ITSS PRACTICE GROUP ITSS-INTERFACE 2 SPECIFICATION - PROFILES

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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 mostsignificant 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, realert 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.

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/0
		uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R	М
0x01	SwBuildVersion	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				
		uint16	0x0000 to 0xFFFF	0x0000	R	М
0x02	HwBuildVersion	Shows the current hardware version the end device using the following scheme: 0xAABB 0xAA = Major Version, 0xBB = Minor Version				ng the
0x03	BatteryState	uint8	0x00 to 0x64	0x00	R	М
0x03		Battery state in percentage				
0x04	HealthState	map8	0bxxxxxx0 = unhealthy 0bxxxxxx1 = healthy	unhealthy	R	М
		If the end device works as expected the health state shall b 0bxxxxxx1, otherwise it shall be set to 0bxxxxxx0, e.g. emp battery				
0x20	TimeStamp	uint48	0x0000000000000 to 0xFFFFFFFFFFFFFF	0x00000000 0000	R	М
			Timestamp of the las	t HealthState me	easurement	

2.6.1.2 Supported Values and Configurations

 Table 3: Supported attributes for health state profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	М/О
0x41	ReportingInterval	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	М
		Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol.				
		A re	eporting interval of (transmissio) will disable syn n for this endpoi		ata

Table 4: Supported configuration for health state profile

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 0bxxxxxx1.

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/0		
0x01	Temperature	int16	0x8000 to 0x7FFF	0x7FFF	R	М		
0.01	Temperature	Is the last	t measured temperatu	re in tenth of degree	Celsius ([1/	′10]°C)		
			AlertTriggered Level_1 Obxxxxxx0 = not exceeded Obxxxxxx1 = exceeded	0bxxxxxx0	R	0		
			Flag shall be s	et on exceeding/unde AlertLevel_1	rcutting the	<u>5</u>		
			AlertTriggered Level_2 Obxxxxx0x= not undercut Obxxxxx1x =undercut	0bxxxxxx0x	R	0		
0x02	Flags		Flag shall be set on exceeding/undercutting the AlertLevel_2					
0x02	Flags	map8	MaxIncrease Triggered 0bxxxx0xx = not triggered 0bxxxxx1xx = triggered	0bxxxxx0xx	R	0		
			_	bxxxxx1xx if the max mperature was excee		sing of		
			MaxDecrease Triggered 0bxxxx0xxx = not triggered 0bxxxx1xxx = triggered	0bxxxx0xxx	R	0		
			Flag shall be set to 0bxxxx1xxx if the maximal decreasing of the temperature was exceeded					
0x20	TimeStamp	uint48	0x0000000000000 to 0xFFFFFFFFFFFFFF	0x0000000000000	R	0		
			Timestamp of the las	st temperature measu	rement			

Table 5: Supported attributes for temperature profile

Attr. ID	Attribute	Value Type	V	alue Range	-	fault alue	Acc	ess	M/0	
		int16	0x8	000 to 0x7FFF	0x	7FFF	R/	W	0	
0x43	AlertLevel_1	Is a l		mit on that exce essage shall be g	0		0		rent	
		int16	0x8	000 to 0x7FFF	0x	8000	R/	W	0	
0x44	AlertLevel_2	Is level limit on that exceeding or undercut an event message shall be generated, in ([1/10]°C)						ssage		
		uint1	.6	0x0000 to 0x	FFFF	0xFFI	F	R/W	0	
0x45	HysteresisAlertLevel_1	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								
		uint1	.6	0x0000 to 0x	FFFF	0xFFF	F	R/W	0	
0x46	HysteresisAlertLevel_2	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								
		uint16		0x0000 to 0xFFFF	0xF	FFF	R/W		0	
0x47	MaxIncrease			um value increas ceeding an event						
0.40		uint16		0x0000 to 0xFFFF	0xF	FFF	R/W		0	
0x48	MaxDecrease	Is the m		Im decreasing al eding an event m					on that	
		uint16		0x0000 to 0xFFFF	0xF	FFF	R/W		0	
0x49	RealertDeltaLevel_1	AlertLevel_1 was s further increas ated again each for the	ing or d time th	lecreasir e temper	ng an a	lert m	nessage			
		uint16		0x0000 to 0xFFFF	0xF	FFF	R/W		0	
0x4A	RealertDeltaLevel_2	Once the AlertLevel_2 was exceeded or undercut but the temperature is further increasing or decreasing an alert messag shall be generated again each time the temperature has changed for the given delta						nessage		

			initiate an event	0bxxxxxx0 et to 0bxxxxxx1 message if the A	lertLevel_	
		was exceeded or undercu AlertEnable Level_2	R/W	0		
		initiate an event	et to 0bxxxxxx1x message if the A exceeded or und	lertLevel_		
0x50	Flags	map8	RealertEnable Level_1 Obxxxx0xx = not enabled Obxxxxx1xx = enabled	0bxxxxx0xx	R/W	0
			If this bit was so initiate an event n has increased or		e the temp	erature
			RealertEnable Level_2 0bxxxx0xxx = not enabled 0bxxxx1xxx = enabled	0bxxxx0xxx	R/W	0
			If this bit was so initiate an event r has increased or		e the temp	erature
			IncreaseAlert Enable Obxxx0xxxx = not enabled Obxxx1xxxx = enabled	0bxxx0xxxx	R/W	0
			0bxxx1xxxx if the increasing shall			

					[
			DecreaseAlert Enable Obxx0xxxxx = not enabled Obxx1xxxxx =	0bxx0xxxxx	R/W	0	
			enabled				
			0bxx1xxxxx if the decreasing shall t				
			TriggerBelow Level_1				
			0bx1xxxxxx = trigger below	0bx0xxxxxx	R/W	0	
			0bx0xxxxxx = above				
				x an alert will be utting the AlertL		on	
		If 0bx0xxxxx an alert will be triggered on exe the AlertLevel_1.					
			TriggerBelow Level_2				
			0b1xxxxxx = trigger below	0b0xxxxxxx	R/W	0	
			0b0xxxxxx = trigger above				
				x an alert will be utting the AlertL		on	
			If 0b0xxxxxxx an a t	lert will be trigg he AlertLevel_2.		ceeding	
		uint24	0x000000 to 0xFFFFFF	0x000000	R/W	М	
0x41	ReportingInterval	The allo	Reporting interval used by this endpoint. Allowed range depends on the underlying communication protocol.				
		A rej	porting interval of 0 transmission	will disable sync for this endpoin		ata	
		uint32	0x00000000 to 0xFFFFFFFF	0x0000000 0	R/W	М	
0x42	MeasurementInterval	Measu	Measurement interval with which the temperature shall be measured.				
			The allowed range				
		A meas	surement interval of	0 will disable the	e measurer	nent.	

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 0bxxxxxx1.

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

This profile is optional for end devices.

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/0
0x01	Humidity	uint8	0x00 to 0x64	0x00	R	М
0.01	numuity		Is the last measure	ed humidity in p	percent	
			AlertTriggered Level_1 0bxxxxxxx0 = not exceeded	0bxxxxxx0	R	0
0x02			0bxxxxxx1 = exceeded			
			Flag shall be set o	on exceeding/u AlertLevel_1	ndercuttir	ng the
			AlertTriggered Level_2			
			0bxxxxx0x= not undercut	0bxxxxx0x	R	0
			0bxxxxxx1x =undercut			
	Flags	map8	Flag shall be set o	on exceeding/u AlertLevel_2	ndercuttir	ng the
0.02	riags	шаро	MaxIncrease Triggered			
			0bxxxxx0xx = not triggered	0bxxxxx0x x	R	0
			0bxxxxx1xx = triggered			
			Flag shall be set increasing of	to 0bxxxxx1xx the humidity w		
			MaxDecrease Triggered			
			0bxxxx0xxx = not triggered	0bxxxx0xx x	R	0
			0bxxxx1xxx = triggered			
			Flag shall be set decreasing of	to 0bxxxx1xxx the humidity w		
0x20	TimeStamp	uint48	0x00000000000 0 to 0xFFFFFFFFFF F	0x0000000 00000	R	0
		Т	'imestamp of the las	t humidity mea	surement	

2.6.3.2 Supported Values und Configurations

Table 7: Supported	attributes for	humidity profile
---------------------------	----------------	------------------

Attr. ID	Attribute	Value Type	Value Range	Default Value	e Access	M/0		
		uint8	0x00 to 0x64	0x64	R/W	0		
0x43	AlertLevel_1	Is a hum	dity limit on that ex message sha	ceeding or under all be generated	cutting an	event		
		uint8	0x00 to 0x64	0x00	R/W	0		
0x44	AlertLevel_2	Is a Hum	idity limit on that ex message sha	ceeding or under all be generated	cutting an	event		
		uint16	0x00 to 0x64	0x64	R/W	0		
0x45	HysteresisAlertLevel_1	retrigge	teresis of the AlertLe r an alert message if AlertLevel_1 or if co	the measured va	lue is boun	cing		
		uint16	0x00 to 0x64	0x64	R/W	0		
0x46	HysteresisAlertLevel_2	retrigge	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_					
0 47	Martuara	uint16	uint16 0x0000 to 0xFFFF		R/W	0		
0x47	MaxIncrease	Is the maximum increasing allowed for the humidity exceeding an event message shall be generated						
0x48	MaxDecrease	uint16 0x0000 to 0xFFFF		0xFFFF	R/W	0		
0X40	MaxDeciease		aximum decreasing a kceeding an event m					
		uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0		
0x49	RealertDeltaLevel_1	further	e limit was exceeded increasing or decre again each time the l	asing an alert me	essage shall	be		
		uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0		
0x4A	RealertDeltaLevel_2	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 0bxxxxxx0 = not enabled 0bxxxxxx1 = enabled	0bxxxxxx0	R/W	0		

initiate an event	et to 0bxxxxxx1 message if the A exceeded or und	lertLevel_		
AlertEnable Level_2				
0bxxxxx0x = not enabled	0bxxxxxx0x	R/W	0	
0bxxxxx1x = enabled				
initiate an event	et to 0bxxxxxx1x message if the A exceeded or und	lertLevel_2		
RealertEnable Level_1				
0bxxxxx0xx = not enabled	0bxxxxx0xx	R/W	0	
0bxxxxx1xx = enabled				
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	0bxxxx0xxx	R/W	0	
0bxxxx1xxx = enabled				
initiate an event n	et to 0bxxxx1xxx nessage each tim ecreased a given AlertLevel_2	e the humi	dity has	
IncreaseAlert Enable				
0bxxx0xxxx = not enabled	0bxxx0xxxx	R/W	0	
0bxxx1xxxx = enabled				
0bxxx1xxxx if the alert of the maximal humidity increasing shall be enabled otherwise 0bxxx0xxxx				
DecreaseAlert Enable				
0bxx0xxxxx = not enabled	0bxx0xxxxx	R/W	0	
0bxx1xxxxx = enabled				

			0bxx1xxxxx if th decreasing shall h	ne alert of the ma be enabled otherv		
			TriggerBelow Level_1 0bx1xxxxx = trigger below 0bx0xxxxx = above	0bx0xxxxxx	R/W	0
			underc If 0bx0xxxxxx an a		evel_1.	
				the AlertLevel_1.		
			TriggerBelow Level_2 0b1xxxxxx = trigger below	0b0xxxxxxx	R/W	0
			0b0xxxxxx = trigger above			
			underc	x an alert will be utting the AlertL	evel_2.	
			If 0b0xxxxxx an a	lert will be trigge the AlertLevel_2.	ered on ex	ceeding
		uint24	0x000000 to 0xFFFFFF	0x000000	R/W	М
0x41	ReportingInterval	The allow	Reporting interval ved range depends or pro			cation
		A rep	orting interval of 0 w transmission f	vill disable synch for this endpoint.		ta
		uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	М
0x42	MeasurementInterval		ent interval with whi The allowed range arement interval of 0	is set in milliseco	onds.	

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 0bxxxxxx1.

Measuring the weight shall be at least equal or faster corresponding to the set reporting interval. This profile is optional for end devices.

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/ 0	
0x01	Weight	uint24	0x000000 to 0xFFFFFF	0x000000	R	М	
]	s the last measured	weight in kilog	ram (kg)		
			AlertTriggered Level_1				
			0bxxxxxx0 = not exceeded	0bxxxxxx0	R	0	
			0bxxxxxx1 = exceeded				
			Flag shall be set o	on exceeding/u AlertLevel_1	ndercuttin	g the	
			AlertTriggered Level_2				
			0bxxxxx0x= not undercut	0bxxxxxx0x	R	0	
			0bxxxxxx1x =undercut				
0x02	Flags	man0	Flag shall be set o	on exceeding/u AlertLevel_2	ndercuttin	g the	
0x02	riags	map8	MaxIncrease Triggered				
			0bxxxxx0xx = not triggered	0bxxxxx0x x	R	0	
			0bxxxxx1xx = triggered				
			Flag shall be set increasing of	to 0bxxxxx1xx f the weight wa			
			MaxDecrease Triggered				
			0bxxxx0xxx = not triggered	0bxxxx0xx x	R	0	
			0bxxxx1xxx = triggered				
		-	Flag shall be set to 0bxxxx1xxx if the maximal decreasing of the weight was exceeded				
0x20	TimeStamp	uint48	0x00000000000 0 to 0xFFFFFFFFFF F	0x0000000 00000	R	0	
			Timestamp of the la	st weight meas	urement		

2.6.4.2 Supported Values and Configuration

Table 9: Supported attributes for accurate weight profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/0			
0x43	AlertLevel_1	uint24	0x000000 to 0xFFFFFF	0xFFFFFF	R/W	0			
0x43	AlertLevel_1	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	0			
0.744	Alei (Level_2			logram (kg), on th t message shall be					
		uint24	0x000000 to 0xFFFFFF	0xFFFFFF	R/W	0			
0x45	HysteresisAlertLevel_1	retrigger	an alert message ound the AlertLe	Level_1 will preve if the measured v vel_1 or if configu tDeltaLevel_1	alue is bou				
0x46		uint24	0x000000 to 0xFFFFFF	0xFFFFFF	R/W	0			
	HysteresisAlertLevel_2	The hysteresis of the AlertLevel_2 will prevent the sys retrigger an alert message if the measured value is bou around the AlertLevel_2 or if configured their RealertDeltaLevel_2							
		uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0			
0x47	MaxIncrease			g allowed for the v nessage shall be g		n that			
		uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0			
0x48	MaxDecrease			g allowed for the v nessage shall be g		n that			
		uint24	0x000000 to 0xFFFFFF	0xFFFFFF	R/W	0			
0x49	RealertDeltaLevel_1	Once the AlertLevel_1 was exceeded or undercut but the weighing is further increasing or decreasing an alert mess shall be generated each time the weighing has changed for given delta							
0x4A	RealertDeltaLevel_2	uint24	0x000000 to 0xFFFFFF	0xFFFFFF	R/W	0			

		weighi	e the AlertLevel_2 wa ng is further increasin e generated each time giv	ng or decreasing	an alert m	essage
			AlertEnable Level_1 Obxxxxxx0 = not enabled Obxxxxxx1 = enabled	0bxxxxxx0	R/W	0
		enabled If this bit was set to 0bxxxxxx1 the prinitiate an event message if the AlertLeve exceeded or undercut AlertEnable Level_2 0bxxxxxx0x = not				
			Level_2			
				0bxxxxx0x	R/W	0
			If this bit was se initiate an event me exc		tLevel_2 li	
0x50	Flags	map8	RealertEnable Level_1 Obxxxxx0xx = not enabled Obxxxxx1xx =	0bxxxxx0xx	R/W	0
			initiate an event r	t to 0bxxxxx1xx nessage each tim creased a given c AlertLevel_1	ie the weig	ht has
			RealertEnable Level_2 0bxxxx0xxx = not enabled	0bxxxx0xxx	R/W	0
			0bxxxx1xxx = enabled			
			initiate an event r	t to 0bxxxx1xxx nessage each tim creased a given c AlertLevel_2	ie the weig	ht has

			IncreaseAlert Enable Obxxx0xxxx = not enabled Obxxx1xxxx = enabled Obxxx1xxxx if t increasing shall b DecreaseAlert Enable Obxx0xxxxx = not enabled	0bxxx0xxxx the alert of the ma be enabled otherv 0bxx0xxxxx		
			0bxx1xxxxx = enabled 0bxx1xxxxx if t decreasing shall b	he alert of the ma		
			TriggerBelow Level_1 Obx1xxxxx = trigger below Obx0xxxxx = above	0bx0xxxxxx	R/W	0
			If 0bx1xxxxx an alert will be triggered on undercutting the AlertLevel_1. If 0bx0xxxxx an alert will be triggered on exceeding the AlertLevel_1.			
			TriggerBelow Level_2 Ob1xxxxxx = trigger below Ob0xxxxxx = trigger above	0b0xxxxxxx	R/W	0
			If 0b1xxxxxx an alert will be triggered on undercutting the AlertLevel_2. If 0b0xxxxxxx an alert will be triggered on exceeding the AlertLevel_2.			
		uint24	0x000000 to 0xFFFFFF	0x000000	R/W	М
0x41	ReportingInterval	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	М
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.

Attr. ID	Attribute	Value Type	Value Range	Default Value	access	M/0	
0x01	State	uint8 0x00 to 0x03 0x00 = Locked 0x01 = unlocked 0x02 = partially locked 0x03 = unknown		0x03	R	М	
			State of the manual brake				
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFFFF	0x0000000000000	R	0	
		Timestamp of the last state measurement					

2.6.5.2 Supported Values and Configuration

Table 11: Supported attributes for manual brake state profile

Attribute	Value Type	Value Range	Default Value	access	M/0		
		StateReport Enable					
	0	0bxxxxxx0 = not enabled	0bxxxxxx0	R/W	0		
Flags	map8	0bxxxxxx1 = enabled					
		If this bit was set to 0bxxxxxx1 the endpoint shall initiate an event message on each state change					
	uint24	0x000000 to 0xFFFFFF 0x000000		R/W	М		
ReportingInterval	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.						
MeasurementInterval	uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	М		
	Measurement interval with which the manual brake state shall be measured.						
	The allowed range is set in milliseconds.						
		ReportingInterval uint24 ReportingInterval The all A r uint32 MeasurementInterval Measure	FlagsEnable 0bxxxxx0 = not enabled 0bxxxxxx1 = enabledFlagsmap80bxxxxxx0 = not enabled 0bxxxxxx1 = enabledIf this bit wa initiate anIf this bit wa initiate anuint240x000000 to 0xFFFFFF0x000000 to 0xFFFFFFReportingIntervalThe allowed range dependence transmited to 0xFFFFFFFMeasurementIntervalMeasurement interval wi The allowed	Flags Enable Obxxxxxx0 = not enabled Obxxxxxx0 = not enabled Imap8 If this bit was set to Obxxxxxx1 = enabled If this bit was set to Obxxxxxx1 initiate an event message on each or the set of this bit was set to Obxxxxxx1 ReportingInterval uint24 Ox000000 to OxFFFFF Ox000000 ReportingInterval uint24 Ox000000 to OxFFFFFF Ox000000 A reporting interval of 0 will disable syntransmission for this endpoind to OxFFFFFFF Ox0000000 Ox0000000 MeasurementInterval Measurement interval with which the manua measured. The allowed range is set in milling	FlagsEnable 0bxxxxx0 = not enabled0bxxxxx0 = not enabled0bxxxxx0 0bxxxxx1 = enabledN/WFlagsmap8If this bit was set to 0bxxxxxx1 the endpoint initiate an event message on each state of 0xFFFFFFReportingIntervaluint240x000000 to 0xFFFFFF0x000000R/WReporting interval of 0 will disable synchronous transmission for this endpoint.MeasurementIntervaluint320x0000000 to 0xFFFFFFF0x0000000R/WMeasurementIntervalMeasurement interval with which the manual brake state measured.		

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.

	-	-	-	-		-
Attr. ID	Attribute	Value Type	Value Range	Default Value	access	M/ 0
0x01	State	uint8	0x00 to 0x03 0x00 =closed 0x01 = partially open 0x02 = open 0x03 = unknown	closed partially 0x03 open		М
		State of the door				
0x20	TimeStamp	uint48	0x0000000000000 to 0xFFFFFFFFFFFFFF	0x0000000000000	R	М
			Timestamp of	the last measurement		

2.6.6.2 Supported Values and Configuration

Table 13: Supported attributes for door open profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	access	M/0	
			StateReport Enable				
0 50		0	0bxxxxxx0 = not enabled	0bxxxxxx0	R/W	М	
0x50	0x50 Flags	map8	0bxxxxxx1 = enabled				
			If this bit was set to 0bxxxxxx1 the endpoint shall initiate an event message on each state change				
		uint24	0x000000 to 0xFFFFFF	0x000000	R/W	М	
		Reporting interval used by this endpoint.					
0x41	ReportingInterval	The allow	The allowed range depends on the underlying communication protocol.				
		A reporting interval of 0 will disable synchronous data transm for this endpoint.					
		uint32	0x00000000 to 0xFFFFFFFF	0x0000000000000	R/W	М	
0x42	MeasurementInterval	Measurement interval with which the door state shall be measured.					
		The allowed range is set in milliseconds.					
		A Measu	rement interval o	of 0 will disable the me	easuremen	it.	

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 0bxxxxxx1.

This profile is optional for end devices.

2.6.7.2 Supported Attributes

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/0
			XAxisTriggere d 0bxxxxxx0 = not triggered 0bxxxxxx1 = triggered	0bxxxxxx0	R	М
			Sh	ock in x-direction trig	gered	
			YAxisTriggere d			
0x01	Trigger	map8	0bxxxxx0x = not triggered 0bxxxxx1x =	0bxxxxx0x	R	М
			triggered			
			She	ock in y-direction trig	gered	
			ZAxisTriggere d			
			0bxxxxx0xx = not triggered	0bxxxxx0xx	R	М
			0bxxxx1xx = triggered			
			Sh	ock in z-direction trig	gered	
0x04	XAxis	int16	0x8000 to 0x7FFF	0x0000	R	М
		Peak s	hock value for X-A	Axis, in 1/1000 g. (1 g	= 9,81 m/s ²)
0x05	YAxis	int16	0x8000 to 0x7FFF	0x0000	R	М
		Peak sl	hock value for Y-A	Axis, in 1/1000 g. (1 g	= 9,81 m/s ²)
0x06	ZAxis	int16	0x8000 to 0x7FFF	0x0000	R	М
		Peak s	hock value for Z-A	axis, in 1/1000 g. (1 g	= 9,81 m/s ²)
0x0D	EnergyEquivalentX	uint16	0x0000 to 0xFFFF	0x0000	R	0
UXUD	Axis	The energy		detected shock calcul xis. See Figure 4 for d		shock
Ower	EnergyEquivalentY	uint16	0x0000 to 0xFFFF	0x0000	R	0
0x0E	Axis	The energy		detected shock calcul xis. See Figure 4 for d		shock
0x0F	EnergyEquivalentZ Axis	uint16	0x0000 to 0xFFFF	0x0000	R	0

		The energy equivalent of the detected shock calculated for the shock duration of this axis. See Figure 4 for details					
		uint16	0x0000 to 0xFFFF	0x0000	R	М	
0x10	ShockDurationXAxis	trigger limi	it has been exceed	ck in milliseconds from ded to the moment the er limit. See Figure 4 fo	e measured		
		uint16	0x0000 to 0xFFFF	0x0000	R	М	
0x11	ShockDurationYAxis	trigger limi	it has been exceed	ck in milliseconds from ded to the moment the er limit. See Figure 4 fo	e measured		
		uint16	0x0000 to 0xFFFF	0x0000	R	М	
0x12	ShockDurationZAxis	trigger limi	it has been exceed	ck in milliseconds from ded to the moment the er limit. See Figure 4 fo	e measured		
0x81	RawXAxis	array_int16	0x8000 to 0x7FFF	0x0000	R	0	
		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	0	
		Single value	es of the Shock fo	or Y-Axis, in 1/1000 g. (1 g = 9,81 m/s ²)			
0x83	RawZAxis	array_int16	0x8000 to 0x7FFF	0x0000	R	0	
		Single values of the Shock for Z-Axis, in 1/1000 g. (1 g = 9,81 m/s ²)					
0x84	RawTimeStamp	uint48	0x000000000 000 to 0xFFFFFFFF FFF	0x0000000000000	R	0	
		Timestamp f	or the first measu	red raw data value wl y, z-Axes	nich contair	ns the x,	
0x20	TimeStamp	uint48	0x000000000 000 to 0xFFFFFFFF FFF	0x0000000000000	R	М	
		Moment of t		his may differ from th leasurement	e time of th	e peak	

 Table 15: Supported attributes for shock detected profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/0		
0x43	XAxisUpperLimit	int16	0x8000 to 0x7FFF	0x0000	R/W	0		
		Uppe	er limit for X-Axis, i	in 1/1000 g. (1 g =	9,81 m/s ²)		
0x44	YAxisUpperLimit	int16	0x8000 to 0x7FFF	0x0000	R/W	0		
		Uppe	er limit for Y-Axis, i	in 1/1000 g. (1 g =	9,81 m/s ²)		
0x45	ZAxisUpperLimit	int16	0x8000 to 0x7FFF	0x0000	R/W	0		
		Uppe	er limit for Z-Axis, i	in 1/1000 g. (1 g =	9,81 m/s ²)		
0x46	XAxisLowerLimit	int16	0x8000 to 0x7FFF	0x0000	R/W	0		
		Lowe	er limit for X-Axis, i	in 1/1000 g. (1 g =	• 9,81 m/s ²	[;])		
0x47	YAxisLowerLimit	int16	0x8000 to 0xFFFF	0x0000	R/W	0		
		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	0		
		Lower limit for Z-Axis, in $1/1000$ g. (1 g = 9,81 m/s ²)						
		uint16	0x000 to 0xFFFF	0x0000	R/W	М		
0x49	MeasurementTime	data after a	n time in millisecor a shock in one of th value 0x0000 mear	e three axes has b	een detect			
		uint64	0x00 to 0x02	see Figure 5	R/W	М		
0x4A	Filterchain	Each byte within the filter chain will activate one of the filters listed below. 0x00: no Filter selected 0x01: 32 Hz Butterworth filter 4 th order 0x02: Highpass filter						
0w4P	CampleDate	uint16	0x0000 to 0xFFFF	0x00C8	R/W	М		
0x4B	SampleRate	The sampli	ing rate of the sens	or for the raw dat in Hz	a recording	g, given		
0x50	Flags	map8	AlertEnable 0bxxxxxx0 = not enabled 0bxxxxxx1 = enabled	0bxxxxxxx0	R/W	0		

	If this bit was set to 0bxxxxxx1 the profile shall initiate an event message if a shock in one or more directions has been detected
--	-------------------------------------------------------------------------------------------------------------------------------------------





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 0bxxxxxx1.

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

This profile is optional for end devices.

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/0	
0x01	Pressure	uint16	0x0000 to 0xFFFF	0x0000	R	М	
0701	Tressure		Is the last measured	pressure in kil	o pascal		
0x02			AlertTriggered Level_1 0bxxxxxx0 = not exceeded 0bxxxxxx1 = exceeded	0bxxxxxx0	R	0	
			Flag shall be set o	n exceeding/ur Level_1	dercutting	g the	
			AlertTriggered Level_2 Obxxxxxx0x= not undercut Obxxxxxx1x	0bxxxxx0x	R	0	
	Flags	map8	=undercut Flag shall be set on exceeding/undercutting the Level_2				
			MaxIncrease Triggered 0bxxxxx0xx = not triggered 0bxxxxx1xx = triggered	0bxxxxx0x x	R	0	
			Flag shall be set to 0bxxxxx1xx if the maximal increasing of the weight was exceeded				
			MaxDecrease Triggered 0bxxxx0xxx = not triggered 0bxxxx1xxx = triggered	0bxxxx0xx x	R	0	
			Flag shall be set t decreasing of	to 0bxxxx1xxx i the weight was			
0x20	TimeStamp	uint48	0x0000000000000 to 0xFFFFFFFFFFFFF	0x0000000 00000	R	0	
			Timestamp of the last	pressure meas	urement		

2.6.8.2 Supported Values and Configuration

Table 17: Supported attributes for pressure pro	ofile
-------------------------------------------------	-------

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/ 0
0x43	AlertLevel_1	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0
0X43	AlertLevel_1	Is the pres		t exceeding or un hall be generated	dercut an e	event
0x44	AlertLevel_2	uint16	0x0000 to 0xFFFF	0x0000	R/W	0
0.744	Alei (Levei_2	Is a press		undercut or exce nall be generated	eding an ev	vent
		uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0
0x45	HysteresisAlertLevel_1	The hysteresis of the AlertLevel_1 will prevent the syste to retrigger an alert message if the measured value is bouncing around the AlertLevel_1 or if configured the RealertDeltaLevel_1				is
		uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0
0x46	HysteresisAlertLevel_2	to retr	igger an alert me ng around the Ale	tLevel_2 will prev ssage if the meas rtLevel_2 or if co tDeltaLevel_2	ured value	is
047	Mayluguaga	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0
0x47	MaxIncrease			allowed for the p nessage shall be g		that
040	MauDaguaga	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0
0x48	MaxDecrease			ing allowed for th t message shall b		
		uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0
0x49	RealertDeltaLevel_1	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				
		uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0
0x4A	RealertDeltaLevel_2	press	ure is further incr e shall be genera	is exceeded or un easing or decreas ted each time the or the given delta	sing an aler	t

			AlertEnable Level_1 0bxxxxxx0 = not enabled 0bxxxxxx1 = enabled	0bxxxxxx0	R/W	0		
			initiate an event m	et to 0bxxxxxx1 nessage if the Ale ceeded or under	rtLevel_1 l			
			AlertEnable Level_2 Obxxxxx0x = not enabled Obxxxxx1x = enabled	0bxxxxxx0x	R/W	0		
			initiate an event m	was set to 0bxxxxx1x the profile shall rent message if the AlertLevel_2 limit was exceeded or undercut				
0x50	Flags	map8	RealertEnable Level_1 Obxxxxx0xx = not enabled Obxxxxx1xx = enabled	0bxxxxx0xx	R/W	0		
			initiate an event n	nessage each tim	xx1xx the profile shall th time the pressure has given delta relative to el_1			
			RealertEnable Level_2 0bxxxx0xxx = not enabled 0bxxxx1xxx = enabled	0bxxxx0xxx	R/W	0		
			initiate an event n	et to 0bxxxx1xxx nessage each tim ecreased a given AlertLevel_2	e the press	sure has		
			IncreaseAlert Enable Obxxx0xxxx = not enabled	0bxxx0xxxx	R/W	0		
			0bxxx1xxxx = enabled 0bxxx1xxxx if t increasing shall	he alert of the ma be enabled other				

			DecreaseAlert Enable					
			0bxx0xxxxx = not enabled	0bxx0xxxxx	R/W	0		
			0bxx1xxxxx = enabled					
			0bxx1xxxxx if tl decreasing shall l	he alert of the ma be enabled other				
			TriggerBelow Level_1					
			0bx1xxxxxx = trigger below	0bx0xxxxxx	R/W	0		
			0bx0xxxxxx = above					
				x an alert will be sutting the AlertL		on		
			llert will be trigg the AlertLevel_1.		ceeding			
			TriggerBelow Level_2					
			0b1xxxxxxx = trigger below	0b0xxxxxxx	R/W	0		
			0b0xxxxxxx = trigger above					
				x an alert will be utting the AlertL		on		
			If 0b0xxxxxx an a	llert will be trigg the AlertLevel_2.		ceeding		
		uint24	0x000000 to 0xFFFFFF	0x000000	R/W	М		
0x41	ReportingInterval	The allo	Reporting interval used by this endpoint. The allowed range depends on the underlying communication					
				rotocol.	-			
				n for this endpoir				
		uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	М		
0x42	MeasurementInterval	Measurement interval with which the pressure shall be measured.						
		The allowed range is set in milliseconds.						
		A Mea	surement interval of	f 0 will disable th	e measure	ement.		

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/0	
0x01	State	uint8	0x00 to 0x01 0x00 =no derailment 0x01 =derailment	0x00	R	М	
				ment was detected, ailment was detected			
0x20	TimeStamp	uint48	0x0000000000000000 to 0xFFFFFFFFFFFFFFFF	0x0000000000000	R	0	
		Timestamp of the last derailment measurement					

Table 19: Supported attributes for derailment profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/0	
			StateReport Enable				
0.50		0	0bxxxxxx0 = not enabled	0bxxxxxxx0	R/W	М	
0x50	Flags	map8	0bxxxxxx1 = enabled		n each state cha		
				set to 0bxxxxxx1 event message on e			
		uint24 0x000000 to 0xFFFFFF 0x000000		R/W	М		
0x41	ReportingInterval	Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol.					
		A reporting interval of 0 will disable synchronous data tran for this endpoint.					
		uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	М	
0x42	MeasurementInterval	Measurem			which the derailment shall be measured.		
		A Me		Γhe allowed range is set in milliseconds. ement 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 0bxxxxxx1.

Measuring the level shall be at least equal or faster corresponding to the set ReportingInterval. This profile is optional for end devices.

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/0
0x01	Level	uint8	0x00 to 0x64	0x00	R	М
0.01			Value Range Value Access M/ 3 0x00 to 0x64 0x00 R N Is the last measured level in percentage Is the last measured level in percentage N AlertTriggered Level_1 0bxxxxxx0 R 0 0bxxxxxx1 = exceeded 0bxxxxxx0 R 0 Flag shall be set on exceeding/undercutting the Level_2 0bxxxxx0x R 0 0bxxxxx1x = undercut 0bxxxxx0x R 0 Flag shall be set on exceeding/undercutting the Level_2 0bxxxxx0x R 0 0bxxxxx1x = undercut 0bxxxxx0x R 0 Flag shall be set on exceeding/undercutting the Level_2 0 0 MaxIncrease Triggered 0bxxxxx0x R 0 Obxxxxx1xx = triggered 0bxxxxx1xx if the maximal increasing of the filling level was exceeded 0			
			Level_1 0bxxxxxx0 = not exceeded 0bxxxxxx1 =	0bxxxxxx0	R	0
			Flag shall be set o		idercutting	g the
			Level_2 Obxxxxx0x= not undercut Obxxxxx1x	0bxxxxx0x	R	0
0.00		0	Flag shall be set o		dercutting	g the
0x02	Flags	map8	Triggered 0bxxxxx0xx = not triggered 0bxxxxx1xx =		R	0
			-			
			Triggered 0bxxxx0xxx = not triggered 0bxxxx1xxx =		R	0
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFFFF	0x0000000 0	R	0
			Timestamp of the la	st level measur	ement	·

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/0
		uint8	0x00 to 0x64	0x64	R/W	0
0x43	AlertLevel_1	TypeValue RangeDefault ValueAccessMuint80x00 to 0x640x64R/WIIs the filling level limit on that exceeding or undercut an evenessage shall be generateduint80x00 to 0x640x00R/WIs the filling level limit on that exceeding or undercut an evenessage shall be generateduint80x00 to 0x640x64R/WIs the filling level limit on that exceeding or undercut an evenessage shall be generateduint80x00 to 0x640x64R/WUint80x00 to 0x640x64R/WIIThe hysteresis of the AlertLevel_1 will prevent the system retrigger an alert message if the measured value is bounci around the AlertLevel_2 or if configured their realert leveluint80x00 to 0x640x64R/WThe hysteresis of the AlertLevel_2 will prevent the system retrigger an alert message if the measured value is bounci around the AlertLevel_2 or if configured their realert leveluint160x0000 to 0xFFFF0xFFFFR/WIs the maximum increasing allowed for the filling level on t exceeding an event message shall be generateduint160x000 to 0x640x64R/WIIs the maximum decreasing allowed for the filling level on t 		n event		
		uint8	0x00 to 0x64	0x00	R/W	0
0x44	AlertLevel_2	Is the fil				n event
		uint8	0x00 to 0x64	0x64	R/W	0
0x47	HysteresisAlertLevel_1	retrigg	er an alert message	e if the measured	value is bou	incing
		uint8	0x00 to 0x64	0x64	R/W	0
0x48	HysteresisAlertLevel_2	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				incing
040	Manlugueses	uint16		0xFFFF	R/W	0
0x49	MaxIncrease	Is the maximum increasing allowed for the filling level on th exceeding an event message shall be generated				
04.4	MarDannaa	uint16		0xFFFF	R/W	0
0x4A	MaxDecrease					on that
		uint8	0x00 to 0x64	0x64	R/W	0
0x4B	RealertDeltaLevel_1	level is f	urther increasing of erated each time t	or decreasing an a he filling level has	lert messag	ge shall
		uint8	0x00 to 0x64	0x64	R/W	0
0x4C	RealertDeltaLevel_2	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				ge shall
0x50	Flags	map8	AlertEnable Level_1 0bxxxxxx0 = not enabled 0bxxxxxx1 = enabled	0bxxxxxx0	R/W	0

initiate an event	et to 0bxxxxxx1 message if the A exceeded or und	lertLevel_	
AlertEnable Level_2 Obxxxxx0x = not enabled Obxxxxx1x = enabled	0bxxxxx0x	R/W	0
initiate an event	et to 0bxxxxxx1x message if the A exceeded or und	lertLevel_2	
RealertEnable Level_1 Obxxxx0xx = not enabled Obxxxxx1xx = enabled	0bxxxxx0xx	R/W	0
If this bit was se initiate an event has increased or		ne the fillir	ıg level
RealertEnable Level_2 Obxxxx0xxx = not enabled Obxxxx1xxx = enabled	0bxxxx0xxx	R/W	0
		ne the fillir	ıg level
IncreaseAlert Enable Obxxx0xxxx = not enabled Obxxx1xxxx = enabled	0bxxx0xxxx	R/W	0
0bxxx1xxxx if th increasing shall	e alert of the max be enabled other		
DecreaseAlert Enable Obxx0xxxxx = not enabled Obxx1xxxxx = enabled	0bxx0xxxxx	R/W	0

			0bxx1xxxxx if th decreasing shall	e alert of the max be enabled other		
			TriggerBelow Level_1			
			0bx1xxxxxx = trigger below	0bx0xxxxxx	R/W	0
			0bx0xxxxxx = above			
				x an alert will be cutting the AlertL		on
			If 0bx0xxxxxx an a	alert will be trigge the AlertLevel_1.	ered on ex	ceeding
			TriggerBelow Level_2			
			0b1xxxxxxx = trigger below	0b0xxxxxxx	R/W	0
			0b0xxxxxxx = trigger above			
				x an alert will be cutting the AlertL		on
			If 0b0xxxxxxx an a	alert will be trigge the AlertLevel_2.	ered on ex	ceeding
		uint24	0x000000 to 0xFFFFFF	0x000000	R/W	М
0x41	ReportingInterval	Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol.				
		A re	porting interval of 0 transmission) will disable sync n for this endpoir		lata
		uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	М
0x42	MeasurementInterval	Measurement interval with which the filling level shall be measured.				
		A Mea	The allowed rang surement interval of			ement.

 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.

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/0	
0x01	State	uint8	0x00 to 0x02 0x00 =closed 0x01 = open 0x02 = unknown	0x02	R	М	
		0x01 if cover/lid state is open, 0x00 if cover/lid is closed					
0x20	TimeStamp	uint32	0x0000000000000000 to 0xFFFFFFFFFFFFFFFF	0x0000000000000	R	М	
		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/0		
			StateReport Enable					
0.50		0	0bxxxxxx0 = not enabled	0bxxxxxx0	R/W			
0x50	Flags	map8	0bxxxxxx1 = enabled					
				et to 0bxxxxxx1 ent message on e				
		uint24	0x000000 to 0xFFFFFF	0x000000	R/W	М		
		Reporting interval used by this endpoint.						
0x41	ReportingInterval	The allowed range depends on the underlying communication protocol.						
		A reporting interval of 0 will disable synchronous data transmissio for this endpoint.						
		uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	М		
0x42	MeasurementInterval	Measurement interval with which the cover/lid state shall be measured.						
			The allowed ran	ge is set in millis	econds.			
		A Mea	asurement interval o	f 0 will disable th	ne measureme	ent.		

Table 24: Supported configuration	for cover/Lid profile
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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/0		
0x01	State	uint8	0x00 to 0x02 0x00 =closed 0x01 = open 0x02 = unknown	0x02	R	М		
		0x01 if Valve is open, 0x00 if valve is closed						
0x20	TimeStamp	uint48	0x0000000000000 to 0xFFFFFFFFFFFFFF	0x0000000000000	R	М		
		Timestamp of the last weight measurement						

Table 25: Supported attributes for valve profile

Attribute	Value Type Value Range		Default Value	Access	M/0		
		StateReport Enable					
		0bxxxxxx0 = not enabled	0bxxxxxx0	R/W	М		
Flags	map8	0bxxxxxx1 = enabled					
		If this bit was set to 0bxxxxxx1 the endpoint shall initiate an event message on each state change					
	uint24	0x000000 to 0xFFFFFF	0x000000	R/W	М		
x41 ReportingInterval		Reporting interval used by this endpoint. The allowed range depends on the underlying communication protocol.					
	A re				lata		
	uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	М		
MeasurementInterval	Measurement interval with which the valve state shall be measured.						
	A Mea		0		ement.		
	Flags ReportingInterval	Attribute Type Flags map8 Flags uint24 ReportingInterval The allo Are uint32 MeasurementInterval MeasurementInterval	AttributeTypeValue RangeFlagsStateReport EnableStateReport EnableFlagsmap8StateReport enabledFlagsmap8StateReport enabledIf this bit was se initiate an even initiate an even Unit24If this bit was se initiate an even Ox000000 to OxFFFFFFReportingIntervaluint24Ox000000 to OxFFFFFFReporting IntervalReporting interval of transmissionMeasurementIntervalMeasurement interval with m The allowed range	AttributeTypeValue RangeValueTypeTypeStateReport Enable 0bxxxxxx0 = not enabled 0bxxxxxx1 = enabled0bxxxxxx0 = 0bxxxxxx0Flagsmap8StateReport Enable 0bxxxxxx1 = enabled0bxxxxxx0 = 0bxxxxxx1 = enabledReportingIntervaluint240x000000 to 0xFFFFF The allowed range depends on the underlyin protocol.0x0000000Reporting intervaluint320x00000000 to 0xFFFFFFF0x0000000 outlisable syn transmission for this endpoindMeasurementIntervalMeasurement interval with which the value measured. The allowed range is set in millis0x0000000	AttributeTypeValue RangeValueAccessTypeTypeValueValueAccessFlagsStateReport Enable 0bxxxxxx0 = not enabled 0bxxxxxx1 = enabled0bxxxxxx0R/WFlagsIf this bit was set to 0bxxxxxx1 the endpoint initiate an event message on each state chReportingIntervaluint240x000000 to 0xFFFFFF0x000000ReportingIntervaluint240x0000000 to 0xFFFFFF0x000000A reporting interval used by this endpoint. The allowed range depends on the underlying commun protocol.Areporting interval of 0 will disable synchronous of transmission for this endpoint.MeasurementIntervalMeasurement interval with which the valve state sh		

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 0bxxxxxx1.

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

This profile is optional for end devices.

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/0
0x01	Tomporaturo	uint16	0x8000 to 0x7FFF	0x0000	R	М
0X01	Temperature	Is the last measured temperature in degree Celsius				
			AlertTemp Level_1 Obxxxxxx0 = not exceeded Obxxxxxx1 = exceeded	0bxxxxxx0	R	0
0.00	Flore	Flag shall be set to 0bxxxxxx1 on exceeding AlertLevel_1 limit				5
0x02	Flags	map8	MaxIncrease Triggered Obxxxxx0x = not triggered Obxxxxx1x = triggered	0bxxxxx0x	R	0
			Flag shall be set to Ol of the ten	oxxxxxx1x if the manperature was exce		easing
0x20	TimeStamp	uint48	0x000000000000 to 0xFFFFFFFFFFFFFF	0x00000000	R	0
			Timestamp of the last	temperature measu	ırement	

2.6.13.2 Supported Values and Configuration

Table 27: Supported attributes for hot box profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/0		
		int16	0x8000 to 0x7FFI	F 0x7FFF	R/W	0		
0x43	AlertLevel_1	Is the 1	Femperature limit on	that exceeding an event n generated	nessage sha	ll be		
		uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0		
0x45	HysteresisAlertLevel_1		ssage if the measured	vel_1 will prevent the syste l value is bouncing arounc ed their RealertDeltaLevel	l the Level_	vel_1 limit		
0x47	Maylnanoooo	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0		
0x47	MaxIncrease	Is th		ng allowed for the temper ent message shall be gener		at		
		uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0		
0x4B	RealertDeltaLevel_1		creasing an alert mess	exceeded but the tempera sage shall be generated ea is changed for the given de	ch time the			
			AlertEnable Level_1 0bxxxxxx0 = not enabled 0bxxxxxx1 = enabled	0bxxxxxx0	R/W	0		
				to 0bxxxxxx1 the profile age if the AlertLevel_1 was		te an		
0x50	Flags	map8	RealertEnable Level_1 0bxxxxx0xx = not enabled 0bxxxxx1xx = enabled	0bxxxxx0xx	R/W	0		
			event message each	to 0bxxxxx1xx the profile a time the temperature is f fter the AlertLevel_1 was e	further incr	easing		
			AlertIncrease Enable					
			0bxx0xxxxx = not enabled	0bxx0xxxxx	R/W	0		
			0bxx1xxxxx = enabled					
				lert of the maximal tempe abled otherwise 0bxx1xx		easing		

		uint24	0x000000 to 0xFFFFFF	0x000000	R/W	М	
0x41	ReportingInterval	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.					
		uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	М	
0x42	MeasurementInterval		ement interval with whic The allowed rang Measurement interval of	e is set in milliseconds		ured.	

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 0b0xxxxxx.

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
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Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/ 0
0x01	Distance	uint16	0x0000 to 0xFFFF Binary statement: 0x0000 = min 0xFFFF = max	0x0000	R	М
			measured distance i in and max values ir ; if loaded (maximur (minimum,	a case of a binar	y load sens d) or unload	or,
			Inverted mounting Obxxxxxx0 = not inverted Obxxxxxx1 = inverted	0bxxxxxx0	R	М
0x02 Flags			Flag shall be se	t, if distance fal deflection	l) or unloaded R M s with higher R M c only provide a exact distance n or max value, he threshold in	
	Flags	map8	Is binary 0bxxxxx0x = is integer 0bxxxxx1x = is binary	0bxxxxx0x		М
		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	0x00000000000 0 to 0xFFFFFFFFFF F	0x0000000 00000	R	0
		T	imestamp of the last	deflection mea	surement	

able 29: Supported attributes for deflection profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/0	
		uint24	0x000000 to 0xFFFFFF	0x000000	R/W	М	
0x41	ReportingInterval	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.					
		uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	М	
0x42	MeasurementInterval	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 0bxxxxxx1.

2.7.1.1 Supported Values and Configuration

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/0		
0x01	State	uint8	0x00 to 0x02 0x00 = Low 0x01 = High 0x02 = unknown	0x02	R	М		
		-	x02 will indicate that the he values 0x01 and 0x00					
0x20	TimeStamp	uint48	0x0000000000000 to 0xFFFFFFFFFFFFFF	0x0000000000000	R	М		
		Timestamp of the last measurement						

Table 31: Supported attributes for digital sensor profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/0		
			StateReport Enable					
			0bxxxxxx0 = not enabled	0bxxxxxx0	R/W	М		
0x50	Flags	map8	0bxxxxxx1 = enabled					
			If this bit was set to 0bxxxxxx1 the endpoint shall initiate an event message on each state change					
	uint24		0x000000 to 0xFFFFFF	0x000000	R/W	М		
0x41	ReportingInterval		Reporting i	nterval used by this endpoi	int.			
		The allow	wed range depend	s on the underlying commu	inication p	rotocol.		
		A report	ing interval of 0 w	ill disable synchronous dat this endpoint.	a transmiss	sion for		
		uint32	0x00000000 to 0xFFFFFFFF	0x0000000	R/W	М		
0x42	MeasurementInterval	Measurement interval with which the digital state shall be measured.						
			The allowe	d range is set in millisecon	ds.			
		A	Measurement inte	rval of 0 will disable the me	easurement	t.		

Table 32: Supported con	nfiguration for	r digital sensor profi	le
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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/0
0x01	Value	int16	0x0000 to 0xFFFF	0x0000	R	0
			Shows the me	easured value		
			AlertTriggered Level_1			
			0bxxxxxx0 = not exceeded	0bxxxxxx0	R	0
			0bxxxxxx1 = exceeded			
			Flag shall be set	on exceeding/ur Level_1	ndercuttin	g the
			AlertTriggered Level_2			
	Flags		0bxxxxx0x= not undercut	0bxxxxxx0x	R	0
			0bxxxxx1x =undercut			
0x02		map8	map8 Flag shall be set on exceeding/undercutting the Level_2			
			MaxIncrease Triggered			
			0bxxxxx0xx = not triggered	0bxxxxx0xx	R	0
			0bxxxxx1xx = triggered			
			Flag shall be set to 0bxxxxx1xx if the maximal increasing of the measured value was exceeded			
			MaxDecrease Triggered			
			0bxxxx0xxx = not triggered	0bxxxx0xxx	R	0
			0bxxxx1xxx = triggered			

			Flag shall be set to 0bxxxx1xxx if the maximal decreasing of the measured value was exceeded				
0x20	0x20 TimeStamp	uint48	0x00000000000 0 to 0xFFFFFFFFFFF F	0x00000000 0000	R	0	
		Time	estamp of the last te	mperature measu	urement		

Table 33: Supported attributes for analog sensor profile

Attr. ID	Attribute	Value Type	Value Range	Default Value	Access	M/0	
0x43	AlertLevel_1	int16	0x8000 to 0x7FFF	0x7FFF	R/W	0	
0X43	Alei (Level_1	Is the f	message sh	all be			
0x44	AlertLevel_2	int16	0x8000 to 0x7FFF	0x8000	R/W	0	
0244	Alei (Level_2	Is the is	s the second level on shall b	that exceeding be generated	an event me	ssage	
0x45	MaxIncrease	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0	
0245	Maxinciease		ne value on t generated	hat			
046	MauDoanaga	uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0	
0x46	MaxDecrease		e maximum decreasi exceeding an event r			hat	
		uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0	
0x47	HysteresisAlertLevel_1	Hysteresis for the AlertLevel_1 or if configured their RealertDeltaLevel_1					
0x48		uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0	
0X40	HysteresisAlertLevel_2	Ну	steresis for the Alert Realer	tLevel_2 or if cor tDeltaLevel_2	nfigured thei	ir	
		uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0	
0x49	RealertDeltaLevel_1	increas	he AlertLevel_1 was sing or decreasing ar ch time the value ha	n alert message s	hall be gene	rated	
		uint16	0x0000 to 0xFFFF	0xFFFF	R/W	0	
0x4A	RealertDeltaLevel_2	Once the AlertLevel_2 was triggered but the value is further increasing or decreasing an alert message shall be gen each time the value has changed for the given delivered by the second secon					
0x50	Flags	map8	AlertEnable Level_1 0bxxxxxx0 = not enabled 0bxxxxxx1 = enabled	0bxxxxxx0	R/W	0	

initiate an even	et to 0bxxxxxx1 t message if the A xceeded/underco	Alertlevel_1	
AlertEnable Level_2 Obxxxxx0x = not enabled Obxxxxx1x =	0bxxxxx0x	R/W	0
initiate an event	et to 0bxxxxx1x message if the A xceeded/underco	lertLevel_2	
RealertEnable Level_1 Obxxxx0xx = not enabled Obxxxx1xx = enabled	0bxxxxx0xx	R/W	0
initiate an event increased/o	et to 0bxxxxx1xx message each ti decreased a giver indercutting the	me the valu n delta after	e has
RealertEnable Level_20bxxxx0x xx = not enabled 0bxxxx1xxx = enabled	0bxxxx0xxx	R/W	0
initiate an event increased/o	et to Obxxxx1xxx message each ti lecreased a given ndercutting the	me the value n delta after	e has
AlertIncrease Enable0bxxx0xx xx = not enabled 0bxxx1xxxx = enabled	0bxxx0xxxx	R/W	0
0bxxx1xxxx if al value increasing	erting on exceed is enabled other		
AlertDecrease Enable Obxx0xxxxx = not enabled Obxx0xxxxx = enabled	0bxx0xxxxx	R/W	0
0bxx0xxxxx if al	erting on exceed lecreasing is ena 0bxx0xxxxx		

			TriggerBelow Level_1 0bx1xxxxx = below 0bx0xxxxx = above	0bx0xxxxxx	R/W	0	
		If 0bx1xxxxx an alert will be triggered on undercutting the Level_1. If 0bx0xxxxxx an alert will be triggered on exceedin the Level_1.					
			TriggerBelow Level_2 0b1xxxxxx = trigger below 0b0xxxxxx = trigger above	0b0xxxxxxx	R/W	0	
			undero If 0b0xxxxxx an a	x an alert will be cutting the AlertL alert will be trigg the AlertLevel_2.	evel_2.		
		uint24	0x000000 to 0xFFFFFF	0x000000	R/W	М	
0x41	ReportingInterval	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.					
		uint32	0x00000000 to 0xFFFFFFFF	0x00000000	R/W	М	
0x42	MeasurementInterval	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.