
Wireless M-Bus for Industrial Applications

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Wireless M-Bus is a well-established standard for reading utility meters, such as electricity, gas, water and heat meters. The original standard was released in 2005 as EN 13757-4, using the license free band at 868 MHz. Later the standard has been extended with new frequency bands, notably 169 MHz, in the 2013 edition. The use of a VHF frequency for narrowband communication and up to 500 mW transmission power gave a significant increase in the communication range. Gas and water meters in particular could take advantage of the increased link budget, as they are often installed in hard to reach places. However, Wireless M-Bus is not limited to only metering applications. It is also an attractive solution for industrial wireless sensor networks.

The main advantages of using Wireless M-Bus also in industrial sensor applications are:

- a standardized framework for a complete communication stack
- an optimized solution for battery operation
- security in terms of privacy, integrity and authentication of data
- a power efficient two-way communication protocol for sensor reading and control
- availability of data readers and gateways

Many types of sensors are already standardized in the M-Bus application protocol (EN13757-3 and EN13757-7), such as temperature, humidity, gas, pressure, switches, A/D converters etc. Even sensors that are not standardized yet can be added as “manufacture specific” devices, still taking advantage of the rest of the protocol stack and security elements. Wireless M-Bus is well proven out in the field with tens of millions of devices using the standard. This means there are also off-the-shelf data readers and gateways used to collect sensor data, available in the market.

Wireless M-Bus was developed as a European standard in the 868 MHz band, and later 169 MHz was added. However, in the OMS specification (Open Metering System) which is a complete meter reading specification based on M-Bus, new frequency bands covering other geographical regions outside Europe are defined. For example, 433 MHz, which can be used as a license free band in many countries outside Europe such as Brazil, Australia and New Zealand. 865 MHz can be used in India, and a special sub-band at 868 MHz can be used in Russia.

For long range application in Europe, the 169 MHz is a very interesting alternative for wireless sensor networks. It is combining high output power with excellent receiver sensitivity due to narrowband operation, providing a very good link budget. The selectivity of the radio (which can even be category 1 as defined in EN 300 220) is ideal for operation in harsh industrial environments with interference and electromagnetic noise. Category 1 is a classification for receivers, where the selectivity and blocking properties meet certain requirements. This is the ultimate solution for best performance in environments with radio interference, or where the radio link must be made as robust as possible.

Radiocrafts offer solution on all these frequency bands; 169/433/865/868 MHz, meeting the local radio regulations in many countries even outside Europe. The basic module is the RC1180-MBUS3, which can act as a modem (UART interface) in the sensor, or as a receiver in the data reader or gateway, or even as a Repeater (single hop one-way repeater). The RC1701HP-MBUS4 is the ultra-narrowband solution at 169 MHz. For sensors or counters with pulse outputs, the RC1180-MPC1 or RC1701HP-MPC1 can directly interface the pulse signal, and be configured for scheduled transmissions of the counter index.

It is very easy starting to use Wireless M-Bus also in industrial applications, based on the existing radio modules. Basically, there is not much difference between a sensor and a utility meter. The only real difference is the type of data that is transmitted in the application layer. In the M-Bus application layer such data points are formatted using some descriptors called DIF and VIF (Data Information Field and Value Information Field). As an example, these descriptors may tell that the next 4 bytes are an 8 digits BCD coded value in litres. In the same way, a DIF/VIF can be used to describe any sensor data format. If a sensor is not already defined in the standard it is still possible to use a manufacturer specific descriptor.

The security mechanisms, such as encryption can be used in the same way as for metering applications. The radio modules support encryption based on AES-128.

And of course, the efficient coding of the link layer, the use of a repeater, and the low power features of the two-way protocol can be used also in industrial applications of the Wireless M-Bus protocol.

Document Revision History

Document Revision	Changes
1.0	First release

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