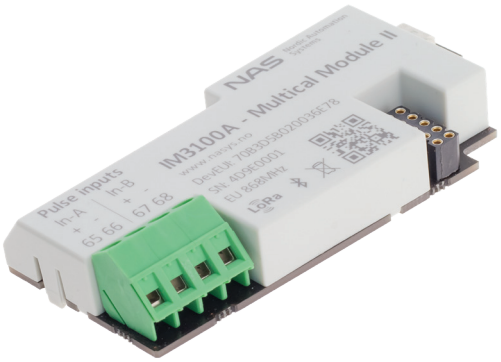
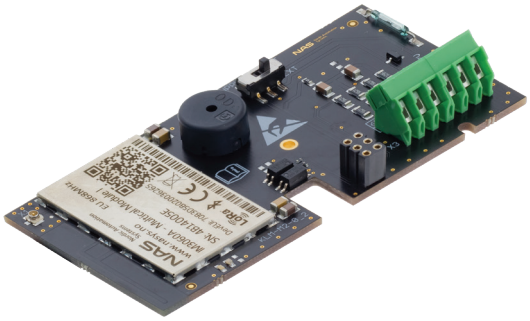
Nordic Automation Systems

LoRaWAN®
Multical® MODULE II/I
IM3100/IM3060

KAMSTRUP



LoRaWAN® Multical® Module II IM3100



LoRaWAN® Multical® Module I IM3060

LoRaWAN® Multical® Module I/II enables the acquisition of consumption data from Kamstrup Multical® series meters and transmit it wirelessly to the available LoRaWAN® network.

LoRaWAN® Multical® Module I/II is meant to be attached to the existing meter as internal module.

IM3060 FW >= 0.10.0; IM3100 FW >= 0.9.0

OVERVIEW

Efficient

LoRaWAN® Multical® 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
- Kamstrup data input port
- Metering
- Configurable reporting interval
- Maintenance free - install & forget
- Easy installation
- Secure communication
- Internal BT antenna
- MCX antenna connector
- On board buzzer

SPECIFICATIONS

	IM3100	IM3060
Width:	35 mm	44.3 mm
Height:	16.3 mm	11.2 mm
Length:	90 mm	89.3 mm
Weight:	27 g	19 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®	
Device Class:	A/C**	

* Communication range is dependent on the location of the sensor and nearest base station.
** Can be forced to work as C class devide. Should ONLY be used with Power suplly module (24 or 240 VAC).

COMMUNICATION

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

INPUT SPECIFICATIONS

For pulse input specifiacation look at the Kamstrup Multical® meter data sheet.

PORT LIST

fPort	Usage	Format	Uplink	Unit	Comment
24	Status		yes	-	Defined below
25	Consumption		yes	-	Defined below
50	Configuration		no	-	Defined below
51	Update mode		no	-	Defined below
60	Command		no	-	Defined below
99	Boot/Debug		yes	-	Defined below

For firmware version >= 0.9.0

fPort 24 Status Message

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 8/4	Byte 9	Byte 10	Byte ..	Byte ..	Byte ..	Byte ..	Byte ..	Byte 42	Byte 43	Byte 44	Byte 45	Byte 46
Meter-ing time	Clock				Battery **	Sensor RSSI	Register ID	Register value 1				Register ID	Register value ..				Register ID	Register value 8			
0..143* FF - live	uint32 - Unix timestamp in utc				uint8	int8	uint8	Float IEEE754/int32				uint8	Float IEEE754/int32				uint8	Float IEEE754/int32 ***			

* Metering time is offset from the beginning of the day in 10 minute steps. See time step chart for more information. Value FF is used when the fixed time metering is not activated and the metering data is live.
** FF no battery info
*** Check Register ID Mapping table

Message sample

Message in base64

```
/zbiD1//nQEMEAMAOwwdZQA=
```

Message decoded to HEX

```
ff36e20f5fff9d010c1003003b0c1d6500
```

Metering time

```
FF
```

HEX message converted to decimal

```
255
```

Decimal value translated to time

```
Live measurement
```

Device clock `36e20f5f` HEX message flip for MSB

```
0x5f0fe236
```

HEX message converted to decimal (epoch)

```
1594876470 (seconds)
```

Epoch time converted to date

```
Thursday, 16 July 2020 05:14:30 (UTC)
```

Sensor Battery HEX message

```
FF
```

HEX message converted to battery level

```
No battery info
```

Sensor RSSI HEX message

```
9d
```

HEX message converted to signed decimal

```
-99 (dBm)
```

1st Register

Register in HEX

```
01
```

HEX value converted to decimal

```
1
```

Decimal value translated to register

```
Register Date(yy.mm.dd), type uint32, unit: None
```

Register value in HEX

```
0c100300
```

HEX message flip for MSB

```
0x0003100c
```

HEX value converted to int32

```
200716(meaning 2020/07/16)
```

2nd Register

Register in HEX

```
3b
```

HEX value converted to decimal

```
59
```

Decimal value translated to register

```
Serial No.
```

Register value in HEX

```
0c1d6500
```

HEX message flip for MSB

```
0x00651d0c
```

HEX value converted to int32

```
6626572
```

fPort 25 Usage message

Byte0	Byte ...	Byte n
Header	Payload	

Different headers with their respective payloads are described below

Meter usage

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte ..	Byte ..	Byte ..	Byte ..	Byte ..	Byte 42	Byte 43	Byte 44	Byte 45	Byte 46
Header	Measuring time	Register ID	Register value 1				Register ID	Register value ..				Register ID	Register value 9			
00	0..143 255 - live	uint8	Float IEEE754/int32				uint8	Float IEEE754/int32				uint8	Float IEEE754/int32			

Message sample

Message in base64

```
AB8C4TyiSQ1wtFVHHgAAAATS7YAABU4xwAAG8L1mEA=
```

Message decoded to HEX

```
001f02e13ca2490d70b45547 1e 00000000 13 4bb60000 15 38c70000 1b c2f59840
```

Header `00` decoded

```
Standard usage message
```

Metering time

```
1f
```

HEX message converted to decimal

```
31
```

Decimal value translated to time

```
05:10 UTC
```

1st Register

Register in HEX

```
02
```

HEX value converted to decimal

```
2
```

Decimal value translated to register

```
Heat energy E1, type: float32, unit: kWh
```

Register value in HEX

```
e13ca249
```

HEX message flip for MSB

```
0x49a23ce1
```

HEX value converted to Float (IEEE-754)

```
1329052 (kWh)
```

2nd Register

Register in HEX

```
0d
```

HEX value converted to decimal

```
13
```

Decimal value translated to register

```
Volume V1, type: float32, unit: m3
```

Register value in HEX

```
70b45547
```

HEX message flip for MSB

```
0x4755b470
```

HEX value converted to uint32

```
54708.44 (m³)
```

3rd Register

Register in HEX

```
1e
```

HEX value converted to decimal

```
30
```

Decimal value translated to register

```
Flow V1 actual, type: float32, unit: l/h
```

Register value in HEX

```
00000000
```

HEX message flip for MSB

```
0x00000000
```

HEX value converted to decimal

```
0 l/h
```

4th Register

Register in HEX

```
13
```

HEX value converted to decimal

```
19
```

Decimal value translated to register

```
Operating hours, type uint32, unit: None
```

Register value in HEX

```
4bb60000
```

HEX message flip for MSB

```
0x0000b64b
```

HEX value converted to uint32

```
46667
```

5th Register

Register in HEX

```
15
```

HEX value converted to decimal

```
21
```

Decimal value translated to register

```
Time(hh.mm.ss), type uin32, unit: None
```

Register value in HEX

```
38c70000
```

HEX message flip for MSB

```
0x0000c738
```

HEX value converted to decimal

```
51000(05:10:00)
```

6th Register

Register in HEX

```
1b
```

HEX value converted to decimal

```
27
```

Decimal value translated to register

```
t1-t2 diff. temp, type float32, unit: C
```

Register value in HEX

```
c2f59840
```

HEX message flip for MSB

```
0x4098f5c2
```

HEX value converted to decimal

```
4.78 C
```

Digital inputs

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
Header	Measuring time	Kamstrup pulse 1 count				Kamstrup pulse 2 count			
02	0..144 255 - live	uint32				uint32			

Uses registers Pulse input A1, B1. See Register ID Mapping table.

Message sample

Message in base64

```
Ak6lAAAAAAAAAA==
```

Message decoded to HEX

```
024EA5000000|00000000
```

Header `02` decoded

```
Pulse usage message
```

Metering time

```
4E
```

HEX message converted to decimal

```
78
```

Decimal value translated to time

```
13:00:00 (UTC)
```

1st Pulse interface

Register in HEX

```
A5000000
```

HEX value flipped for MSB

```
000000A5
```

HEX value converted to decimal

```
165 (pulses)
```

2nd Pulse interface

Register in HEX

```
00000000
```

HEX value flipped for MSB

```
00000000
```

HEX value converted to decimal

```
0 (pulses)
```

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 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
Header	Usage interval (seconds)				Status interval (seconds)				Options
00	uint32* default - 3600				uint32** default - 86400				

Bit #	Function	Value
0	RFU	
1	Kamstrup pulses	0 - off (default) 1 - on
2	Device class	0 - A (default) 1 - C ***
3	Fixed measuring****	0 - off (default) 1 - on
4	RFU	
5		
6		
7		

Value	Fixed measuring interval*****
00	Not used
01	10 min
02	20 min
03	30 min
04	1 h
05	24 h
06	RFU
07	RFU

* Can't be configured shotrer than 600. When set to 0 disables usage packets.
** Can't be configured shorter than 600.
*** Should ONLY be used with Power supply module (24 or 230VAC).
**** Fixed measuring will take the measurements on fixed points in time and then report them with time delay (to avoid network overload). Measurments can be taken in 10 minute steps from 00:00.
***** Fixed measuring interval determins how often the measurment is taken and reported. When used, one of the measurements is always at full hour (except 24h interval, then the measurement is taken at 00:00). This will over ride normal reporting intervals.

Message sample

Message goal: Configure usage interval to 10 minutes and status interval to 1 hour.

Header

Select Header HEX code

```
00
```

Usage reporting interval

Convert interval `600` to HEX

```
258
```

Flip HEX value to LSB

```
58020000
```

Status reporting interval

Convert interval `3600` to HEX

```
E10
```

Flip HEX value to LSB

```
100E0000
```

Option selection

```
0 : RFU
0 : Kamstrup pulses - off
0 : Device class - A
0 : Fixed measuring - off
0 : RFU
X : Fixed measuring interval
X :
X :
```

Interval `not used` mapped to Decimal

```
0
```

Decimal message converted to binary

```
0B000
```

Whole binary message assembled

```
0B00000000
```

Binary value converted to HEX

```
0x00
```

Compile message for sending (HEX)

```
00|58020000|100E0000|00
```

Control value in base64 to control after sending

```
AFgCAAAQDgAAAA==
```

Usage package registers

Byte 0	Byte 1	Byte ..	Byte 9	Comment
Header	Register ID*	Register ID*	Register ID*	Max 9 registers. Send as few as possible.
01	uint8	uint8	uint8	

* If disable all registers value is sent then usage message reporting is disabled. If an improper register value is sent the configuration is not saved.

Message sample

Message goal: Configure standard usage message registers. Heat energy E1, Volume V1, Flow V1 actual, Operating hours, Time(hh.mm.ss), t1-t2 diff.

Header

Find register decimal values

```
2 13 30 19 21 27
```

Convert to Hex:

```
02 0d 1e 13 15 1b
```

Add header:

```
01
```

Compile message for sending (HEX):

```
01 02 0d 1e 13 15 1b
```

Control value in base64 to control after sending

```
AQINHhMVGw==
```

Status package registers

Byte 0	Byte 1	Byte ..	Byte 9	Comment
Header	Register ID	Register ID	Register ID	Max 9 registers. Send as few as possible.
02	uint8	uint8	uint8	

* If disable all registers value is sent then uregister value reporting in status message is disabled. If an improper register value is sent the configuration is not saved.

Message sample

Message goal: Configure status message registers: Date(yy.mm.dd), Serial No.

Header

Find register decimal values

```
01 59
```

Convert to Hex:

```
013b
```

Add header:

```
02
```

Compile message for sending (HEX):

```
02013b
```

Control value in base64 to control after sending

```
AgE7
```

Time settings

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

Message sample

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

Header

Select Header HEX code

```
03
```

Device clock

Choose desired time

```
22 August 2017 11:50:00 (UTC)
```

Convert to epoch

```
1503402600
```

Covert to hex

```
599C1A68
```

Flip HEX value for LSB

```
681A9C59
```

Compile message for sending (HEX)

```
03681A9C59
```

Control value in base64 to control after sending

```
A2ganFk=
```

Time settings

Byte 0	Byte 1	Byte 2
Header	Device clock offset	
04	int16 (seconds)	

Message sample

Message goal: Adjust device clock 2min 37 seconds back.

Header

Select Header HEX code

```
04
```

Device clock offset

Choose desired time

```
-157 seconds
```

Covert to hex

```
FF63
```

Flip HEX value for LSB

```
63FF
```

Compile message for sending (HEX)

```
0463FF
```

Control value in base64 to control after sending

```
BGP/
```

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

Byte0	Byte ...	Byte n
Header	Payload	

Different headers with their respective payloads are described below

Request register values

Byte 0	Byte 1	Byte ..	Byte 9
Header	Register ID	Register ID	Register ID
00	uint8	uint8	uint8

Max 9 registers. Answer is sent to fPort25 in usage message format.

Message sample

Message goal: Order Volume register V1

Header

Select Header HEX code

```
00
```

1st Register

Register name

```
Volume register V1
```

Register translated to register number

```
13
```

Decimal value converted to HEX

```
0D
```

Compile message for sending (HEX)

```
000D
```

Control value in base64 to control after sending

```
AA0=
```

Request digital input values

Byte 0
Header
02

Answer will be sent to fPort 25 according to usage message format

Message sample

Message goal: Request digital input values

Header

Select Header HEX code

```
02
```

Compile message for sending (HEX)

```
02
```

Control value in base64 to control after sending

```
Ag==
```

Request historic data

Byte 0	Byte 1
Header	Measuring time
03	uint8 (0..143)*

* This request can only be used when fixed interval measuring is activated. Only actual measurment points data can be requested (if measurement is set to hourly, then half hourly data can not be requested). Only data within last 24h can be requested. Answer is sent as a usage packet.

Message sample

Message goal: Request values from 14:00

Header

Select Header HEX code

```
03
```

Select time

```
14:00
```

Convert time to according time step chart

```
84
```

Convert to HEX

```
54
```

Compile message for sending (HEX)

```
0354
```

Control value in base64 to control after sending

```
A1Q=
```

fPort 99 Boot/Debug Message

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5-7	Byte 8-12	Byte 13-16	Byte 17-23	Byte 24-27	Byte 28	Byte 29-32
Header (HEX)	Payload										
0x00 Boot	Serial (HEX)				Firmware (HEX)	Kamstrup meter ID	Kamstrup config. (ABC-CCCCC)	Kamstrup config. (DDDEEFF-GGMN)	Kamstrup type	Active Device class	Device clock (epoch)
0x01 Shutdown											

Message sample

Message in base64

```
AHYAHk0ACAFSgx0EAJvw/QHVAAAYGAAAExEGAQDeZJVa
```

Message decoded to HEX

```
00|76001E4D|000801|52831D0400|9BF0FD01|D5000018180000|13110601|00|DE64955A
```

Header

```
00
```

Value translated to message type

```
Boot
```

Device serial `76001E4D` HEX message flip for MSB

```
4D1E0076
```

Firmware version

Major version in HEX

```
00
```

HEX value converted to decimal

```
0
```

Minor version in HEX

```
08
```

HEX value converted to decimal

```
8
```

Patch version in HEX

```
01
```

HEX value converted to decimal

```
1
```

Kamstrup meter ID

Meter ID `52831D0400` HEX message flip for MSB

`00041D8352`

HEX value converted to decimal

`69043026`

Kamstrup Configuration (A B CCC CCC)

Config. `9BF0FD01` HEX message flip for MSB

`01FDF09B`

HEX value converted to decimal

`3 3 419 419`

Kamstrup Configuration (DDD EE FF GG M N)

Config. `D5000018180000` HEX message converted to decimal values

DDD `D5` HEX value converted to decimal

`213`

EE `00` HEX value converted to decimal

`0`

FF `18` HEX value converted to decimal

`24`

GG `18` HEX value converted to decimal

`24`

M `00` HEX value converted to decimal

`0`

N `00` HEX value converted to decimal

`0`

Kamstrup type

Type `13110601` HEX message converted to decimal values

Software version

Major version in HEX

`13`

HEX value converted to decimal

`19`

Minor version in HEX

`11`

HEX value converted to decimal

`17`

Display version

Major version in HEX

`06`

HEX value converted to decimal

`6`

Minor version in HEX

```
01
```

HEX value converted to decimal

```
1
```

Device class

```
00
```

Class value converted to binary

```
00000000
```

Binary converted to classes (LSB)

```
0 : Class C - not active
0 : RFU
0 : RFU
0 : RFU
0 : RFU
0 : RFU
0 : RFU
0 : RFU
```

Device clock `DE64955A` HEX message flip for MSB

```
5A9564DE
```

HEX message converted to decimal (epoch)

```
1519740126 (seconds)
```

Epoch time converted to date

```
27 February 2018 14:02:06 (Kamstrup time)
```

REGISTER ID MAPPING TABLE

NAS ID	Register ID		Register name	Multical®												Unit/Type
	Hex	Dec.		66	62	S6	602	601	601+	801	402	403	21	302	603	
1	03EB	1003	Date (yy.mm.dd)	+	+	+	+	+	+	+	+	+	+	+	+	-/uint32
2	003C	60	Heat energy E1			+	+	+	+	+	+	+		+	+	kWh/float32
3	005E	94	Heat energy E2			+	+	+	+	+					+	kWh/float32
4	003F	63	Cooling energy E3			+	+	+	+	+	+	+		+	+	kWh/float32
5	003D	61	Inlet energy E4			+	+	+	+	+					+	kWh/float32
6	003E	62	Outlet energy E5			+	+	+	+	+					+	kWh/float32
7	005F	95	Tap water energy E6			+	+	+	+	+					+	kWh/float32
8	0060	96	Tap water energy E7			+	+	+	+	+					+	kWh/float32
9	0061	97	Energy E8			+	+	+	+	+	+	+		+	+	-/uint32
10	006E	110	Energy E9			+	+	+	+	+	+	+		+	+	-/uint32
11	0040	64	Tariff TA2	+	+	+	+	+	+	+	+	+			+	-/uint32
12	0041	65	Tariff TA3	+	+	+	+	+	+	+	+	+			+	-/uint32
13	0044	68	Volume V1	+	+	+	+	+	+	+	+	+	+	+	+	m^3/float32
14	0045	69	Volume V2	+		+	+	+	+	+					+	m^3/float32
15	0054	84	Pulse input A1		+	+	+	+	+	+	+	+			+	-/uint32
16	0055	85	Pulse input B1		+	+	+	+	+	+	+	+			+	-/uint32
17	0048	72	Mass M1	+		+	+	+	+	+					+	ton/float32
18	0049	73	Mass M2	+		+	+	+	+	+					+	ton/float32
19	03EC	1004	Operating hours	+	+	+	+	+	+	+	+	+	+	+	+	-/uint32
20	0071	113	Info event counter		+	+	+	+	+	+	+	+	+	+	+	-/uint32
21	03EA	1002	Time (hh.mm.ss)	+	+	+	+	+	+	+	+	+	+	+	+	-/uint32
22	0063	99	Info code	+	+	+	+	+	+	+	+	+	+	+	+	-/uint32
23	0056	86	t1 actual (2 decimals)	+		+	+	+	+	+	+	+		+	+	C/float32
24	0057	87	t2 actual (2 decimals)	+		+	+	+	+	+	+	+		+	+	C/float32
25	0058	88	t3 actual (2 decimals)	+		+	+	+	+	+					+	C/float32
26	007A	122	t4 actual (2 decimals)			+	+	+	+	+					+	C/float32
27	0059	89	t1-t2 diff. temp (2 decimals)	+		+	+	+	+	+	+	+		+	+	C/float32
28	005B	91	P1 actual	+		+	+	+	+	+					+	Bar/float32
29	005C	92	P2 actual	+		+	+	+	+	+					+	Bar/float32
30	004A	74	Flow V1 actual	+	+	+	+	+	+	+	+	+	+	+	+	lh/float32
31	004B	75	Flow V2 actual	+		+	+	+	+	+					+	lh/float32
32	0050	80	Power E1 actual	+		+	+	+	+	+	+	+		+	+	kW/float32
33	007B	123	Flow V1 max year date		+	+	+	+	+	+	+	+		+	+	-/uint32
34	007C	124	Flow V1 max year		+	+	+	+	+	+	+	+		+	+	lh/float32
35	007D	125	Flow V1 min year date		+	+	+	+	+	+	+	+			+	-/uint32
36	007E	126	Flow V1 min year		+	+	+	+	+	+	+	+			+	lh/float32
37	007F	127	Power max year date			+	+	+	+	+	+	+		+	+	-/uint32
38	0080	128	Power max year			+	+	+	+	+	+	+		+	+	kW/float32
39	0081	129	Power min year date			+	+	+	+	+	+	+			+	-/uint32
40	0082	130	Power min year			+	+	+	+	+	+	+			+	kW/float32
41	008A	138	Flow V1 max month date		+	+	+	+	+	+	+	+	+	+	+	-/uint32
42	008B	139	Flow V1 max month		+	+	+	+	+	+	+	+	+	+	+	lh/float32
43	008C	140	Flow V1 min month date		+	+	+	+	+	+	+	+	+		+	-/uint32
44	008D	141	Flow V1 min month		+	+	+	+	+	+	+	+	+		+	lh/float32
45	008E	142	Power max month date			+	+	+	+	+	+	+		+	+	-/uint32
46	008F	143	Power max month			+	+	+	+	+	+	+		+	+	kW/float32

NAS ID	Register ID		Register name	Multical®												Unit*
	Hex	Dec.		66	62	S6	602	601	601+	801	402	403	21	302	603	
47	0090	144	Power min month date			+	+	+	+	+	+	+			+	-/uint32
48	0091	145	Power min month			+	+	+	+	+	+	+			+	kW/float32
49	0092	146	t1 average year			+	+	+	+	+	+	+		+	+	C/float32
50	0093	147	t2 average year			+	+	+	+	+	+	+		+	+	C/float32
51	0095	149	t1 average month			+	+	+	+	+	+	+		+	+	C/float32
52	0096	150	t2 average month			+	+	+	+	+	+	+		+	+	C/float32
53	0042	66	Tariff limit TL2	+	+	+	+	+	+	+	+	+			+	-/uint32
54	0043	67	Tariff limit TL3	+	+	+	+	+	+	+	+	+			+	-/uint32
55	0062	98	Target date	+	+	+	+	+	+	+	+		+	+		-/uint32
56	0098	152	Program No,	+	+	+	+	+	+	+	+					-/uint32
57	0099	153	Config No. 1	+	+	+	+	+	+	+	+	+	+	+	+	-/uint32
58	00A8	168	Config No. 2	+	+	+	+	+	+	+	+	+		+	+	-/uint32
59	03E9	1001	Serial No.	+	+	+	+	+	+	+	+	+	+	+	+	-/uint32
60	0070	112	Customer No. 2	+	+	+	+	+	+	+	+	+		+	+	-/uint32
61	03F2	1010	Customer No. 1	+	+	+	+	+	+	+	+	+		+	+	-/uint32
62	0072	114	Meter No. input A1		+	+	+	+	+	+	+	+			+	-/uint32
63	0068	104	Meter No. input B1		+	+	+	+	+	+	+	+			+	-/uint32
64	03ED	1005	Meter type incl. SW edition		+	+	+	+	+	+	+	+	+	+	+	-/uint32
65	009A	154	SW check sum		+	+	+	+	+	+	+	+	+	+	+	-/uint32
66	009B	155	Energy high res. TEST			+	+	+	+	+	+					-/uint32
67	009D	157	Top module ID		+	+	+	+	+	+						-/uint32
68	009E	158	Base modeule 1 ID		+	+	+	+	+	+						-/uint32
69	00AF	175	Error hour counter	+	+	+	+		+			+		+	+	-/uint32
70	00EA	234	Pulse value A1/A2	+					+			+			+	-/uint32
71	00EB	235	Pulse value B1/B2	+					+			+			+	-/uint32
72			E1-E2	+												kWh/float32
73			QSUM1	+												-/uint32
74			QSUM2	+												-/uint32
75			Pre. counter 1	+												-/uint32
76			Pre. counter 2	+												-/uint32
77			E cold	+												kWh/float32
78			M3TF	+												-/uint32
79			M3TR	+												-/uint32
80			Calendar	+												-/uint32
81			P power act.	+												kW/float32
82			P power year	+												kW/float32
83	015C	348	Date and time									+			+	-/uint32
84	01D9	473	Energy E10												+	kWh/float32
85	01DA	474	Energy E11												+	kWh/float32
86	00B2	178	Differential energy dE												+	-/uint32
87	00B3	179	Control energy cE												+	-/uint32
88	00B4	180	Differential volume dV												+	-/uint32
89	00B5	181	Control volume cV												+	-/uint32
90	016C	364	Heat energy A1									+			+	kWh/float32
91	016D	365	Heat energy A2									+			+	kWh/float32
92	016A	362	Tariff TA4									+			+	-/uint32
93	016B	363	Tariff limit TL4									+			+	-/uint32
94	0101	257	Pulse value V1		+	+	+								+	-/uint32
95	0102	258	Pulse value V2			+	+									-/uint32

NAS ID	Register ID		Register name	Multical®												Unit*
	Hex	Dec.		66	62	S6	602	601	601+	801	402	403	21	302	603	
96	0103	259	Qp V1		+	+	+								+	-/uint32
97	0104	260	Qp V2			+	+									-/uint32
98	00E0	224	Pulse input A2												+	-/uint32
99	00E1	225	Pulse input B2												+	-/uint32
100	00E2	226	Meter No. input A2												+	-/uint32
101	00E3	227	Meter No. input B2												+	-/uint32
102	0171	369	Info bits									+			+	-/uint32
103	017F	383	Flow V1 max year time									+			+	lph/float32
104	0180	384	Flow V1 mine year time									+			+	lph/float32
105	0181	385	Power max year time									+			+	kW/float32
106	0182	386	Power min year time									+			+	kW/float32
107	0183	387	Flow V1 max month time									+			+	lph/float32
108	0184	388	Flow V1 min month time									+			+	lph/float32
109	0185	389	Power max month time									+			+	kW/float32
110	0186	390	Power min month time									+			+	kW/float32
111	00F1	241	Flow V1 max day										+			lph/float32
112	00F2	242	Flow V1 min day										+			lph/float32
113	0173	371	COP									+			+	-/uint32
114	018D	395	COP average period									+			+	-/uint32
115	0163	355	COP year									+			+	-/uint32
116	016F	367	COP month									+			+	-/uint32
117	017B	379	t1 time average day									+			+	C/float32
118	017C	380	t2 time average day									+			+	C/float32
119	01DD	477	t3 time average day												+	C/float32
120	017D	381	t1 time average hour									+			+	C/float32
121	017E	382	t2 time average hour									+			+	C/float32
122	01DE	478	t3 time average hour												+	C/float32
123	01F9	505	P1 average day												+	kW/float32
124	01FA	506	P2 average day												+	kW/float32
125	01FB	507	P1 average hour												+	kW/float32
126	01FC	508	P2 average hour												+	kW/float32
127	018E	398	t1 actual (1 decimal)									+			+	C/float32
128	018F	399	t2 actual (1 decimal)									+			+	C/float32
129	0190	400	t1-t2 diff. temp. (1 decimal)									+			+	-/uint32
130	0174	372	Power input B1									+			+	-/uint32
131	0153	339	Controlled output C1/C2									+			+	-/uint32
132	0154	340	Controller output D1/D2									+			+	-/uint32
133	010D	269	Theta HC									+		+	+	-/uint32
134	0159	345	Temperature offset									+			+	-/uint32
135	0193	403	t2 preset									+			+	C/float32
136	016E	366	t5 limit									+			+	C/float32
137	010C	268	QP average time									+		+	+	-/uint32
138	0147	327	Target date 1 year									+			+	-/uint32
139	0148	328	Target date 2 year									+			+	-/uint32
140	0149	329	Target date 1 month									+			+	-/uint32
141	014A	330	Target date 2 month									+			+	-/uint32
142	00E4	228	Config No. 3									+			+	-/uint32
143	0170	368	Config No. 4									+			+	-/uint32

NAS ID	Register ID		Register name	Multical®												Unit*
	Hex	Dec.		66	62	S6	602	601	601+	801	402	403	21	302	603	
144	00FE	254	Type No.									+	+	+	+	-/uint32
145	0117	279	DIN meter ID									+		+	+	-/uint32
146	015A	346	SW revision									+			+	-/uint32
147	00AB	171	Base module 2 ID							+						-/uint32
148	00AC	172	External module ID							+						-/uint32
149	00B8	184	Bus pri. adr. module 1							+	+	+		+	+	-/uint32
150	00B9	185	M-Bus sec. adr. module 1							+	+	+		+	+	-/uint32
151	00DA	218	Bus pri. adr. module 2							+					+	-/uint32
152	00DB	219	M-Bus sec. adr. module 2							+					+	-/uint32
153	00DC	220	Bus pri. adr. ext. module							+						-/uint32
154	00DD	221	M-Bus sec. adr. ext. module							+						-/uint32
155	00B6	182	M-Bus pri. adr. internal												+	-/uint32
156	00B7	183	M-Bus sec. adr. internal												+	-/uint32
157	00DE	222	Config counter		+	+	+					+		+	+	-/uint32
158	00BA	186	Time stamp 1 (yy.mm)		+	+	+									-/uint32
159	00BB	187	Time stamp 1 (dd.hh)		+	+	+									-/uint32
160	01FE	510	Type approval rev. heat												+	-/uint32
161	01FF	511	Type approval rev. cooling												+	-/uint32
162	0200	512	Type approval rev. national												+	-/uint32
163	014B	331	E1 high res. auto int.									+			+	kWh/float32
164	014C	332	E3 high res. auto int.									+			+	kWh/float32
165	0151	337	V1 high res. auto int.												+	m^3/float32
166	00E5	229	t1 avg. auto int.								+	+		+	+	C/float32
167	00E6	230	t2 avg. auto int.								+	+		+	+	C/float32
168	0191	401	A1 auto int.												+	-/uint32
169	0192	402	A2 auto int.												+	-/uint32
170	010A	266	E1 high res.									+		+	+	kWh/float32
171	010B	267	E3 high res.									+		+	+	kWh/float32
172	00EF	239	V1 high res.		+	+	+					+	+	+	+	m^3/float32
173	00F3	243	V1 reverse										+			m^3/float32
174	00DF	223	Volume high res. TEST								+		+			-/uint32
175	0214	532	Optical eye lock									+			+	-/uint32
...																
255			Disable all registers	+	+	+	+	+	+	+	+	+	+	+	+	

IM3060 - this table describes FW ver 0.10.x
FW 0.7.x - all registers are float32

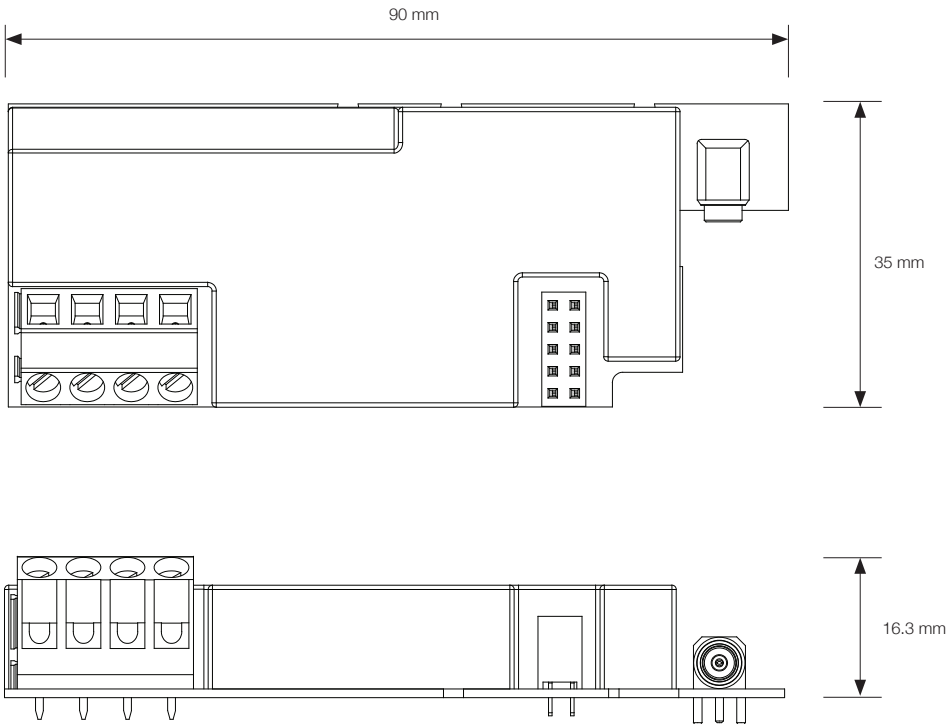
IM3100 - this table describes FW ver 0.9.x
FW 0.8.x - all registers are float32

* NB: Registers without unit are sent as int32, registers with unit are sent as float

TIME STEP CHART

0 - 00:00	29 - 04:50	58 - 09:40	87 - 14:30	116 - 19:20
1 - 00:10	30 - 05:00	59 - 09:50	88 - 14:40	117 - 19:30
2 - 00:20	31 - 05:10	60 - 10:00	89 - 14:50	118 - 19:40
3 - 00:30	32 - 05:20	61 - 10:10	90 - 15:00	119 - 19:50
4 - 00:40	33 - 05:30	62 - 10:20	91 - 15:10	120 - 20:00
5 - 00:50	34 - 05:40	63 - 10:30	92 - 15:20	121 - 20:10
6 - 01:00	35 - 05:50	64 - 10:40	93 - 15:30	122 - 20:20
7 - 01:10	36 - 06:00	65 - 10:50	94 - 15:40	123 - 20:30
8 - 01:20	37 - 06:10	66 - 11:00	95 - 15:50	124 - 20:40
9 - 01:30	38 - 06:20	67 - 11:10	96 - 16:00	125 - 20:50
10 - 01:40	39 - 06:30	68 - 11:20	97 - 16:10	126 - 21:00
11 - 01:50	40 - 06:40	69 - 11:30	98 - 16:20	127 - 21:10
12 - 02:00	41 - 06:50	70 - 11:40	99 - 16:30	128 - 21:20
13 - 02:10	42 - 07:00	71 - 11:50	100 - 16:40	129 - 21:30
14 - 02:20	43 - 07:10	72 - 12:00	101 - 16:50	130 - 21:40
15 - 02:30	44 - 07:20	73 - 12:10	102 - 17:00	131 - 21:50
16 - 02:40	45 - 07:30	74 - 12:20	103 - 17:10	132 - 22:00
17 - 02:50	46 - 07:40	75 - 12:30	104 - 17:20	133 - 22:10
18 - 03:00	47 - 07:50	76 - 12:40	105 - 17:30	134 - 22:20
19 - 03:10	48 - 08:00	77 - 12:50	106 - 17:40	135 - 22:30
20 - 03:20	49 - 08:10	78 - 13:00	107 - 17:50	136 - 22:40
21 - 03:30	50 - 08:20	79 - 13:10	108 - 18:00	137 - 22:50
22 - 03:40	51 - 08:30	80 - 13:20	109 - 18:10	138 - 23:00
23 - 03:50	52 - 08:40	81 - 13:30	110 - 18:20	139 - 23:10
24 - 04:00	53 - 08:50	82 - 13:40	111 - 18:30	140 - 23:20
25 - 04:10	54 - 09:00	83 - 13:50	112 - 18:40	141 - 23:30
26 - 04:20	55 - 09:10	84 - 14:00	113 - 18:50	142 - 23:40
27 - 04:30	56 - 09:20	85 - 14:10	114 - 19:00	143 - 23:50
28 - 04:40	57 - 09:30	86 - 14:20	115 - 19:10	

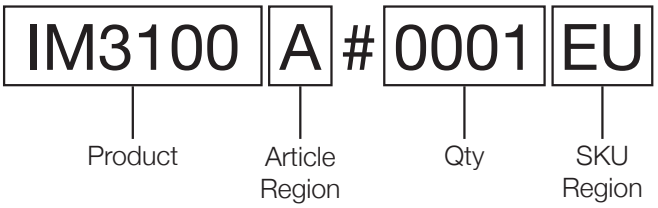
IM3100 DIMENSIONS



COMPATIBILITY LIST

Multical® 403, Multical® 603

ORDERING INFORMATION

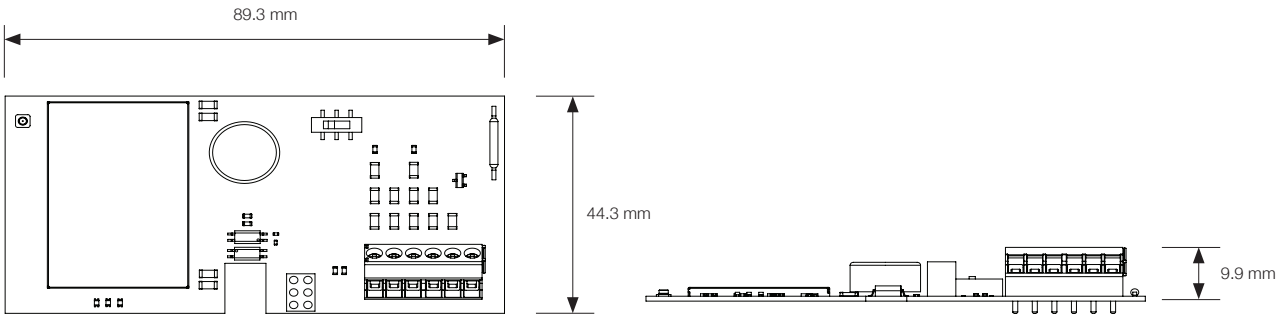


Product/SKU	Package qty	Version
IM3100x#0001xx	1	Multical® Module II

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

DIMENSIONS / PACKAGING

Dimensions



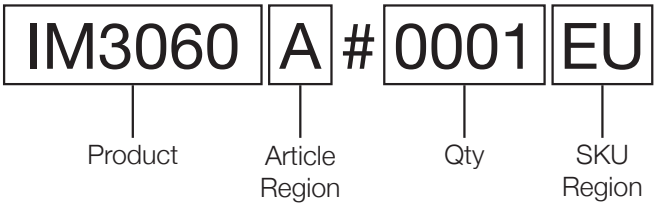
Packaging

1 pcs ESD bag

COMPATIBILITY LIST

Multical® 61, Multical® 62, Multical® 66, Multical® 601, Multical® 602, Multical® 801

ORDERING INFORMATION



Product/SKU	Package qty	Version
IM3060x#0001xx	1	Multical® Module I

Article / SKU	Package qty	Frequency	Region
IM3060A#0001EU	1	868 MHz	EU
IM3060B#0001AU	1	922 MHz	AU
IM3060C#0001US	1	915 MHz	US
IM3060D#0001AS	1	923 MHz	AS
IM3060E#0001CN	1	780 MHz	CN
IM3060F#0001KR	1	922 MHz	KR
IM3060G#0001EU	1	433 MHz	EU
IM3060H#0001CN	1	470 MHz	CN
IM3060I#0001IN	1	866 MHz	IN

CONTACT INFORMATION

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REVISION HISTORY

1.0 - First version

2.0 - Support for fw 0.9.0

- Format of registers without unit converted flom float to int to avoid rounding errors.

3.0 - Merged IM3100 and IM3060 documentation.