Smoke Alarm - SMSZB-120

Technical manual

Revised 21.03.2016

ZigBee® Control your world

Content

RoHS $C\,E$

1   Cautionary notes

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2 Features

2.1 Smoke Alarm - SMSZB-120

Smoke-level and temperature monitoring for optimal fire detection.

With the Smoke Alarm from Develco Products, you will never have to worry about fire or smoke in your home again.

The Smoke Alarm will alert you about smoke while at home using a loud sound as a warning. While away you can be alarmed through an internet connected gateway.

Moreover, the Smoke Alarm will report the status and temperature every two minutes via the system you have in your home.

The wireless Smoke Alarm is battery powered and easily mounted to the ceiling with the included screws.

2.2 IAS Zone

The Smoke Alarm is implemented as a IAS Zone ZigBee end point according to ZigBee Home Automation profile „IAS Zone".

2.3 Temperature

The temperature sensor measures temperature with a resolution of 0.1°C.
It supports standard ZigBee reporting (on change or interval).
The end point is configured as the Home Automation profile "Temperature Sensor"

2.4 Key features

Key features are:

- Alarm sensor – IAS Zone
- Warning device – IAS WD
- Temperature sensor
- Certified ZigBee Home Automation application profile
- ZigBee PRO is supported
- 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 Temperature Sensor

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

3.4 Develco Utility

- Application profile Id 0xC0C9 (Develco Products private profile)
- Application device Id 0x0001
- Manufactor 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 Products' 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 ManufacturerName

 "Develco Products A/S"

4.1.1.1.2 ModelIdentifier

"SMSZB-120"

4.1.1.2 Manufacture Specific Attribute

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

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 0x0028 FireSensor
0x0002	Zone Status	Uint16	M	The following bits are supported: Bit0: Alarm 1 Bit3: Battery (30 days left) Bit4: Supervision reports Bit5: Restore reports Bit8: Test
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

Bit3: Battery

Bit4: Supervision reports

Bit5: Restore reports

Bit8: Test

When the battery is below **2.8 VDC** Bit3: Battery is set high and "Zone Status" is transmitted to the coordinator.

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

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 7.5 seconds
0x0002	*ShortPollIntervall*	Uint16		M	Default value is 1 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 sensor 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   IAS WD – Cluster id 0x0502

The IAS WD cluster is described in ZigBee Cluster Library Specification.

Using this cluster, a ZigBee device can access a ZigBee enabled IAS WD device and issue alarm warning indications (Smoke siren) when a system alarm condition is detected.

4.2.4.1   Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0000	*MaxDuration*	Uint16	Type range	M	Default is 240 sec

The *MaxDuration* attribute specifies the maximum time in seconds that the siren will sound continuously, regardless of start/stop commands.

4.2.4.2   Commands

The IAS WD cluster has 1 command as server.

Id#	Name	Man/Opt	Relevance and ref.
0x00	*Start warning*	M	

4.2.4.2.1   Command - Start warning

This command starts the WD operation. The WD alerts the surrounding area by audible (siren).

The *Start Warning* command payload shall be formatted as illustrated

Command Data	Size	Description
Warning	1 byte	0 = Siren off 1 = Siren On
Warning duration	2 byte	Warning duration is sec

Note: The start warning command doesn't set the alarm bit in the IAS Zone status.
The alarm is only triggered if the devices detect smoke or fire.

4.2.5   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 initiate the firmware upgrade process.

4.2.5.1   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.

4.2.5.2   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

4.2.5.3 OTA Upgrade Messages Diagram
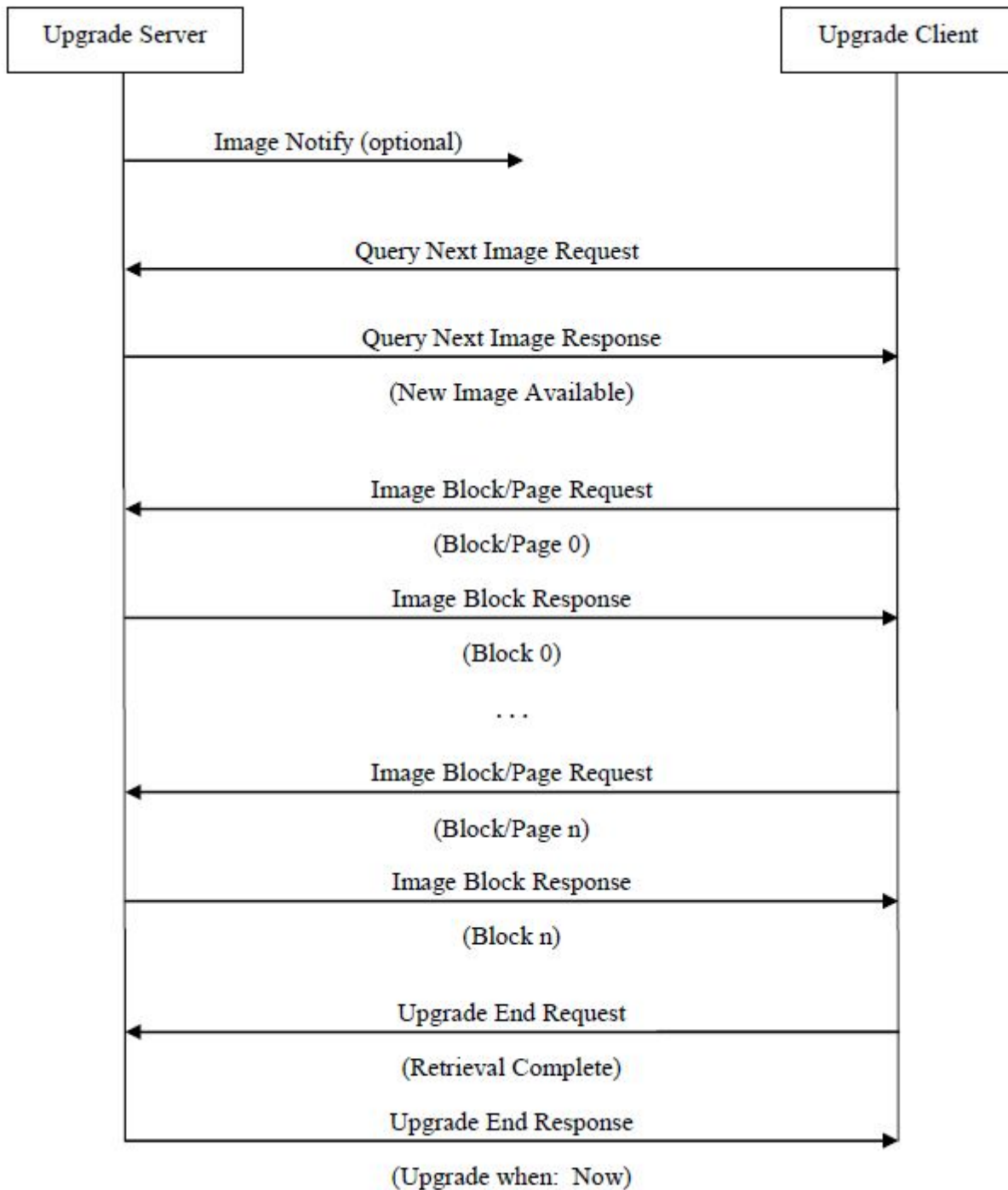
4.2.6   Time – Cluster id 0x000A

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)

4.2.6.1   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	

4.3   Temperature Sensor Device – EP 0x26

4.3.1   Temperature Measurement – Cluster id 0x0402

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

4.3.1.1   Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0000	*MeasuredValue*	Sint16	MinValue to MaxValue	M	
0x0001	*MinMeasuredValue*	Sint16	0	M	
0x0002	*MaxMeasuredValue*	Sint16	5000	M	

4.3.1.1.1   MeasuredValue

Default reporting is set to

Min reporting interval: 60 sec

Max reporting interval: 600 sec

Reportable Change: 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.

4.3.1.1.2   MinMeasuredValue

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

4.3.1.1.3   MaxMeasuredValue

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

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.
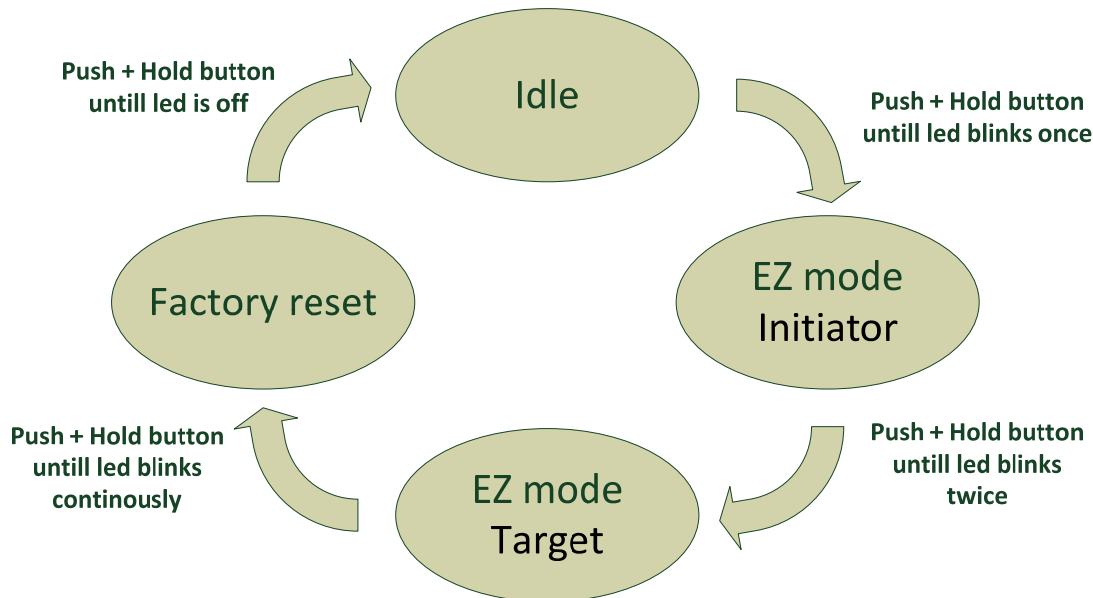
When cycling through the menu modes, the state is indicated by a number of 100ms blinks on the LED. The device is supporting the ZigBee standardized EZ- mode Commissioning.

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

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

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.

7 Specifications

General	
Dimensions (Ø x H)	Ø 65 x 40 mm
Colour	White
Power supply	Battery: 1 x CR123 exchangeable
	Battery life: up to 5 years, 2 minutes reporting
Radio	Sensitivity: -98 dBm
	Output power: +8 dBm
Environment	IP class: IP20
	Operation temperature 0 to +50˚C
	Relative humidity 10-95% non-condensing

Function	
Smoke Alarm	Optical
	Siren output 85dB/3m
Temperature sensor	Range: 0 to +50˚C
	Resolution: 0.1˚C (accuracy: ±0.5˚C)
	Sample time: config.: 2s – 65,000s
	Reporting: configurable

Communication	
Wireless protocol	ZigBee Home Automation compliant
	ZigBee end-device

Certifications	
	RoHS compliant according to the EU Directive 2002/95/EC

8 Contact Information

Technical support: Please contact Develco Products for support.

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