Nordic Automation Systems

LoRaWAN™ WATER METER SENSOR CM3000

RETROFIT

LoRaWAN™ water meter sensor enables the acquisition of water consumption data and transmits it wirelessly to the available LoRaWAN™ network.

LoRaWAN™ water meter sensor is meant to be attached to the existing water meter

OVERVIEW

Efficient

LoRaWAN™ Water Meter Sensor has 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

Water metering

Frequent reporting provides a detailed usage overview.

Leakage and usage detection

LoRaWAN™ Water Meter Sensor can be configured to send alerts when leakage/usage is detected.

Tampering detection

Sensor sends an alert when magnetic tampering is detected.

FEATURES

- Long range wireless data transmission
- Optical detection of the water meter rotating gear movement
- Magnetic detection of the water meter magnetic dial movement
- Pre-installed long-life battery
- Water metering
- Backflow detection
- Removal detection
- Tamper alert
- Leakage/usage detection
- Configurable reporting interval
- Maintenance free - install & forget
- Easy installation
- Average life 10 years*
- Secure communication

* Lifetime depends from the reading method (optical or magnetic), device location and reporting interval. With optical reading and hourly reporting the minimal expected lifetime is 2 years.

SPECIFICATIONS

Diameter:	73.0 mm
Height:	41.0 mm
Water meter front panel diameter:	60mm-67mm
Weight:	60 g
Operating temperature:	-20°C ... +65°C
Communication range:	up to 15km*
Tx power:	up to +20dBm
Rx Sensitivity:	-140dBm
MAC Layer:	LoRaWAN™
Physical Layer:	LoRa®
Body material:	Polycarbonate
IP Rating:	IP54
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	Format	Uplink	Unit	Comment
6	Count	uint64_t	yes	-	Cumulative
14	Water Usage	uint64_t	yes	liters	Cumulative
24	Status		yes	-	Defined below
50	Configuration		no	-	Defined below
99	Boot/Debug		yes	-	Defined below

fPort6 usage message

Byte0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Pulse count (uint64)							

MESSAGE SAMPLE

Message in base64

```
gAoAAAAAAA=
```

Message decoded to hex

```
800A000000000000
```

HEX message flip for MSB

```
0000000000000A80
```

HEX message converted to decimal

```
2688 (pulses)
```

fPort14 water usage

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Liters (uint64)							

Message sample

Message in base64

```
TikAAAAAAA=
```

Message decoded to hex

```
4E29000000000000
```

HEX message flip for MSB

```
000000000000294E
```

HEX message converted to decimal

```
10574 (liters)
```

fPort24 Status Message

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Usage counter (uint32)				Battery Offset (Int8)	Temperature °C (int8)	Sensor RSSI dBm (int8)	Status	

Bit #	Function	Byte 1	Byte 2
0	Watch mode	0: off (default) 1: on	0: ok 1: alert
1	Leak detection	0: off (default) 1: on	
2	Rev. flow detection	0: off 1: on (default)	
3	Tamper detection	0: off 1: on (default)	
4	Sensor mode	0: magnetic (preferred) 1: optical	n/a
5	Reporting mode	0: pulses (default) 1: units (liters)	n/a
6	Temp. detection	0: off (default) 1: on	0: ok 1: alert
7	RFU		

Message sample

Message in base64

```
EQAAAE4kqmwI
```

Message decoded to hex

```
11000000|4E|24|AA|6C08
```

Usage counter `11000000` HEX message flip for MSB

```
00000011
```

HEX message converted to decimal

```
17 (liters, as units are transmitted)
```

Battery HEX message

```
4E
```

HEX message converted to decimal

```
78
```

Offset value converted to volts

```
2.482V (see volts conversion map)
```

Temperature HEX message

```
24
```

HEX message converted to decimal

```
36°C
```

Sensor RSSI HEX message

```
AA
```

HEX message converted to signed decimal

```
-42 dBm
```

Status HEX message

```
6C08
```

Status HEX message first byte converted to binary

```
0110 1100
```

Binary converted to statuses (LSB)

```
0 : Watch mode - off
0 : Leak detection - off
1 : Reverse flow detection - on
1 : Tamper detection - on
0 : Sensor mode - magnetic
1 : Reporting mode - units
1 : Temperature detection - on
0 : RFU
```

Status HEX message second byte converted to binary

```
0000 1000
```

Binary converted to alerts (LSB)

```
0 : Watch mode - ok
0 : Leak detection - ok
0 : Reverse flow detection - ok
1 : Tamper detection - alert
0 : N/A
0 : N/A
0 : Temperature detection - ok
0 : RFU
```

CONFIGURATION MESSAGE

Byte0	Byte ...	Byte n
Header	Payload	

Value	Bit #	Parameter	Payload size	Type	Value	Unit	Comment
0: not sent 1: sent	0	Pulse multiplier	32bit	float (IEEE754)	1	pulses per unit	
	1	Reporting interval	32bit	uint	600	seconds	0 = disabled min. value 150. Will be reported if at least 1 pulse is received
	2	Reporting interval	32bit	uint	10	pulses/units	0 = disabled
	3	Status Interval	32bit	uint	3600	seconds	0 = default
	4	Counter	64bit	uint		units	
	5	Temp. threshold	8bit	int	0	°C	
	6	RFU					
	7	Functions	8bit				

Bit #	Function	Value
0	Watch mode	0: off (default) 1: on
1	Leak detection	0: off 1: on (default)
2	Rev. flow detection	
3	Tamper detection	
4	Sensor mode	0: magnetic (preferred) 1: optical
5	Reporting mode	0: pulses (default) 1: units (liters)
6	Temp. detection	0: off 1: on (default)
7	RFU	

Message sample

Message goal: Configure multiplier to 256, reporting interval to 600 sec & reporting interval to 400 liters

Header

Function selection

```
1 : Pulse multiplier - set
1 : Reporting interval (seconds) - set
1 : Reporting interval (units) - set
0 : Status interval - not set
0 : Counter - not set
0 : Temperature threshold - not set
0 : RFU
0 : Functions - not set
```

Selection converted to binary

```
00000111
```

Selection converted to HEX

```
07
```

Multiplier

Converting multiplier `256.0` from float (IEEE 754) to HEX

```
43800000
```

Flip multiplier for LSB

```
00008043
```

Reporting interval (seconds)

Converting interval `600` to HEX

```
258
```

Flip interval for LSB

```
58020000
```

Reporting interval (units)

Converting interval `400` to HEX

```
190
```

Flip interval for LSB

```
90010000
```

Compile message for sending (HEX)

```
07|00008043|58020000|90010000
```

Control value in base64 to control after sending

```
BwAAgENYAgAAkAEAAA==
```

BOOT/DEBUG MESSAGE

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Header (HEX)	Payload (Message specific)						
0x00 Boot	Serial (HEX)				Firmware (HEX)		
0x01 Shutdown							

Message sample

Message in base64

```
ADoAEDUAApg=
```

Message decoded to hex

```
003A001035000298
```

Header HEX message

```
00
```

HEX translated to type

```
Boot
```

Serial HEX message

```
3A001035
```

Flip HEX message for MSB

```
3510003A
```

Firmware version

Major version in HEX

```
00
```

HEX value converted to decimal

```
0
```

Minor version in HEX

```
02
```

HEX value converted to decimal

```
2
```

Patch version in HEX

```
98
```

HEX value converted to decimal

```
152
```

BATTERY OFFSET CHART

255 - Not measured

254 - 3,6V
253 - 3,55V
252 - 3,5V
251 - 3,45V
250 - 3,4V
249 - 3,35V
248 - 3,3V
247 - 3,25V
246 - 3,2V
245 - 3,15V
244 - 3,146V
243 - 3,142V
242 - 3,138V
241 - 3,134V
240 - 3,13V
239 - 3,126V
238 - 3,122V
237 - 3,118V
236 - 3,114V
235 - 3,11V
234 - 3,106V
233 - 3,102V
232 - 3,098V
231 - 3,094V
230 - 3,09V
229 - 3,086V
228 - 3,082V
227 - 3,078V
226 - 3,074V
225 - 3,07V
224 - 3,066V
223 - 3,062V
222 - 3,058V
221 - 3,054V
220 - 3,05V
219 - 3,046V
218 - 3,042V
217 - 3,038V
216 - 3,034V
215 - 3,03V
214 - 3,026V
213 - 3,022V
212 - 3,018V
211 - 3,014V
210 - 3,01V
209 - 3,006V
208 - 3,002V
207 - 2,998V
206 - 2,994V
205 - 2,99V
204 - 2,986V
203 - 2,982V
202 - 2,978V
201 - 2,974V
200 - 2,97V
199 - 2,966V
198 - 2,962V
197 - 2,958V
196 - 2,954V
195 - 2,95V
194 - 2,946V
193 - 2,942V
192 - 2,938V
191 - 2,934V
190 - 2,93V
189 - 2,926V
188 - 2,922V
187 - 2,918V
186 - 2,914V
185 - 2,91V
184 - 2,906V
183 - 2,902V
182 - 2,898V
181 - 2,894V
180 - 2,89V
179 - 2,886V
178 - 2,882V
177 - 2,878V
176 - 2,874V
175 - 2,87V
174 - 2,866V
173 - 2,862V
172 - 2,858V
171 - 2,854V
170 - 2,85V
169 - 2,846V
168 - 2,842V
167 - 2,838V
166 - 2,834V
165 - 2,83V
164 - 2,826V
163 - 2,822V
162 - 2,818V
161 - 2,814V
160 - 2,81V
159 - 2,806V
158 - 2,802V
157 - 2,798V
156 - 2,794V
155 - 2,79V
154 - 2,786V
153 - 2,782V
152 - 2,778V
151 - 2,774V
150 - 2,77V
149 - 2,766V
148 - 2,762V
147 - 2,758V
146 - 2,754V
145 - 2,75V
144 - 2,746V
143 - 2,742V
142 - 2,738V
141 - 2,734V
140 - 2,73V
139 - 2,726V
138 - 2,722V
137 - 2,718V
136 - 2,714V
135 - 2,71V
134 - 2,706V
133 - 2,702V

132 - 2,698V
131 - 2,694V
130 - 2,69V
129 - 2,686V
128 - 2,682V
127 - 2,678V
126 - 2,674V
125 - 2,67V
124 - 2,666V
123 - 2,662V
122 - 2,658V
121 - 2,654V
120 - 2,65V
119 - 2,646V
118 - 2,642V
117 - 2,638V
116 - 2,634V
115 - 2,63V
114 - 2,626V
113 - 2,622V
112 - 2,618V
111 - 2,614V
110 - 2,61V
109 - 2,606V
108 - 2,602V

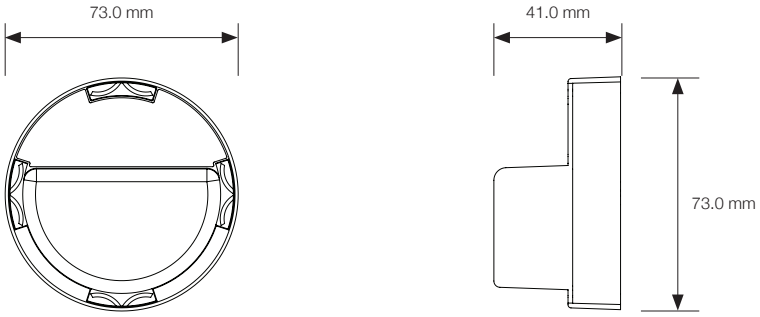
107 - 2,598V
106 - 2,594V
105 - 2,59V
104 - 2,586V
103 - 2,582V
102 - 2,578V
101 - 2,574V
100 - 2,57V
99 - 2,566V
98 - 2,562V
97 - 2,558V
96 - 2,554V
95 - 2,55V
94 - 2,546V
93 - 2,542V
92 - 2,538V
91 - 2,534V
90 - 2,53V
89 - 2,526V
88 - 2,522V
87 - 2,518V
86 - 2,514V
85 - 2,51V
84 - 2,506V
83 - 2,502V

82 - 2,498V
81 - 2,494V
80 - 2,49V
79 - 2,486V
78 - 2,482V
77 - 2,478V
76 - 2,474V
75 - 2,47V
74 - 2,466V
73 - 2,462V
72 - 2,458V
71 - 2,454V
70 - 2,45V
69 - 2,446V
68 - 2,442V
67 - 2,438V
66 - 2,434V
65 - 2,43V
64 - 2,426V
63 - 2,422V
62 - 2,418V
61 - 2,414V
60 - 2,41V
59 - 2,406V
58 - 2,402V
57 - 2,398V
56 - 2,394V
55 - 2,39V
54 - 2,386V
53 - 2,382V
52 - 2,378V
51 - 2,374V
50 - 2,37V
49 - 2,366V
48 - 2,362V
47 - 2,358V
46 - 2,354V
45 - 2,35V
44 - 2,346V
43 - 2,342V
42 - 2,338V
41 - 2,334V
40 - 2,33V
39 - 2,326V
38 - 2,322V
37 - 2,318V
36 - 2,314V
35 - 2,31V
34 - 2,306V
33 - 2,302V
32 - 2,298V
31 - 2,294V
30 - 2,29V
29 - 2,286V
28 - 2,282V
27 - 2,278V
26 - 2,274V
25 - 2,27V
24 - 2,266V
23 - 2,262V
22 - 2,258V
21 - 2,254V
20 - 2,25V
19 - 2,246V
18 - 2,242V
17 - 2,238V
16 - 2,234V
15 - 2,184V
14 - 2,134V
13 - 2,084V
12 - 2,034V
11 - 1,984V
10 - 1,934V
9 - 1,884V
8 - 1,834V
7 - 1,784V
6 - 1,734V
5 - 1,684V
4 - 1,634V
3 - 1,584V
2 - 1,534V
1 - 1,484V

0 - N/A

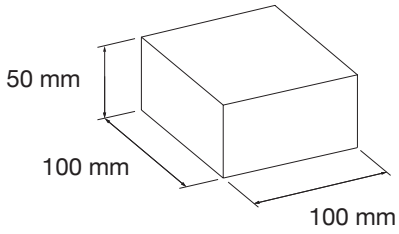
DIMENSIONS / PACKAGING

Dimensions



Packaging

1 pcs box



ORDERING INFORMATION

Article / SKU	Package qty	Frequency	Region	Water meter front panel diameter
CM3000A#0001EU	1	868 MHz	EU	60mm-67mm
CM3000B#0001AU	1	922 MHz	AU	60mm-67mm
CM3000C#0001US	1	915 MHz	US	60mm-67mm
CM3000D#0001AS	1	923 MHz	AS	60mm-67mm
CM3000E#0001CN	1	780 MHz	CN	60mm-67mm
CM3000F#0001KR	1	922 MHz	KR	60mm-67mm
CM3000G#0001EU	1	433 MHz	EU	60mm-67mm
CM3000H#0001CN	1	470 MHz	CN	60mm-67mm
CM3000I#0001IN	1	866 MHz	IN	60mm-67mm

CONTACT INFORMATION

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REVISION HISTORY

1.0 - First version

1.1 - Added communication protocol.

1.2 - Added code samples & Battery info