Nordic Automation Systems

LoRaWAN®
MODULARIS MODULE
CM3021

LoRaWAN® Modularis Module enables the acquisition of water consumption data and transmits it wirelessly to the available LoRaWAN® network or or as a drive-by target in wM-Bus C1 or T1 mode.

LoRaWAN® Modularis Module is meant to be attached to the Modularis (compatible) water meters.

FW >= 1.0.0

FEATURES

- Dual radio LoRaWAN® and wM-Bus
- LoRaWAN® ready in wM-Bus mode (automatic switchover)
- Reverse flow taken into account on usage reporting
- Pre-installed long-life battery
- NFC
- NAS Connect support
- Secure communication in both modes
- Average life 8 years*
- Operating temperature -5°C … +65°C

* Lifetime depends from the device location and reporting interval.

SPECIFICATIONS

Diameter:	64.0 mm
Height:	39.2 mm
Weight:	60 g
Operating temperature:	-5°C ... +65°C
Communication range:	up to 15km*
Tx power:	up to +20dBm
Rx Senitivity:	-140dBm
Body material:	Polycarbonate
IP Rating:	IP68

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

COMMUNICATION SPECIFICATIONS

LoRAWAN®	Device class:	A
	Activation:	OTAA
	LoRAWAN® version:	1.0.3a
wM-Bus	Mode:	C1 / T1
	OMS version:	4.1.2

COMMUNICATION

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

COMMUNICATION PACKETS

fPort	Usage	Transmission	Page
14	Usage (legacy)	↑↑	5
24	Status	↑↑	6
25	Usage	↑↑	10
49	Config request	↓↓	12
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60	Command	↑↓	37
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For FW version >= 1.0.0

fPort 14 Usage Message (legacy)

Byte 0	Byte 1	Byte 2	Byte 3
counter_instant			
type: uint32 unit: l 0xFFFFFFFF - *not_available*			

Message sample

Message in base64

```
gAoAAA==
```

Message decoded to hex

```
800A0000
```

HEX message flip for MSB

```
00000A80
```

HEX message converted to decimal

```
2688 (liters)
```

fPort 24 Status Message

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9..12	Byte 13..16	Byte 17	Byte 18	Byte 19	Byte 20
header	*general*	*active_ alerts*	*battery*		*board*		*downlink*		*counter_ instant*	*counter_ prev_1*	*meter- ing_time*	*calibration_delta*		
			percent- age	*voltage*	*tempera- ture*	*extremes*	*rssi*	*snr*				*ch_1*	*ch_2*	*ch_3*
0x01	See fig. 1	See fig. 2	type: uint8 unit: % value: /2.54 0xFF - *not_ available*	type: uint8 unit: V value: mapped 3_6V	type: int8 unit: °C	See fig. 3	type: uint8 unit: dBm value: *-1	type: int8 unit: Bm	type: uint32 unit: l 0xFFFF FFFF - *not_ available*	type: uint32 unit: l when: *counter_ previous = sent* 0xFFFF FFFF - *not_ available*	See fig. 4	type: int8 when: *de- bug_info = sent*	type: int8 when: *de- bug_info = sent*	type: int8 when: *de- bug_info = sent*

1.

Bit #	Parameter	Value
0	*counter_prvious*	0 - *not_sent* 1 - *sent*
1	*fixed_metering*	0 - *disabled* 1 - *enabled*
2	RFU	
3	RFU	
4	*debug_info*	0 - *not_sent* 1 - *sent*
5	*packet_reason_app*	0 - *false* 1 - *true*
6	*packet_reason_mag- net*	
7	*packet_reason_alert*	

2.

Bit #	Parameter
0	*reverse_flow*
1	RFU
2	RFU
3	RFU
4	RFU
5	RFU
6	RFU
7	RFU

3.

Bit #	Parameter	Value
0	*min_offset*	type: uint4 unit: °C value: *-2
1		
2		
3		
4	*max_offset*	type: uint4 unit: °C value: *2
5		
6		
7		

4.

Bit #	Parameter	Value
0	*hour*	type: uint5 unit: h (from 00:00) 31 - live
1		
2		
3		
4		
5	*metering_interval*	0 - *hourly* 1 - *daily*
6	RFU	
7	RFU	

Message sample

Message in base64

```
ATAA/xEQAE8HAQAAAAAAAA==
```

Message decoded to HEX

```
01|30|00|FF|11|10|00|4F|07|01000000|000000
```

header HEX message

```
0x01
```

general HEX message

```
0x30
```

general HEX message converted to binary

```
0B00110000
```

Binary converted to statuses (LSB)

```
0 : counter_previous - not sent
0 : fixed_metering - disabled
0 : RFU - n/a
0 : RFU - n/a
1 : debug_info - sent
1 : packet_reason_app - true
0 : packet_reason_magnet - false
0 : packet_reason_alert - false
```

active_alerts HEX message

```
0x00
```

active_alerts HEX message converted to binary

```
0B00000000
```

Binary converted to statuses (LSB)

```
0 : reverse_flow - false
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
```

battery

percentage HEX message

```
0xFF
```

HEX message converted to value

```
not_available
```

voltage HEX message

```
0x11
```

HEX message converted to decimal

```
17
```

Decimal value mapped to voltage

```
2.684 (V)
```

board

temperature HEX message

```
0x10
```

HEX message converted to signed decimal

```
16 (°C)
```

extremes HEX message

```
0x00
```

extremes HEX message converted to binary

```
0B00000000
```

Binary converted to extremes (LSB)

```
0 : min_offset [0B0000]
0 :
0 :
0 :
0 : max_offset [0B0000]
0 :
0 :
0 :
```

min_offset binary value converted to HEX

```
0x00
```

HEX message converted to decimal

```
0
```

Decimal offset value multiplied by -2

```
0 (°C)
```

max_offset binary value converted to HEX

```
0x00
```

HEX message converted to decimal

```
0
```

Decimal offset value multiplied by 2

```
0 (°C)
```

downlink

rssi HEX message

```
0x4F
```

HEX message converted to decimal

```
79
```

Decimal value multiplied by -1

```
-79 (dBm)
```

snr HEX message

```
0x07
```

HEX message converted to signed decimal

```
7 (dB)
```

counter_instant HEX message

```
0x01000000
```

HEX message flip for MSB

```
0x00000001
```

HEX message converted to decimal

```
1 (Liter)
```

calibration_delta

ch_1 HEX message

```
0x00
```

ch_2 HEX message

```
0x00
```

ch_3 HEX message

```
0x00
```

fPort 25 Usage Message

Byte 0	Byte 1	Byte 2..5	Byte 6..9	Byte 10..13	Byte 14
header	*general*	*counter_instant*	*counter_prev_1*	*counter_prev_1*	*metering_time*
0x01	See fig. 1	type: uint32 unit: l 0xFFFFFFFF - ***not_available***	type: uint32 unit: l when: ***counter_previous = sent*** 0xFFFFFFFF - ***not_available***	type: uint32 unit: l when: ***counter_previous = sent*** 0xFFFFFFFF - ***not_available***	See fig. 2

1.

Bit #	Parameter	Value
0	*counter_prvious*	0 - *not_sent* 1 - *sent*
1	*fixed_metering*	0 - *disabled* 1 - *enabled*
2	*usage_detected*	0 - false 1 - true
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

2.

Bit #	Parameter	Value
0	*hour*	type: uint5 unit: h (from 00:00) 31 - live
1		
2		
3		
4		
5	*metering_interval*	0 - *hourly* 1 - *daily*
6	RFU	
7	RFU	

Message sample

Message in base64

```
AQQEAAAA
```

Message decoded to HEX

```
01|04|04000000
```

header HEX message

```
0x01
```

general HEX message

```
0x04
```

general HEX message converted to binary

```
0B00000100
```

Binary converted to statuses (LSB)

```
0 : counter_previous - not sent
0 : fixed_metering - disabled
1 : usage_detected - true
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
```

counter_instant HEX message

```
0x04000000
```

HEX message flip for MSB

```
0x00000004
```

HEX message converted to decimal

```
4 (Liters)
```

fPort 49 Configuration Request Message

Byte 0	Operation
0x00	*reporting_config_request*

Message sample

Message goal: Request reporting 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 50 in the following format

Reporting configuration

Byte 0	Byte 1	Byte 2..3	Byte 4..5	Byte 6
packet_type	*configured_parameters*	*usage_interval*	*status_interval*	*behaviour*
0x00 *reporting_config_packet*	See fig. 1	type: uint16 unit: min when: *usage_interval* = *configured* 0x00 - disable min - 10min max - 24h default - 1h	type: uint16 unit: min when: *usage_interval* = *configured* min - 1h max - 7days default - 24h	See fig. 2

1.

Bit #	Parameter	Value
0	*usage_interval*	0 - *not_configured* 1 - *configured*
1	*status_interval*	
2	*behaviour*	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

2.

Bit #	Parameter	Value
0	*send_usage*	0 - *only_when_new_data* 1 - *always* *default - 1*
1	RFU	
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

Message sample

Message in base64

```
AAc8ANACAQ==
```

Message decoded to HEX

```
00|07|3C00|D002|01
```

packet_type HEX message

```
0x00
```

HEX message translated to *packet_type*

```
reporting_config_packet
```

configured_parameters HEX message

```
0x07
```

HEX message converted to binary

```
0B00000111
```

Binary converted to configuration (LSB)

```
1 : usage_interval - configured
1 : status_interval - configured
1 : behaviour - configured
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
```

usage_interval HEX message

```
0x3C00
```

HEX message flip for MSB

```
0x003C
```

HEX message converted to decimal

```
60 (Minutes)
```

status_interval HEX message

```
0xD002
```

HEX message flip for MSB

```
0x02D0
```

HEX message converted to decimal

```
720 (Minutes)
```

behaviour HEX message

```
0x01
```

Interface map HEX message converted to binary

```
0B00000001
```

Binary converted to configuration (LSB)

```
1 : send_usage - always
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
```

Byte 0	Operation
0x05	*metering_config_request*

Message sample

Message goal: Request metering configuration

Header

Select Header HEX code

```
0x05
```

Compile message for sending (HEX)

```
0x05
```

Control value in base64 to control after sending

```
BQ==
```

Response

Sent to fPort 50 in the following format

Metering configuration

Byte 0	Byte 1	Byte 2	Byte 3..6	Byte 7..8	Byte 9..10	Byte 11..12
packet_type	*configured_parameters*	*general_config*	*absolute_reading*	*offset*	*permanent_flow_q3*	*meter_serial*
0x05 *metering_config_packet*	See fig. 1	See fig. 2	type: uint32 unit: l when: *reading_absolute = configured*	type: int16 unit: l when: *reading_offset = configured*	type: uint16 unit: l value: /10 when: *permanent_flow = configured* min=16	type: hex when: *meter_serial = configured* 0xFFFFFFFF - not_set

1.

Bit #	Parameter	Value
0	*general_config*	0 - *not_configured* 1 - *configured*
1	*reading_absolute**	
2	*reading_offset**	
3	*permanent_flow*	
4	*meter_serial*	
5	RFU	
6	RFU	
7	RFU	

2.

Bit #	Parameter	Value
0	*exponent* (units per pulse)	0 - *ignore* 1 - *1_L* 2 - *10_L* 3 - *100_L* 4 - *1000_L*
1		
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

* Only one of the parameters can be sent in a message.

Message sample

Message in base64

```
BQMBh9YSAA==
```

Message decoded to HEX

```
05 03 01 87D61200
```

packet_type HEX message

```
0x05
```

HEX message translated to *packet_type*

```
metering_config_packet
```

configured_parameters HEX message

```
0x03
```

HEX message converted to binary

```
0B00000011
```

Binary converted to configuration (LSB)

```
1 : general_config - configured
1 : reading_absolute - configured
0 : reading_offset - configured
0 : permanent_flow - configured
0 : meter_serial - configured
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
```

general_config HEX message

```
0x01
```

extremes HEX message converted to binary

```
0B00000001
```

Binary converted to extremes (LSB)

```
1 : exponent [0B001]
0 :
0 :
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
```

exponent binary value converted to HEX

```
0x01
```

HEX message converted to decimal

```
1
```

Decimal value converted to exponent

```
1_L (1L per pulse)
```

absolute_reading HEX message

```
0x87D61200
```

HEX message flip for MSB

```
0x0012D687
```

HEX message converted to decimal

```
1234567 (Liters - 1234.567m³)
```

Byte 0	Operation
0x10	*meta_pos_config_request*

Message sample

Message goal: Request position configuration

Header

Select Header HEX code

```
0x10
```

Compile message for sending (HEX)

```
0x10
```

Control value in base64 to control after sending

```
EA==
```

Response

Sent to fPort 50 in the following format

Position configuration

Byte 0	Byte 1	Byte 2..5	Byte 6..9	Byte 10	Byte 11..x
packet_type	*configured_parameters*	*gps_position*		*address*	
		latitude	*longitude*	*length*	*data[0]..data[length-1]*
0x10 *meta_pos_config_packet*	See fig. 1	type: int32 value: /10^7 when: *gps_position* = *configured* 0x7FFFFFFF - not_configured	type: int32 value: /10^7 when: *gps_position* = *configured* 0x7FFFFFFF - not_configured	type: uint8 unit: B when: *address* = *configured* max=38	type: char array (utf-8) when: *address* = *configured*

1.

Bit #	Parameter	Value
0	*gps_position*	0 - *not_configured* 1 - *configured*
1	*address*	
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

Message sample

Message in base64

```
EANxFGwj0/6yDhp2YWJhw7VodW11dXNldW1pIHRlZSAxLTIwMQ==
```

Message decoded to HEX

```
10|03|71146C23|D3FEB20E|1A|76616261C3B568756D75757365756D692074
656520312D323031
```

packet_type HEX message

```
0x10
```

HEX message translated to *packet_type*

```
meta_pos_config_packet
```

configured_parameters HEX message

```
0x03
```

HEX message converted to binary

```
0B00000011
```

Binary converted to configuration (LSB)

```
1 : gps_position - configured
1 : address - configured
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
```

downlgps_positionink

latitude HEX message

```
0x71146C23
```

HEX message flip for MSB

```
0x236C1471
```

HEX message converted to decimal

```
594285681
```

Decimal value multiplied divided 10000000

```
59.4285681
```

longitude HEX message

```
0xD3FEB20E
```

HEX message flip for MSB

```
0x0EB2FED3
```

HEX message converted to decimal

```
246611667
```

Decimal value multiplied divided 10000000

```
24.6611667
```

address

length HEX message

```
0x1A
```

HEX message converted to decimal

```
26 (Bytes)
```

data[0..25] HEX message

```
0xD3FEB20E
```

HEX message flip for MSB

```
0x76616261C3B568756D75757365
  756D692074656520312D323031
```

HEX message converted to char array (UTF-8)

```
vabaõhumuuseumi tee 1-201
```

Byte 0	Operation
0x11	*meta_id_config_request*

Message sample

Message goal: Request id configuration

Header

Select Header HEX code

```
0x11
```

Compile message for sending (HEX)

```
0x11
```

Control value in base64 to control after sending

```
EQ==
```

Response

Sent to fPort 50 in the following format

Id configuration

Byte 0	Byte 1	Byte 2..5	Byte 6..9	Byte 10	Byte 11..x
packet_type	*configured_parameters*	*id_customer_len*	*id_customer* *id_1[0]..id_1[id_customer_len-1]*	*id_location_len*	*id_location* *id_1[0]..id_1[id_location_len-1]*
0x11 *meta_id_config_packet*	See fig. 1	type: uint8 unit: B when: *id_customer* = *configured* min=1 max=16	type: char array (utf-8) when: *id_customer* = *configured*	type: uint8 unit: B when: *id_location* = *configured* min=1 max=16	type: char array (utf-8) when: *id_location* = *configured*

1.

Bit #	Parameter	Value
0	*id_customer*	0 - *not_configured* 1 - *configured*
1	*id_location*	
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

Message sample

Message in base64

```
EQMQdGhpc2lzY3Vzb21lcmlkEHRoaXNpc2xvY2F0aW9uaWQ=
```

Message decoded to HEX

```
11|03|10|74686973697363757 36F6D65726964|10|7468697369736C6F636174696F6E6964
```

packet_type HEX message

```
0x11
```

HEX message translated to *packet_type*

```
meta_id_config_packet
```

configured_parameters HEX message

```
0x03
```

HEX message converted to binary

```
0B00000011
```

Binary converted to configuration (LSB)

```
1 : id_customer - configured
1 : id_location - configured
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
```

id_customer_len HEX message

```
0x10
```

HEX message converted to decimal

```
16 (Bytes)
```

id_customer

id_1[0..15] HEX message

```
0x74686973697363757 36F6D65726964
```

HEX message converted to char array (UTF-8)

```
thisiscusomerid
```

id_location_len HEX message

```
0x10
```

HEX message converted to decimal

```
16 (Bytes)
```

id_location

id_1[0..15] HEX message

```
0x7468697369736C6F636174696F6E6964
```

HEX message converted to char array (UTF-8)

```
thisislocationid
```

fPort 50 Configuration Message

reporting_config_packet

Byte 0	Byte 1	Byte 2..3	Byte 4..5	Byte 6
packet_type	*configured_parameters*	*usage_interval*	*status_interval*	*behaviour*
0x00 *reporting_config_packet*	See fig. 1	type: uint16 unit: min when: *usage_interval* = *configured* 0x00 - disable min - 10min max - 24h default - 1h	type: uint16 unit: min when: *usage_interval* = *configured* min - 1h max - 7days default - 24h	See fig. 2

1.

Bit #	Parameter	Value
0	*usage_interval*	0 - *not_configured* 1 - *configured*
1	*status_interval*	
2	*behaviour*	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

2.

Bit #	Parameter	Value
0	*send_usage*	0 - *only_when_new_data* 1 - *always* *default - 1*
1	RFU	
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

Message sample

Message goal: Set usage interval to 120 minutes and behaviour to only when new data

Header

Select Header HEX code

```
0x00
```

configured_parameters

```
1 : usage_interval - configured
0 : status_interval - not_configured
1 : behaviour - configured
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
```

Selection converted to binary

```
0B00000101
```

Selection converted to HEX

```
0x05
```

usage_interval decimal value

```
120
```

Decimal value converted to HEX

```
0x0078
```

HEX message flip for LSB

```
0x7800
```

behaviour

```
0 : send_usage - only_when_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
```

Selection converted to binary

```
0B00000000
```

Selection converted to HEX

```
0x00
```

Compile message for sending (HEX)

```
00|05|7800|00
```

Control value in base64 to control after sending

```
AAV4AAA=
```

metering_config_packet

Byte 0	Byte 1	Byte 2	Byte 3..6	Byte 7..8	Byte 9..10	Byte 11..12
packet_type	*configured_parameters*	*general_config*	*absolute_reading*	*offset*	*permanent_flow_q3*	*meter_serial*
0x05 *metering_config_packet*	See fig. 1	See fig. 2	type: uint32 unit: l when: *reading_absolute = configured*	type: int16 unit: l when: *reading_offset = configured*	type: uint16 unit: l value: *10 when: *permanent_flow = configured* min=16	type: hex when: *meter_serial = configured* 0xFFFFFFFF - not_set

1.

Bit #	Parameter	Value
0	*general_config*	0 - *not_configured* 1 - *configured*
1	*reading_absolute**	
2	*reading_offset**	
3	*permanent_flow*	
4	*meter_serial*	
5	RFU	
6	RFU	
7	RFU	

2.

Bit #	Parameter	Value
0	*exponent* (units per pulse)	0 - *ignore* 1 - *1_L* 2 - *10_L* 3 - *100_L* 4 - *1000_L*
1		
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

Message sample

Message goal: Set reading value to 23.657m^3 and meter serial to 34500027

Header

Select Header HEX code

```
0x05
```

configured_parameters

```
0 : general_config - not_configured
1 : reading_absolute - configured
0 : reading_offset - not_configured
0 : permanent_flow - not_configured
1 : meter_serial - configured
0 : RFU - n/a
0 : RFU - n/a
0 : RFU - n/a
```

Selection converted to binary

```
0B00010010
```

Selection converted to HEX

```
0x12
```

absolute_reading decimal value

```
23657
```

Decimal value converted to HEX

```
0x00005C7B
```

HEX message flip for LSB

```
0x7B5C0000
```

meter_serial decimal value

```
34500027
```

Decimal value converted to HEX

```
0x020E6DBB
```

HEX message flip for LSB

```
0xBB6D0E02
```

Compile message for sending (HEX)

```
05|12|7B5C0000|BB6D0E02
```

Control value in base64 to control after sending

```
BRJ7XAAAu20OAg==
```

meta_pos_config_packet

Byte 0	Byte 1	Byte 2..5	Byte 6..9	Byte 10	Byte 11..x
packet_type	*configured_parameters*	*gps_position*		*address*	
		latitude	*longitude*	*length*	*data[0]..data[length-1]*
0x10 *meta_pos_config_packet*	See fig. 1	type: int32 value: $*10^7$ when: *gps_position* = *configured* 0x7FFFFFFF - not_configured	type: int32 value: $*10^7$ when: *gps_position* = *configured* 0x7FFFFFFF - not_configured	type: uint8 unit: B when: *address* = *configured* max=38	type: char array (utf-8) when: *address* = *configured*

1.

Bit #	Parameter	Value
0	*gps_position*	0 - *not_configured* 1 - *configured*
1	*address*	
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

Message sample

Message goal: Set the device coordinates to 59.4286400, 24.6610052

Header

Select Header HEX code

```
0x10
```

configured_parameters

```
1 : gps_position - configured
0 : address - not_configured
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

```
0B00000001
```

Selection converted to HEX

```
0x01
```

gps_position

latitude decimal value (7 decimal places)

```
59.4286400
```

Decimal value multipleid by 10000000

```
594286400
```

Decimal value converted to HEX

```
0x236C1740
```

HEX message flip for LSB

```
0x40176C23
```

longitude decimal value (7 decimal places)

```
24.6610052
```

Decimal value multipleid by 10000000

```
246610052
```

Decimal value converted to HEX

```
0x0EB2F884
```

HEX message flip for LSB

```
0x84F8B20E
```

Compile message for sending (HEX)

```
10|01|40176C23|84F8B20E
```

Control value in base64 to control after sending

```
EAFAF2wjhPiyDg==
```

meta_id_config_packet

Byte 0	Byte 1	Byte 2..5	Byte 6..9	Byte 10	Byte 11..x
packet_type	*configured_parameters*	*id_customer_len*	*id_customer* *id_1[0]..id_1[id_customer_len-1]*	*id_location_len*	*id_location* *id_1[0]..id_1[id_location_len-1]*
0x11 *meta_id_config_packet*	See fig. 1	type: uint8 unit: B when: *id_customer* = *configured* min=1 max=16	type: char array (utf-8) when: *id_customer* = *configured*	type: uint8 unit: B when: *id_location* = *configured* min=1 max=16	type: char array (utf-8) when: *id_location* = *configured*

1.

Bit #	Parameter	Value
0	*id_customer*	0 - *not_configured* 1 - *configured*
1	*id_location*	
2	RFU	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

Message sample

Message goal: Set the device customer id to ee067398900009fi

Header

Select Header HEX code

```
0x11
```

configured_parameters

```
1 : id_customer - configured
0 : id_location - not_configured
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

```
0B00000001
```

Selection converted to HEX

```
0x01
```

id_customer_len decimal value

```
16
```

Decimal value converted to HEX

```
0x10
```

id_customer

id_1[0..15] char array message (UTF-8)

```
ee067398900009fi
```

char array coverted to HEX

```
65653036373339383930303030396669
```

Compile message for sending (HEX)

```
11|01|16|65653036373339383930303030396669
```

Control value in base64 to control after sending

```
EQEWZWUwNjczOTg5MDAwMDlmaQ==
```

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 60 Command Message

Byte 0	Operation
0x02	*request_calibration_data*

Message sample

Message goal: Request reporting configuration

Header

Select Header HEX code

```
0x02
```

Compile message for sending (HEX)

```
0x02
```

Control value in base64 to control after sending

```
Ag==
```

Response

Sent to fPort 60 in the following format

Byte 0	Byte 1	Byte 2..3	Byte 4..9			Byte 10..15			Byte 16..21			Byte 22..27			Byte 28..30			Byte 31..33			Byte 34..35
packet_type	*sensor_type*	*fw_version*	*afe_1_min*			*afe_1_max*			*afe_2_min*			*afe_2_max*			*recalib_delta*			*initail_noise*			*communi-cation_er-ror_count*
			ch_1	*ch_2*	*ch_3*	*ch_1*	*ch_2*	*ch_3*	*ch_1*	*ch_2*	*ch_3*	*ch_1*	*ch_2*	*ch_3*	*ch_1*	*ch_2*	*ch_3*	*ch_1*	*ch_2*	*ch_3*	
0x02 *request_cali-bration_data*	0x01 *inductive_sen-sor*	type: uin16	type: uint16 0xFFFF - *not_ available*			type: uint16 0xFFFF - *not_ available*			type: uint16 0xFFFF - *not_ available*			type: uint16 0xFFFF - *not_ available*			type: int8			type: uint8			type: uint16

Message sample

Message in base64

```
AgECAIkGZwbdBr4GsAYVB40GagbfBsAGsgYYBwAAAAdHRwEA
```

Message decoded to HEX

```
02|01|0200|8906|6706|DD06|BE06|B006|1507|8D06|6A06|DF06|C006|B206|1807|00|00|00|07|47|47|0100
```

packet_type HEX message

```
0x02
```

HEX message translated to *packet_type*

```
request_calibration_data
```

sensor_type HEX message

```
0x01
```

fw_version HEX message

```
0x0200
```

HEX message flip for MSB

```
0x0002
```

HEX message converted to decimal

```
2
```

afe_1_min

ch_1 HEX message

```
0x8906
```

HEX message flip for MSB

```
0x0689
```

HEX message converted to decimal

```
1673
```

ch_2 HEX message

```
0x6706
```

HEX message flip for MSB

```
0x0667
```

HEX message converted to decimal

```
1639
```

ch_3 HEX message

```
0xDD06
```

HEX message flip for MSB

```
0x06DD
```

HEX message converted to decimal

```
1757
```

afe_1_max

ch_1 HEX message

```
0xBE06
```

HEX message flip for MSB

```
0x06BE
```

HEX message converted to decimal

```
1726
```

ch_2 HEX message

```
0xB006
```

HEX message flip for MSB

```
0x06B0
```

HEX message converted to decimal

```
1712
```

ch_3 HEX message

```
0x1507
```

HEX message flip for MSB

```
0x0715
```

HEX message converted to decimal

```
1813
```

afe_2_min

ch_1 HEX message

```
0x8D06
```

HEX message flip for MSB

```
0x068D
```

HEX message converted to decimal

```
1677
```

ch_2 HEX message

```
0x6A06
```

HEX message flip for MSB

```
0x066A
```

HEX message converted to decimal

```
1642
```

ch_3 HEX message

```
0xDF06
```

HEX message flip for MSB

```
0x06DF
```

HEX message converted to decimal

```
1759
```

afe_2_max

ch_1 HEX message

```
0xC006
```

HEX message flip for MSB

```
0x06C0
```

HEX message converted to decimal

```
1728
```

ch_2 HEX message

```
0xB206
```

HEX message flip for MSB

```
0x06B2
```

HEX message converted to decimal

```
1714
```

ch_3 HEX message

```
0x1807
```

HEX message flip for MSB

```
0x0718
```

HEX message converted to decimal

```
1816
```

recalib_delta

ch_1 HEX message

```
0x00
```

HEX message converted to decimal

```
0
```

ch_2 HEX message

```
0x00
```

HEX message converted to decimal

```
0
```

ch_3 HEX message

```
0x00
```

HEX message converted to decimal

```
0
```

initial_noise

ch_1 HEX message

```
0x07
```

HEX message converted to decimal

```
7
```

ch_2 HEX message

```
0x47
```

HEX message converted to decimal

```
71
```

ch_3 HEX message

```
0x47
```

HEX message converted to decimal

```
71
```

communication_error_count HEX message

```
0x0100
```

HEX message flip for MSB

```
0x0001
```

HEX message converted to decimal

```
1
```

fPort 99 Boot/Debug Messages

boot_packet

Byte 0	Byte 1..4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11..12	Byte 13..16
packet_type	*device_serial*	*device_fw_version*			*reset_info*	*general_info*	*hardware_config*	*sensor_fw_version*	*device_uptime*
		major	*minor*	*patch*					
0x00 *boot_packet*	type: uint:32 format: HEX	type: uint8	type: uint8	type: uint8	See fig. 1	See fig. 2	0x00 *Modularis*	type: uint16 0x0000 - n/a	type: uint24 unit: h

1.

Bit #	Parameter	Value
0	RFU	
1	*watchdog_reset*	0 - *false* 1 - *true*
2	*soft_reset* (e.g DFU)	
3	RFU	
4	*magnet_wakeup*	0 - *false* 1 - *true*
5	RFU	
6	RFU	
7	*nfc_wakeup*	0 - *false* 1 - *true*

2.

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

Message sample

Message in base64

```
AJYAgkwBAAGAAAACAAAAAA==
```

Message decoded to HEX

```
00|9600824C|01|00|01|80|00|00|02|00|000000
```

packet_type HEX message

```
0x00
```

HEX message translated to *packet_type*

```
boot_packet
```

device_serial HEX message

```
0x9600824C
```

HEX message flip for MSB

```
0x4C820096
```

device_fw_version

major HEX message

```
0x01
```

HEX message converted to decimal

```
1
```

minor HEX message

```
0x00
```

HEX message converted to decimal

```
0
```

patch HEX message

```
0x01
```

HEX message converted to decimal

```
1
```

reset_info HEX message

```
0x80
```

HEX message converted to binary

```
0B10000000
```

Binary converted to configuration (LSB)

```
0 : RFU - n/a
0 : watchdog_reset - false
0 : soft_reset - false
0 : RFU - n/a
0 : magnet_wakeup - false
0 : RFU - n/a
0 : RFU - n/a
1 : nfc_wakeup - true
```

general_info HEX message

```
0x00
```

HEX message converted to binary

```
0B00000000
```

Binary converted to configuration (LSB)

```
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
0 : configuration_restored - false
```

hardware_config HEX message

```
0x00
```

HEX message translated to *hardware_config*

```
modularis
```

sensor_fw_version HEX message

```
0x0200
```

HEX message flip for MSB

```
0x0002
```

HEX message converted to decimal

```
2
```

device_uptime HEX message

```
0x000000
```

HEX message flip for MSB

```
0x000000
```

HEX message converted to decimal

```
0 (hours)
```

shutdown_packet

Byte 0	Byte 1	Byte 2..x
packet_type	*shutdown_reason*	*last_status_packet*
0x01 *shutdown_packet*	See fig. 1	Value: full payload of regular *status_message*

1.

Value	reason
0x10	*calibration_timeout*
0x20	*hardware_error*
0x31	*magnet_shutdown*
0x32	*enter_dfu*
0x33	*app_shutdown*
0x34	*switch_to_wmbus*

Message sample

Message in base64

```
ATIBEAD/ERAATwcBAAAAAAAA
```

Message decoded to HEX

```
01|32|01|10|00|FF|11|10|00|4F|07|01|00|00|00|00|00|00
```

packet_type HEX message

```
0x01
```

HEX message translated to *packet_type*

```
shutdown_packet
```

shutdown_reason HEX message

```
0x32
```

HEX message converted to *shutdown_reason*

```
enter_dfu
```

status_packet

header HEX message

```
0x01
```

general HEX message

```
0x10
```

general HEX message converted to binary

```
0B00010000
```

Binary converted to statuses (LSB)

```
0 : counter_previous - not sent
0 : fixed_metering - disabled
0 : RFU - n/a
0 : RFU - n/a
1 : debug_info - sent
0 : packet_reason_app - false
0 : packet_reason_magnet - false
0 : packet_reason_alert - false
```

active_alerts HEX message

```
0x00
```

active_alerts HEX message converted to binary

```
0B00000000
```

Binary converted to statuses (LSB)

```
0 : reverse_flow - false
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
```

battery

percentage HEX message

```
0xFF
```

HEX message converted to value

```
not_available
```

voltage HEX message

```
0x11
```

HEX message converted to decimal

```
17
```

Decimal value mapped to voltage

```
2.684 (V)
```

board

temperature HEX message

```
0x10
```

HEX message converted to signed decimal

```
16 (°C)
```

extremes HEX message

```
0x00
```

extremes HEX message converted to binary

```
0B00000000
```

Binary converted to extremes (LSB)

```
0 : min_offset [0B0000]
0 :
0 :
0 :
0 : max_offset [0B0000]
0 :
0 :
0 :
```

min_offset binary value converted to HEX

```
0x00
```

HEX message converted to decimal

```
0
```

Decimal offset value multiplied by -2

```
0 (°C)
```

max_offset binary value converted to HEX

```
0x00
```

HEX message converted to decimal

```
0
```

Decimal offset value multiplied by 2

```
0 (°C)
```

downlink

rssi HEX message

```
0x4F
```

HEX message converted to decimal

```
79
```

Decimal value multiplied by -1

```
-79 (dBm)
```

snr HEX message

```
0x07
```

HEX message converted to signed decimal

```
7 (dB)
```

counter_instant HEX message

```
0x01000000
```

HEX message flip for MSB

```
0x00000001
```

HEX message converted to decimal

```
1 (Liter)
```

calibration_delta

ch_1 HEX message

```
0x00
```

ch_2 HEX message

```
0x00
```

ch_3 HEX message

```
0x00
```

config_failed_packet

Byte 0	Byte 1	Byte 2..x
packet_type	*packet_from_fport*	*parse_error_code*
0x13 *config_failed_packet*	type: uint8	See fig. 1

1.

Value	reason
2	*unknown_fport*
3	*packet_size_short*
4	*packet_size_long*
5	*value_error*
6	*protocol_parse_error*
7	*reserved_flag_set*
8	*invalid_flag_combination*
9	*unavailable_feature_request*
10	*unsupported_header*
11	*unreachable_hw_request*
13	*internal_error*

Message sample

Message in base64

```
EzMK
```

Message decoded to HEX

```
13330A
```

packet_type HEX message

```
0x13
```

HEX message translated to *packet_type*

```
config_failed_packet
```

packet_from_fport HEX message

```
0x33
```

HEX message converted to decimal

```
(fPort) 51
```

parse_error_code HEX message

```
0x0A
```

HEX message converted to decimal

```
10
```

Decimal message converted to error

```
unsupported_header
```

wM-Bus Message

Byte #	Payload (HEX)	Decrypted Payload (HEX)	Block information	Field Information
0	1E	not encrypted	wM-Bus Header	L-field. 30 Bytes to follow
1	44			C-field. SND-NR (Send/No Reply)
2	33			Manufacturer ID. 0x3833 > 0b01110 0b00001 0b10011 > NAS
3	38			
4	96			A-Field Device ID. Little Endian BCD 20039696
5	96			
6	03			
7	20			
8	01			A-field Version
9	07			A-field Type. 0x07 - Water meter
10	7A		Payload Header	Short header
11	7B			ACC - Access number
12	00			Status byte
13	10			Configuration field. Value 0x2510 Bits: BASMMMMMNNNNCCRH S - 1(synchronous message) M - 5(OMS Security Mode 5 N - 1(Nr of encryption blocks)
14	25			
15	B9	2F	Encrypted Application Payload	Encryption verification
16	67	2F		
17	66	02		DIF - 16bit integer, OMS 4.1.2 Data point ID6!, unique message identification
18	7E	FD		VIF - linear VIF extension, next byte is VIF
19	BE	08		VIFE - Unique message identifcation
20	61	08		0x0008 > tx count = 8
21	0A	00		
22	35	04		DIF - 32 bit integer, OMS 4.1.2 Data point VM1!, Volume, current value, total
23	5B	13		VIF - Volume, unit liters
24	B2	0A		0x0000000A > 10 liters
25	87	00		
26	E0	00		
27	99	00		
28	1F	2F		Encryption padding
29	E5	2F		
30	2C	2F		

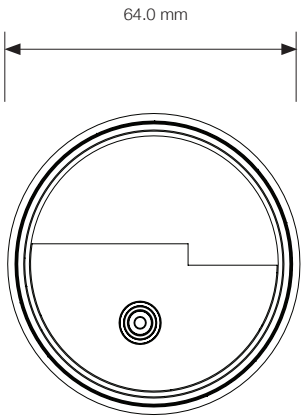
BATTERY OFFSET CHART

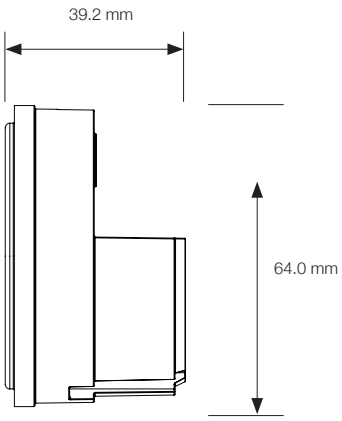
255 - Not measured

254 - 4
253 - 3,95
252 - 3,9
251 - 3,85
250 - 3,8
249 - 3,75
248 - 3,7
247 - 3,65
246 - 3,646
245 - 3,642
244 - 3,638
243 - 3,634
242 - 3,63
241 - 3,626
240 - 3,622
239 - 3,618
238 - 3,614
237 - 3,61
236 - 3,606
235 - 3,602
236 - 3,606
235 - 3,602
234 - 3,598
233 - 3,594
232 - 3,59
231 - 3,586
230 - 3,582
229 - 3,578
228 - 3,574
227 - 3,57
226 - 3,566
225 - 3,562
224 - 3,558
223 - 3,554
222 - 3,55
221 - 3,546
220 - 3,542
219 - 3,538
218 - 3,534
217 - 3,53
216 - 3,526
215 - 3,522
214 - 3,518
213 - 3,514
212 - 3,51
211 - 3,506
210 - 3,502
209 - 3,498
208 - 3,494
207 - 3,49
206 - 3,486
205 - 3,482
204 - 3,478
203 - 3,474
202 - 3,47
201 - 3,466
200 - 3,462
199 - 3,458
198 - 3,454
197 - 3,45
196 - 3,446
195 - 3,442
194 - 3,438
193 - 3,434
192 - 3,43
191 - 3,426
190 - 3,422
189 - 3,418
188 - 3,414
187 - 3,41
186 - 3,406
185 - 3,402
184 - 3,398
183 - 3,394
182 - 3,39
181 - 3,386
180 - 3,382
179 - 3,378
178 - 3,374
177 - 3,37
176 - 3,366
175 - 3,362
174 - 3,358
173 - 3,354
172 - 3,35
171 - 3,346
170 - 3,342
169 - 3,338
168 - 3,334
167 - 3,33
166 - 3,326
165 - 3,322
164 - 3,318
163 - 3,314
162 - 3,31
161 - 3,306
160 - 3,302
159 - 3,298
158 - 3,294
157 - 3,29
156 - 3,286
155 - 3,282
154 - 3,278
153 - 3,274
152 - 3,27
151 - 3,266
150 - 3,262
149 - 3,258
148 - 3,254
147 - 3,25
146 - 3,246
145 - 3,242
144 - 3,238
143 - 3,234
142 - 3,23
141 - 3,226
140 - 3,222
139 - 3,218
138 - 3,214
137 - 3,21
136 - 3,206
135 - 3,202
134 - 3,198
133 - 3,194
132 - 3,19
131 - 3,186
130 - 3,182
129 - 3,178
128 - 3,174
127 - 3,17
126 - 3,166
125 - 3,162
124 - 3,158
123 - 3,154
122 - 3,15
121 - 3,146
120 - 3,142
119 - 3,138
118 - 3,134
117 - 3,13
116 - 3,126
115 - 3,122
114 - 3,118
113 - 3,114
112 - 3,11
111 - 3,106
110 - 3,102
109 - 3,098
108 - 3,094
107 - 3,09
106 - 3,086
105 - 3,082
104 - 3,078
103 - 3,074
102 - 3,07
101 - 3,066
100 - 3,062
99 - 3,058
98 - 3,054
97 - 3,05
96 - 3,046
95 - 3,042
94 - 3,038
93 - 3,034
92 - 3,03
91 - 3,026
90 - 3,022
89 - 3,018
88 - 3,014
87 - 3,01
86 - 3,006
85 - 3,002
84 - 2,998
83 - 2,994
82 - 2,99
81 - 2,986
80 - 2,982
79 - 2,978
78 - 2,974
77 - 2,97
76 - 2,966
75 - 2,962
74 - 2,958
73 - 2,954
72 - 2,95
71 - 2,946
70 - 2,942
69 - 2,938
68 - 2,934
67 - 2,93
66 - 2,926
65 - 2,922
64 - 2,918
63 - 2,914
62 - 2,91
61 - 2,906
60 - 2,902
59 - 2,898
58 - 2,894
57 - 2,89
56 - 2,886
55 - 2,882
54 - 2,878
53 - 2,874
52 - 2,87
51 - 2,866
50 - 2,862
49 - 2,858
48 - 2,854
47 - 2,85
46 - 2,846
45 - 2,842
44 - 2,838
43 - 2,834
42 - 2,83
41 - 2,826
40 - 2,822
39 - 2,818
38 - 2,814
37 - 2,81
36 - 2,806
35 - 2,802
34 - 2,798
33 - 2,794
32 - 2,79
31 - 2,786
30 - 2,782
29 - 2,778
28 - 2,774
27 - 2,77
26 - 2,766
25 - 2,762
24 - 2,758
23 - 2,754
22 - 2,75
21 - 2,746
20 - 2,742
19 - 2,738
18 - 2,734
17 - 2,684
16 - 2,634
15 - 2,584
14 - 2,534
13 - 2,484
12 - 2,434
11 - 2,384
10 - 2,334
9 - 2,284
8 - 2,234
7 - 2,184
6 - 2,134
5 - 2,084
4 - 2,034
3 - 1,984
2 - 1,934
1 - 1,884

0 - N/A

DIMENSIONS





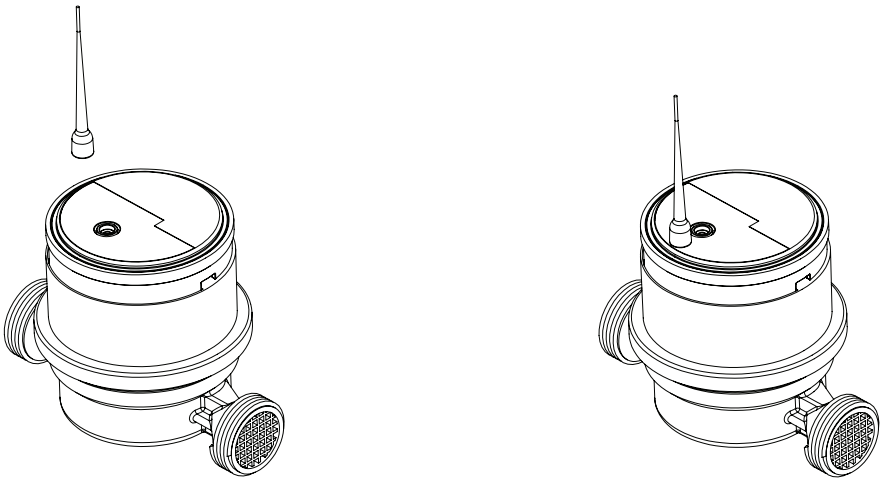
COMPATIBILITY LIST

- Wehrle Modularis meters
- Bernhardt Modularis compatible meters
- Maddalena CD SD PLUS EVO
- Maddalena VTZ
- Simens WFW30/WFK30 series
- Wasser-Geräte ECO type meters
- WaterTech Polaris-S

ACTIVATION

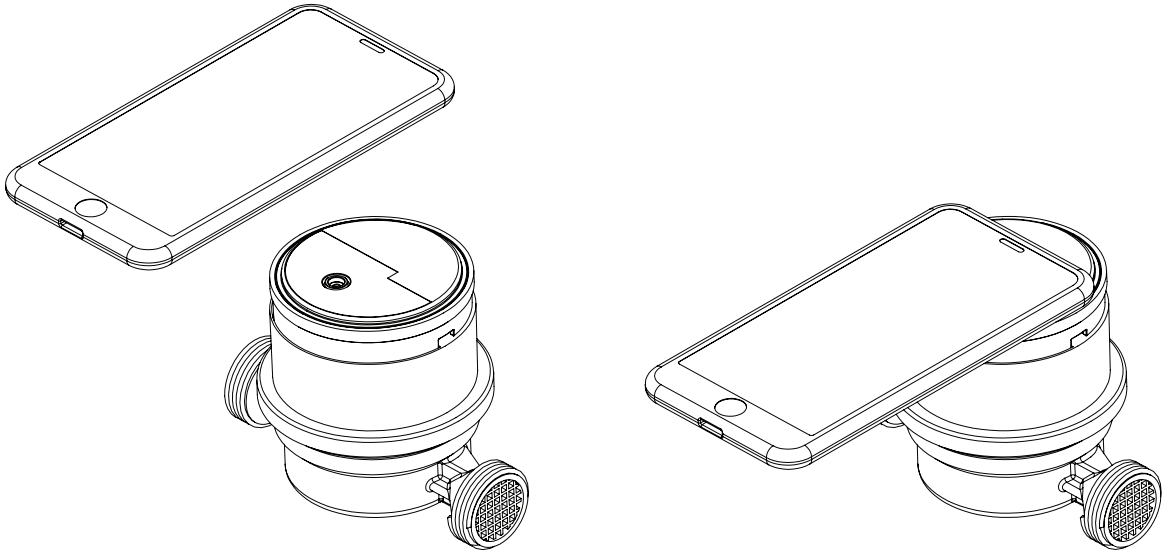
Magnet Activation

To activate the device, hold the magnet against the device approximately on the NAS logo (see illustration) for atleast 1 second. You can remove the magnet when the red light starts to flash

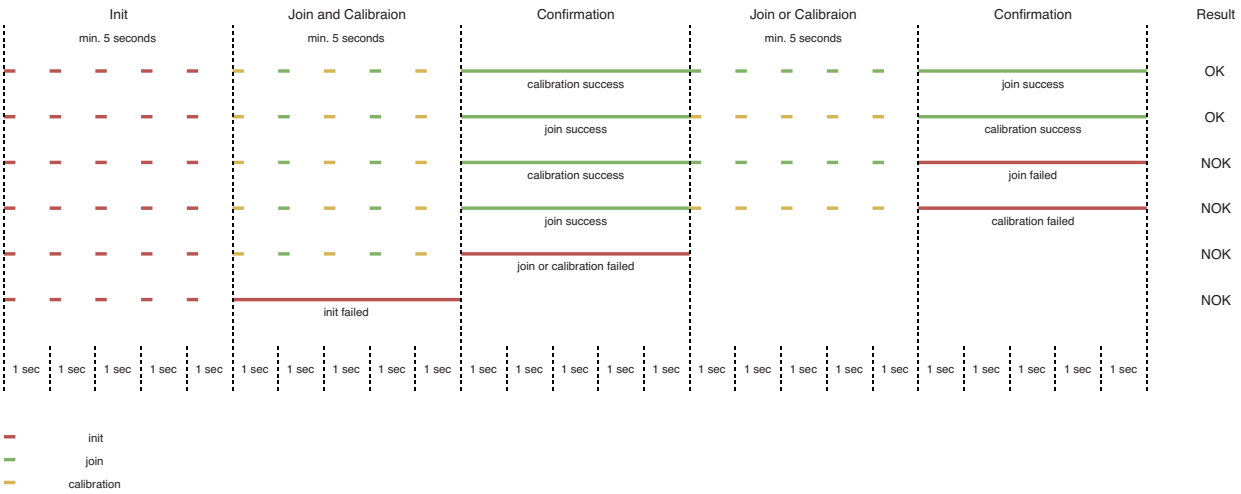


NFC Activation

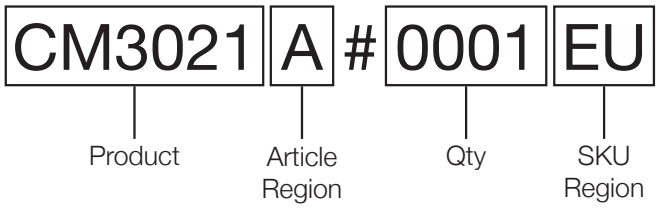
To activate the device, run the NAS Connect application on your phone and scan the NFC on the device (see illustration). You can remove the phone when the “Check” icon is displayed on the phone.



LED behaviour during activation



ORDERING INFORMATION



Product/SKU	Package qty	Version
CM3021x#0001xx	1	Modularis

Article region	SKU region	Band
A	EU	EU868
B	AU	AU915
C	US	US915
D	AS	AS923
F	KR	KR920
I	IN	IN865
J	RU	RU864

CONTACT INFORMATION

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REVISION HISTORY

1.0 - First version