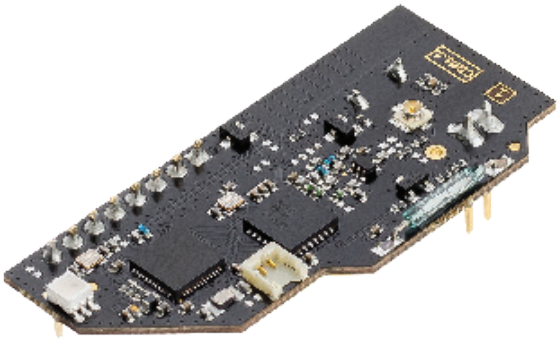
Nordic Automation Systems

LoRaWAN®
QALCOSONIC MODULE
IM3071



LoRaWAN® Qalcosonic Module enables the acquisition of metering data from Qalcosonic E1 and F1 series meters and transmits it wirelessly to the available LoRaWAN® network.

LoRaWAN® Qalcosonic Module is meant to be attached to the existing meter as internal module.

FW version >= 0.3.0

OVERVIEW

Efficient

LoRaWAN® Qalcosonic Module has bidirectional, long range transceiver with low power consumption.

Intelligent

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

APPLICATIONS

Metering

Frequent reporting provides a detailed usage overview.

FEATURES

- Long range wireless data transmission
- Metering
- Configurable reporting interval
- NFC ready
- On board buzzer
- Maintenance free - install & forget
- Easy installation
- Secure communication

SPECIFICATIONS

Width:	15 mm
Height:	23 mm
Length:	50 mm
Weight:	4.6 g
Operating temperature:	-40°C ... +60°C
Communication range:	up to 15km**
Tx power:	up to +20dBm
Rx Senitivity:	-140dBm
MAC Layer:	LoRaWAN®
Physical Layer:	LoRa®
IP Rating:	N/A
Communication:	LoRaWAN®
LoRa Device Class:	A

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

COMMUNICATION

Byte 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	⇅	12
50	Configuration	⇅	14
51	Update mode	⇊	16
99	Boot/Debug	⇈	17

FW version >= 0.3.0

fPort 24 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
Module Battery	Module Temp.	Module RSSI	Alerts	Volume				Meter error code				Register map	RFU	Register payload	
uint8 (mapped)	int8 (°C)	uint8 (-dBm)		uint32 (L)*				Meter manufacturer error codes**					0	See register map	

Bit #	Parameter	Value
0	User triggered	0 - false 1 - true
1	Error changed	
2	Temp alert	
3	RFU	
4	RFU	
5	RFU	
6	RFU	
7	RFU	

Bit #	Register	Unit	Payload	Value
0	Heat energy	kWh	int32	0 - not sent 1 - sent
1	Cooling energy	kWh	int32	
2	Pulse 1	L	int32	
3	Pulse 2	L	int32	
4	RFU			
5	RFU			
6	RFU			
7	RFU			

Byte 8		
Bit	Error	Meter display
0	n/a	
1	n/a	
2	Hardwate status flag Er02	8000
3	Hardwate status flag Er02	8000
4	End of battery life time	1000
5	Hardwate status flag Er02	0008
6	n/a	
7	n/a	

Byte 9		
Bit	Error	Meter display
0	n/a	
1	n/a	
2	Flow sensor is empty	0001
3	Reverse flow	0002
4	Flow rate less Qi	
5	n/a	
6	n/a	
7	n/a	

Byte 10		
Bit	Error	Meter display
0	Temperature sesnsor 1 error or short circuit	0080
1	Temperature sesnsor 1 disconnected	0080
2	Temperatre 1 < 0 °C	00C0
3	Temperatre 1 > 180 °C	0080
4	Temperature sesnsor 2 error or short circuit	0800
5	Temperature sesnsor 2 disconnected	0800
6	Temperatre 2 < 0 °C	0C00
7	Temperatre 2 > 180 °C	0800

Byte 11		
Bit	Error	Meter display
0	Hardwate status flag Er30	0880
1	n/a	
2	Temperatre difference < 3 °C	4000
3	Temperatre difference > 150 °C	2000
4	flow rate greater 1.2 Qs	0004
5	Hardwate status flag Er35	8000
6	n/a	
7	Hardwate status flag Er37	8000

Message sample

Message in base64

```
6Q5rAB17AAAAAAAAAAA=
```

Message decoded to HEX

```
E9|0E|6B|00|1D7B0000|00000000|00|00
```

Sensor Battery HEX message

```
0xE9
```

HEX message converted to decimal

```
233
```

Decimal value mapped to voltage

```
3.594 (V)
```

Sensor Tempertaure HEX message

```
0x0E
```

HEX message converted to signed decimal

```
14 (°C)
```

Sensor RSSI HEX message

```
0x6B
```

HEX message converted to decimal

```
107
```

Decimal value multiplied by -1

```
-107 (dBm)
```

Alerts HEX message

```
0x00
```

Interface map HEX message converted to binary

```
0B00000000
```

Binary converted to statuses (LSB)

```
0 : User triggered - false
0 : Error changed - false
0 : Temperature alert - false
0 : RFU
0 : RFU
0 : RFU
0 : RFU
0 : RFU
```

Volume `0x1D7B0000` HEX message flip for MSB

```
0x00007B1D
```

HEX message converted to decimal

```
31517 (Liters)
```

Meter error code HeX message

```
0x00000000
```

1st error code HEX message converted to binary

```
0B00000000
```

Binary converted to errors (LSB)

```
0 : n/a
0 : n/a
0 : Hardware status flag Er02 - false
0 : Hardware status flag Er03 - false
0 : End of battery lifetime - false
0 : Hardware status flag Er03 - false
0 : n/a
0 : n/a
```

2nd error code HEX message converted to binary

```
0B00000000
```

Binary converted to errors (LSB)

```
0 : n/a
0 : n/a
0 : Flow sensor is empty - false
0 : Reverse flow - false
0 : Flow rate less Qi - false
0 : n/a
0 : n/a
0 : n/a
```

3rd error code HEX message converted to binary

```
0B00000000
```

Binary converted to errors (LSB)

```
0 : Temperature sensor 1 error or short circuit - false
0 : Temperature sensor 1 disconnected - false
0 : Temperature 1 < 0°C  - false
0 : Temperature 1 > 180°C  - false
0 : Temperature sensor 2 error or short circuit - false
0 : Temperature sensor 2 disconnected - false
0 : Temperature 2 < 0°C  - false
0 : Temperature 2 > 180°C  - false
```

4th error code HEX message converted to binary

```
0B00000000
```

Binary converted to errors (LSB)

```
0 : Hardware status flag Er30 - false
0 : n/a
0 : Temperature difference  < 3°C  - false
0 : Temperature difference > 150°C  - false
0 : Flow rate greater 1.2 Qs - false
0 : Hardware status flag Er35 - false
0 : n/a
0 : Hardware status flag Er37 - false
```

Register map HEX message

```
0x00
```

Regsiter map HEX message converted to binary

```
0B00000000
```

Binary converted to statuses (LSB)

```
0 : Heat energy - not sent
0 : Cooling energy - not sent
0 : Pulse 1 - not sent
0 : Pulse 2 - not sent
0 : RFU
0 : RFU
0 : RFU
0 : RFU
```

RFU HEX message

```
0x00
```

fPort 25 Usage message

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5-36(max)		
Volume				Register map	RFU	Register payload	
int32 - Liters					0	See register map	

Bit #	Register	Unit	Payload	Value
0	Heat energy	kWh	int32	0 - not sent 1 - sent
1	Cooling energy	kWh	int32	
2	Pulse 1	L	int32	
3	Pulse 2	L	int32	
4	Flow rate	m^3/h	float IEEE754 - 32bit	
5	Power	kW	float IEEE754 - 32bit	
6	Temperature 1	°C	int16	
7	Temperature 2	°C	int16	

Message sample

Message in base64

```
H3sAABAAAAAAAA==
```

Message decoded to HEX

```
1F7B0000|10|00|00000000
```

Volume `0x1F7B0000` HEX message flip for MSB

```
0x00007B1F
```

HEX message converted to decimal

```
31519 (Liters)
```

Register map HEX message

```
0x10
```

Regsiter map HEX message converted to binary

```
0B00000000
```

Binary converted to statuses (LSB)

```
0 : Heat energy - not sent
0 : Cooling energy - not sent
0 : Pulse 1 - not sent
0 : Pulse 2 - not sent
1 : Flow rate - sent
0 : Power - not sent
0 : Temperature 1 - not sent
0 : Temperature 2 - not sent
```

RFU HEX message

```
0x00
```

Flow rate `0x00000000` HEX message flip for MSB

```
0x00000000
```

HEX message converted to float IEEE 754

```
0 (L/h)
```

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
Header	Usage interval		Status interval	
00	uint16 (min)		uint16 (min)	

Message sample

Message in base64

```
AB4AaAE=
```

Message decoded to HEX

```
001E006801
```

Header `0x00` decoded

```
Response for general configuration request
```

Usage interval `0x1E00` HEX message flip for MSB

```
0x001E
```

HEX message converted to decimal

```
30 (Minutes)
```

Status interval `0x6801` HEX message flip for MSB

```
0x0168
```

HEX message converted to decimal

```
360 (Minutes)
```

fPort 50 Configuration Message

Byte0	Byte ...	Byte n
Header	Payload	

Different headers with their respective payloads are described below

Reporting

Byte 0	Byte 1	Byte 2	Byte 5	Byte 6
Header	Usage interval (minutes)		Status interval (minutes)	
00	uint16* default - 60		uint16** default - 1440	

* Can't be configured shorer than 10. When set to 0 disables usage packets. When there is no connection to the meter, the usage messages are replaced by status messages
** Can't be configured shorer than 60.

Message sample

Message goal: Set usage reporting to 30 minutes and staus reporting to 6 hours.

Header

Select Header HEX code

```
0x00
```

Configuration

Usage reporting interval

Convert interval `30` to HEX

```
0x1E
```

Flip HEX value to LSB

```
0x1E00
```

Status reporting interval

Convert interval `360` to HEX

```
0x168
```

Flip HEX value to LSB

```
0x6801
```

Compile message for sending (HEX)

```
001E006801
```

Control value in base64 to control after sending

```
AB4AaAE=
```

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 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
Header (HEX)	Payload												
0x00 Boot	Serial (HEX)						Firmware (HEX)		Reset reason (HEX)	Meter ID (BCD)			Meter type

Bit #	Reason
0	RFU
1	Watchdog reset
2	Soft reset (DFU)
3	RFU
4	Wakeup by magnet
5	Previous config restored (after DFU)
6	RFU
7	RFU

Message sample

Message in base64

```
ACQAE00AAwUQiRQIAAA=
```

Message decoded to hex

```
00|2400134D|000305|10|89140800|00
```

Header `0x00` decoded

```
Boot message
```

Device serial `0x2400134D` HEX message flip for MSB

```
0x4D130024
```

Firmware version

Major version in HEX

```
0x00
```

HEX value converted to decimal

```
0
```

Minor version in HEX

```
0x03
```

HEX value converted to decimal

```
3
```

Patch version in HEX

```
0x05
```

HEX value converted to decimal

```
5
```

Rest reason HEX message

```
0x10
```

Regsiter map HEX message converted to binary

```
0B00010000
```

Binary converted to statuses (LSB)

```
0 : n/a
0 : Watchdog reset - false
0 : Soft reset - false
0 : n/a
1 : Wakeup by magnet - true
0 : previous configuration restored - false
0 : n/a
0 : n/a
```

Meter ID

```
89140800
```

Meter type `0x00` HEX message

HEX message converted to type

```
water meter
```

3.6V 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
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141 - 3,226
140 - 3,222
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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
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82 - 2,99
81 - 2,986
80 - 2,982
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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
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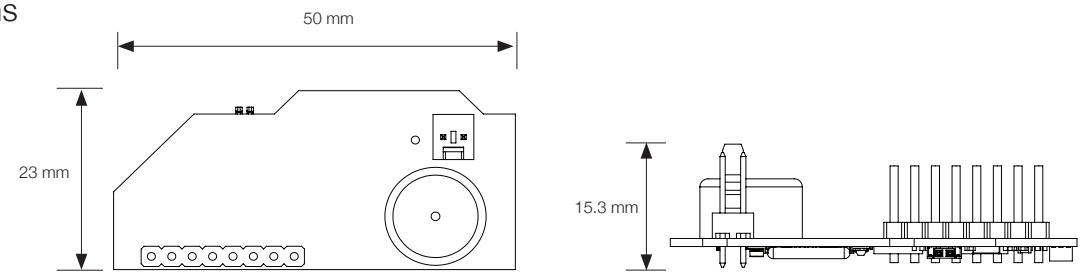
58 - 2,894
57 - 2,89
56 - 2,886
55 - 2,882
54 - 2,878
53 - 2,874
52 - 2,87
51 - 2,866
50 - 2,862
49 - 2,858
48 - 2,854
47 - 2,85
46 - 2,846
45 - 2,842
44 - 2,838
43 - 2,834
42 - 2,83
41 - 2,826
40 - 2,822
39 - 2,818
38 - 2,814
37 - 2,81
36 - 2,806
35 - 2,802
34 - 2,798
33 - 2,794
32 - 2,79
31 - 2,786
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 / PACKAGING

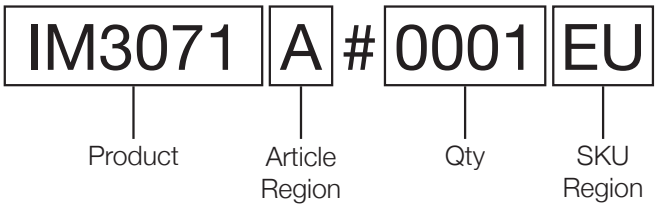
Dimensions



COMPATIBILITY LIST

Qalcosonic F1, Qalcosonic E1

ORDERING INFORMATION



Article region	SKU region	Band
A	EU	EU868
B	AU	AU915
C	US	US915
D	AS	AS923
E	CN	CN779
F	KR	KR920
G	EU	EU433
H	CN	CN470
I	IN	IN865

CONTACT INFORMATION

Nordic Automation Systems AS

www.nasys.no

info@nasys.no

REVISION HISTORY

0.1 First draft