ITSS PRACTICE GROUP
ITSS-INTERFACE 2 SPECIFICATION - PROFILES

Revision	1
Version	1.1
Accepted by	This document has been accepted for release by the members of the ITSS practice group

DOCUMENT HISTORY

Revision	Date	Details/Comments	Editor
00	September 21st 2020	Document created based on Version 1.0	Simon Hügi
01	September 21st 2020	Review comments based on IMT feedback and ITSS preparation meeting	Simon Hügi

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1 INTRODUCTION

During the last decades the absence of a common standard has led to many different unique solutions for telematics and their sensors. The huge diversity was the main reason because there was no market penetration for this sensor networks in freight traffic. Without a common standard the compatibility of telematics box and sensors by different suppliers is not guaranteed. Only with a common standard the technology of different suppliers can communicate with each other and a widely spread migration into the European wagon fleet seems possible.

This document specifies the profiles used in the ITSS protocol standard for communication on train wagon between a telematics box, called coordinator, and sensors units, called end devices. It includes the description of the device registration and configuration as well as the application data management.

1.1 SCOPE

The scope of this document is to give a general overview about the supported profiles with their structure and supported attributes.

1.2 PURPOSE

The purpose of this document is to provide a definitive description of the profiles as basis future implementations, such that any number of companies incorporating this standard into platforms and devices.

1.3 CONVENTIONS

1.3.1 *NUMBER FORMATS*

In this specification hexadecimal numbers are prefixed with the designation "0x" and binary numbers are prefixed with the designation "0b". All other numbers are assumed to be decimal unless indicated otherwise within the associated text.

1.3.2 *RESERVED VALUES*

Unless otherwise specified, all reserved fields appearing in a frame structure shall be set to zero on transmission and ignored upon reception. Reserved values appearing in multi-value fields shall not be used

1.4 ACRONYMS AND ABBREVIATIONS

ID	Identifier
ITSS	Industrieplattform Telematik und Sensorik im Schienengüterverkehr

2 GENERAL DESCRIPTION

2.1 STACK ARCHITECTURE

This document describes the ITSS application profiles of end devices. This description is independent of the underlying communication protocol. However, this underlying protocol needs to consider the requirements implied by this specification. The stack architecture is shown in Figure 1.

A coordinator has no application profile and is not covered by this document.
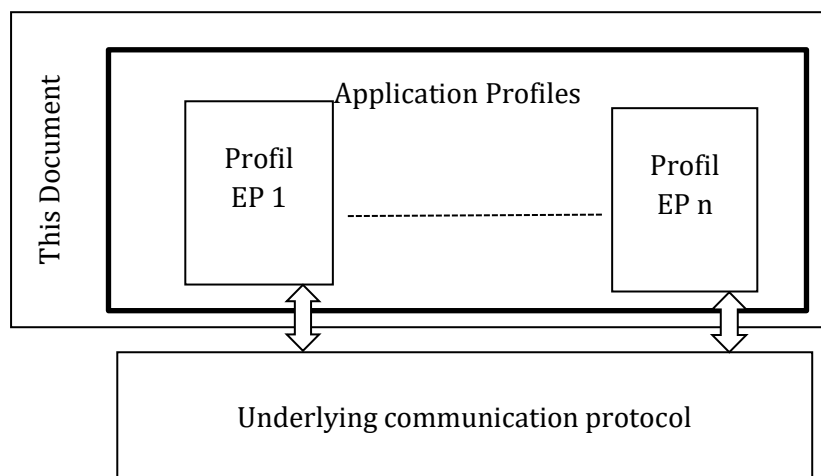
Figure 1: ITSS End device stack architecture

2.2 TIMESTAMP

Within a running network an end device shall synchronize its local time to the system time communicated by its coordinator.

The timestamp is given in milliseconds started from the 01.01.1970.

A timestamp shall be set after each successful measurement.

2.3 ATTRIBUTE ID CATEGORIES

The profiles will support three different categories of attributes, which are marked with 2 most-significant bits of the attributed ID, as shown in Table 1.

Attribute ID	Attribute Category
0b0000 0000 (0x00)	High priority
0b0100 0000 (0x40)	Low priority
0b1000 0000 (0x80)	Configuration

Table 1: Supported attribute categories

These categories shall be used for a distinction of each attribute during.

2.4 ATTRIBUTE TYPE IDS

Each attribute of a profile shall have a well-defined data type, which describes the length and general properties of this attribute.

The profile specification may use the unique data type short name to reduce the text size of the specification.

Attribute Type ID	Attribute Type	Short
0x00	No data	nodata
0x01	8-bit unsigned	uint8
0x02	8-bit signed	int8
0x03	16-bit unsigned	uint16
0x04	16-bit signed	int16
0x05	24-bit unsigned	uint24
0x06	24-bit signed	int24
0x07	32-bit unsigned	uint32
0x08	32-bit signed	int32
0x09	48-bit unsigned	uint48
0x0A	48-bit signed	int48
0x0B	64-bit unsigned	uint64
0x0C	64-bit signed	int64
0x0D	Character String	string
0x11	8-bit bitmap	map8
0x12	16-bit bitmap	map16
0x21	8-bit Enumeration	enum8
0x20	16-bit Enumeration	enum16
0x34	Array of 16-bit signed	array_int16

Table 2: Attribute types and attribute type IDs

2.5 ALERT LEVEL USAGE UND CONFIGURATION

Some profiles described within this specification are defined to support flexible alert level, re-alert level and alert generation direction configuration.

Generally, each profile for sensors measuring an analog value, profile, e.g. temperature, pressure, supports two different alert levels which can be configured independently. Each of the alert level can be configured separately by setting the corresponding AlertEnableLevel_x bit to 0b1 for enable or to 0x0 for disable the corresponding alert level.

If an alert level is enabled the alert direction has to be defined by setting the TriggerBelowLevel_x bit to 0b0 for generating an alert if the measured value is above the configured AlertLevel_x or if set to 0b1 an alert will be generated if the measured value is below the configured value.

For an AlertLevel_x the TriggerBelowLevel_x configuration bit shall be set corresponding to the relative position of the allowed region for the measured value and the configured Alert Level_x, e.g. for an upper and lower, as shown in Figure 2, two lower or two upper alert level, as shown in Figure 2.

Further on for each enabled AlertLevel_x a RealertDeltaLevel_x can be configured separately by setting the EnableRealertLevel_x parameter to 0b1 for enable or to 0b0 for. This shall be used to generate further alert messages if the measured value is further moving in a not allowed direction and has reached a configured absolute change regarding to the last alert level.

The direction of the re-alert corresponds to the configuration done using TriggerBelowLevel_x parameter.

A TriggerBelowLevel_x of 0b0 will only generate re-alerts if the AlertLevel_x was already exceeded, and the measured value is further increasing.

A TriggerBelowLevel_x of 0b1 will only generate re-alerts if the AlertLevel_x was already undercut, and the measured value is further decreasing.

To prevent the system from generating alert messages while the measured value is bouncing around an AlertLevel_x or re-alert level with small relative amplitudes a hysteresis can be configured, using the HysteresisAlertLevel_x parameter.

Setting the HysteresisAlertLevel_x to the 0x0 will disable the Hysteresis functionality and an alert will be generated each time the alert or re-alert level is exceeded or undercut according to the configured TriggerBelowLevel_x parameter.

Further on an alert can be generated if the value change within a given time exceeds a configured limit, e.g. to detect an unallowed pressure drop or temperature rise before the first alert level was undercut or exceeded. This can be configured using the MaxIncrease and MaxDecrease parameter of each profile and shall be enabled using IncreaseEnable and DecreaseEnable configuration bit.

Figure 2 shows an alert level configuration, were the allowed region for the measured value is in between of the AlertLevel_1 and AlertLevel_2. The RealterEnableLevel_1 and RealertEnableLevel_2 are both set to 0b1, a hysteresis was configured, the TriggerBelowLevel_1 was set to 0b0 and the TriggerBelowLevel_2 was set to 0b1. IncreaseEnable and DecreaseEnable was set to 0b0
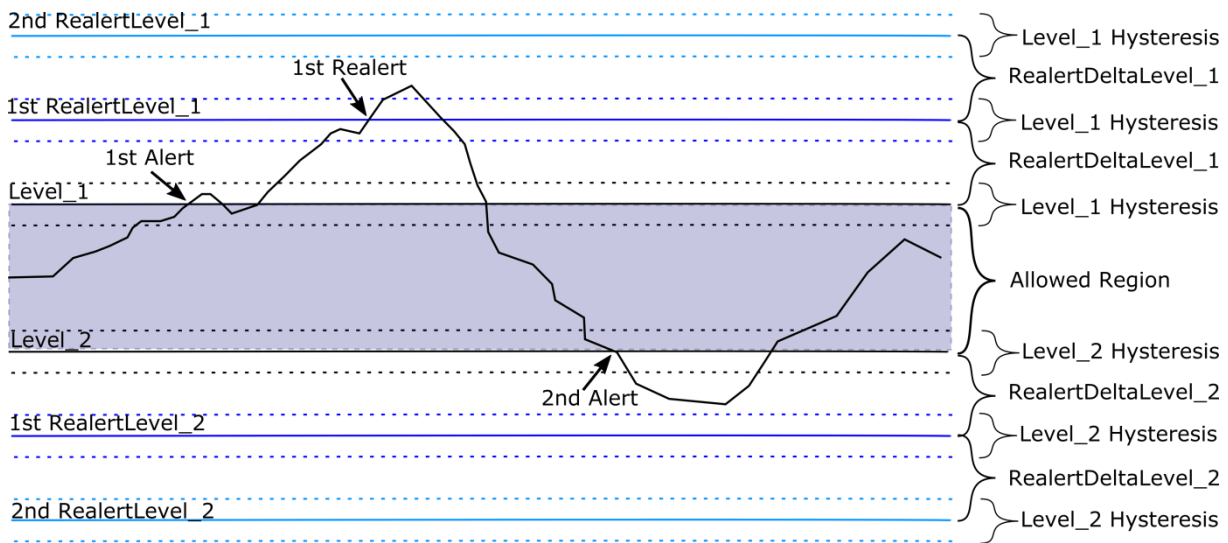
Figure 2: AlertLevel configuration were the allowed region is in between the configured alert level

Figure 3 shows an alert level configuration, were the allowed region for the measured value is below of the AlertLevel_1 and AlertLevel_2. The RealertEnableLevel_1 and RealertEnableLevel_2 are both set to 0b1, a hysteresis was configured and the TriggerBelowLevel_1 and TriggerBelowLevel_2 were both set to 0b0. IncreaseEnable was set to 0b0 and DecreaseEnable was set to 0b1
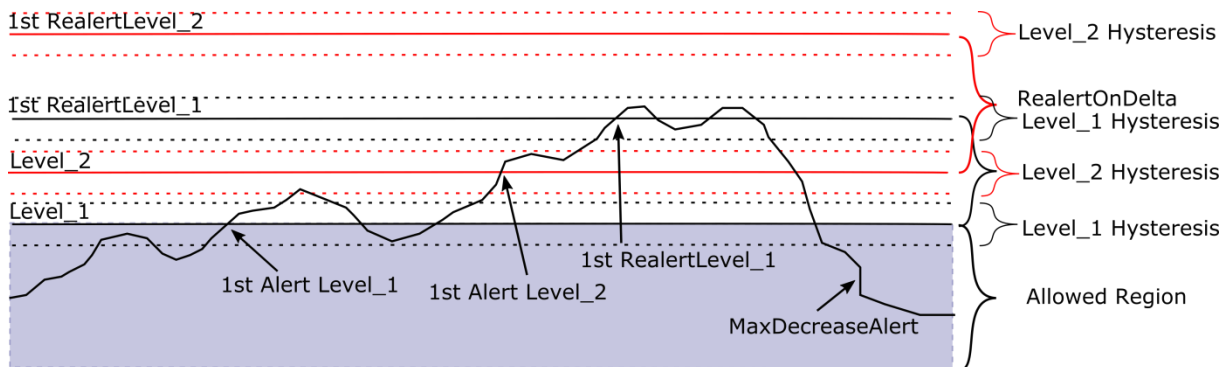
Figure 3: AlertLevel configuration were the allowed region is below the configured alert level

A configuration of both levels above the allowed region an end device can also be configured to have both levels below the allowed region. It is also possible to use only one alert level or none. Both alert levels (1 and 2) are identical and an end device can be configured with disabled AlertLevel_1 and enabled AlertLevel_2 which should give the same functionality as an AlertLevel_1 enabled and AlertLevel_2 disabled configuration. Hence, both AlertLevel_x operate independently and are functional equal.

The Increase/Decrease alerts are also independent from the AlertLevel_x configuration and should also operate if no Alertlevel_x is configured or enabled.

2.6 PROFILE DESCRIPTION

This sub-clause will list all by an end device supported profiles with their supported attributes. It will show the value range, the read or write permitted and if this attribute is mandatory or optional.

The read and/or write access is shown in table column called access were a letter of "R" indicates that there is read access permitted and a letter of "W" shows that there is write access permitted.

The column "M/O" indicates if this attribute is mandatory ("M") or optional ("O").

2.6.1 HEALTH STATE (0X13)

2.6.1.1 Short Description

The Health State profile carries information about the current non-functional end device state. This profile is mandatory for all end devices.

2.6.1.2 Supported Values and Configurations

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x01	SwBuildVersion	uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R	M
		Shows the current software build version the end device is running, using the following scheme: 0xAABBCCCC 0xAA = Major Version, 0xBB = Minor Version, 0xCCCC = Build number				
0x02	HwBuildVersion	uint16	0x0000 to 0xFFFF	0x0000	R	M
		Shows the current hardware version the end device using the following scheme: 0xAABB 0xAA = Major Version, 0xBB = Minor Version				
0x03	BatteryState	uint8	0x00 to 0x64	0x00	R	M
		Battery state in percentage				
0x04	HealthState	map8	0bxxxxxxx0 = unhealthy 0bxxxxxxx1 = healthy	unhealthy	R	M
		If the end device works as expected the health state shall be 0bxxxxxxx1, otherwise it shall be set to 0bxxxxxxx0, e.g. empty battery				
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFF	0x000000000000	R	M
		Timestamp of the last HealthState measurement				

Table 3: Supported attributes for health state profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x41	ReportingInterval	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	M
		Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol. A reporting interval of 0 will disable synchronous data transmission for this endpoint.				

Table 4: Supported configuration for health state profile

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2.6.2 *TEMPERATURE (0X03)*

2.6.2.1 Short Description

The temperature profile shall be used for measuring temperature in degree Celsius and is able to trigger if the value exceeds an upper or a lower limit. In case where an upper or a lower limit was reached the corresponding endpoint shall generate an event immediately only if AlertEnable parameter is set to 0bxxxxxxx1.

Measuring the temperature shall be at least equal or faster corresponding to the set ReportingInterval.

This profile is optional for end devices.

2.6.2.2 Supported Attributes

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x01	Temperature	int16	0x8000 to 0x7FFF	0x7FFF	R	M
			Is the last measured temperature in tenth of degree Celsius ([1/10]°C)			
0x02	Flags	map8	AlertTriggered Level_1 0bxxxxxxx0 = not exceeded 0bxxxxxxx1 = exceeded	0bxxxxxxx0	R	O
			Flag shall be set on exceeding/undercutting the AlertLevel_1			
			AlertTriggered Level_2 0bxxxxxx0x= not undercut 0bxxxxxx1x =undercut	0bxxxxxx0x	R	O
			Flag shall be set on exceeding/undercutting the AlertLevel_2			
			MaxIncrease Triggered 0bxxxxx0xx = not triggered 0bxxxxx1xx = triggered	0bxxxxx0xx	R	O
			Flag shall be set to 0bxxxxx1xx if the maximal increasing of the temperature was exceeded			
			MaxDecrease Triggered 0bxxxx0xxx = not triggered 0bxxxx1xxx = triggered	0bxxxx0xxx	R	O
			Flag shall be set to 0bxxxx1xxx if the maximal decreasing of the temperature was exceeded			
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFF	0x000000000000	R	O
			Timestamp of the last temperature measurement			

Table 5: Supported attributes for temperature profile

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Attr. ID	Attribute	Value Type	Value Range		Default Value	Access	M/O
0x43	AlertLevel_1	int16	0x8000 to 0x7FFF		0x7FFF	R/W	O
		Is a level limit on that exceeding or undercutting an event message shall be generated, in ([1/10]°C)					
0x44	AlertLevel_2	int16	0x8000 to 0x7FFF		0x8000	R/W	O
		Is level limit on that exceeding or undercut an event message shall be generated, in ([1/10]°C)					
0x45	HysteresisAlertLevel_1	uint16	0x0000 to 0xFFFF		0xFFFF	R/W	O
		The hysteresis of the AlertLevel_1 will prevent the system to retrigger an alert message if the measured value is bouncing around the AlertLevel_1 or if configured their RealertDeltaLevel_1					
0x46	HysteresisAlertLevel_2	uint16	0x0000 to 0xFFFF		0xFFFF	R/W	O
		The hysteresis of the AlertLevel_2 will prevent the system to retrigger an alert message if the measured value is bouncing around the AlertLevel_2 or if configured their RealertDeltaLevel_2					
0x47	MaxIncrease	uint16	0x0000 to 0xFFFF	0xFFFF	R/W		O
		Is the maximum value increase allowed for the temperature on that exceeding an event message shall be generated					
0x48	MaxDecrease	uint16	0x0000 to 0xFFFF	0xFFFF	R/W		O
		Is the maximum decreasing allowed for the temperature on that exceeding an event message shall be generated					
0x49	RealertDeltaLevel_1	uint16	0x0000 to 0xFFFF	0xFFFF	R/W		O
		Once the AlertLevel_1 was exceeded or undercut but the temperature is further increasing or decreasing an alert message shall be generated again each time the temperature has changed for the given delta					
0x4A	RealertDeltaLevel_2	uint16	0x0000 to 0xFFFF	0xFFFF	R/W		O
		Once the AlertLevel_2 was exceeded or undercut but the temperature is further increasing or decreasing an alert message shall be generated again each time the temperature has changed for the given delta					

0x50	Flags	map8	AlertEnable Level_1 0bxxxxxxx0 = not enabled 0bxxxxxxx1 = enabled	0bxxxxxxx0	R/W	O
			If this bit was set to 0bxxxxxxx1 the profile shall initiate an event message if the AlertLevel_1 limit was exceeded or undercut			
			AlertEnable Level_2 0bxxxxxx0x = not enabled 0bxxxxxx1x = enabled	0bxxxxxx0x	R/W	O
			If this bit was set to 0bxxxxxx1x the profile shall initiate an event message if the AlertLevel_2 limit was exceeded or undercut			
			RealertEnable Level_1 0bxxxxx0xx = not enabled 0bxxxxx1xx = enabled	0bxxxxx0xx	R/W	O
			If this bit was set to 0bxxxxx1xx the profile shall initiate an event message each time the temperature has increased or decreased a given delta relative to AlertLevel_1			
			RealertEnable Level_2 0bxxxx0xxx = not enabled 0bxxxx1xxx = enabled	0bxxxx0xxx	R/W	O
			If this bit was set to 0bxxxx1xxx the profile shall initiate an event message each time the temperature has increased or decreased a given delta relative to AlertLevel_2			
			IncreaseAlert Enable 0bxxx0xxxx = not enabled 0bxxx1xxxx = enabled	0bxxx0xxxx	R/W	O
			0bxxx1xxxx if the alert of the maximal temperature increasing shall be enabled otherwise 0bxxx0xxxx			

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			DecreaseAlert Enable 0bxx0xxxxx = not enabled 0bxx1xxxxx = enabled	0bxx0xxxxx	R/W	O
			0bxx1xxxxx if the alert of the maximal temperature decreasing shall be enabled otherwise 0bxx0xxxxx			
			TriggerBelow Level_1 0bx1xxxxxx = trigger below 0bx0xxxxxx = above	0bx0xxxxxx	R/W	O
			If 0bx1xxxxxx an alert will be triggered on undercutting the AlertLevel_1. If 0bx0xxxxxx an alert will be triggered on exceeding the AlertLevel_1.			
			TriggerBelow Level_2 0b1xxxxxxx = trigger below 0b0xxxxxxx = trigger above	0b0xxxxxxx	R/W	O
			If 0b1xxxxxxx an alert will be triggered on undercutting the AlertLevel_2. If 0b0xxxxxxx an alert will be triggered on exceeding the AlertLevel_2.			
0x41	ReportingInterval	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	M
		Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol. A reporting interval of 0 will disable synchronous data transmission for this endpoint.				
0x42	MeasurementInterval	uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	M
		Measurement interval with which the temperature shall be measured. The allowed range is set in milliseconds. A measurement interval of 0 will disable the measurement.				

Table 6: Supported configuration for temperature profile

2.6.3 HUMIDITY (0X04)

2.6.3.1 Short Description

The humidity profile shall be used for measuring humidity in percentage and is able to trigger if the value exceeds an upper or a lower limit. In case where an upper or a lower limit was reached the corresponding endpoint shall generate an event immediately only if AlertEnable parameter is set to 0bxxxxxxx1.

Measuring the humidity shall be at least equal or faster corresponding to the set ReportingInterval.

This profile is optional for end devices.

2.6.3.2 Supported Values und Configurations

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x01	Humidity	uint8	0x00 to 0x64	0x00	R	M
			Is the last measured humidity in percent			
0x02	Flags	map8	AlertTriggered Level_1 0bxxxxxxx0 = not exceeded 0bxxxxxxx1 = exceeded	0bxxxxxxx0	R	O
			Flag shall be set on exceeding/undercutting the AlertLevel_1			
			AlertTriggered Level_2 0bxxxxxx0x= not undercut 0bxxxxxx1x =undercut	0bxxxxxx0x	R	O
			Flag shall be set on exceeding/undercutting the AlertLevel_2			
			MaxIncrease Triggered 0bxxxxx0xx = not triggered 0bxxxxx1xx = triggered	0bxxxxx0xx	R	O
			Flag shall be set to 0bxxxxx1xx if the maximal increasing of the humidity was exceeded			
			MaxDecrease Triggered 0bxxxx0xxx = not triggered 0bxxxx1xxx = triggered	0bxxxx0xxx	R	O
			Flag shall be set to 0bxxxx1xxx if the maximal decreasing of the humidity was exceeded			
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFF	0x000000000000	R	O
			Timestamp of the last humidity measurement			

Table 7: Supported attributes for humidity profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x43	AlertLevel_1	uint8	0x00 to 0x64	0x64	R/W	O
		Is a humidity limit on that exceeding or undercutting an event message shall be generated				
0x44	AlertLevel_2	uint8	0x00 to 0x64	0x00	R/W	O
		Is a Humidity limit on that exceeding or undercutting an event message shall be generated				
0x45	HysteresisAlertLevel_1	uint16	0x00 to 0x64	0x64	R/W	O
		The hysteresis of the AlertLevel_1 will prevent the system to retrigger an alert message if the measured value is bouncing around the AlertLevel_1 or if configured their RealertDeltaLevel_1				
0x46	HysteresisAlertLevel_2	uint16	0x00 to 0x64	0x64	R/W	O
		The hysteresis of the AlertLevel_2 will prevent the system to retrigger an alert message if the measured value is bouncing around the AlertLevel_2 or if configured their RealertDeltaLevel_2				
0x47	MaxIncrease	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Is the maximum increasing allowed for the humidity on that exceeding an event message shall be generated				
0x48	MaxDecrease	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Is the maximum decreasing allowed for the humidity on that exceeding an event message shall be generated				
0x49	RealertDeltaLevel_1	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Once the limit was exceeded or undercut but the humidity is further increasing or decreasing an alert message shall be generated again each time the humidity has changed for the given delta				
0x4A	RealertDeltaLevel_2	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Once the limit was exceeded or undercut but the humidity is further increasing or decreasing an alert message shall be generated again each time the humidity has changed for the given delta				
0x50	Flags	map8	AlertEnable Level_1 0bxxxxxxx0 = not enabled 0bxxxxxxx1 = enabled	0bxxxxxxx0	R/W	O

				If this bit was set to 0bxxxxxxx1 the profile shall initiate an event message if the AlertLevel_1 limit was exceeded or undercut		
				AlertEnable Level_2 0bxxxxxx0x = not enabled 0bxxxxxx1x = enabled	0bxxxxxx0x	R/W	O
				If this bit was set to 0bxxxxxx1x the profile shall initiate an event message if the AlertLevel_2 limit was exceeded or undercut		
				RealertEnable Level_1 0bxxxxx0xx = not enabled 0bxxxxx1xx = enabled	0bxxxxx0xx	R/W	O
				If this bit was set to 0bxxxxx1xx the profile shall initiate an event message each time the humidity has increased or decreased a given delta relative to AlertLevel_1		
				RealertEnable Level_2 0bxxxx0xxx = not enabled 0bxxxx1xxx = enabled	0bxxxx0xxx	R/W	O
				If this bit was set to 0bxxxx1xxx the profile shall initiate an event message each time the humidity has increased or decreased a given delta relative to AlertLevel_2		
				IncreaseAlert Enable 0bxxx0xxxx = not enabled 0bxxx1xxxx = enabled	0bxxx0xxxx	R/W	O
				0bxxx1xxxx if the alert of the maximal humidity increasing shall be enabled otherwise 0bxxx0xxxx		
				DecreaseAlert Enable 0bxx0xxxxx = not enabled 0bxx1xxxxx = enabled	0bxx0xxxxx	R/W	O

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			0bxx1xxxxx if the alert of the maximal humidity decreasing shall be enabled otherwise 0bxx0xxxxx			
			TriggerBelow Level_1 0bx1xxxxxx = trigger below 0bx0xxxxxx = above	0bx0xxxxxx	R/W	O
			If 0bx1xxxxxx an alert will be triggered on undercutting the AlertLevel_1. If 0bx0xxxxxx an alert will be triggered on exceeding the AlertLevel_1.			
			TriggerBelow Level_2 0b1xxxxxxx = trigger below 0b0xxxxxxx = trigger above	0b0xxxxxxx	R/W	O
			If 0b1xxxxxxx an alert will be triggered on undercutting the AlertLevel_2. If 0b0xxxxxxx an alert will be triggered on exceeding the AlertLevel_2.			
0x41	ReportingInterval	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	M
		Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol. A reporting interval of 0 will disable synchronous data transmission for this endpoint.				
0x42	MeasurementInterval	uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	M
		Measurement interval with which the humidity shall be measured. The allowed range is set in milliseconds. A measurement interval of 0 will disable the measurement.				

Table 8: Supported configuration for humidity profile

2.6.4 *ACCURATE WEIGHING (0x06)*

2.6.4.1 *Short Description*

The accurate weighing profile shall be used for measuring weight in kilograms and is able to trigger if the value exceeds an upper or a lower limit. In case where an upper or a lower limit was reached the corresponding endpoint shall generate an event immediately only if AlertEnable parameter is set to 0bxxxxxxx1.

Measuring the weight shall be at least equal or faster corresponding to the set reporting interval.

This profile is optional for end devices.

2.6.4.2 Supported Values and Configuration

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x01	Weight	uint24	0x000000 to 0xFFFFFF	0x000000	R	M
			Is the last measured weight in kilogram (kg)			
0x02	Flags	map8	AlertTriggered Level_1 0bxxxxxxx0 = not exceeded 0bxxxxxxx1 = exceeded	0bxxxxxxx0	R	O
			Flag shall be set on exceeding/undercutting the AlertLevel_1			
			AlertTriggered Level_2 0bxxxxxx0x= not undercut 0bxxxxxx1x =undercut	0bxxxxxx0x	R	O
			Flag shall be set on exceeding/undercutting the AlertLevel_2			
			MaxIncrease Triggered 0bxxxxx0xx = not triggered 0bxxxxx1xx = triggered	0bxxxxx0xx	R	O
			Flag shall be set to 0bxxxxx1xx if the maximal increasing of the weight was exceeded			
			MaxDecrease Triggered 0bxxxx0xxx = not triggered 0bxxxx1xxx = triggered	0bxxxx0xxx	R	O
			Flag shall be set to 0bxxxx1xxx if the maximal decreasing of the weight was exceeded			
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFF	0x000000000000	R	O
			Timestamp of the last weight measurement			

Table 9: Supported attributes for accurate weight profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x43	AlertLevel_1	uint24	0x000000 to 0xFFFFFF	0xFFFFFF	R/W	O
		Is the weighing limit, in kilogram (kg), on that exceeding or undercutting an event message shall be generated				
0x44	AlertLevel_2	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	O
		Is the weighing limit, in kilogram (kg), on that exceeding or undercutting an event message shall be generated				
0x45	HysteresisAlertLevel_1	uint24	0x000000 to 0xFFFFFF	0xFFFFFF	R/W	O
		The hysteresis of the AlertLevel_1 will prevent the system to retrigger an alert message if the measured value is bouncing around the AlertLevel_1 or if configured their RealertDeltaLevel_1				
0x46	HysteresisAlertLevel_2	uint24	0x000000 to 0xFFFFFF	0xFFFFFF	R/W	O
		The hysteresis of the AlertLevel_2 will prevent the system to retrigger an alert message if the measured value is bouncing around the AlertLevel_2 or if configured their RealertDeltaLevel_2				
0x47	MaxIncrease	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Is the maximum increasing allowed for the weighing on that exceeding an event message shall be generated				
0x48	MaxDecrease	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Is the maximum decreasing allowed for the weighing on that exceeding an event message shall be generated				
0x49	RealertDeltaLevel_1	uint24	0x000000 to 0xFFFFFF	0xFFFFFF	R/W	O
		Once the AlertLevel_1 was exceeded or undercut but the weighing is further increasing or decreasing an alert message shall be generated each time the weighing has changed for the given delta				
0x4A	RealertDeltaLevel_2	uint24	0x000000 to 0xFFFFFF	0xFFFFFF	R/W	O

0x50	Flags	map8	Once the AlertLevel_2 was exceeded or undercut but the weighing is further increasing or decreasing an alert message shall be generated each time the weighing has changed for the given delta			
			AlertEnable Level_1 0bxxxxxxx0 = not enabled 0bxxxxxxx1 = enabled	0bxxxxxxx0	R/W	O
			If this bit was set to 0bxxxxxxx1 the profile shall initiate an event message if the AlertLevel_1 limit was exceeded or undercut			
			AlertEnable Level_2 0bxxxxxx0x = not enabled 0bxxxxxx1x = enabled	0bxxxxxx0x	R/W	O
			If this bit was set to 0bxxxxxx1x the profile shall initiate an event message if the AlertLevel_2 limit was exceeded or undercut			
			RealertEnable Level_1 0bxxxxx0xx = not enabled 0bxxxxx1xx = enabled	0bxxxxx0xx	R/W	O
			If this bit was set to 0bxxxxx1xx the profile shall initiate an event message each time the weight has increased or decreased a given delta relative to AlertLevel_1			
			RealertEnable Level_2 0bxxxx0xxx = not enabled 0bxxxx1xxx = enabled	0bxxxx0xxx	R/W	O
			If this bit was set to 0bxxxx1xxx the profile shall initiate an event message each time the weight has increased or decreased a given delta relative to AlertLevel_2			

				IncreaseAlert Enable 0bxxx0xxxx = not enabled 0bxxx1xxxx = enabled	0bxxx0xxxx	R/W	O
				0bxxx1xxxx if the alert of the maximal weight increasing shall be enabled otherwise 0bxxx0xxxx			
				DecreaseAlert Enable 0bxx0xxxxx = not enabled 0bxx1xxxxx = enabled	0bxx0xxxxx	R/W	O
				0bxx1xxxxx if the alert of the maximal weight decreasing shall be enabled otherwise 0bxx0xxxxx			
				TriggerBelow Level_1 0bx1xxxxxx = trigger below 0bx0xxxxxx = above	0bx0xxxxxx	R/W	O
				If 0bx1xxxxxx an alert will be triggered on undercutting the AlertLevel_1. If 0bx0xxxxxx an alert will be triggered on exceeding the AlertLevel_1.			
				TriggerBelow Level_2 0b1xxxxxxx = trigger below 0b0xxxxxxx = trigger above	0b0xxxxxxx	R/W	O
				If 0b1xxxxxxx an alert will be triggered on undercutting the AlertLevel_2. If 0b0xxxxxxx an alert will be triggered on exceeding the AlertLevel_2.			
0x41	ReportingInterval	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	M
		Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol. A reporting interval of 0 will disable synchronous data transmission for this endpoint.				
0x42	MeasurementInterval	uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	M

		Measurement interval with which the weight shall be measured. The allowed range is set in milliseconds. A measurement interval of 0 will disable the measurement.

Table 10: Supported configuration for accurate weight profile

2.6.5   MANUAL BRAKE STATE (0X07)

2.6.5.1   Short Description

The manual brake state profile shall be used to indicate manual brake state.

Indicating a variation in the manual brake state the endpoint shall generate an event message.

This profile is optional for end devices.

2.6.5.2   Supported Values and Configuration

Attr. ID	Attribute	Value Type	Value Range	Default Value	access	M/O
0x01	State	uint8	0x00 to 0x03 0x00 = Locked 0x01 = unlocked 0x02 = partially locked 0x03 = unknown	0x03	R	M
			State of the manual brake			
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFF	0x000000000000	R	O
			Timestamp of the last state measurement			

Table 11: Supported attributes for manual brake state profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	access	M/O
0x50	Flags	map8	StateReport Enable 0bxxxxxxx0 = not enabled 0bxxxxxxx1 = enabled	0bxxxxxxx0	R/W	O
			If this bit was set to 0bxxxxxxx1 the endpoint shall initiate an event message on each state change			
0x41	ReportingInterval	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	M
			Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol. A reporting interval of 0 will disable synchronous data transmission for this endpoint.			
0x42	MeasurementInterval	uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	M
			Measurement interval with which the manual brake state shall be measured. The allowed range is set in milliseconds. A measurement interval of 0 will disable the measurement.			

Table 12: Supported configuration for manual brake state profile

2.6.6 DOOR STATE (0x08)

2.6.6.1 Short Description

The door state profile shall be used for indicating the door state.

Indicating a variation to the door state the endpoint shall generate an event message.

This profile is optional for end devices.

2.6.6.2 Supported Values and Configuration

Attr. ID	Attribute	Value Type	Value Range	Default Value	access	M/ O
0x01	State	uint8	0x00 to 0x03 0x00 =closed 0x01 = partially open 0x02 = open 0x03 = unknown	0x03	R	M
			State of the door			
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFF	0x000000000000	R	M
			Timestamp of the last measurement			

Table 13: Supported attributes for door open profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	access	M/O
0x50	Flags	map8	StateReport Enable 0bxxxxxxx0 = not enabled 0bxxxxxxx1 = enabled	0bxxxxxxx0	R/W	M
			If this bit was set to 0bxxxxxxx1 the endpoint shall initiate an event message on each state change			
0x41	ReportingInterval	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	M
		Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol. A reporting interval of 0 will disable synchronous data transmission for this endpoint.				
0x42	MeasurementInterval	uint32	0x00000000 to 0xFFFFFFFF	0x000000000000	R/W	M
		Measurement interval with which the door state shall be measured. The allowed range is set in milliseconds. A Measurement interval of 0 will disable the measurement.				

Table 14: Supported configuration for door open profile

2.6.7 DETECTED SHOCK (0x0C)

2.6.7.1 Short Description

The detected shock profile shall be used for detecting a shock during runtime in 1/1000 g (g = 9,81 m/s²) and is able to trigger if the value exceeds an upper or a lower limit. In case where an upper or a lower limit was reached the corresponding endpoint shall generate an event immediately only if AlertEnable parameter is set to 0bxxxxxxx1.

This profile is optional for end devices.

2.6.7.2 Supported Attributes

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x01	Trigger	map8	XAxisTriggered 0bxxxxxxx0 = not triggered 0bxxxxxxx1 = triggered	0bxxxxxxx0	R	M
			Shock in x-direction triggered			
			YAxisTriggered 0bxxxxxx0x = not triggered 0bxxxxxx1x = triggered	0bxxxxxx0x	R	M
			Shock in y-direction triggered			
			ZAxisTriggered 0bxxxxx0xx = not triggered 0bxxxxx1xx = triggered	0bxxxxx0xx	R	M
			Shock in z-direction triggered			
0x04	XAxis	int16	0x8000 to 0x7FFF	0x0000	R	M
		Peak shock value for X-Axis, in 1/1000 g. (1 g = 9,81 m/s^2)				
0x05	YAxis	int16	0x8000 to 0x7FFF	0x0000	R	M
		Peak shock value for Y-Axis, in 1/1000 g. (1 g = 9,81 m/s^2)				
0x06	ZAxis	int16	0x8000 to 0x7FFF	0x0000	R	M
		Peak shock value for Z-Axis, in 1/1000 g. (1 g = 9,81 m/s^2)				
0x0D	EnergyEquivalentX Axis	uint16	0x0000 to 0xFFFF	0x0000	R	O
		The energy equivalent of the detected shock calculated for the shock duration of this axis. See Figure 4 for details				
0x0E	EnergyEquivalentY Axis	uint16	0x0000 to 0xFFFF	0x0000	R	O
		The energy equivalent of the detected shock calculated for the shock duration of this axis. See Figure 4 for details				
0x0F	EnergyEquivalentZ Axis	uint16	0x0000 to 0xFFFF	0x0000	R	O

		The energy equivalent of the detected shock calculated for the shock duration of this axis. See Figure 4 for details
0x10	ShockDurationXAxis	uint16	0x0000 to 0xFFFF	0x0000	R	M
		Duration of the detected shock in milliseconds from the moment the trigger limit has been exceeded to the moment the measured value falls below the trigger limit. See Figure 4 for details
0x11	ShockDurationYAxis	uint16	0x0000 to 0xFFFF	0x0000	R	M
		Duration of the detected shock in milliseconds from the moment the trigger limit has been exceeded to the moment the measured value falls below the trigger limit. See Figure 4 for details
0x12	ShockDurationZAxis	uint16	0x0000 to 0xFFFF	0x0000	R	M
		Duration of the detected shock in milliseconds from the moment the trigger limit has been exceeded to the moment the measured value falls below the trigger limit. See Figure 4 for details
0x81	RawXAxis	array_int16	0x8000 to 0x7FFF	0x0000	R	O
		Single values of the Shock for X-Axis, in 1/1000 g. (1 g = 9,81 m/s^2)
0x82	RawYAxis	array_int16	0x8000 to 0x7FFF	0x0000	R	O
		Single values of the Shock for Y-Axis, in 1/1000 g. (1 g = 9,81 m/s^2)
0x83	RawZAxis	array_int16	0x8000 to 0x7FFF	0x0000	R	O
		Single values of the Shock for Z-Axis, in 1/1000 g. (1 g = 9,81 m/s^2)
0x84	RawTimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFF	0x000000000000	R	O
		Timestamp for the first measured raw data value which contains the x, y, z-Axes
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFF	0x000000000000	R	M
		Moment of the first trigger. This may differ from the time of the peak measurement

Table 15: Supported attributes for shock detected profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x43	XAxisUpperLimit	int16	0x8000 to 0x7FFF	0x0000	R/W	O
		Upper limit for X-Axis, in 1/1000 g. (1 g = 9,81 m/s^2)				
0x44	YAxisUpperLimit	int16	0x8000 to 0x7FFF	0x0000	R/W	O
		Upper limit for Y-Axis, in 1/1000 g. (1 g = 9,81 m/s^2)				
0x45	ZAxisUpperLimit	int16	0x8000 to 0x7FFF	0x0000	R/W	O
		Upper limit for Z-Axis, in 1/1000 g. (1 g = 9,81 m/s^2)				
0x46	XAxisLowerLimit	int16	0x8000 to 0x7FFF	0x0000	R/W	O
		Lower limit for X-Axis, in 1/1000 g. (1 g = 9,81 m/s^2)				
0x47	YAxisLowerLimit	int16	0x8000 to 0xFFFF	0x0000	R/W	O
		Lower limit for Y-Axis, in 1/1000 g. (1 g = 9,81 m/s^2)				
0x48	ZAxisLowerLimit	int16	0x8000 to 0x7FFF	0x0000	R/W	O
		Lower limit for Z-Axis, in 1/1000 g. (1 g = 9,81 m/s^2)				
0x49	MeasurementTime	uint16	0x000 to 0xFFFF	0x0000	R/W	M
		Maximum time in milliseconds the sensor shall record the raw data after a shock in one of the three axes has been detected. The value 0x0000 means 'no raw data recording'				
0x4A	Filterchain	uint64	0x00 to 0x02	see Figure 5	R/W	M
		Each byte within the filter chain will activate one of the filters listed below. 0x00: no Filter selected 0x01: 32 Hz Butterworth filter 4th order 0x02: Highpass filter				
0x4B	SampleRate	uint16	0x0000 to 0xFFFF	0x00C8	R/W	M
		The sampling rate of the sensor for the raw data recording, given in Hz				
0x50	Flags	map8	AlertEnable 0bxxxxxxx0 = not enabled 0bxxxxxxx1 = enabled	0bxxxxxxx0	R/W	O

				If this bit was set to 0bxxxxxxx1 the profile shall initiate an event message if a shock in one or more directions has been detected

Table 16: Supported configuration for shock detected profile
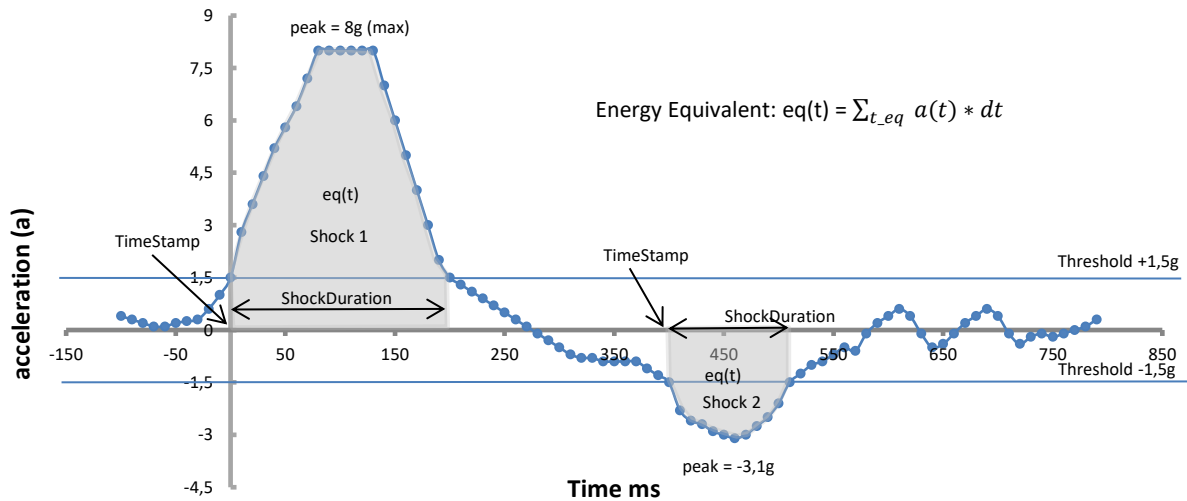
Figure 4: Shock measurement

To transmit raw data the endpoint shall use the Overwrite Flag in the ALME-WRITE-EP.request in the following way:

- On every single measurement the endpoint shall only write the RawXAxis, RawYAxis, RawZAxis and RawTimestamp attribute with the Overwrite flag set to FALSE
- At the end of the shock the endpoint writes all results, e.g. the peak value, duration and the start time of the shock to the according attributes with the Overwrite flag set to TRUE

The underlying layer will send the data of all high priority attributes either as event or at the next regular time slot to the coordinator. The low priority data (raw data) will be sent at the regular send intervals using the remaining message size left over after the high priority attributes have been collected.

2.6.7.3 *ReportingInterval of Detected Shock Profile (Attr. ID 0x41)*

A shock sensor is generally an autonomously working sensor which only generates data when a shock has been detected. A ReportingInterval unequal to 0 would instruct the underlying layer to transmit one single X/Y/Z axes data sample in a certain interval to the coordinator. As this is not considered as meaningful data for a shock detection sensor, the profile does not support the ReportingInterval attribute. An implementation of this profile shall always set the ReportingInterval to 0.

2.6.7.4 Filterchain Configuration

The shock detection sensor can be configured with a chain of up to eight filters. Each filter will be represented by its FilterId with a length of eight bit as described in Table 16.

An incoming measured signal will pass the filter chain starting with the most significant byte first (MSB) on by one until the least significant byte (LSB) was reached.

The default configuration of the filter chain with only two filters used is given in Figure 5

MSB							LSB
0x01	0x02	0x00	0x00	0x00	0x00	0x00	0x00

Figure 5: Default Configuration for the Filterchain

Not configured filters can be at the beginning, the end or in-between configured filters.

2.6.8 PRESSURE (0X14)

2.6.8.1 Short Description

The Pressure profile shall be used for measuring the absolute pressure in in kilo pascal and is able to trigger if the value exceeds an upper or a lower limit. In case where an upper or a lower limit was reached the corresponding endpoint shall generate and event immediately only if AlertEnable parameter is set to 0bxxxxxxx1.

Measuring the pressure shall be at least equal or faster corresponding to the set ReportingInterval.

This profile is optional for end devices.

2.6.8.2 Supported Values and Configuration

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x01	Pressure	uint16	0x0000 to 0xFFFF	0x0000	R	M
			Is the last measured pressure in kilo pascal			
0x02	Flags	map8	AlertTriggered Level_1 0bxxxxxxx0 = not exceeded 0bxxxxxxx1 = exceeded	0bxxxxxxx0	R	O
			Flag shall be set on exceeding/undercutting the Level_1			
			AlertTriggered Level_2 0bxxxxxx0x= not undercut 0bxxxxxx1x =undercut	0bxxxxxx0x	R	O
			Flag shall be set on exceeding/undercutting the Level_2			
			MaxIncrease Triggered 0bxxxxx0xx = not triggered 0bxxxxx1xx = triggered	0bxxxxx0xx	R	O
			Flag shall be set to 0bxxxxx1xx if the maximal increasing of the weight was exceeded			
			MaxDecrease Triggered 0bxxxx0xxx = not triggered 0bxxxx1xxx = triggered	0bxxxx0xxx	R	O
			Flag shall be set to 0bxxxx1xxx if the maximal decreasing of the weight was exceeded.			
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFF	0x000000000000	R	O
			Timestamp of the last pressure measurement			

Table 17: Supported attributes for pressure profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x43	AlertLevel_1	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Is the pressure limit on that exceeding or undercut an event message shall be generated				
0x44	AlertLevel_2	uint16	0x0000 to 0xFFFF	0x0000	R/W	O
		Is a pressure limit on that undercut or exceeding an event message shall be generated				
0x45	HysteresisAlertLevel_1	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		The hysteresis of the AlertLevel_1 will prevent the system to retrigger an alert message if the measured value is bouncing around the AlertLevel_1 or if configured their RealertDeltaLevel_1				
0x46	HysteresisAlertLevel_2	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		The hysteresis of the AlertLevel_2 will prevent the system to retrigger an alert message if the measured value is bouncing around the AlertLevel_2 or if configured their RealertDeltaLevel_2				
0x47	MaxIncrease	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Is the maximum increasing allowed for the pressure on that exceeding an event message shall be generated				
0x48	MaxDecrease	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Is the maximum decreasing allowed for the pressure on that exceeding an event message shall be generated				
0x49	RealertDeltaLevel_1	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Once the AlertLevel_1 was exceeded or undercut but the pressure is further increasing or decreasing an alert message shall be generated each time the pressure has changed for the given delta				
0x4A	RealertDeltaLevel_2	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Once the AlertLevel_2 was exceeded or undercut but the pressure is further increasing or decreasing an alert message shall be generated each time the pressure has changed for the given delta				

0x50	Flags	map8	AlertEnable Level_1 0bxxxxxxx0 = not enabled 0bxxxxxxx1 = enabled	0bxxxxxxx0	R/W	O
			If this bit was set to 0bxxxxxxx1 the profile shall initiate an event message if the AlertLevel_1 limit was exceeded or undercut			
			AlertEnable Level_2 0bxxxxxx0x = not enabled 0bxxxxxx1x = enabled	0bxxxxxx0x	R/W	O
			If this bit was set to 0bxxxxxx1x the profile shall initiate an event message if the AlertLevel_2 limit was exceeded or undercut			
			RealertEnable Level_1 0bxxxxx0xx = not enabled 0bxxxxx1xx = enabled	0bxxxxx0xx	R/W	O
			If this bit was set to 0bxxxxx1xx the profile shall initiate an event message each time the pressure has increased or decreased a given delta relative to AlertLevel_1			
			RealertEnable Level_2 0bxxxx0xxx = not enabled 0bxxxx1xxx = enabled	0bxxxx0xxx	R/W	O
			If this bit was set to 0bxxxx1xxx the profile shall initiate an event message each time the pressure has increased or decreased a given delta relative to AlertLevel_2			
			IncreaseAlert Enable 0bxxx0xxxx = not enabled 0bxxx1xxxx = enabled	0bxxx0xxxx	R/W	O
			0bxxx1xxxx if the alert of the maximal pressure increasing shall be enabled otherwise 0bxxx0xxxx			

			DecreaseAlert Enable 0bxx0xxxxx = not enabled 0bxx1xxxxx = enabled	0bxx0xxxxx	R/W	O
			0bxx1xxxxx if the alert of the maximal pressure decreasing shall be enabled otherwise 0bxx0xxxxx			
			TriggerBelow Level_1 0bx1xxxxxx = trigger below 0bx0xxxxxx = above	0bx0xxxxxx	R/W	O
			If 0bx1xxxxxx an alert will be triggered on undercutting the AlertLevel_1. If 0bx0xxxxxx an alert will be triggered on exceeding the AlertLevel_1.			
			TriggerBelow Level_2 0b1xxxxxxx = trigger below 0b0xxxxxxx = trigger above	0b0xxxxxxx	R/W	O
			If 0b1xxxxxxx an alert will be triggered on undercutting the AlertLevel_2. If 0b0xxxxxxx an alert will be triggered on exceeding the AlertLevel_2.			
0x41	ReportingInterval	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	M
		Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol. A reporting interval of 0 will disable synchronous data transmission for this endpoint.				
0x42	MeasurementInterval	uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	M
		Measurement interval with which the pressure shall be measured. The allowed range is set in milliseconds. A Measurement interval of 0 will disable the measurement.				

Table 18: Supported configuration for pressure profile

2.6.9 *DERAILMENT (0X15)*

2.6.9.1 Short Description

The derailment profile shall be used for indicating the derailment.

Indicating a derailment the endpoint shall generate an event message.

This profile is optional for end devices.

2.6.9.2 Supported Values and Configuration

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x01	State	uint8	0x00 to 0x01 0x00 =no derailment 0x01 =derailment	0x00	R	M
			0x01 if derailment was detected, 0x00 if no derailment was detected			
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFF	0x000000000000	R	O
			Timestamp of the last derailment measurement			

Table 19: Supported attributes for derailment profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x50	Flags	map8	StateReport Enable 0bxxxxxxx0 = not enabled 0bxxxxxxx1 = enabled	0bxxxxxxx0	R/W	M
			If this bit was set to 0bxxxxxxx1 the endpoint shall initiate an event message on each state change			
0x41	ReportingInterval	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	M
		Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol. A reporting interval of 0 will disable synchronous data transmission for this endpoint.				
0x42	MeasurementInterval	uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	M
		Measurement interval with which the derailment shall be measured. The allowed range is set in milliseconds. A Measurement interval of 0 will disable the measurement.				

Table 20: Supported configuration for derailment profile

2.6.10 *FILLING LEVEL (0X16)*

2.6.10.1 Short Description

The level profile shall be used for measuring level in percentage and is able to trigger if the value exceeds an upper or a lower limit. In case where an upper or a lower limit was reached the corresponding endpoint shall generate an event immediately only if AlertEnable parameter is set to 0bxxxxxxx1.

Measuring the level shall be at least equal or faster corresponding to the set ReportingInterval.

This profile is optional for end devices.

2.6.10.2 Supported Values and Configuration

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x01	Level	uint8	0x00 to 0x64	0x00	R	M
			Is the last measured level in percentage			
0x02	Flags	map8	AlertTriggered Level_1 0bxxxxxxx0 = not exceeded 0bxxxxxxx1 = exceeded	0bxxxxxxx0	R	O
			Flag shall be set on exceeding/undercutting the Level_1			
			AlertTriggered Level_2 0bxxxxxx0x= not undercut 0bxxxxxx1x =undercut	0bxxxxxx0x	R	O
			Flag shall be set on exceeding/undercutting the Level_2			
			MaxIncrease Triggered 0bxxxxx0xx = not triggered 0bxxxxx1xx = triggered	0bxxxxx0xx	R	O
			Flag shall be set to 0bxxxxx1xx if the maximal increasing of the filling level was exceeded			
			MaxDecrease Triggered 0bxxxx0xxx = not triggered 0bxxxx1xxx = triggered	0bxxxx0xxx	R	O
			Flag shall be set to 0bxxxx1xxx if the maximal decreasing of the filling level was exceeded			
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFF	0x000000000 0	R	O
			Timestamp of the last level measurement			

Table 21: Supported attributes for filling level profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x43	AlertLevel_1	uint8	0x00 to 0x64	0x64	R/W	O
		Is the filling level limit on that exceeding or undercut an event message shall be generated				
0x44	AlertLevel_2	uint8	0x00 to 0x64	0x00	R/W	O
		Is the filling level limit on that exceeding or undercut an event message shall be generated				
0x47	HysteresisAlertLevel_1	uint8	0x00 to 0x64	0x64	R/W	O
		The hysteresis of the AlertLevel_1 will prevent the system to retrigger an alert message if the measured value is bouncing around the AlertLevel_1 or if configured their realert level				
0x48	HysteresisAlertLevel_2	uint8	0x00 to 0x64	0x64	R/W	O
		The hysteresis of the AlertLevel_2 will prevent the system to retrigger an alert message if the measured value is bouncing around the AlertLevel_2 or if configured their realert level				
0x49	MaxIncrease	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Is the maximum increasing allowed for the filling level on that exceeding an event message shall be generated				
0x4A	MaxDecrease	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Is the maximum decreasing allowed for the filling level on that exceeding an event message shall be generated				
0x4B	RealertDeltaLevel_1	uint8	0x00 to 0x64	0x64	R/W	O
		Once the AlertLevel_1 was exceeded or undercut but the filling level is further increasing or decreasing an alert message shall be generated each time the filling level has changed for the given delta				
0x4C	RealertDeltaLevel_2	uint8	0x00 to 0x64	0x64	R/W	O
		Once the AlertLevel_2 was exceeded or undercut but the filling level is further increasing or decreasing an alert message shall be generated each time the filling level has changed for the given delta				
0x50	Flags	map8	AlertEnable Level_1 0bxxxxxxx0 = not enabled 0bxxxxxxx1 = enabled	0bxxxxxxx0	R/W	O

	If this bit was set to 0bxxxxxxx1 the profile shall initiate an event message if the AlertLevel_1 limit was exceeded or undercut			
AlertEnable Level_2 0bxxxxxx0x = not enabled 0bxxxxxx1x = enabled	0bxxxxxx0x	R/W	O
	If this bit was set to 0bxxxxxx1x the profile shall initiate an event message if the AlertLevel_2 limit was exceeded or undercut			
RealertEnable Level_1 0bxxxxx0xx = not enabled 0bxxxxx1xx = enabled	0bxxxxx0xx	R/W	O
	If this bit was set to 0bxxxxx1xx the profile shall initiate an event message each time the filling level has increased or decreased a given delta relative to AlertLevel_1			
RealertEnable Level_2 0bxxxx0xxx = not enabled 0bxxxx1xxx = enabled	0bxxxx0xxx	R/W	O
	If this bit was set to 0bxxxx1xxx the profile shall initiate an event message each time the filling level has increased or decreased a given delta relative to AlertLevel_2			
IncreaseAlert Enable 0bxxx0xxxx = not enabled 0bxxx1xxxx = enabled	0bxxx0xxxx	R/W	O
	0bxxx1xxxx if the alert of the maximal filling level increasing shall be enabled otherwise 0bxxx0xxxx			
DecreaseAlert Enable 0bxx0xxxxx = not enabled 0bxx1xxxxx = enabled	0bxx0xxxxx	R/W	O

			0bxx1xxxxx if the alert of the maximal filling level decreasing shall be enabled otherwise 0bxx0xxxxx		
		TriggerBelow Level_1 0bx1xxxxxx = trigger below 0bx0xxxxxx = above	0bx0xxxxxx	R/W	O
		If 0bx1xxxxxx an alert will be triggered on undercutting the AlertLevel_1. If 0bx0xxxxxx an alert will be triggered on exceeding the AlertLevel_1.		
		TriggerBelow Level_2 0b1xxxxxxx = trigger below 0b0xxxxxxx = trigger above	0b0xxxxxxx	R/W	O
		If 0b1xxxxxxx an alert will be triggered on undercutting the AlertLevel_2. If 0b0xxxxxxx an alert will be triggered on exceeding the AlertLevel_2.		
0x41	ReportingInterval	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	M
		Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol. A reporting interval of 0 will disable synchronous data transmission for this endpoint.		
0x42	MeasurementInterval	uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	M
		Measurement interval with which the filling level shall be measured. The allowed range is set in milliseconds. A Measurement interval of 0 will disable the measurement.		

Table 22: Supported configuration for filling level profile

2.6.11 COVER/LID STATE (0X17)

2.6.11.1 Short Description

The Cover/Lid State profile shall be used for indicating the state of a cover or a lid.
Indicating a variation to the lid state the endpoint shall generate an event message.
This profile is optional for end devices.

2.6.11.2 Supported Values and Configuration

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x01	State	uint8	0x00 to 0x02 0x00 =closed 0x01 = open 0x02 = unknown	0x02	R	M
			0x01 if cover/lid state is open, 0x00 if cover/lid is closed			
0x20	TimeStamp	uint32	0x000000000000 to 0xFFFFFFFFFFFF	0x000000000000	R	M
			Timestamp of the last weight measurement			

Table 23: Supported attributes for Cover/Lid profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x50	Flags	map8	StateReport Enable 0bxxxxxxx0 = not enabled 0bxxxxxxx1 = enabled	0bxxxxxxx0	R/W	M
			If this bit was set to 0bxxxxxxx1 the endpoint shall initiate an event message on each state change			
0x41	ReportingInterval	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	M
		Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol. A reporting interval of 0 will disable synchronous data transmission for this endpoint.				
0x42	MeasurementInterval	uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	M
		Measurement interval with which the cover/lid state shall be measured. The allowed range is set in milliseconds. A Measurement interval of 0 will disable the measurement.				

Table 24: Supported configuration for cover/Lid profile

2.6.12 VALVE STATE (0X18)

2.6.12.1 Short Description

The valve state profile shall be used for indicating the state of a valve.

Indicating a variation to the valve the endpoint shall generate an event message.

This profile is optional for end devices.

2.6.12.2 Supported Values and Configuration

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x01	State	uint8	0x00 to 0x02 0x00 =closed 0x01 = open 0x02 = unknown	0x02	R	M
			0x01 if Valve is open, 0x00 if valve is closed			
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFF	0x000000000000	R	M
			Timestamp of the last weight measurement			

Table 25: Supported attributes for valve profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x50	Flags	map8	StateReport Enable 0bxxxxxxx0 = not enabled 0bxxxxxxx1 = enabled	0bxxxxxxx0	R/W	M
			If this bit was set to 0bxxxxxxx1 the endpoint shall initiate an event message on each state change			
0x41	ReportingInterval	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	M
			Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol. A reporting interval of 0 will disable synchronous data transmission for this endpoint.			
0x42	MeasurementInterval	uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	M
			Measurement interval with which the valve state shall be measured. The allowed range is set in milliseconds. A Measurement interval of 0 will disable the measurement.			

Table 26: Supported configuration for valve profile

2.6.13 HOT BOX (0X19)

2.6.13.1 Short Description

The hot box profile shall be used for indicating if parts of the wagon exceed a critical temperature in degree Celsius and is able to trigger if the value exceeds an upper. In case where a lower limit was reached the corresponding endpoint shall generate an event immediately only if AlertEnable parameter is set to 0bxxxxxxx1.

Measuring the temperature shall be at least equal or faster corresponding to the set ReportingInterval.

This profile is optional for end devices.

2.6.13.2 Supported Values and Configuration

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x01	Temperature	uint16	0x8000 to 0x7FFF	0x0000	R	M
			Is the last measured temperature in degree Celsius			
0x02	Flags	map8	AlertTemp Level_1 0bxxxxxxx0 = not exceeded 0bxxxxxxx1 = exceeded	0bxxxxxxx0	R	O
			Flag shall be set to 0bxxxxxxx1 on exceeding AlertLevel_1 limit			
			MaxIncrease Triggered 0bxxxxxx0x = not triggered 0bxxxxxx1x = triggered	0bxxxxxx0x	R	O
			Flag shall be set to 0bxxxxxx1x if the maximal increasing of the temperature was exceeded			
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFF	0x00000000	R	O
			Timestamp of the last temperature measurement			

Table 27: Supported attributes for hot box profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x43	AlertLevel_1	int16	0x8000 to 0x7FFF	0x7FFF	R/W	O
		Is the Temperature limit on that exceeding an event message shall be generated				
0x45	HysteresisAlertLevel_1	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		The hysteresis of the AlertLevel_1 will prevent the system to retrigger an alert message if the measured value is bouncing around the Level_1 limit or if configured their RealertDeltaLevel_1				
0x47	MaxIncrease	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Is the maximum increasing allowed for the temperature on that exceeding an event message shall be generated				
0x4B	RealertDeltaLevel_1	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Once the AlertLevel_1 was exceeded but the temperature is further increasing an alert message shall be generated each time the temperature has changed for the given delta				
0x50	Flags	map8	AlertEnable Level_1 0bxxxxxxx0 = not enabled 0bxxxxxxx1 = enabled	0bxxxxxxx0	R/W	O
			If this bit was set to 0bxxxxxxx1 the profile shall initiate an event message if the AlertLevel_1 was exceeded			
			RealertEnable Level_1 0bxxxxx0xx = not enabled 0bxxxxx1xx = enabled	0bxxxxx0xx	R/W	O
			If this bit was set to 0bxxxxx1xx the profile shall initiate an event message each time the temperature is further increasing a given delta after the AlertLevel_1 was exceeded first			
			AlertIncrease Enable 0bxx0xxxxx = not enabled 0bxx1xxxxx = enabled	0bxx0xxxxx	R/W	O
			0bxx1xxxxx if the alert of the maximal temperature increasing is enabled otherwise 0bxx1xxxxx			

0x41	ReportingInterval	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	M
		Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol. A reporting interval of 0 will disable synchronous data transmission for this endpoint.				
0x42	MeasurementInterval	uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	M
		Measurement interval with which the temperature shall be measured. The allowed range is set in milliseconds. A Measurement interval of 0 will disable the measurement.				

Table 28: Supported configuration for hot box profile

The Hot Box profile does not know a trigger direction configuration, e.g. TriggerBelowLevel_1 for the AlertLevel_1. The implementation shall assume that the trigger configuration is always set to exceeding, that is, a TriggerBelowLevel_1 attribute would be set to 0b0xxxxxxx.

2.6.14 DEFLECTION (0X20)

2.6.14.1 Short Description

The deflection profile shall be used for measuring the deflection of a bogie in millimeters.

Measuring the deflection shall be at least equal or faster corresponding to the set ReportingInterval.

This profile does not support event messages.

This profile is optional for end devices.

2.6.14.2 Supported Values and Configuration

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x01	Distance	uint16	0x0000 to 0xFFFF Binary statement: 0x0000 = min 0xFFFF = max	0x0000	R	M
			The last measured distance in tenth of a millimeter. Carrying the min and max values in case of a binary load sensor, stating if loaded (maximum, if not inverted) or unloaded (minimum, if not inverted)			
0x02	Flags	map8	Inverted mounting 0bxxxxxxx0 = not inverted 0bxxxxxxx1 = inverted	0bxxxxxxx0	R	M
			Flag shall be set, if distance falls with higher deflection			
			Is binary 0bxxxxxx0x = is integer 0bxxxxxx1x = is binary	0bxxxxxx0x	R	M
			Flag shall be set, if the sensor can only provide a binary loaded state, instead of an exact distance value. The sensor then gives a min or max value, which is either above or below the threshold in every case. The inverted mounting rules apply here too, so the sensor applies the rules for the min/max values before sending the values to the coordinator. The coordinator does not need to implement any special evaluation logic for binary sensors, other than taking this flag as an indication, that the distance value is not a real distance in [mm].			
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFF	0x000000000000	R	O
			Timestamp of the last deflection measurement			

Table 29: Supported attributes for deflection profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x41	ReportingInterval	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	M
		Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol. A reporting interval of 0 will disable synchronous data transmission for this endpoint.				
0x42	MeasurementInterval	uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	M
		Measurement interval with which the distance shall be measured. The allowed range is set in milliseconds. A Measurement interval of 0 will disable the measurement.				

Table 30: Supported configuration for deflection profile

2.7 GENERIC SENSORS

2.7.1 DIGITAL SENSOR (0XA0)

The generic digital sensor shall use the profile-ID of 0xA0.

This sensor profile can be used for providing a generic digital sensor to different applications depending on the sensor placement and usage.

Event Messages will be generated on Event change 0 -> 1 or 1 -> 0, only if StateReportEnable parameter is set to 0bxxxxxxx1.

2.7.1.1 Supported Values and Configuration

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x01	State	uint8	0x00 to 0x02 0x00 = Low 0x01 = High 0x02 = unknown	0x02	R	M
		0x02 will indicate that the current value is unknown. The values 0x01 and 0x00 depend on the application.				
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFF	0x000000000000	R	M
		Timestamp of the last measurement				

Table 31: Supported attributes for digital sensor profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x50	Flags	map8	StateReport Enable 0bxxxxxxx0 = not enabled 0bxxxxxxx1 = enabled	0bxxxxxxx0	R/W	M
			If this bit was set to 0bxxxxxxx1 the endpoint shall initiate an event message on each state change			
0x41	ReportingInterval	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	M
		Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol. A reporting interval of 0 will disable synchronous data transmission for this endpoint.				
0x42	MeasurementInterval	uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	M
		Measurement interval with which the digital state shall be measured. The allowed range is set in milliseconds. A Measurement interval of 0 will disable the measurement.				

Table 32: Supported configuration for digital sensor profile

2.7.2 ANALOG SENSOR (0XB0)

The Analog sensor shall use the profile ID of 0xB0.

This sensor profile can be used for providing a generic analog sensor to different applications depending on the sensor placement and usage.

2.7.2.1 Supported Values and Configuration

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x01	Value	int16	0x0000 to 0xFFFF	0x0000	R	O
			Shows the measured value			
0x02	Flags	map8	AlertTriggered Level_1 0bxxxxxxx0 = not exceeded 0bxxxxxxx1 = exceeded	0bxxxxxxx0	R	O
			Flag shall be set on exceeding/undercutting the Level_1			
			AlertTriggered Level_2 0bxxxxxx0x= not undercut 0bxxxxxx1x =undercut	0bxxxxxx0x	R	O
			Flag shall be set on exceeding/undercutting the Level_2			
			MaxIncrease Triggered 0bxxxxx0xx = not triggered 0bxxxxx1xx = triggered	0bxxxxx0xx	R	O
			Flag shall be set to 0bxxxxx1xx if the maximal increasing of the measured value was exceeded			
			MaxDecrease Triggered 0bxxxx0xxx = not triggered 0bxxxx1xxx = triggered	0bxxxx0xxx	R	O

0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFF	0x000000000000	R	O
			Flag shall be set to 0bxxxx1xxx if the maximal decreasing of the measured value was exceeded			
		Timestamp of the last temperature measurement				

Table 33: Supported attributes for analog sensor profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/O
0x43	AlertLevel_1	int16	0x8000 to 0x7FFF	0x7FFF	R/W	O
		Is the first level on that exceeding an event message shall be generated				
0x44	AlertLevel_2	int16	0x8000 to 0x7FFF	0x8000	R/W	O
		Is the is the second level on that exceeding an event message shall be generated				
0x45	MaxIncrease	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Is the maximum decreasing allowed for the value on that exceeding an event message shall be generated				
0x46	MaxDecrease	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Is the maximum decreasing allowed for the value on that exceeding an event message shall be generated				
0x47	HysteresisAlertLevel_1	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Hysteresis for the AlertLevel_1 or if configured their RealertDeltaLevel_1				
0x48	HysteresisAlertLevel_2	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Hysteresis for the AlertLevel_2 or if configured their RealertDeltaLevel_2				
0x49	RealertDeltaLevel_1	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Once the AlertLevel_1 was triggered but the value is further increasing or decreasing an alert message shall be generated each time the value has changed for the given delta				
0x4A	RealertDeltaLevel_2	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	O
		Once the AlertLevel_2 was triggered but the value is further increasing or decreasing an alert message shall be generated each time the value has changed for the given delta				
0x50	Flags	map8	AlertEnable Level_1 0bxxxxxxx0 = not enabled 0bxxxxxxx1 = enabled	0bxxxxxxx0	R/W	O

				If this bit was set to 0bxxxxxxx1 the profile shall initiate an event message if the Alertlevel_1 was exceeded/undercut			
				AlertEnable Level_2 0bxxxxxx0x = not enabled 0bxxxxxx1x = enabled	0bxxxxxx0x	R/W	O
				If this bit was set to 0bxxxxxx1x the profile shall initiate an event message if the AlertLevel_2 was exceeded/undercut			
				RealertEnable Level_1 0bxxxxx0xx = not enabled 0bxxxxx1xx = enabled	0bxxxxx0xx	R/W	O
				If this bit was set to 0bxxxxx1xx the profile shall initiate an event message each time the value has increased/decreased a given delta after exceeding/undercutting the AlertLevel_1			
				RealertEnable Level_20bxxxx0x xx = not enabled 0bxxxx1xxx = enabled	0bxxxx0xxx	R/W	O
				If this bit was set to 0bxxxx1xxx the profile shall initiate an event message each time the value has increased/decreased a given delta after exceeding/undercutting the AlertLevel_2			
				AlertIncrease Enable0bxxx0xx xx = not enabled 0bxxx1xxxx = enabled	0bxxx0xxxx	R/W	O
				0bxxx1xxxx if alerting on exceeding the maximal value increasing is enabled otherwise 0bxxx0xxxx			
				AlertDecrease Enable 0bxx0xxxxx = not enabled 0bxx0xxxxx = enabled	0bxx0xxxxx	R/W	O
				0bxx0xxxxx if alerting on exceeding the maximal allowed value decreasing is enabled otherwise 0bxx0xxxxx			

			TriggerBelow Level_1 0bx1xxxxxx = below 0bx0xxxxxx = above	0bx0xxxxxx	R/W	O
			If 0bx1xxxxxx an alert will be triggered on undercutting the Level_1. If 0bx0xxxxxx an alert will be triggered on exceeding the Level_1.			
			TriggerBelow Level_2 0b1xxxxxxx = trigger below 0b0xxxxxxx = trigger above	0b0xxxxxxx	R/W	O
			If 0b1xxxxxxx an alert will be triggered on undercutting the AlertLevel_2. If 0b0xxxxxxx an alert will be triggered on exceeding the AlertLevel_2.			
0x41	ReportingInterval	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	M
		Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol. A reporting interval of 0 will disable synchronous data transmission for this endpoint.				
0x42	MeasurementInterval	uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	M
		Measurement interval with which the analog value shall be measured. The allowed range is set in milliseconds. A Measurement interval of 0 will disable the measurement.				

Table 34: Supported configuration for analog sensor profile

2.8 MANUFACTURER SPECIFIC SENSORS

2.8.1 *MANUFACTURER SPECIFIC PROFILE (0xC0)*

The Manufacturer specific profile can be used to describe data in a manufacturer specific way. The profile uses the Identifier 0xC0. This specification does not further regulate this profile.

3 FUNCTIONAL DESCRIPTION

3.1 MEASUREMENT CYCLE

Running a measurement shall be done cyclical with respect to the configured
MeasurementInterval parameter of each sensor if the MeasurementInterval values are unequal
to 0.

If the measurement was done successfully the endpoint shall check if the AlertEnable flag is set.

If the alert detection is enabled for one or more endpoints the endpoint is responsible to observe
the limit exceeding or undercut of the last measured value. If a limit was exceeded or undercut
and the corresponding alert was enabled the endpoint shall immediately generate a notification.

In general, all measurements shall be sent by overwriting previously stored measurement
values. The underlying layer shall store the last delivered measurement values to send these
values with the next reporting interval. In this case, the measurement values shall be delivered
with high priority.

In some other cases it is necessary that the previously delivered values shall not be over written
(e.g. on building a shock profile for a given time at a given sample frequency on a detected
shock). The underlying layer is responsible for buffering these values.

NOTE: End devices with more than one endpoint or profiles with a lot of high priority profile
attributes may have not enough bandwidth for sending a bigger amount of these buffered data.
Therefore, the transmission of buffered data can take some time depending of the sending
interval and the number of bytes which can be sent within each frame. Every buffered value shall
be deleted after the transmission was done successfully.

3.2 READING AND WRITING ATTRIBUTES

Values of a profile indicated with 'R' can only be read, and values indicated with 'R/W' can be
read and written, see section 2.5.