WIRELESS M-BUS

INTRODUCTION
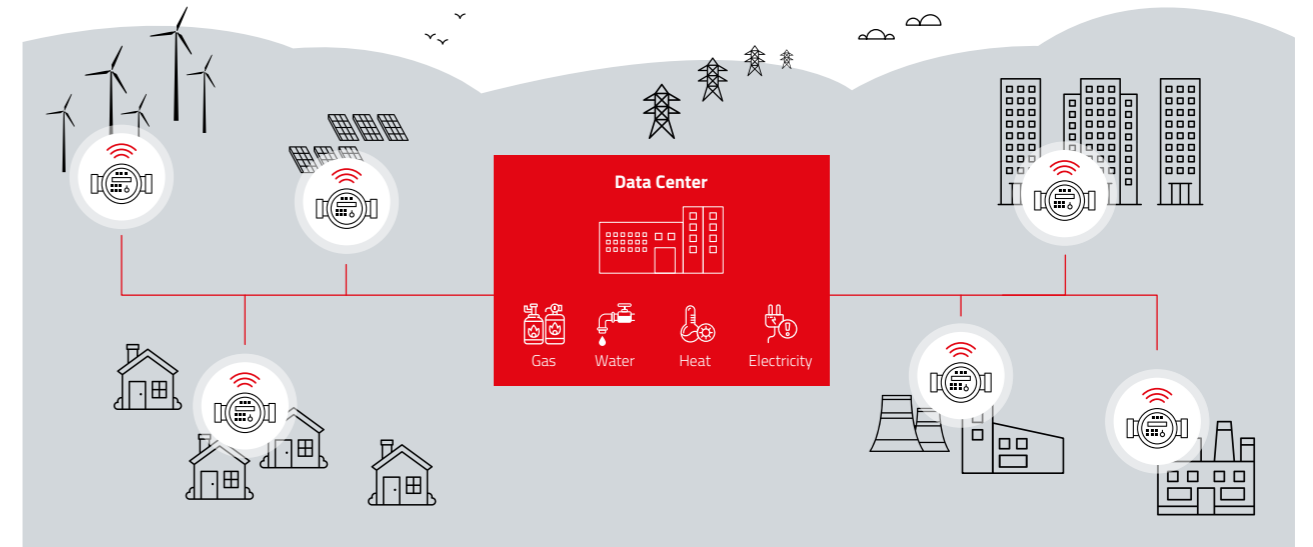
Wireless M-Bus

Wireless Meter Bus (wM-BUS) is the extension of the meter Bus (M-BUS) with a wireless protocol and role scheme for handling communication over a standardized wireless communication interface between meters and data loggers – so called smart meter gateways (SMGW). This scheme is specified by the European standard EN 13757 and its sub-standards. The motivation of this standard is to allow an automated measuring and processing of data, track the usage of resources and to optimize provisioning in order to create an "Advanced Metering Infrastructure" (AMI).

Such Smart grid / meter devices are typically battery operated and in need for a long range and robust wireless communication. This is the reason for using the Sub GHz frequencies in the free ISM Bands. EN13757-4 is specifying radio options in the 169 MHz, 434 MHz or 868 MHz band, regarding to the region.

In between those frequencies there are different modes with different functions. In the table below you can see those specifications.

Mode	Frequency	Uni-/ Bidirectional	Description of Use
S1, Stationary	868.3 MHz	Uni	Send data a few times per day. Optimized for battery operation and stationary operation. 32.7 kbps
S1-m, Stationary	868.3 MHz	Uni	Same as S1, but optimized for mobile receiver
S2, Stationary	868.3 MHz	Bi	Same as S1, but bi-directional communication
T1, Frequent transmit	868.95 MHz	Uni	Send data every few seconds. Configurable interval. 100 kbps
T2, Frequent transmit	868.95 MHz, 868.3 MHz	Bi	Same as T1, but bi-directional operation
C1, Compact	868.95 MHz	Uni	Unidirectional communication using NRZ coding. Similar to T1 but higher data-rate, 50 kbps. Stationary operation
C2, Compact	868.95 MHz, 869.525 MHz	Bi	Same as C1, but bi-directional operation
N1a-f, Narrowband	169 MHz @ 12.5 kHz	Uni	Unidirectional, 4.8 kbps, stationary operation
N2a-f, Narrowband	169 MHz @ 12.5 kHz	Bi	Same as N1a-f, but bi-directional operation
N1g, Narrowband	169 MHz @ 50 kHz	Uni	Unidirectional, 19.2 kbps, stationary operation
N2g, Narrowband	169 MHz @ 50 kHz	Bi	Same as N1g, but bi-directional operation

Cellular

Bluetooth®

Wi-Fi

Proprietary

Combined

Mesh

Wireless M-Bus

Build Your Own Firmware

GNSS

Sensors

GENERAL INFORMATION

Uni- / Bidirectional

The wireless M-Bus (EN13757-4) differentiates the transfer in a network in 2 directions: uplink and downlink. Where uplink is used when a "meter" sends data to a receiver ("other") and downlink is used when a sender ("other") sends data to a "meter".

This two directions are, depending on the wireless M-Bus mode, either symmetric (S and N modes) or asymmetric (T and C modes). Where symmetric means that the same radio parameters (radio data rate, coding, modulation, frequency) are used for both directions. On the other hand asymmetric means that those radio parameters are different for the two directions.
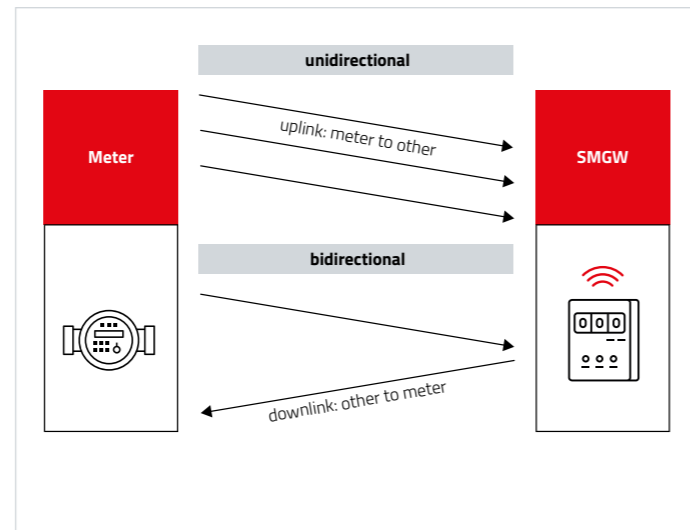
Payload

A wireless M-Bus mode containing a "1" means "sender only" so any radio frame reception is deactivated. Whereas a "2" in the wM-BUS mode means sender and receiver. The "sender only" mode of operation (e.g. C1 meter) has it's right to exist in a battery operated meter which does not need any information in the downlink direction and should operate in the order of 10 years with the integrated battery - which applies for the majority of meters today.

The payload of a wireless M-Bus frame is coded according to EN13757-3. Any meter reading value is located in one data block and the frame can contain one or multiple of such blocks. This allows the meter reading values to be transferred efficiently and in a well-defined yet flexible manner to provide interoperability. The drawback of this is, that the raw data of a wM-BUS frame is not readable for a human without parsing the data back into a readable format.
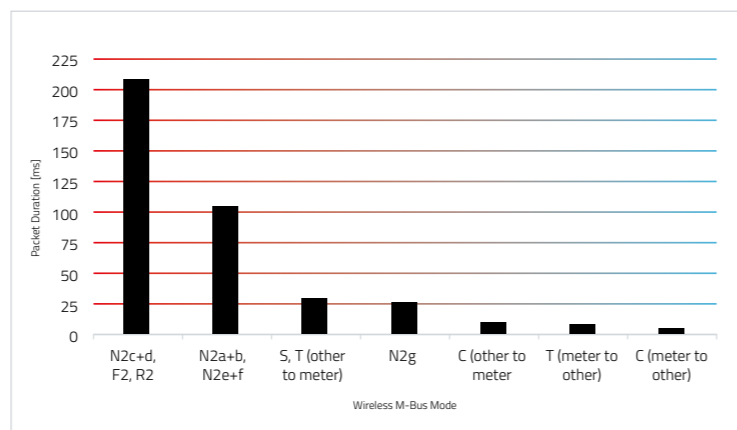
Different "Standards" in Europe

Europe in general
- EN13757; 169, 434 and 868 MHz wM-BUS Modes
- Based on OMS group recommendations

France
- „GrDF" (Gaz réseau distribution France)
- EN13757 N-Modus, 169 MHz narrow band

Italy
- „CIG" (Italian Gas Committee)
- Italian UNI TS11291 Specification
- EN13757 N-Modus, 169 MHz narrow band

PRODUCT OVERVIEW

	Mimas-I	Metis-I	Metis-II
Order Code	2607011113000	2605041183000	2607021183000
Frequency	169 MHz	868 MHz	868 MHz
Wireless M-Bus modes	N1a to N1f N2a to N2f	S, T, C	S, T, C
Output Power	14 dBm	11 dBm	14 dBm
Power Consumption Rx	28 mA	22 mA	30 mA
Power Consumption Tx	59 mA	31 mA	53 mA
Power Consumption Sleep	10 µA	0.3 µA	3 µA
Supply Voltage min - max	2.0 - 3.6 VDC	2.2 - 3.6 VDC	2.0 - 3.6 VDC
Op. Temp	-40 ... +85 °C		
Max Datarate	4.8 kbps	100 kbps	100 kbps
Payload	255 Byte	255 Byte	255 Byte
Antenna	external		
LoS Range	3000 m	700 m	1000 m
LoS Test Conditions	2 m Antenna height / 2400 bit/s	2 m Antenna height / 32768 bit/s	2 m Antenna height / 32768 bit/s
Interface	UART		
Transparent Mode	✔	✔	✔
Repeater	–	–	✔
Certification	CE		
	we-online.com/ Mimas-I	we-online.com/ Metis-I	we-online.com/ Metis-II

Cellular

Bluetooth®

Wi-Fi

Proprietary

Combined

Mesh

Wireless M-Bus

Build Your Own Firmware

GNSS

Sensors

OUR ANALYZER
WM-BUS TOOL

Wireless M-Bus Analyzer

The Wireless M-Bus Analyzer is a tool for receiving and parsing wireless M-Bus telegrams that comply with EN 13757-4:2013 transmitted by devices with role „meter" or „other". It currently supports both unencrypted and encrypted telegrams (supported encryption modes are: 0, 5, 7) in accordance with the OMS specification Vol2 V4.1.0 (draft June 2016) and EN13757-3:2013.

The data records in the telegrams are displayed in plain text by means of the integrated parser, which greatly simplifies the interpretation of a telegram. A review of the configuration settings or, for example, the meter readings can therefore be completed simply.

The Wireless M-Bus Analyzer is an excellent tool for analyzing errors and RF range of M-Bus devices. Thanks to the simplified representation and an integrated logging function, data can also be analyzed at a later time. The software only works in combination with a licensed AMB8665-AT2 USB stick. This USB stick acts as the receiver for telegrams from the meters and supports the S-, T- and C-mode.

Name	Part No.	Frequency [MHz]	Range* [m]	Modes	Compatible Modules
Metis-Simulator (AMB8665-M-S)	2607056283011	868	800	S, T, C	Metis-I (AMB8426-M), Metis-II (AMB8626-M)
		Wireless M-Bus Simulator Plug transmitting meter frames in S-, T-, C-mode for range estimation and meter simulation			
Metis-Analyzer (AMB8665-AT2)	2607057283011	Wireless M-Bus Receiver Plug plus smart meter software analyzer tool for wireless M-Bus			

* Range stated is calculated assuming line-of-sight. Antenna above ground 1.5 m and 6 dB margin. Actual range will vary based upon specific board integration, antenna selection and environment.

Characteristics

- Tool for monitoring and analysis of wireless M-Bus communication
- Packet content visualization
- Supports data records according to EN13757-3:2013 standard
- OMS (Open metering System) parser (according to OMS 4.1.0 draft 06/2016)
- Message parser for deep packet analysis incl. M-Bus application layer

- Decryption function (AES128) for security profiles A and B (encryption modes 5 and 7)
- Log feature (.xlsx, MS Excel) for offline analysis
- Various wireless M-Bus modes supported (S-, T- and C-Mode)

we-online.com/wM-Bus-Analyzer

ADDED VALUES

Development Tools
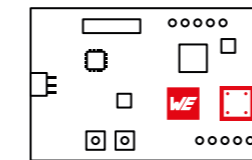
Eval Boards
- Easy testing
- Rapid prototyping
- FTDI integrated (UART to USB)
- Pins available on header
- Current measurement

we-online.com/EVAL-wM-BUS

More information on page 150

USB-Radio Stick
- USB-FTDI-RF-Module
- Range extension in Flooding Mesh networks
- Radio connection for computer

we-online.com/USB-wM-BUS
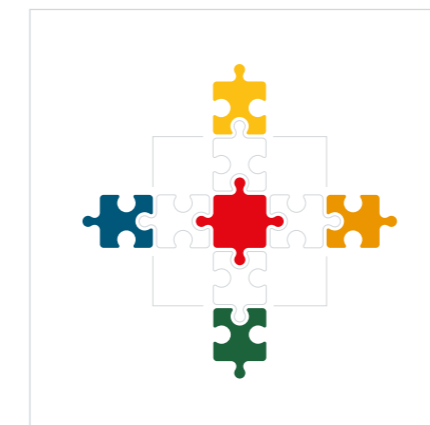
More information on page 150

AppNotes

ANR001 Metis-II Repeater Mode
we-online.com/ANR001

Software Development Kit
- Typically as C-Files, for mobile Apps platform specific languages
- For comfortable coding of:
  – The HOST-controller system
  – PC Applications & Mobile Apps
- Code examples in Application notes and Manuals

we-online.com/WCO-SDK

USER APPLICATION

A meter billing service provider switches from yearly manual reading to the use of wM-BUS based heat cost allocators and a smart meter gateway.

The typical use-case contains only the transmission from the meter to the data logger, but no transmission from the data logger to the meter. Each meter sends a message in a certain period. This period always contains a randomly chosen part to avoid permanent collisions between two devices. This period varies according to the medium: for electricity the OMS recommends 7.5 minutes, for water 30 minutes and for heat cost allocators 240 minutes.

Metering media	Mandatory (billing and actuator)		Informative aspects (consumer)
	Average update interval maximum [min]	Visualization interval for energy provider [hour]	Visualization interval for consumer [min]
Electricity	7,5	1	15
Gas	30,0	1	60
Heat (district heating)	30,0	1	60
Water / Warm water	240,0	24	–
Heat cost allocators	240,0	24	–
Heat / Cost (sub metering)	240,0	24	–
Repeater*	240,0	–	–

* Limit refers to datagrams that are generated by the repeater itself. Not for repeated datagrams!
Source: OMS spec generation 4, volue 2 issue 4.2.1

The data logger forwards the (still encrypted) data to a data center or a smart meter gateway, which can also decrypt the data locally because it has received the keys of the meters through the exchange with this data center. The permitted procedure is also country-specific in Europe.

Advantages for the Customers

- „Almost live" data access on his currently use of resources including a "live" cost estimation instead of yearly billing
- Comparison on a day-by-day basis when data is available
- No costs for the manual readout, no huddle with a yearly appointment for manual meter readout person
- Secure due to encryption, only the owner of the data knows the key required for decrypting the messages of the meters
- Several metering providers can share a single Smart meter Gateway (water, gas, electricity, heat cost, …)

Disadvantages for the Customers

- High initial costs: Smart meter gateway and meters with wireless interface
- Battery lifetime requires exchanging devices each 7 - 10 years in case of battery operated devices – due to security reasons "just" changing the battery is often prevented

Advantages

Time saving   No personal contact needed   Autonomous   Measuring possible at any time   Smart metering: Measure and control