

# LoRaWAN™ WM-Bus Bridge UM6000



LoRaWAN™ WM-Bus Bridge is designed for receiving wireless M-Bus signals from utility meters and forwarding them via LoRaWAN networks to the service provider.

# OVERVIEW

## Universal

LoRaWAN™ WM-Bus Bridge supports multiple WM-Bus Link modes.

# APPLICATIONS

## Remote reading

It creates a bridge between short range WM-Bus and LoRaWAN™, thus enabling remote reading of devices that are normally not remote readable.

# FEATURES

- Long range wireless data transmission
- Grid powered
- Built-in antenna
- Configurable reporting interval
- Maintenance free - install & forget
- Easy installation
- Secure communication
- Supported WM-Bus link modes: S1, S1-m, S2, T1, T2, R2, C1 T-A, C2 T-A, C1 T-B, C2 T-B
- Supports upto 16 different devices

# SPECIFICATIONS

Diameter:	110 mm
Height:	50 mm
Weight:	95 g
Operating temperature:	0°C ... +60°C
Communication range:	up to 15 km*
Tx power:	up to +20 dBm
Rx Sensitivity:	-142 dBm
MAC Layer:	LoRaWAN™
Physical Layer:	LoRa®
Socket:	"Europlug" Type C
Power consumption:	230V -15% .. +10% <1V A
Body material:	PA6
IP Rating:	IP
Communication:	LoRaWAN™

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

# COMMUNICATION

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

## PORT LIST

fPort	Usage	Transmission	Page
24	Status	↑↑	5
25	Usage	↑↑	9
49	Config request	↑↓	11
50	Configuration	↓↓	17
51	Update mode	↓↓	24
53	Notification	↑↑	25
60	Command	↓↓	32
99	Boot/Debug	↑↑	34

For FW version  $\geq 0.1.0$

# fPort 24 Status Message

## Bridge status message

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
Header	Device clock				RSSI	Temp	Battery	Status	Connected devices	Available devices
0x00	uint32 epoch time UTC in seconds				uint8 (dBm) *-1	int8 (°C)	0xFF		uint8	uint8

Bit #	Parameter	Value
0	Grid power	0 - false 1 - true
1	RFU	
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

## Message sample

Message in base64

```
AEYs0FxsFP8BBAU=
```

Message decoded to HEX

```
00462CD05C6C14FF010405
```

Header HEX message

```
0x00
```

HEX message converted to packet type

```
Bridge status message
```

Device clock 462CD05C HEX message flip for MSB

```
5CD02C46
```

HEX message converted to decimal (epoch)

```
1557146694 (seconds)
```

Epoch time converted to date

```
6 May 2019 12:44:54 (UTC)
```

Sensor RSSI HEX message

0x6C

HEX message converted to decimal

108

Decimal value multiplied by -1

-108 (dBm)

Sensor Temperture HEX message

0x14

HEX message converted to signed decimal

20 (°C)

Sensor Battery HEX message

0xFF

HEX message converted to decimal

255

Decimal converted to value

Grid power only

Status HEX message

0x01

Interface map HEX message converted to binary

0b00000001

Binary converted to statuses (LSB)

1 : Grid power - true

0 : RFU

0 : RFU

0 : RFU

0 : RFU

0 : RFU

0 : RFU

0 : RFU

Connected devices HEX message

0x04

HEX message converted to decimal

4 (devices)

Available devices HEX message

0x05

HEX message converted to decimal

5 (devices)

## Device status message

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14 .. Byte n
Header	Measuring time	Time difference	WM-Bus RSSI	WM-Bus frame*										
				Length	C-field	Manufacturer ID	Serial			Version	Type	Payload***		
0x01	uint8 0..143 255 - live	int8 minutes**	uint8 (dBm) *-1	HEX	HEX	HEX	HEX			HEX	HEX	HEX		

\*WM-Bus frame as received from the over the WM-Bus

\*\*Time difference of the sending moment and stored value.

\*\*\*In case the payload is only 1B long it is an error message notifying that there is no payload and the reason for it. It should be decoded as following.

Bit #	Parameter	Value
0	Maximum SF (where the frame still fits into the message)	uint 7..12
1		
2		
3		
4	SF too low	0 - false 1 - true
5	Communication lost	
6	RFU	
7	RFU	

## Message sample

Message in base64

```
Af/+NkTmHmBTWQACDnJRlFQW5h48B1UwIGV31s71yGXD+2Bv0iHlIDDHk7HRwuJn0xmTq7
9vWy3bSg==
```

Message decoded to HEX

```
01FFFE3644E61E60535900020E7251945416E61E3C075530206577D6CEF5C865C3FB60
6FD221E52030C793B1D1C2E267D31993ABBF6F5B2DDB2
```

Header HEX message

```
0x01
```

HEX message converted to packet type

```
Device status message
```

## Measuring time

FF

HEX message converted to decimal

255

Decimal value translated to time

Live

## Time difference

FE

HEX message converted to decimal

-2 (minutes ago)

## WM-Bus RSSI HEX message

0x36

HEX message converted to decimal

54

Decimal value multiplied by -1

-54 (dBm)

## Start of WM-Bus frame

Length HEX message

0x44

C-field HEX message

0xE6

Manufacturer ID HEX message

0x1E60

Serial HEX message

0x53590002

Version HEX message

0x0E

Type HEX message

0x72

WM-Bus payload HEX message

0x51945416E61E3C075530206577D6CEF5C865C3FB606FD221E52030C793  
B1D1C2E267D31993ABBF6F5B2DDBB2



# fPort 25 Usage Message

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11	Byte 12	Byte 13 .. Byte n
Header	Measuring time	Time difference	WM-Bus frame*										
			Length	C-field	Manufacturer ID	Serial			Version	Type	Payload***		
0x01	uint8 0..143 255 - live	int8 minutes**	HEX	HEX	HEX	HEX			HEX	HEX	HEX		

Messages that do not fit inside the usage message are not sent. With the next status message an error message is received instead.

## Message sample

Message in base64

```
Af/+ROYeYFNZAAlOc1GUVBbmHjwHVTAqZXfWzvXIZcP7YG/SIeUgMMeTsdHC4mfTGZOrv2
9bLduy
```

Message decoded to HEX

```
01FFFE44E61E60535900020E7251945416E61E3C075530206577D6CEF5C865C3FB606F
D221E52030C793B1D1C2E267D31993ABBF6F5B2DDBB2
```

Header HEX message

```
0x01
```

HEX message converted to packet type

```
Device usage message
```

Measuring time

```
FF
```

HEX message converted to decimal

```
255
```

Decimal value translated to time

```
Live
```

Time difference

```
FE
```

HEX message converted to decimal

```
-2 (minutes ago)
```

Start of WM-Bus frame

Length HEX message

0x44

C-field HEX message

0xE6

Manufacturer ID HEX message

0x1E60

Serial HEX message

0x53590002

Version HEX message

0x0E

Type HEX message

0x72

WM-Bus payload HEX message

0x51945416E61E3C075530206577D6CEF5C865C3FB606FD221E52030C793  
B1D1C2E267D31993ABBF6F5B2DDBB2

# fPort 49 Configuration Request Message

## Reporting interval

Byte 0
Header
0x00

The answer is sent to fPort 49 in the same format as is used in configuration messages for reporting interval configuration.

## Message sample

Message goal: Request reporting interval configuration

Header

Select Header HEX code

0x00

Compile message for sending (HEX)

0x00

Control value in base64 to control after sending

AA==

## Device clock

Byte 0
Header
0x01

The answer is sent to fPort 49 in the same format as is used in configuration messages for setting device clock.

## Message sample

Message goal: Request device clock

Header

Select Header HEX code

0x01

Compile message for sending (HEX)

0x01

Control value in base64 to control after sending

AQ==

## Device list

Byte 0	Byte 1
Header	Type
0x02	0x00 - connected devices 0x01 - available devices

Request for available devices trigger a WM-Bus connect package to fport 53. The answer to request for connected devices is described below.

## Message sample

Message goal: Request the list of connected devices

### Header

Select Header HEX code

0x02

Select Type

Connected devices

Convert type to HEX

0x00

Compile message for sending (HEX)

0x0200

Control value in base64 to control after sending

AgA=

## Answer to connected devices request

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte ..	Byte ..	Byte ..	Byte n
Header	Message count	Serial 1				Serial n			
0x02		HEX				HEX			

Bit #	Parameter	Value
0	Message #	uint 0..15
1		
2		
3		
4	Total # of mes- sages	uint 0..15
5		
6		
7		

## Message sample

Message in base64

```
AgBgU1kAIFY0BhaYFG1jAJNp
```

Message decoded to HEX

```
020060535900205634061698146963009369
```

Header HEX message

```
0x02
```

HEX message converted to packet type

```
Answer for connected devices request
```

Message count HEX message

```
0x00
```

HEX message converted to binary

```
0B00000000
```

Binary converted to configuration (LSB)

```
0 : Message number - [0B0000]
0 :
0 :
0 :
0 : Total number of messages - [0B0000]
0 :
0 :
0 :
```

Message number binary value converted to HEX

```
0x00
```

HEX message converted to message number

```
0
```

Total number of messages binary value converted to HEX

```
0x00
```

HEX message converted to total number

```
0
```

1<sup>st</sup> connected devices serial HEX message

```
0x60535900
```

2<sup>nd</sup> connected devices serial HEX message

```
0x20563406
```

3<sup>rd</sup> connected devices serial HEX message

```
0x16981469
```

4<sup>th</sup> connected devices serial HEX message

```
0x63009369
```

## Lost alert configuration

Byte 0
Header
0x03

The answer is sent to fPort 49 in the same format as is used in configuration messages for configuring lost alert.

## Message sample

Message goal: Request lost alert configuration

Header

Select Header HEX code

0x03

Compile message for sending (HEX)

0x03

Control value in base64 to control after sending

Aw==

## Bridge mode configuration

Byte 0
Header
0x04

The answer is sent to fPort 49 in the same format as is used in configuration messages for configuring bridge mode.

## Message sample

Message goal: Request bridge mode configuration

Header

Select Header HEX code

0x04

Compile message for sending (HEX)

0x04

Control value in base64 to control after sending

BA==



# fPort 50 Configuration Message

General configuration packet structure

## Request

Byte 0	Byte 1	Byte ..	Byte n
Header	Payload*		

## Answer

Byte 0	Byte 1	Byte 2	Byte ..	Byte n
Header	Status	Payload*		

\*Optional. Depends from request/answer

## Status

Value	Status
0x00	OK
0x01	Unknown error
0x02	Invalid message length
0x03	Invalid parameter value
0x04	Functionality not available
0x05	Invalid header

## Reporting interval configuration

Byte 0	Byte 1	Byte 2	Byte 3
Header	Usage interval	Status interval	Reporting mode
0x00	uint8 - hours min 1h, default 1h	uint8 - hours min 1h, default 24h	0x00 - Live

## Message sample

Message goal: Set usage interval to 2h and status interval to 12h.

### Header

Select Header HEX code

0x00

Usage reporting interval

Convert interval 2 to HEX

0x02

Status reporting interval

Convert interval 12 to HEX

0x0C

Reporting mode

0x00

Compile message for sending (HEX)

0x00020c00

Control value in base64 to control after sending

AAIMAA==

## Device clock configuration

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4
Header	Device clock			
0x01	uint32 (Unix timestamp in UTC)			

## Message sample

Message goal: Set device clock to 22 August 2017 11:50:00

### Header

Select Header HEX code

01

### Device clock

Choose desired time

22 August 2017 11:50:00 (UTC)

Convert to epoch

1503402600

Covert to hex

0x599C1A68

Flip HEX value for LSB

0x681A9C59

Compile message for sending (HEX)

0x01681A9C59

Control value in base64 to control after sending

AWganFk=

## Add device to bridge listening queue

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte ..	Byte ..	Byte ..	Byte n
Header	Serial 1			Serial n				
0x02	HEX			HEX				

## Message sample

Message goal: Add devices with following serials to the bridge listening queue: 34785634, 98765423, 23452301

### Header

Select Header HEX code

0x02

Select 1<sup>st</sup> device serial in HEX

0x34785634

Select 2<sup>nd</sup> device serial in HEX

0x98765423

Select 3<sup>rd</sup> device serial in HEX

0x23452301

Compile message for sending (HEX)

0x02|34785634|98765423|23452301

Control value in base64 to control after sending

AjR4VjSYdlQjI0UjAQ==

## Lost alert configuration

Byte 0	Byte 1
Header	Time lost
0x03	uint8 - hours 0x00 - n/a, 0xFF - disabled

Lost alert is triggered to fPort 53 after no messages from a subscribed device have not been received for the configured amount of time.

## Message sample

Message goal: Set lost alert to 48 hours

Header

Select Header HEX code

0x03

Time lost

Convert interval 48 to HEX

0x30

Compile message for sending (HEX)

0x0330

Control value in base64 to control after sending

AzA=

## Bridge mode configuration

Byte 0	Byte 1		Byte ..		Byte n	
Header	Value	WM-Bus Mode	Value	WM-Bus Mode	Value	WM-Bus Mode
0x04	0x02	S2	0x02	S2	0x02	S2
	0x04	T2	0x04	T2	0x04	T2
	0x05	R2	0x05	R2	0x05	R2
	0x08	C2 T-A	0x08	C2 T-A	0x08	C2 T-A
	0x09	C2 T-B	0x09	C2 T-B	0x09	C2 T-B
	0xFE*	Auto	n/a			

\*When using 0xFE in the first byte, then no other config should follow.

## Message sample

Message goal: Set the bridge to listen on the following modes: S2, R2

Header

Select Header HEX code

0x04

Select 1<sup>st</sup> mode

S2

Convert mode to HEX

0x02

Select 2<sup>nd</sup> mode

R2

Convert mode to HEX

0x05

Compile message for sending (HEX)

0x040205

Control value in base64 to control after sending

BAIF

## Remove configuration

## Remove device from bridge listening queue

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte ..	Byte ..	Byte ..	Byte n
Header	Serial 1				Serial n			
0xFF	HEX				HEX			

## Message sample

Message goal: Remove devices with following serials to the bridge listening queue: 34785634, 98765423, 23452301

### Header

Select Header HEX code

0xFF

Select 1<sup>st</sup> device serial in HEX

0x34785634

Select 2<sup>nd</sup> device serial in HEX

0x98765423

Select 3<sup>rd</sup> device serial in HEX

0x23452301

Compile message for sending (HEX)

0xFF347856349876542323452301

Control value in base64 to control after sending

/zR4VjSYdlQjI0UjAQ==

# 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

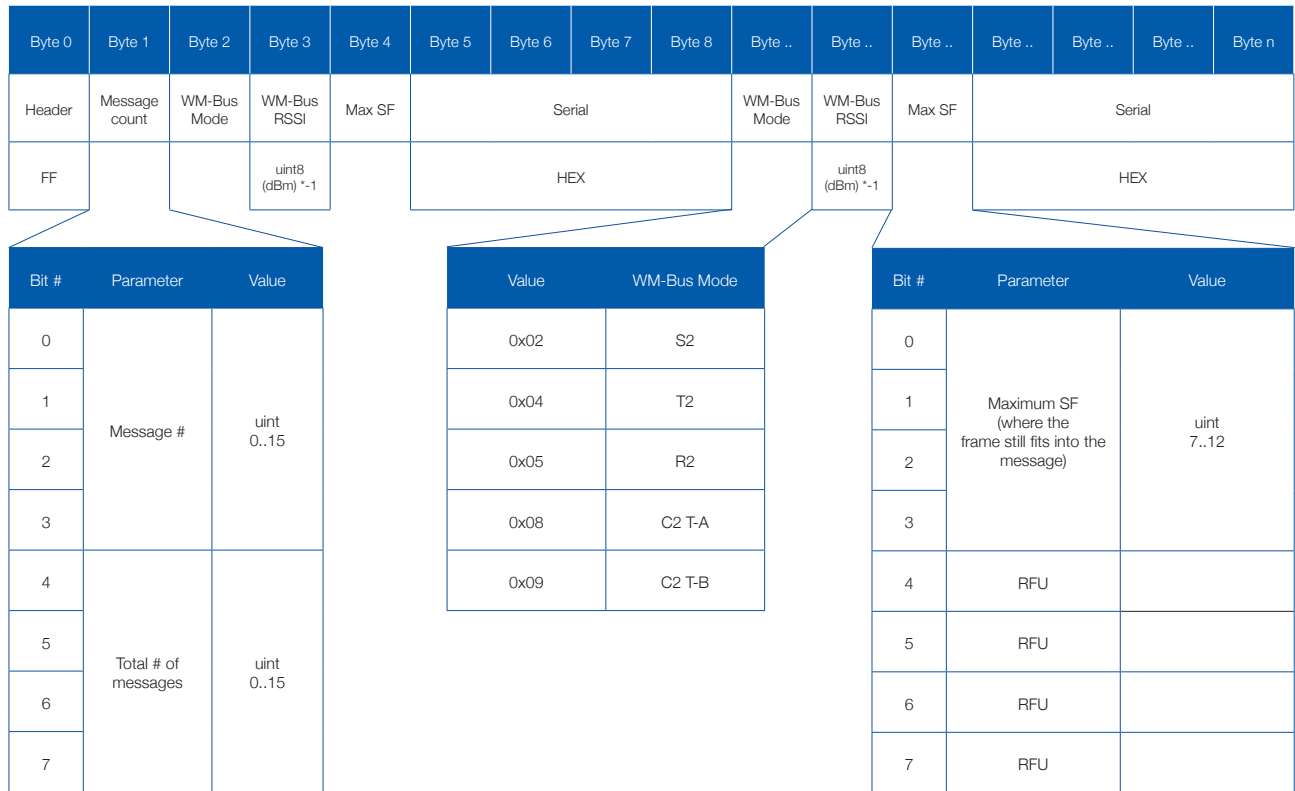
Control value in base64 to control after sending

/w==



# fPort 53 Notification message

## WM-Bus discover packet



## Message sample

Message in base64

```
AAAEawlgU1kACAQMIFy0Bgg7DBaYFGkIsAxjAJNpCC4MYXMygA==
```

Message decoded to HEX

```
0000046B096053590008030C20563406083B0C1698146908B00C63009369
082E0C61733280
```

Header HEX message

```
0x00
```

HEX message converted to packet type

```
WM-Bus discover packet
```

Message count HEX message

0x00

HEX message converted to binary

0b00000000

Binary converted to configuration (LSB)

```
0 : Message number - [0b0000]
0 :
0 :
0 :
0 : Total number of messages - [0b0000]
0 :
0 :
0 :
```

Message number binary value converted to HEX

0x00

HEX message converted to message number

0

Total number of messages binary value converted to HEX

0x00

HEX message converted to total number

0

1<sup>st</sup> available device

Device mode WM-Bus HEX value

0x03

HEX value converted to WM-Bus mode

T2

WM-Bus RSSI HEX message

0x6B

HEX message converted to decimal

107

Decimal value multiplied by -1

-107 (dBm)

Max SF HEX message

0x09

HEX message converted to binary

0b00001001

Binary converted to configuration (LSB)

```
1 : Max SF - [0B1001]
0 :
0 :
1 :
0 : rfu
0 : rfu
0 : rfu
0 : rfu
```

Max SF binary value converted to HEX

0x09

HEX message converted to SF

(SF) 9

Device serial HEX value

0x60535900

2<sup>nd</sup> available device

Device mode WM-Bus HEX value

0x08

HEX value converted to WM-Bus mode

C2 T-A

WM-Bus RSSI HEX message

0x03

HEX message converted to decimal

3

Decimal value multiplied by -1

-3 (dBm)

Max SF HEX message

0x0C

HEX message converted to binary

0B00001100

Binary converted to configuration (LSB)

```
0 : Max SF - [0B1100]
0 :
1 :
1 :
0 : rfu
0 : rfu
0 : rfu
0 : rfu
```

Max SF binary value converted to HEX

0x0C

HEX message converted to SF

(SF) 12

Device serial HEX value

0x20563406

3<sup>rd</sup> available device

Device mode WM-Bus HEX value

0x08

HEX value converted to WM-Bus mode

C2 T-A

WM-Bus RSSI HEX message

0x3B

HEX message converted to decimal

59

Decimal value multiplied by -1

-59 (dBm)

Max SF HEX message

0x0C

HEX message converted to binary

0b00001100

Binary converted to configuration (LSB)

0 : Max SF - [0b1100]

0 :

1 :

1 :

0 : rfu

0 : rfu

0 : rfu

0 : rfu

Max SF binary value converted to HEX

0x0C

HEX message converted to SF

(SF) 12

Device serial HEX value

0x16981469

4<sup>th</sup> available device

Device mode WM-Bus HEX value

0x08

HEX value converted to WM-Bus mode

C2 T-A

WM-Bus RSSI HEX message

0xB0

HEX message converted to decimal

176

Decimal value multiplied by -1

-176 (dBm)

Max SF HEX message

0x0C

HEX message converted to binary

0<sub>B</sub>00001100

Binary converted to configuration (LSB)

0 : Max SF - [0<sub>B</sub>1100]

0 :

1 :

1 :

0 : rfu

0 : rfu

0 : rfu

0 : rfu

Max SF binary value converted to HEX

0x0C

HEX message converted to SF

(SF) 12

Device serial HEX value

0x63009369

5<sup>th</sup> available device

Device mode WM-Bus HEX value

0x08

HEX value converted to WM-Bus mode

C2 T-A

WM-Bus RSSI HEX message

0x2E

HEX message converted to decimal

46

Decimal value multiplied by -1

-46 (dBm)

Max SF HEX message

0x0c

HEX message converted to binary

0<sub>B</sub>00001100

Binary converted to configuration (LSB)

```
0 : Max SF - [0b1100]
0 :
1 :
1 :
0 : rfu
0 : rfu
0 : rfu
0 : rfu
```

Max SF binary value converted to HEX

```
0x0C
```

HEX message converted to SF

```
(SF) 12
```

Device serial HEX value

```
0x61733280
```

## Communication lost packet

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
Header	WM-Bus device Serial			Alert status	Alert duration	
0x01	HEX			0x00 - cleared 0x01 - raised	uint8 hours	

## Message sample

Message in base64

```
ATQJACMAXw==
```

Message decoded to HEX

```
0134090023005F
```

Header HEX message

```
0x01
```

HEX message converted to packet type

```
Communication lost packet
```

WM-Bus device HEX serial

```
0x34090023
```

Alert status HEX message

```
0x00
```

HEX message converted to packet type

```
Cleared (communication restored)
```

Alert duration HEX message

```
0x5F
```

HEX message converted to decimal

```
95 (hours)
```

# fPort 60 Command message

## Request bridge status

Byte 0
Header
0x01

The answer is sent to fPort 24 as a standard bridge status message

## Message sample

Message goal: Request device clock

Header

Select Header HEX code

0x01

Compile message for sending (HEX)

0x01

Control value in base64 to control after sending

AQ==



## Check available device by serial

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4
Header	WM-Bus device serial			
0x02	HEX			

Request trigger a WM-Bus connect package to fport 53 with only 1 entry.

## Message sample

Message goal: Query the bridge if device with serial 34120099 is available/in range

Header

Select Header HEX code

0x02

WM-Bus device serial in HEX

34120099

Compile message for sending (HEX)

0x0234120099

Control value in base64 to control after sending

AjQSAJk=

# 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
Header	Serial			Firmware			Connected devices	
0x00	HEX			HEX			int8	

## Message sample

### Message in base64

```
ABUAHUwAAQoE
```

### Message decoded to hex

```
0015001D4C00010A04
```

Header 0x00 decoded

```
Boot message
```

Device serial 0x15001D4C HEX message flip for MSB

```
0x4C1D0015
```

### Firmware version

Major version in HEX

```
0x00
```

HEX value converted to decimal

```
0
```

Minor version in HEX

```
0x01
```

HEX value converted to decimal

```
1
```

Patch version in HEX

```
0x0A
```

HEX value converted to decimal

```
10
```

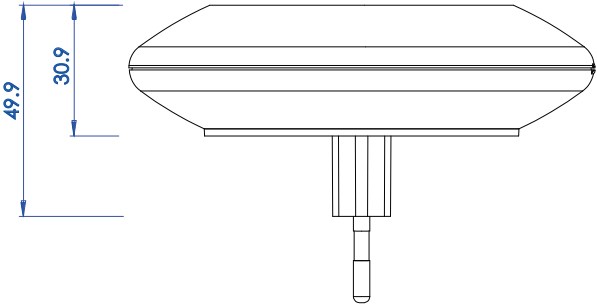
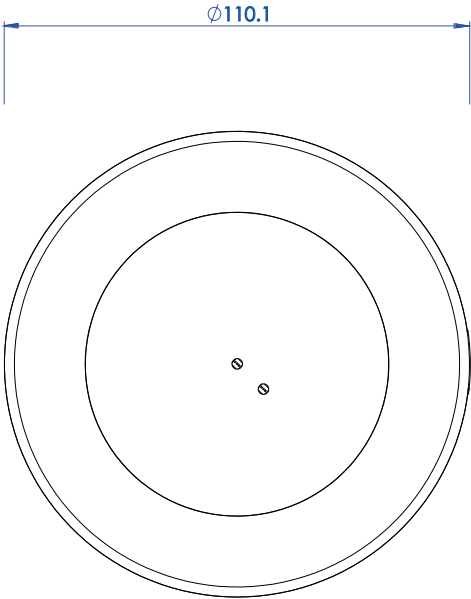
### Connected devices HEX message

```
0x04
```

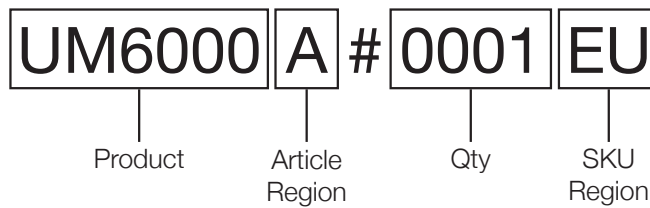
HEX value converted to decimal

```
4
```

# DIMENSIONS



# ORDERING INFORMATION



Product/SKU	Package qty
UM6000x#0001xx	1

Article region	SKU region	Band
A	EU	EU868
B	AU	AU915
C	US	US915
D	AS	AS923
F	KR	KR920
I	IN	IN865

# CONTACT INFORMATION

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# REVISION HISTORY

1.0 - First version

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.