

LoRaWAN™ IP68 PULSE READER + ANALOG UM3023



LoRaWAN™ IP68 pulse reader, enables acquisition of data from the pulse emitting devices and analog interfaces and transmits it wirelessly to the LoRaWAN™ network.

LoRaWAN™ IP68 pulse reader is meant to be connected to the existing devices' pulse or analog signal output. It is powered by a long-life battery.

OVERVIEW

Efficient

LoRaWAN™ IP68 Pulse Reader has a bidirectional, battery powered, long-range transceiver with low power consumption.

Intelligent

Real-time usage data is gathered wirelessly and processed automatically. Data is accessible from your LoRaWAN™ provider.

APPLICATIONS

Pulse metering

Frequent reporting provides a detailed usage overview. Can be used with any pulse emitting device (water, electricity, gas meter, etc.).

Analog measurement

Possible to read both 0..10V & 4mA..20mA devices with configurable thresholds

Usage detection

LoRaWAN™ Outdoor Pulse Reader can be configured to trigger mode to send alerts when usage is detected.

FEATURES

- Long range wireless data transmission
- Pulse counting
- 4..20mA interface
- 0..10V interface
- Pre-installed long-life battery
- Built-in antenna
- DIN rail mount
- Trigger mode
- Configurable reporting interval
- Maintenance free - install & forget
- Easy installation
- Average life 8 years*
- Secure communication
- Thresholds

* Lifetime depends from the device location and reporting interval.

SPECIFICATIONS

Length:	109 mm
Height:	27 mm
Width:	27 mm
Weight:	72 g
Cable length:	1 m
Operating temperature:	-20°C ... +65°C
Communication range:	up to 15 km*
Tx power:	up to +20 dBm
Rx Sensitivity:	-142 dBm
MAC Layer:	LoRaWAN™
Physical Layer:	LoRa®
Connector:	M8
Body material:	PA6
IP Rating:	IP68
Communication:	LoRaWAN™

* Communication range is dependent on the location of the sensor and nearest base station.

INPUT SPECIFICATIONS

Digital	Max Frequency:	15 Hz
	(Dry contact) Pulled internal to:	3 V
	(Active contact) Max voltage:	6 V
Analog	(4mA..20mA) Max input current:	30mA
	(0V..10V) Max input voltage:	20V

COMMUNICATION

Bit order:	LSB
Usage reporting:	Unconfirmed messages
Status reporting:	Confirmed messages

PORT LIST

fPort	Usage	Transmission	Page
24	Status	↑↑	5
25	Usage	↑↑	10
49	Config request	↑↓	15
50	Configuration	↓↓	23
51	Update mode	↓↓	31
99	Boot/Debug	↑↑	32

For FW version >= 0.7.0

fPort 24 Status Message

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte ..	Byte n
Interface map	Battery	Temp	RSSI	Interface status blocks		
	uint8 (mapped)*	int8 (°C)	int8 (dBm)	Described below		

Bit #	Parameter	Value
0	Digital 1	0 - not sent 1 - sent
1	Digital 2	
2	Analog 1	
3	Analog 2	n/a
4	SSI	
5	MBus	
6	User triggered	0 - false 1 - true
7	RFU	

Interface values are reported according to the interface map in the order defined in the interface map

* depends from the battery type. (reported in boot message)

Status message can be triggered with 1 second magnet switch (same place as activating). The time between two consecutive packets is dependent of the duty cycle. If the message is triggered too often, it will go to lockdown for 1 hour. It will still be working as meant to, but will not send any data.

Digital interface status block

r Byte 0	r Byte 1	r Byte 2	r Byte 3	r Byte 4
Settings	Counter			
	uint32			

Bit #	Parameter	Value
0	Value during reporting	0 - low 1 - high
1	Trigger mode	0 - disabled 1 - enabled
2	Trigger alert	0 - no 1 - alert
3	RFU	
4	Medium type	
5		
6		
7		

Value	Parameter
00	n/a
01	Pulses
02	Water in L
03	Electricity in Wh
04	Gas in L
05	Heat in Wh
..	RFU
0F	RFU

Analog interface status block

r Byte 0	r Byte 1	r Byte 2	r Byte 3	r Byte 4	r Byte 5	r Byte 6	r Byte 7	r Byte 8
Settings	Instant value*				Average value*			
	Float IEEE 754				Float IEEE 754			

Bit #	Parameter	Value
0	Mode	0 - 0..10V 1 - 4..20mA
1	Threshold alert	0 - ok 1 - alert
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	Instant value*	0 - not reported 1 - reported
7	Average value*	

* Instant and Average value block are only sent when the according flag is set to reported in the Settings byte.

Message sample

Message in base64

```
D/YaSxIBAAAAEMQJAABAOCfgQEFAyddA
```

Message decoded to HEX

```
0F|F6|1A|4B|12|01|00|00|00|10|C4|09|00|00|40|B9|C1|60|40|41|40|C9|D7|40
```

Interface map HEX message

```
0x0F
```

Interface map HEX message converted to binary

```
0b00001111
```

Binary converted to statuses (LSB)

```
1 : Digital 1 - sent
1 : Digital 2 - sent
1 : Analog 1 - sent
1 : Analog 2 - sent
0 : RFU - n/a
0 : RFU - n/a
0 : User triggered - no
0 : RFU - n/a
```

Sensor Battery HEX message

```
0xF6
```

HEX message converted to decimal

```
246
```

Decimal value mapped to voltage

```
3.646 (V)
```

Sensor Tempertaure HEX message

```
0x1A
```

HEX message converted to signed decimal

```
26 (°C)
```

Sensor RSSI HEX message

```
0x4B
```

HEX message converted to decimal

```
75
```

Decimal value multiplied by -1

```
-75 (dBm)
```

Digital 1 settings HEX message

0x12

Interface map HEX message converted to binary

0b00010010

Binary converted to statuses (LSB)

```
0 : Value during reporting - 0
1 : Trigger mode - true
0 : Alert - no
0 : RFU - n/a
1 : Medium type [0b0001]
0 :
0 :
0 :
```

Medium type binary value converted to HEX

0x01

HEX message converted to medium

Pulses

Counter 0x01000000 HEX message flip for MSB

0x00000001

HEX message converted to decimal

1 (Pulse/Trigger)

Digital 2 settings HEX message

0x10

Interface map HEX message converted to binary

0b00010000

Binary converted to statuses (LSB)

```
0 : Value during reporting - 0
0 : Trigger mode - false
0 : Alert - no
0 : RFU - n/a
1 : Medium type [0b0001]
0 :
0 :
0 :
```

Medium type binary value converted to HEX

0x01

HEX message converted to medium

Pulses

Counter `0xC4090000` HEX message flip for MSB

`0x000009C4`

HEX message converted to decimal

`2500 (Pulses)`

Analog 1 settings HEX message

`0x40`

Interface map HEX message converted to binary

`0B01000000`

Binary converted to statuses (LSB)

```
0 : Mode - 0..10V
0 : Alert - false
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
1 : Instant value - reported
0 : Average value - not reported
```

Instant value `0x39C16040` HEX message flip for MSB

`0x4060C139`

HEX message converted to float IEEE 754

`3.512 (V)`

Analog 2 settings HEX message

`0x41`

Interface map HEX message converted to binary

`0B01000001`

Binary converted to statuses (LSB)

```
1 : Mode - 4..20mA
0 : Alert - false
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
1 : Instant value - reported
0 : Average value - not reported
```

Instant value `0x40C9D740` HEX message flip for MSB

`0x40D7C940`

HEX message converted to float IEEE 754

`6.743 (mA)`

fPort 25 Usage Message

Byte 0	Byte 1	Byte ..	Byte n
Settings	Interface usage blocks		
	Described below		

Bit #	Parameter	Value
0	Digital 1	0 - not sent 1 - sent
1	Digital 2	
2	Analog 1	
3	Analog 2	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

Interface values are reported according to the intercaace map in the order defined in the interface map

Digital interface usage block

r Byte 0	r Byte 1	r Byte 2	r Byte 3	r Byte 4
Settings	Counter			
	uint32			

Bit #	Parameter	Value
0	Value during reporting	0 - low 1 - high
1	Trigger mode	0 - disabled 1 - enabled
2	RFU	
3	RFU	
4	Medium type	
5		
6		
7		

Value	Parameter
00	n/a
01	Pulses
02	Water in L
03	Electricity in Wh
04	Gas in L
05	Heat in Wh
..	RFU
0F	RFU

Analog interface usage

r Byte 0	r Byte 1	r Byte 2	r Byte 3	r Byte 4	r Byte 5	r Byte 6	r Byte 7	r Byte 8
Settings	Instant value*				Average value*			
	Float IEEE 754				Float IEEE 754			

Bit #	Parameter	Value
0	Mode	0 - 0..10V 1 - 4..20mA
1	RFU	
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	Instant value*	0 - not reported 1 - reported
7	Average value*	

* Instant and Average value block are only sent when the according flag is set to reported in the Settings byte.

Message sample

Message in base64

```
DxIBAAAAEAAAAADA2jZcQAt+XkDBQMnXQNxz2UA=
```

Message decoded to HEX

```
0F12010000001000000000C0DA365C400B7E5E40C140C9D740DC73D940
```

Interface map HEX message

```
0x0F
```

Interface map HEX message converted to binary

```
0b00001111
```

Binary converted to statuses (LSB)

```
1 : Digital 1 - sent
1 : Digital 2 - sent
1 : Analog 1 - sent
1 : Analog 2 - sent
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
```

Digital 1 settings HEX message

```
12
```

Interface map HEX message converted to binary

```
0b00010010
```

Binary converted to statuses (LSB)

```
0 : Value during reporting - 0
1 : Trigger mode - true
0 : Alert - no
0 : RFU - n/a
1 : Medium type [0b0001]
0 :
0 :
0 :
```

Medium type binary value converted to HEX

```
0x01
```

HEX message converted to medium

```
Pulses
```

Counter

```
0x01000000
```

 HEX message flip for MSB

```
0x00000001
```

HEX message converted to decimal

```
1 (Pulse/Trigger)
```

Digital 2 settings HEX message

0x10

Interface map HEX message converted to binary

0b00010000

Binary converted to statuses (LSB)

```
0 : Value during reporting - 0
0 : Trigger mode - false
0 : Alert - no
0 : RFU - n/a
1 : Medium type [0b0001]
0 :
0 :
0 :
```

Medium type binary value converted to HEX

0x01

HEX message converted to medium

Pulses

Counter 0x00000000 HEX message flip for MSB

0x00000000

HEX message converted to decimal

0 (Pulses)

Analog 1 settings HEX message

0xC0

Interface map HEX message converted to binary

0b11000000

Binary converted to statuses (LSB)

```
0 : Mode - 0..10V
0 : Alert - false
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
1 : Instant value - reported
1 : Average value - reported
```

Instant value 0xDA365C40 HEX message flip for MSB

0x405C36DA

HEX message converted to float IEEE 754

3.441 (V)

Average value 0x0B7E5E40 HEX message flip for MSB

0x405E7E0B

HEX message converted to float IEEE 754

3.476 (V)

Analog 2 settings HEX message

0xC1

Interface map HEX message converted to binary

0B11000001

Binary converted to statuses (LSB)

```
1 : Mode - 4..20mA
0 : Alert - false
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
1 : Instant value - reported
1 : Average value - reported
```

Instant value 0x40C9D740 HEX message flip for MSB

0x40D7C940

HEX message converted to float IEEE 754

6.743 (mA)

Average value 0xDC73D940 HEX message flip for MSB

0x40D973DC

HEX message converted to float IEEE 754

6.795 (mA)

fPort 49 Configuration Request Message

Byte 0	Operation
00	General config request

Message sample

Message goal: Request device configuration

Header

Select Header HEX code

0x00

Compile message for sending (HEX)

0x00

Control value in base64 to control after sending

AA==

Response

Sent to fPort 49 in the following format

General configuration

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte n
Header	Usage interval		Status interval		Config. map	Interface map	Interface config blocks
00	uint16 (min)		uint16 (min)				Described below

Bit #	Parameter	Value
0	usage sent	0 - if new data 1 - always
1	RFU	
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

Bit #	Parameter	Value
0	Digital 1	0 - disabled 1 - enabled
1	Digital 2	
2	Analog 1	
3	Analog 2	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

Digital interface configuration block

Bit #	Parameter	Value
0	Trigger mode	0 - disabled 1 - enabled
1	RFU	
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	Trigger lenght	
7		

Value	Parameter
00	1 sec
01	10 sec
02	1 min
03	1 h

r Byte 0	r Byte 1	r Byte 2	r Byte 3	r Byte 4	r Byte 5
Configuration	Mode	Multiplier			
Float IEEE 754*					

Bit #	Parameter	Value
0	Interface enabled	1 - enabled
1	Mode	1 - sent
2	Multiplier	0 - not sent 1 - sent
3	RFU	
4	Medium type	
5		
6		
7		

Value	Parameter
00	n/a
01	Pulses
02	Water in L
03	Electricity in Wh
04	Gas in L
05	Heat in Wh
..	RFU
0F	RFU

Analog interface configuration block

Bit #	Parameter	Value
0	Sampling rate	0 - 1 min (default) 1 - 1 sec*
1	Mode	0 - 0..10V 1 - 4..20mA
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

r Byte 0	r Byte 1	r Byte 2	r Byte 3	r Byte 4	r Byte 5	r Byte 6	r Byte 7	r Byte 8	r Byte 9	r Byte 10
Config. map	General config.	Parameter config.	Low threshold**				High threshold**			
			Float IEEE 754				Float IEEE 754			

Bit #	Parameter	Value
0	Interface	1 - enabled
1	General config.	1 - sent
2	Parameter config.	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

Bit #	Parameter	Value
0	Alert	0 - disabled 1 - enabled
1	Alert thresholds**	0 - not sent 1 - both sent
2	Usage instant value	0 - do not report 1 - report
3	usage average value	
4	RFU	
5	RFU	
6	Alert trigger sample count	
7		

Value	Parameter
00	1 X
01	3 X
02	10 X (default)
03	100 X

* Using the 1 sec interval will shorten the battery life significantly

** Only sent when the threshold flag is set in the Parameter config byte.

Message sample

Message in base64

```
ADwAoAAADAcBTwAAAEAAAIBABwNPAACgQAAAAEE=
```

Message decoded to HEX

```
003C00A000000C07014F000000400000804007034F0000A04000000041
```

Header 00 decoded

```
Response for general configuration request
```

Usage interval 0x3C00 HEX message flip for MSB

```
0x003C
```

HEX message converted to decimal

```
60 (Minutes)
```

Status interval 0xA000 HEX message flip for MSB

```
0x00A0
```

HEX message converted to decimal

```
160 (Minutes)
```

Configuration map HEX message

```
0x00
```

Interface map HEX message converted to binary

```
0B00000000
```

Binary converted to configuration (LSB)

```
0 : Usage sent - only if new data
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
```

Interface map HEX message

```
0x0C
```

Interface map HEX message converted to binary

```
0B00001100
```

Binary converted to statuses (LSB)

```
0 : Digital 1 - disabled
0 : Digital 2 - disabled
1 : Analog 1 - enabled
1 : Analog 2 - enabled
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
```

Analog 1 configuration map HEX message

0x07

Interface map HEX message converted to binary

0b00000111

Binary converted to configuration (LSB)

```
1 : Interface - enabled
1 : General config - sent
1 : Parameter config - sent
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
```

Analog 1 general configuration map HEX message

0x01

Interface map HEX message converted to binary

0b00000001

Binary converted to configuration (LSB)

```
1 : Sampling rate - 1 second
0 : Mode - 0..10V
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
```

Analog 1 parameter configuration map HEX message

0x4F

Interface map HEX message converted to binary

0b01001111

Binary converted to configuration (LSB)

```
1 : Alert - enable
1 : Alert threshold - sent
1 : Instant value in usage message - reported
1 : Average value in usage message - reported
0 : RFU - n/a
0 : RFU - n/a
1 : Alert trigger sample count [0b01]
0 :
```

Trigger sample count binary value converted to HEX

0x01

HEX message converted to count

3 times (to trigger)

Analog 1 low threshold value 0x00000040 HEX message flip for MSB

0x40000000

HEX message converted to float IEEE 754

2.0 (V)

Analog 1 high threshold value 0x00008040 HEX message flip for MSB

0x40800000

HEX message converted to float IEEE 754

4.0 (V)

Analog 2 configuration map HEX message

0x07

Interface map HEX message converted to binary

0b00000111

Binary converted to configuration (LSB)

```
1 : Interface - enabled
1 : General config - sent
1 : Parameter config - sent
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
```

Analog 2 general configuration map HEX message

0x03

Interface map HEX message converted to binary

0b00000011

Binary converted to configuration (LSB)

```
1 : Sampling rate - 1 second
1 : Mode - 4..20mA
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
```

Analog 2 parameter configuration map HEX message

0x4F

Interface map HEX message converted to binary

0_B01001111

Binary converted to configuration (LSB)

```
1 : Alert - 1enabled
1 : Alert threshold - sent
1 : Instant value in usage message - reported
1 : Average value in usage message - reported
0 : RFU - n/a
0 : RFU - n/a
1 : Alert trigger sample count [0B01 ]
0 :
```

Trigger sample count binary value converted to HEX

0x01

HEX message converted to count

3 times (to trigger)

Analog 2 low threshold value 0x0000A040 HEX message flip for MSB

0x40A00000

HEX message converted to float IEEE 754

5.0 (mA)

Analog 2 high threshold value 0x00000041 HEX message flip for MSB

0x41000000

HEX message converted to float IEEE 754

8.0 (mA)

fPort 50 Configuration Message

Byte0	Byte ...	Byte n
Header	Payload	

Different headers with their respective payloads are described below

General configuration

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
Header	Configuration	Usage interval		Status interval		Usage config.
0x00		uint16 (min)		uint16 (min)		

Bit #	Function	Value
0	Usage interval	0 - not sent 1 - sent
1	Status interval	
2	Usage config.	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

Bit #	Function	Value
0	Usage without new data	0 - not sent 1 - sent
1	RFU	
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

Message sample

Message goal: Set usage reporting to 2 hour and to be sent even without new data.

Header

Select Header HEX code

0x00

Configuration

Configuration selection

```
1 : Usage interval - sent
0 : Status interval - not sent
1 : Usage configuration - sent
0 : RFU
0 : RFU
0 : RFU
0 : RFU
0 : RFU
```

Selection converted to binary

0b00000101

Selection converted to HEX

0x05

Usage reporting interval

Convert interval 120 to HEX

0x78

Flip HEX value to LSB

0x7800

Usage configuration selection

```
1 : send usage - always
0 : RFU
0 : RFU
0 : RFU
0 : RFU
0 : RFU
0 : RFU
0 : RFU
```

Selection converted to binary

0b00000001

Selection converted to HEX

0x01

Compile message for sending (HEX)

```
0005780001
```

Control value in base64 to control after sending

```
AAV4AAE=
```

Interface configuration

Byte 0	Byte 1	Byte 2	Byte ..	Byte n
Header	Settings	Interface configuration blocks		
0x01		Described below		

Bit #	Parameter	Value
0	Digital 1 reporting	0 - not sent 1 - configured
1	Digital 2 reporting	
2	Analog 1 reporting	
3	Analog 2 reporting	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

Digital interface configuration block

Bit #	Parameter	Value
0	Trigger mode	0 - disabled 1 - enabled
1	RFU	
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	Trigger lenght*	
7		

Value	Parameter
00	1 sec
01	10 sec
02	1 min
03	1 h

r Byte 0	r Byte 1	r Byte 2	r Byte 3	r Byte 4	r Byte 5	r Byte 6	r Byte 7	r Byte 8	r Byte 9
Configuration	Mode	Multiplier**			True reading				
		Float IEEE 754 (pulses in unit)			uint32 (units)				

Bit #	Parameter	Value
0	Interface enable***	0 - disable 1 - enable
1	Mode	0 - not sent 1 - configured
2	Multiplier	
3	True reading	
4	Medium type****	
5		
6		
7		

Value	Parameter
00	n/a
01	Pulses
02	Water in L
03	Electricity in Wh
04	Gas in L
05	Heat in Wh
..	RFU
0F	RFU

* Configured together with Trigger mode. Otherwise must be 00

** Multiplier is sent together with Unit type and True reading. In trigger mode Unit type is invalid and entire packet is discarded.

*** Disabled interface can not have any other configuration

**** Configured together with Multiplier. Otherwise must be 00

Analog interface configuration block

Bit #	Parameter	Value
0	Sampling rate	0 - 1 min (default) 1 - 1 sec*
1	Mode	0 - 0..10V 1 - 4..20mA
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

r Byte 0	r Byte 1	r Byte 2	r Byte 3	r Byte 4	r Byte 5	r Byte 6	r Byte 7	r Byte 8	r Byte 9	r Byte 10
Config. map	General config.	Parameter config.	Low threshold**				High threshold**			
			Float IEEE 754 0xFFFFFFFF (NaN) - disabled				Float IEEE 754 0xFFFFFFFF (NaN) - disabled			

Bit #	Parameter	Value
0	Interface	0 - disable 1 - enabled
1	General config.	0 - not sent 1 - sent
2	Parameter config.	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

Bit #	Parameter	Value
0	Alert	0 - disabled 1 - enabled
1	Alert thresholds**	0 - not sent 1 - both sent
2	Usage instant value	0 - do not report 1 - report
3	usage average value	
4	RFU	
5	RFU	
6	Alert trigger sample count	
7		

Value	Parameter
00	1 X
01	3 X
02	10 X (default)
03	100 X

* Using the 1 sec interval will shorten the battery life significantly

** Only sent when the threshold flag is set in the Parameter config byte.

Message sample

Message goal: Configure Analog interface 2 to 4..20mA mode. Set low threshold alert to 12mA. Set alert trigger to 3rd sample (out of threshold bounds). Report instant value in usage message.

Header

Select Header HEX code

```
0x01
```

Configuration

Interface selection

```
0 : Digital 1 - not sent
0 : Digital 2 - not sent
0 : Analog 1 - not sent
1 : Analog 2 - configured
0 : RFU
0 : RFU
0 : RFU
0 : RFU
```

Selection converted to binary

```
0b00001000
```

Selection converted to HEX

```
0x08
```

Analog 2 configuration selection

```
1 : Interface - enable
1 : General configuration - sent
1 : Parameter configuration - sent
0 : RFU
0 : RFU
0 : RFU
0 : RFU
0 : RFU
```

Selection converted to binary

```
0b00000111
```

Selection converted to HEX

```
0x07
```

Analog 2 general configuration selection

```
0 : Sampling rate - 1 minute
1 : Mode - 4..20mA
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
```

Selection converted to binary

```
0b00000010
```

Selection converted to HEX

```
0x02
```

Analog 2 parameter configuration selection

```
1 : Alert - enable
1 : Alert threshold - sent
1 : Instant value in usage message - reported
0 : Average value in usage message - not reported
0 : RFU - n/a
0 : RFU - n/a
x : Alert trigger sample count
x :
```

Trigger sample count decimal value 3 mapped to HEX

```
0x01
```

HEX message converted to binary

```
0b01
```

Whole binary message assembled

```
0b01000111
```

Binary value converted to HEX

```
0x47
```

Analog 2 low threshold value 12.0 converted to hex

```
0x41400000
```

Flip HEX value to LSB

```
0x00004041
```

Analog 2 high threshold value NaN converted to hex

```
0xFFFFFFFF
```

Flip HEX value to LSB

```
0xFFFFFFFF
```

Compile message for sending (HEX)

```
010807024700004041FFFFFFFF
```

Control value in base64 to control after sending

```
AQgHAKcAAEBB/////w==
```

fPort 51 Update message

Byte 0
Header
FF

Activate update mode for BT update for 2 minutes. if nothing is done the device will reboot, join and resume working

NB! **Only** unconfirmed messages should be used for this message.

Message sample

Message goal: Set device to update mode

Header

Select Header HEX code

FF

Compile message for sending (HEX)

FF

Control value in base64 to control after sending

/w==

fPort 99 Boot/Debug Messages

Boot message

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 8
0x00 Boot	Serial (HEX)			Firmware (HEX)			Reset reason (HEX)	Battery info (HEX)	

Value	Reason
0x02	Watchdog reset
0x04	Soft reset (e.g DFU mode)
0x10	Normal startup by magnet

Value	Voltage
0x01	3V
0x02	3.6V

Shutdown message

Byte 0	Byte 1	Byte 2	Byte ..	Byte n
0x01 Shutdown	Reason (HEX)	Regular tatus message		

Value	Voltage
0x20	Hardware error
0x31	Shutdown by user (magnet)
0x32	Shutdown by user (DFU)

Message sample

Message in base64

```
AMcBFkwABwgQA==
```

Message decoded to hex

```
00c701164c0007081002
```

Header `0x00` decoded

```
Boot message
```

Device serial `0xc701164c` HEX message flip for MSB

```
0x4c1601c7
```

Firmware version

Major version in HEX

```
0x00
```

HEX value converted to decimal

```
0
```

Minor version in HEX

```
0x07
```

HEX value converted to decimal

```
7
```

Patch version in HEX

```
0x08
```

HEX value converted to decimal

```
8
```

Reset reason `10` HEX message

```
HEX message converted to reason
```

```
Normal startup by magnet
```

Battery info `02` HEX message

```
HEX message converted to voltage
```

```
3.6 (V)
```

3.6V BATTERY OFFSET CHART

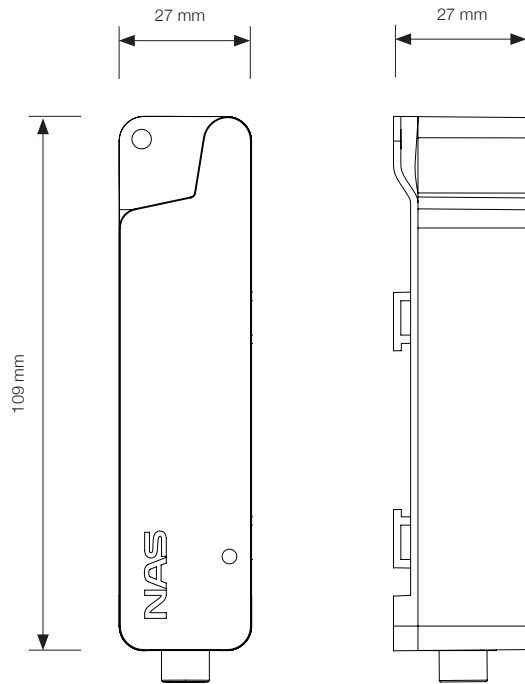
255 - Not measured	206 - 3,486	154 - 3,278	102 - 3,07	50 - 2,862
	205 - 3,482	153 - 3,274	101 - 3,066	49 - 2,858
254 - 4	204 - 3,478	152 - 3,27	100 - 3,062	48 - 2,854
253 - 3,95	203 - 3,474	151 - 3,266	99 - 3,058	47 - 2,85
252 - 3,9	202 - 3,47	150 - 3,262	98 - 3,054	46 - 2,846
251 - 3,85	201 - 3,466	149 - 3,258	97 - 3,05	45 - 2,842
250 - 3,8	200 - 3,462	148 - 3,254	96 - 3,046	44 - 2,838
249 - 3,75	199 - 3,458	147 - 3,25	95 - 3,042	43 - 2,834
248 - 3,7	198 - 3,454	146 - 3,246	94 - 3,038	42 - 2,83
247 - 3,65	197 - 3,45	145 - 3,242	93 - 3,034	41 - 2,826
246 - 3,646	196 - 3,446	144 - 3,238	92 - 3,03	40 - 2,822
245 - 3,642	195 - 3,442	143 - 3,234	91 - 3,026	39 - 2,818
244 - 3,638	194 - 3,438	142 - 3,23	90 - 3,022	38 - 2,814
243 - 3,634	193 - 3,434	141 - 3,226	89 - 3,018	37 - 2,81
242 - 3,63	192 - 3,43	140 - 3,222	88 - 3,014	36 - 2,806
241 - 3,626	191 - 3,426	139 - 3,218	87 - 3,01	35 - 2,802
240 - 3,622	190 - 3,422	138 - 3,214	86 - 3,006	34 - 2,798
239 - 3,618	189 - 3,418	137 - 3,21	85 - 3,002	33 - 2,794
238 - 3,614	188 - 3,414	136 - 3,206	84 - 2,998	32 - 2,79
237 - 3,61	187 - 3,41	135 - 3,202	83 - 2,994	31 - 2,786
236 - 3,606	186 - 3,406	134 - 3,198	82 - 2,99	30 - 2,782
235 - 3,602	185 - 3,402	133 - 3,194	81 - 2,986	29 - 2,778
236 - 3,606	184 - 3,398	132 - 3,19	80 - 2,982	28 - 2,774
235 - 3,602	183 - 3,394	131 - 3,186	79 - 2,978	27 - 2,77
234 - 3,598	182 - 3,39	130 - 3,182	78 - 2,974	26 - 2,766
233 - 3,594	181 - 3,386	129 - 3,178	77 - 2,97	25 - 2,762
232 - 3,59	180 - 3,382	128 - 3,174	76 - 2,966	24 - 2,758
231 - 3,586	179 - 3,378	127 - 3,17	75 - 2,962	23 - 2,754
230 - 3,582	178 - 3,374	126 - 3,166	74 - 2,958	22 - 2,75
229 - 3,578	177 - 3,37	125 - 3,162	73 - 2,954	21 - 2,746
228 - 3,574	176 - 3,366	124 - 3,158	72 - 2,95	20 - 2,742
227 - 3,57	175 - 3,362	123 - 3,154	71 - 2,946	19 - 2,738
226 - 3,566	174 - 3,358	122 - 3,15	70 - 2,942	18 - 2,734
225 - 3,562	173 - 3,354	121 - 3,146	69 - 2,938	17 - 2,684
224 - 3,558	172 - 3,35	120 - 3,142	68 - 2,934	16 - 2,634
223 - 3,554	171 - 3,346	119 - 3,138	67 - 2,93	15 - 2,584
222 - 3,55	170 - 3,342	118 - 3,134	66 - 2,926	14 - 2,534
221 - 3,546	169 - 3,338	117 - 3,13	65 - 2,922	13 - 2,484
220 - 3,542	168 - 3,334	116 - 3,126	64 - 2,918	12 - 2,434
219 - 3,538	167 - 3,33	115 - 3,122	63 - 2,914	11 - 2,384
218 - 3,534	166 - 3,326	114 - 3,118	62 - 2,91	10 - 2,334
217 - 3,53	165 - 3,322	113 - 3,114	61 - 2,906	9 - 2,284
216 - 3,526	164 - 3,318	112 - 3,11	60 - 2,902	8 - 2,234
215 - 3,522	163 - 3,314	111 - 3,106	59 - 2,898	7 - 2,184
214 - 3,518	162 - 3,31	110 - 3,102	58 - 2,894	6 - 2,134
213 - 3,514	161 - 3,306	109 - 3,098	57 - 2,89	5 - 2,084
212 - 3,51	160 - 3,302	108 - 3,094	56 - 2,886	4 - 2,034
211 - 3,506	159 - 3,298	107 - 3,09	55 - 2,882	3 - 1,984
210 - 3,502	158 - 3,294	106 - 3,086	54 - 2,878	2 - 1,934
209 - 3,498	157 - 3,29	105 - 3,082	53 - 2,874	1 - 1,884
208 - 3,494	156 - 3,286	104 - 3,078	52 - 2,87	
207 - 3,49	155 - 3,282	103 - 3,074	51 - 2,866	0 - N/A

3V BATTERY OFFSET CHART

255 - Not measured	204 - 2,986	152 - 2,778	100 - 2,57	48 - 2,362
	203 - 2,982	151 - 2,774	99 - 2,566	47 - 2,358
254 - 3,6	202 - 2,978	150 - 2,77	98 - 2,562	46 - 2,354
253 - 3,55	201 - 2,974	149 - 2,766	97 - 2,558	45 - 2,35
252 - 3,5	200 - 2,97	148 - 2,762	96 - 2,554	44 - 2,346
251 - 3,45	199 - 2,966	147 - 2,758	95 - 2,55	43 - 2,342
250 - 3,4	198 - 2,962	146 - 2,754	94 - 2,546	42 - 2,338
249 - 3,35	197 - 2,958	145 - 2,75	93 - 2,542	41 - 2,334
248 - 3,3	196 - 2,954	144 - 2,746	92 - 2,538	40 - 2,33
247 - 3,25	195 - 2,95	143 - 2,742	91 - 2,534	39 - 2,326
246 - 3,2	194 - 2,946	142 - 2,738	90 - 2,53	38 - 2,322
245 - 3,15	193 - 2,942	141 - 2,734	89 - 2,526	37 - 2,318
244 - 3,146	192 - 2,938	140 - 2,73	88 - 2,522	36 - 2,314
243 - 3,142	191 - 2,934	139 - 2,726	87 - 2,518	35 - 2,31
242 - 3,138	190 - 2,93	138 - 2,722	86 - 2,514	34 - 2,306
241 - 3,134	189 - 2,926	137 - 2,718	85 - 2,51	33 - 2,302
240 - 3,13	188 - 2,922	136 - 2,714	84 - 2,506	32 - 2,298
239 - 3,126	187 - 2,918	135 - 2,71	83 - 2,502	31 - 2,294
238 - 3,122	186 - 2,914	134 - 2,706	82 - 2,498	30 - 2,29
237 - 3,118	185 - 2,91	133 - 2,702	81 - 2,494	29 - 2,286
236 - 3,114	184 - 2,906	132 - 2,698	80 - 2,49	28 - 2,282
235 - 3,11	183 - 2,902	131 - 2,694	79 - 2,486	27 - 2,278
234 - 3,106	182 - 2,898	130 - 2,69	78 - 2,482	26 - 2,274
233 - 3,102	181 - 2,894	129 - 2,686	77 - 2,478	25 - 2,27
232 - 3,098	180 - 2,89	128 - 2,682	76 - 2,474	24 - 2,266
231 - 3,094	179 - 2,886	127 - 2,678	75 - 2,47	23 - 2,262
230 - 3,09	178 - 2,882	126 - 2,674	74 - 2,466	22 - 2,258
229 - 3,086	177 - 2,878	125 - 2,67	73 - 2,462	21 - 2,254
228 - 3,082	176 - 2,874	124 - 2,666	72 - 2,458	20 - 2,25
227 - 3,078	175 - 2,87	123 - 2,662	71 - 2,454	19 - 2,246
226 - 3,074	174 - 2,866	122 - 2,658	70 - 2,45	18 - 2,242
225 - 3,07	173 - 2,862	121 - 2,654	69 - 2,446	17 - 2,238
224 - 3,066	172 - 2,858	120 - 2,65	68 - 2,442	16 - 2,234
223 - 3,062	171 - 2,854	119 - 2,646	67 - 2,438	15 - 2,184
222 - 3,058	170 - 2,85	118 - 2,642	66 - 2,434	14 - 2,134
221 - 3,054	169 - 2,846	117 - 2,638	65 - 2,43	13 - 2,084
220 - 3,05	168 - 2,842	116 - 2,634	64 - 2,426	12 - 2,034
219 - 3,046	167 - 2,838	115 - 2,63	63 - 2,422	11 - 1,984
218 - 3,042	166 - 2,834	114 - 2,626	62 - 2,418	10 - 1,934
217 - 3,038	165 - 2,83	113 - 2,622	61 - 2,414	9 - 1,884
216 - 3,034	164 - 2,826	112 - 2,618	60 - 2,41	8 - 1,834
215 - 3,03	163 - 2,822	111 - 2,614	59 - 2,406	7 - 1,784
214 - 3,026	162 - 2,818	110 - 2,61	58 - 2,402	6 - 1,734
213 - 3,022	161 - 2,814	109 - 2,606	57 - 2,398	5 - 1,684
212 - 3,018	160 - 2,81	08 - 2,602	56 - 2,394	4 - 1,634
211 - 3,014	159 - 2,806	107 - 2,598	55 - 2,39	3 - 1,584
210 - 3,01	158 - 2,802	106 - 2,594	54 - 2,386	2 - 1,534
209 - 3,006	157 - 2,798	105 - 2,59	53 - 2,382	1 - 1,484
208 - 3,002	156 - 2,794	104 - 2,586	52 - 2,378	
207 - 2,998	155 - 2,79	103 - 2,582	51 - 2,374	0 - N/A
206 - 2,994	154 - 2,786	102 - 2,578	50 - 2,37	
205 - 2,99	153 - 2,782	101 - 2,574	49 - 2,366	

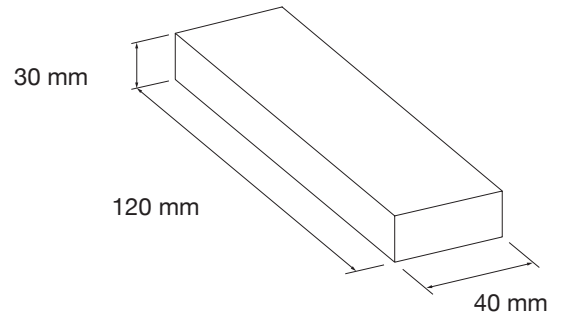
DIMENSIONS / PACKAGING

Dimensions

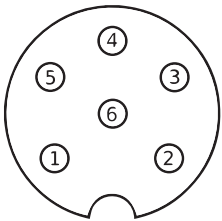


Packaging

1 pcs box



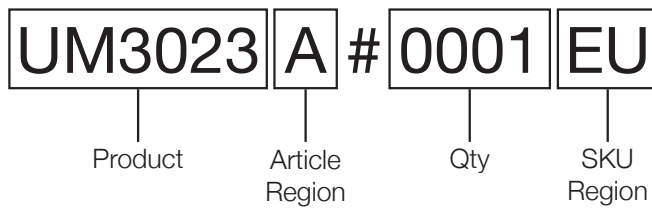
WIRING GUIDE



M8 Sensor side

Pin	Wire color	Function
1	White	Digital 1
2	Brown	Analog 1
3	Grey	Analog 2
4	Black	Common ground
5	Blue	Digital 2
6	Pink	n/a

ORDERING INFORMATION



Product/SKU	Package qty	Version
UM3023x#0001xx	1	Digital + Analog

Article region	SKU region	Frequency
A	EU	868 MHz
B	AU	922 MHz
C	US	915 MHz
D	AS	923 MHz
E	CN	780 MHz
F	KR	922 MHz
G	EU	433 MHz
H	CN	470 MHz
I	IN	866 MHz

CONTACT INFORMATION

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REVISION HISTORY

1.0 - First version

1.1 - Added communication protocol.

1.2 - Communication protocol updated to 0.5.0

2.0 - Support for fw 0.7.0

- RSSI as absolute value
- Analog interface support
- Updated battery mapping
- Configuration request

All content contained herein is subject to change without notice. Nordic Automation Systems reserves the right to change or modify the content at any time.