IAS Zone

- End point number 0x23
- Application profile Id 0x0104 (Home Automation)
- Application device Id 0x0402

3.3   Occupancy Sensor

- End point number 0x22, 0x28 and 0x29
- Application profile Id 0x0104 (Home Automation)
- Application device Id 0x0107

Each end point contains a logic module that can be configured to control the occupancy sensor signal base on the user defined settings for the *temperature* sensor input or the user defined settings for the light sensor input.

3.4   Temperature Sensor

- End point number 0x26
- Application profile Id 0x0104 (Home Automation)
- Application device Id 0x0302

3.5   Light Sensor

- End point number 0x27
- Application profile Id 0x0104 (Home Automation)
- Application device Id 0x0106

3.6   Develco Products Utility

- Application profile Id 0xC0C9 (Develco Products private profile)
- Application device Id 0x0001
- Manufacture code for Develco Products is 0x1015
- Private profile for internal Develco Products use only.

Reference documents:

053474r18ZB_CSG-ZigBee-Specification.pdf

075123r03ZB_AFG-ZigBee_Cluster_Library_Specification.pdf

053520r27ZB_HA_PTG-Home-Automation-Profile.pdf

075356r15ZB_ZSE-ZSE-AMI_Profile_Specification.pdf

They can all be downloaded from :

http://www.zigbee.org/Products/DownloadZigBeeTechnicalDocuments.aspx

4 Supported Clusters

4.1 Common clusters for each end point

The ZCL "General Function Domain" clusters in this section are implemented as server clusters. Refer to ZigBee Cluster Library Specification. http://www.zigbee.org/Specifications.aspx

4.1.1 Basic – Cluster id 0x0000

Only the first set has mandatory attributes, also the optional attributes that can be relevant to a Develco Product's device are all in set 0x000.

4.1.1.1 Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0	ZCLVersion	Uint8	Type range	M	
0x4	ManufacturerName	String	0-32 byte	O	4.1.1.1.1
0x5	ModelIdentifier	String	0-32 byte	O	4.1.1.1.2
0x6	DateCode	String	0-32 byte	O	
0x7	PowerSource	8 bit enum	Type range	M	

4.1.1.1.1 Manufacturer name

Develco Products A/S

4.1.1.1.2 Model identifier

MOSZB-130

4.1.1.1.3 Manufacture Specific Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x8000	PrimarySwVersion	OctetString		M	Read only

ZCL header setting – Manufactor code for Develco Products is 0x1015

4.1.2 Identify – Cluster id 0x0003

4.1.2.1 Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0000	IdentifyTime	Uint16	Type range	M	

4.1.2.2   Commands

The identify cluster has 2 commands as server.

Id#	Name	Payload	Man/Opt	Relevance and ref.
0x00	Identify	Uint16 - Identify Time (seconds)	M	
0x01	Identify Query	none	M	

The identify cluster has 1 command as client.

Id#	Name	Payload	Man/Opt	Relevance and ref.
0x00	Identify Query Response	Uint16 - Identify Time (seconds)	M	

4.2   IAS Zone Device – EP 0x23

4.2.1   IAS Zone - Cluster id 0x0500

The IAS Zone cluster is described in ZigBee Cluster Library Specification

4.2.1.1   Attribute

Id#	Name	Type	Man/Opt	Relevance and ref.
0x0000	Zone State	8-bit Enumeration	M	
0x0001	Zone Type	16-bit Enumeration	M	Hard coded to 0x000D Motion Sensor
0x0002	Zone Status	Uint16	M	The following bits are supported: Bit0: Alarm 1 Bit2: Tamper Bit3: Battery Bit4: Supervision reports Bit5: Restore reports Bit6: Trouble Bit9: Battery defect,
0x0010	IAS CIE Address	Valid 64-bit IEEE address	M	
0x0011	ZoneID	Uint8	M	

4.2.1.1.1 Zone State

The device will automatically start to scan the network for an IAS Zone client in a predefine interval. When the client is found it will automatically attempt to enrol. When it has successfully enrolled the Zone Status command is send every 5 minutes.

The attribute value will change from not enrolled (0x00) to Enrolled (0x01)

4.2.1.1.2 IAS CIE Address

Attribute specifies the address that commands generated by the server shall be sent to.

To un-enroll the device the back end system has to write a new address into this attribute. Any value is valid. If the back end system writes an IEEE adr then it will try to enrol to this devices represented by the IEEE adr.

4.2.1.1.3 ZoneID

A unique reference number allocated by the CIE at zone enrollment time.

Used by IAS devices to reference specific zones when communicating with the CIE. The *ZoneID* of each zone stays fixed until that zone is unenrolled

4.2.1.2   Commands

The IAS Zone cluster has 2 commands as server.

Id#	Name	Payload			Man/Opt	Relevance and ref.
0x00	Zone Status Change Notification	Uint16 – bit mask			M	The status is report to the coordinator every 5 min
0x01	Zone Enroll Request	Bits	16	16	M	
		Data type	16 bit enum	UINT16		
		Field name	Zone type	Manufacturer code		

Init sequence – when the device has join the network it start to scan for an IAS zone client cluster. If a client is found a Zone enroll request command is send and a Zone Enroll response is expected. If it doesn't receive a response within 15 sec it gives up and will continue to scan x number of attempts. When the init sequence is over it will enter a state where it scans for a client every 12 hour.

The following bits are supported in Zone status:

Bit0: Alarm 1

Bit2: Tamper

Bit3: Battery

Bit4: Supervision reports

Bit5: Restore reports

Bit6: Trouble

Bit9: Battery defect,

Bit0, Bit2:

Note: How to clear a alarm in the "Zone status"

The sensor requests ZCL Default Response on the Zone Status Change notification, if any new Alarm bit has been set. Until the IAS CIE has acknowledged the received alarm by sending the mandated Default Response, the Alarm bits are not cleared – even if there is no longer an alarm situation on either tamper or movement. When the Default Response is received, a new Zone Status Change notification is sent with the Alarm bits cleared, if the alarm situation has disappeared since sending the Zone Status message with alarm set.

Bit3: When the battery is below **2.5 VDC.** Battery bit is set high and "Zone Status" is transmitted to the coordinator.

Bit9: When the battery is defect the sensitivity of the motion detector is reduced to avoid false alarms. Therefore when this bit is true it is highly recommended that the battery is changed.

4.2.2   Power Configuration - Cluster id 0x0001

The power configuration cluster is described in ZigBee Cluster Library Specification

4.2.2.1   Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0020	BatteryVoltage	Uint8	0x00 - 0xFF	O	ZCL configure reporting is supported
0x0031	BatterySize	enum8	CR123A (0x08)	O	
0x0033	BatteryQuantity	Uint8	1	O	
0x0034	BatteryRatedVoltage	Uint8	30	O	Unit is in 100 mV
0x0036	BatteryVoltageMinThreshold	Uint8	25		Unit is in 100 mV
0x003E	BatteryAlarmState	Map32		O	Bit0: BatteryVoltageMinThreshold Is set if BatteryVoltage has been below BatteryVoltageMinThreshold or other internal circuits has deemed the supply to be inadequate. This bit will only reset after a power cycle.

					The condition will also be shown on the MMI LED, see MMI description. Reportable. Default Min 12 hours, max 12 hours

Note: The attribute "*BatteryVoltage*" is measuring the battery voltage, in units of 100mV.

4.2.3 Poll Control - Cluster id 0x0020

The poll control cluster is described in ZigBee Cluster Library Specification

This cluster provides a mechanism for the management of an end device's MAC Data Request rate. For the purposes of this cluster, the term "poll" always refers to the sending of a MAC Data Request from the end device to the end device's parent.

This cluster can be used for instance by a configuration device to make an end device responsive for a certain period of time so that the device can be managed by the controller.

4.2.3.1 Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0000	Check-inInterval	Uint32	0x00 - 0xFF	M	Default value is 1 hour
0x0001	LongPoll Interval	Uint32		M	Default value is disabled
0x0002	ShortPollIntervall	Uint16		M	Default value is 3 seconds
0x0003	FastPollTimeout	Uint16		M	Default value is 5 minutes

Start up, auto scan for client poll control cluster on the coordinator. If it is support on the coordinator an auto bind is created and the Smoke Alarm will send a check-in command in the interval specified in attribute "Check-inInterval. The coordinator has to reply with a check-in response. The sensor supports the following commands send from the client (Typically the coordinator).

- 0x00 Check-in Response,
- 0x01 Fast Poll Stop,
- 0x02 Set Long Poll Interval,
- 0x03 Set Short Poll Interval,

If it doesn't find a poll client it will search again periodically.

4.2.4 OTA Upgrade – Cluster id 0x0019

The cluster provides a ZigBee standard way to upgrade devices in the network via OTA messages. The devices support the client side of the cluster.

When the devices has joined a network it will automatically auto scan for a OTA upgrade server in the network. If it finds a server an auto bind is created and ones every 24 hour it will automatically send its "current file version" to the OTA upgrade server. It is the server that initiates the firmware upgrade process.

4.2.4.1   Attributes

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0000	UpgradeServerID	IEEE Address	-	M	
0x0001	FileOffset	Uint32	Type range	O	
0x0002	CurrentFileVersion	Uint32	Type range	O	
0x0003	CurrentZigBeeStackVersion	Uint16	Type range	O	
0x0004	DownloadedFileVersion	Uint32	Type range	O	
0x0005	DownloadedZigBeeStackVersion	Uint16	Type range	M	
0x0006	ImageUpgradeStatus	8 bit enum	0x00 to 0xFF	O	
0x0007	Manufacturer ID	Uint16	Type range	O	
0x0008	Image Type ID	Uint16	Type range	O	
0x0009	MinimumBlockRequestDelay	Uint16	Type range	O	

Above attribute description is to be found in section 6.7 "OTA Cluster Attributes" in ZigBee document – "zigbee-ota-upgrade-cluster-specification" provided by the ZigBee alliance.

4.2.4.2   Commands

The OTA Client cluster can send the following commands

Id#	Name	Man/Opt	Relevance and ref.
0x01	Query Next Image request	M	6.10.1 OTA Cluster Command Identifiers
0x03	Image Block Request	M	6.10.1 OTA Cluster Command Identifiers
0x06	Upgrade End Request	M	6.10.1 OTA Cluster Command Identifiers

4.2.4.3 OTA Upgrade Messages Diagram
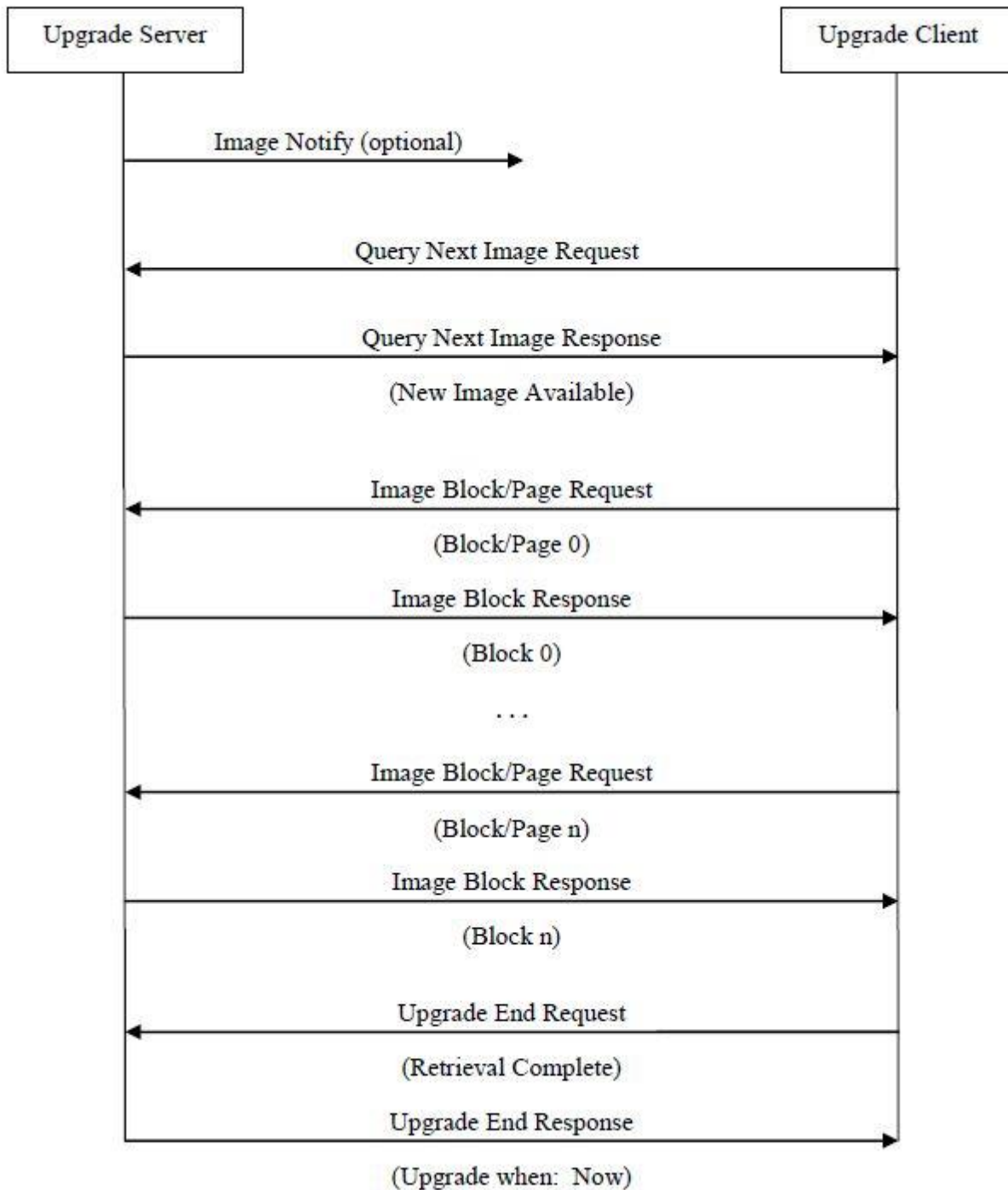
4.2.5   Time – Cluster id 0x000A

The Time cluster is a general cluster for time it is based on a UTC time in seconds since 0 hrs 0 mins 0 sec on 1st January 2000. Refer to [Z2] for ZigBee specification of the time cluster.

The device will use this clusters as a client – provided that a suitable Time Server is available on the network (most likely on the Gateway)

4.2.5.1   Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0000	Time	UTCTime (Uint32)	Type range	M	The module will periodically update its clock by synchronizing through this cluster
0x0001	TimeStatus	8 bit bitmap	00000xxx	M	

4.2.6   Binary Input Cluster - Cluster id 0x000F

The Binary input cluster is described in ZigBee Cluster Library Specification

4.2.6.1   Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x001C	Description	String	Motion	O	
0x0051	OutOfService	Bool	False (0) or True (1)	M	If True, PresentValue will no longer follow the physical input, but will be writeable
0x0055	PresentValue	Bool	False (0) or True (1)	M	Reflects the state of the Motion sensor, unless it is disabled by setting the OutOfService attribute to True. Reportable. Default Min 1 sec, max 10 min
0x0067	Reliabillity	Enum8		O	8 – Process Error: Failure in the detection circuit 7 – Unreliable Other: Battery failure, sensitivity reduced. 0 – No Fault Detected Reportable.

0x006F	StatusFlag	Map8	0x00-0x0F	M	Bit1: Fault. If set, the source can be read in the Reliability attribute Reportable. Default Min 1 sec, max 10 min

4.3   Occupancy Sensor Device – EP 0x22, EP 0x28 and 0x29

Each end point contains a logic module that can be configured to control the occupancy sensor signal base on the user defined settings for the *temperature* sensor input or the user defined settings for the light sensor input.

The manufacture specific attributes in section 4.2.1.2 is used to configure the logic module.

4.3.1   Occupancy sensing - Cluster id 0x0406

The occupancy sensing cluster is described in ZigBee Cluster Library Specification section 4.8

4.3.1.1   Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0000	Occupancy	8-bit Bitmap	0000000x	M	Reporting is supported
0x0001	Occupancy Sensor Type	8-bit Enumeration	0x00 – 0xfe	M	Hard coded to PIR sensor
0x0010	PIROccupiedTo UnoccupiedDelay	Uint16	Type range	O	The time delay, in **seconds**, before the PIR sensor changes to its unoccupied. **Default – 240 sec**
0x0011	PIRUnoccupiedTo OccupiedDelay	Uint16	Type range	O	The time delay, in **seconds**, before the PIR sensor changes to its occupied **Default – 0 sec**
0x0012	PIRUnoccupiedTo OccupiedThreshold	Uint8	Type range	O	Specifies the **number** of movement detection events that must occur before the PIR sensor changes to its occupied state.

					Default – 1 movement

4.3.1.2 Manufacture Specific Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0xFC00	ArmThreshold_ MinTemperature	Sint16	0x954d – 0x7ffe	M	Write/read is supported
0xFC01	ArmThreshold_ MaxTemperature	Sint16	0x954d – 0x7ffe	M	Write/read is supported
0xFC02	*TargetLevel*	Uint16	0x0002 – 0xfffd	M	Write/read is supported

ZCL header setting – Manufactor code for Develco Products is 0x1015

4.3.2 Occupancy Sensor using temperature sensor input

End point 0x22, 0x28 and 0x29 can be configured as a logic module that controls the occupancy sensor signal base on the user defined settings for the temperature sensor input.
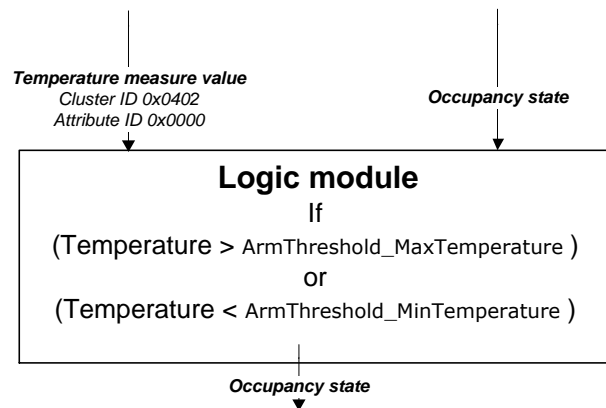
Use case – Energy savings in an office building

The device is installed to obtain energy savings in an office with an air condition. A ZigBee relay is installed to turn on the air condition when the occupancy sensor detects movements in the room. This functionality can be obtained by using the standard occupancy sensor functionality – Standard ZCL attributes.

Using the manufacture specific attributes in section 4.2.1.2 provide the user with an extra check before the air condition is turned on.

The installer can configure the ArmThreshold_MaxTemperature attribute to 25 degrees and when movements are detected in the room the relay only turns on the air condition when the temperature is above the MaxTemperature Setting (25 degrees).

The ArmThreshold_MinTemperature attribute can be used in winter season where the air condition shall warm up the room. The MinTemperature attribute is configured to 20 degrees and when movements are detected in the room and the temperature is below MinTemperature the air condition is turned on heating the room.

4.3.3 Occupancy Sensor using illumination sensor input

End point 0x22, 0x28 and 0x29 can be configured as a logic module that controls the occupancy sensor signal base on the user defined settings for the illumination sensor input.
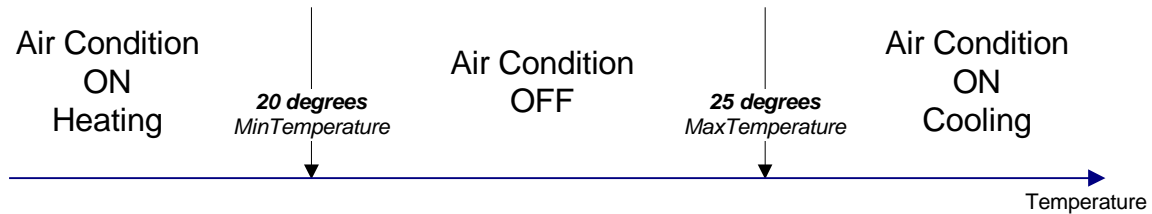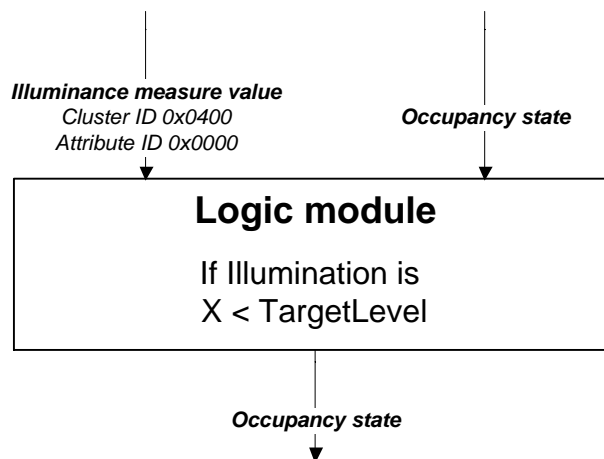

Use case – Energy savings in an office building

The device is installed to obtain energy savings in an office controlling the light. A ZigBee relay is installed to turn on the light when the occupancy sensor detects movements in the room. This functionality can be obtained by using the standard occupancy sensor Standard functionality - ZCL attributes.

Using the manufacture specific attributes in section 4.2.1.2 provide the user with an extra check before the air light is turned on.

The installer can configure the *TargetLevel* attribute to a user defined Lux level. When movements are detected in the room and the Lux level is below the *TargetLevel* the relay turns on the light.
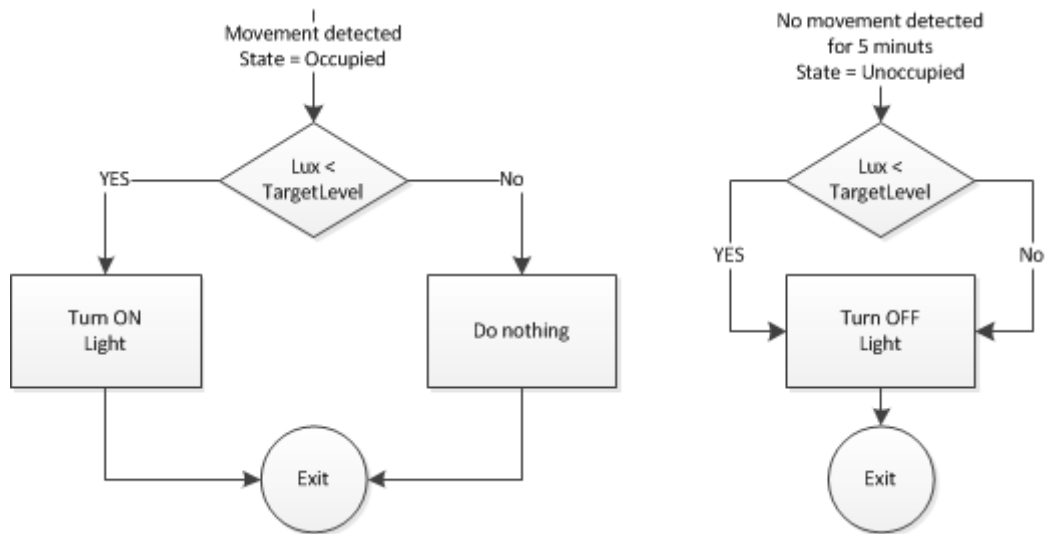
4.4   Temperature Sensor Device – EP 0x26

4.4.1   Temperature Measurement – Cluster id 0x0402

The temperature measurement cluster is described in ZigBee Cluster Library Specification section 4.4

4.4.1.1   Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0000	MeasuredValue	Sint16	MinValue to MaxValue	M	ZCL Reporting is support DP default is configured
0x0001	MinMeasuredValue	Sint16	0	M	
0x0002	MaxMeasuredValue	Sint16	5000	M	

4.4.1.1.1   MeasuredValue

The attribute is configured with the following default "ZCL configure reporting" setting.

- Min Reporting Interval: 0x003C [60 sec]
- Max Reporting Interval: 0x0258 [600 sec]
- Reportable Change: 0x000A [0.1 ˚C]

If the temperature value is stable it will be send every 10 minutes.

If the temperature changes more than 0.1 ˚C it will be reported but not faster than every 1 minute since last reporting value.

Note: Min reporting interval 0 sec is invalid when reportable change is configured.

4.4.1.1.2   MinMeasuredValue

The temperature sensor is NOT supporting temperature measurements below 0 degrees Celsius.

4.4.1.1.3 MaxMeasuredValue

The temperature sensor is NOT supporting temperature measurements above 50 degrees Celsius.

4.5   Light Sensor Device – EP 0x27

4.5.1   Illuminance Measurement - Cluster id 0x0400

The illuminance measurement cluster is described in ZigBee Cluster Library Specification section 4.2

4.5.1.1   Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0000	MeasuredValue	Uint16	MinValue to MaxValue	M	ZCL Reporting is support DP default is configured
0x0001	MinMeasuredValue	Uint16	0x0002 – 0xfffd	M	
0x0002	MaxMeasuredValue	Uint16	0x0001 – 0xfffe	M	
0x0004	LightSensorType	8-bit Enumeration	0x00 – 0xff	O	

4.5.1.1.1   MeasuredValue

The attribute is configured with the following default "ZCL configure reporting" setting.

- Min Reporting Interval: 0x0000 [0 sec]
- Max Reporting Interval: 0x0258 [600 sec]
- Reportable Change: 0xFFFF [Disabled]

The illumination value is sent every 10 minutes according to above settings.

The measured value can be converted into a lux.

lux=10^(y/10000+1)

4.5.1.1.2   MinMeasuredValue

The minimum Lux value supported by the device is 3 Lux.

Converting 3 Lux into min measured value: 10000*LOG(3)+1 = 4772

Min measured value in Hex = 0x1274

4.5.1.1.3   MaxMeasuredValue

The maximum Lux value supported by the device is 70.000 Lux. Converting 70.000 Lux into max measured value:
=10000*LOG(70000)+1 =48452

Max measured value in Hex = 0xBD43

5   MMI user guide

5.1   Push Button Menu

Pushing the button on a device provides the user with several possibilities.

Pushing the button for longer (push, hold for a few seconds, and release) allows the user to set the device into a desired mode. A mode change happens at 5 second interval. Below, these modes are illustrated in a state chart.
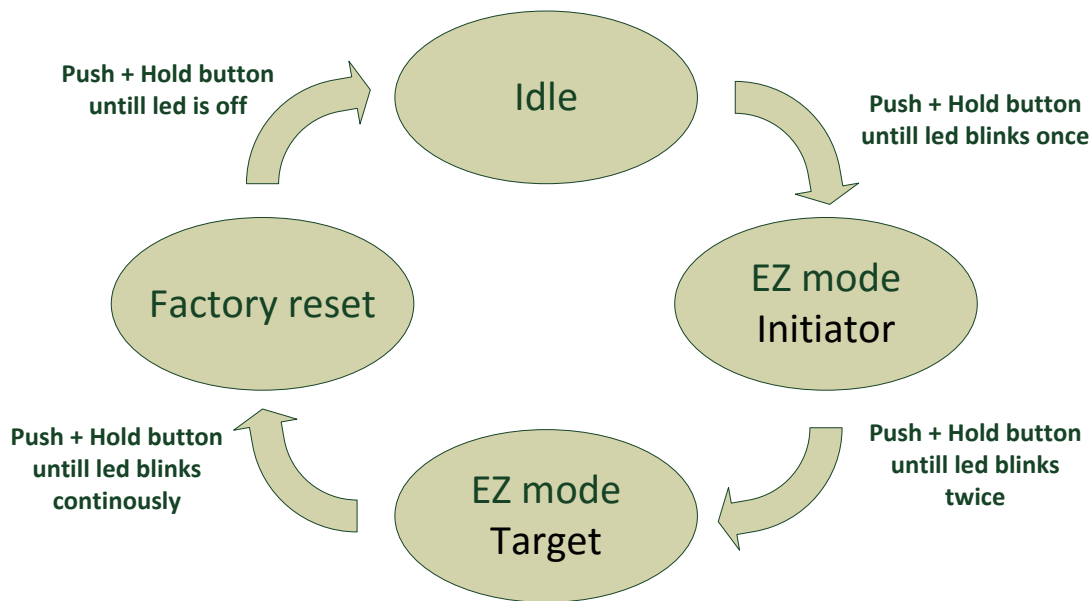
When cycling through the menu modes, the state is indicated by a number of 100ms blinks on the LED. The device is supporting the ZigBee standardized EZ- mode Commissioning.

5.1.1   EZ mode - Initiator

If the devices is not on the network EZ-Mode Network Steering is invoked when the user enter this menu. The led blinks once every 1 sec until the devices has joined the network. If the device was already on the network it will broadcast the PermitJoin messages. It is the trust center policy that decides if the device is allowed to join the network.

When the device has joined the network EZ-Mode Finding and Binding is invoked and the device start to blink every 3 sec until a cluster match is found. When a match is found or the cluster examine is finished the blinking stops and the device sends a messages to the target device to stop the identify time.

The following clusters are support in EZ-mode finding and binding:
- Temperature cluster
- Power configuration cluster

- Occupancy sensing cluster
- Illuminance Measurement cluster

The EZ-mode time is hard coded to 3 minutes. This is the Minimum and recommended PermitJoin time broadcast for EZ-Mode Network Steering and minimum IdentifyTime set for EZ-Mode Finding and Binding. If the user enters the menu again another 3 minutes is started.

5.1.2 EZ mode - Target

If the devices is not on the network EZ-Mode Network Steering is invoked when the user enter this menu. The led blinks twice every 1 sec until the devices has joined the network. If the device was already on the network it will broadcast the PermitJoin messages. It is the trust center policy that decides if the device is allowed to join the network.

When the device has joined the network identify mode is invoke and the device start to blink twice every 3 sec until identify mode is stopped or after the EZ-mode time has expired. If the user enters the menu again another 3 minutes is started.

5.1.3 Factory reset

To allow a device to join a network, one either has to power up a device that has not previously joined a network or push the button until the Reset To Factory default mode is indicated – and subsequently release the button. This will cause the device to reset to its factory default state and scan for a suitable coordinator.

5.2 Action on Power On

As a general rule, all end devices and routers that have not previously joined a network (or have been reset to factory default) will start up and search for a network with join permit open. In this mode, the LED will flash once every second.

Once the device has joined the network, is will start scanning for an OTA server, Time server, Poll control client, OccupancySensor client and an IAS Zone client.

If a device has joined a network and is powered down, it will attempt to rejoin this network upon power up. For the first 30 seconds hereafter, the device will be available for communication. This time can be expanded using the poll control cluster functionality.

6 General network behaviour

6.1 Installation

When the device is virgin and powered for the first time it will start looking for a ZigBee PAN Coordinator or router to join. The device will scan each ZigBee channel starting from 11 to 24. The LED will flash once every second until it joins a device.

#Scan mode - 1	#Sleep mode	#Scan mode - 2	#Sleep mode	#Scan mode - 2
Scan all 16 ZigBee channel until join network or 15 minutes	MCU is in sleep mode (Radio off) 15 minutes	Scan all 16 ZigBee ch x 1 or until join network ~ 30 seconds	MCU is in sleep mode (Radio off) 15 minutes	Scan all 16 ZigBee ch x 1 or until join network ~ 30 seconds

The device will start up using scan mode 1. To increase battery lifetime when the device is joining a network for the first time a scan mode 2 will be used after scan mode 1 has expired. Scan mode 1 it will only be executed one time when the device is powered. If the user invokes EZ-mode it will start scanning the next 3 minutes

In section 5 "MMI" it is explained how to put the device into a join or leave network mode.

Network settings are stored in NV-memory are after a power cycle the device re-join the same network.

If the device has to join a new PAN coordinator the MMI menu supports a **"Reset To Factory Fresh Settings"** mode. This will erase all current network information.

6.2 Normal – Keep alive

The device is sending a "keep alive" message to the PAN coordinator every 15 minute to verify that the device is still connected to the network.

6.2.1 Network lost

If no "keep alive" responses are received 5 times in a row (Worst case 1h15m), the devices will start scanning as specified in the table below.

When the device is in scan mode the LED will flash once every second until it re-joins the network.

According to the ZigBee specification TX is NOT allowed to be enabled all the time and a TX silent period has to be defined.

#Scan mode - 1	#Sleep mode	#Scan mode - 2	#Sleep mode	#Scan mode - 2
Scan current ch 3 times Scan remaining 15 ch 1 time Scan all 16 ch 3 times	MCU is in sleep mode (Radio off) 15 minutes	Scan current ch 3 times Scan remaining 15 ch 1 time	MCU is in sleep mode (Radio off) 15 minutes	Scan current ch 3 times Scan remaining 15 ch 1 time

6.3   Low battery

The current battery voltage can be read from the power configuration cluster described in section 4.3.1. The attribute "*BatteryVoltage*" is measuring the battery voltage, in units of 100mV.

Low batt LED indication – RED LED will blink twice every 60 second

7 Specifications

General	
Dimensions (Wx H x D)	82 x 82 x 28 mm
Colour	White
Battery	CR123, exchangeable
Battery life	3 years, reporting every 2 minutes Battery level and low battery warning can be reported
Radio	Sensitivity: -92 dBm
	Output power: +3 dBm (EU)
Environment	Operation temperature 0 to +50°C
Occupancy	
Range	6m
View angle	45˚ up/down, left/right
Off-time	Configurable 2 s - 65,000 s
Light	
Resolution	3 to 70.000 Lux
Common light source illuminance (lux)	
	Street light: 20
	Dusk: 1 to 100
	Living room: 50 to 200
	Office: 200 to 600
	Operating room: 5 k to 10 k
	Cloudy: 2 k to 10 k
	Hazy: 25 k to 50 k
	Bright sun: 50 k to 100
Tolerance	< 10,000 lux: ± 5% of the measurement and ± 5 Lux. > 10,000 lux: ± 10% of the measurement and ± 5 Lux.
Reporting	configurable
Temperature	
Range	0 to +50°C
Resolution	0.1°C
Accuracy	Typically ±0.5°C and Max ±1°C

8 Contact Information

Technical support: Please contact Develco Products for support.

products@develcoproducts.com

Sales: Please contact Develco Products for information on prices, availability, and lead time.

info@develcoproducts.com