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# Wireless M-Bus Range Extender

AN028 - Power Consumption

Version 1.2

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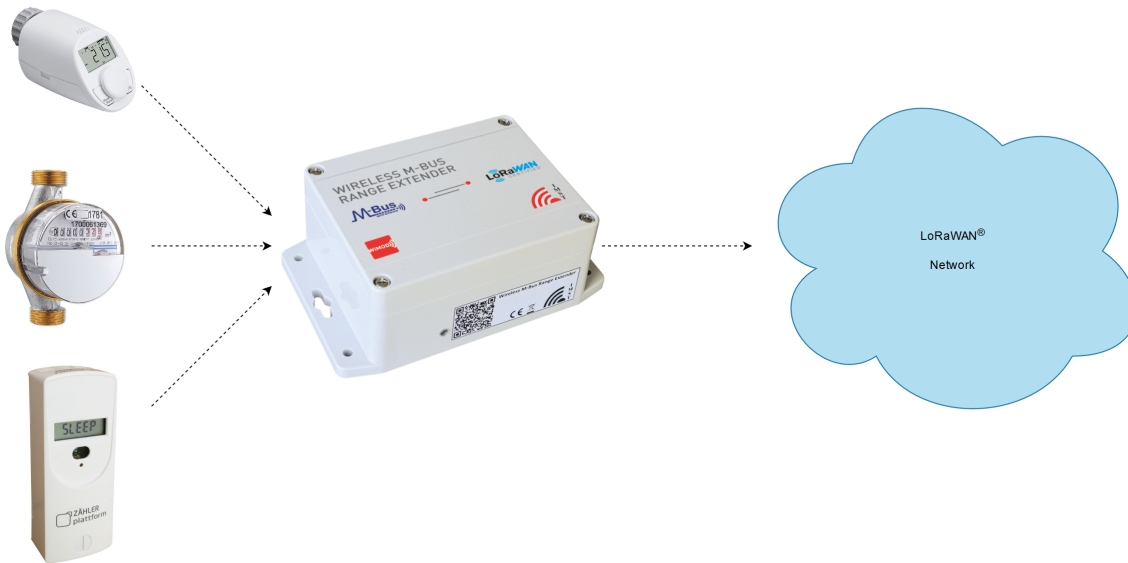
## Revision history

Datum	Version	Kapitel	Änderung
18.06.2020	0.1	all	<ul style="list-style-type: none"><li>• created</li></ul>
19.06.2020	0.2	all	<ul style="list-style-type: none"><li>• scenarios supplemented</li><li>• characteristics added</li></ul>
08.07.2020	0.3	all	<ul style="list-style-type: none"><li>• corrected and supplemented</li></ul>
19.08.2020	1.0	all	<ul style="list-style-type: none"><li>• reviewed</li></ul>
01.10.2020	1.1	<ul style="list-style-type: none"><li>• Scenario 1</li><li>• Scenario 2</li></ul>	<ul style="list-style-type: none"><li>• adjust current consumption to change in firmware</li></ul>
13.11.2020	1.2	<ul style="list-style-type: none"><li>• Electrical Characteristics</li><li>• Scenario 1</li><li>• Scenario 2</li></ul>	<ul style="list-style-type: none"><li>• added Firmware Information</li><li>• adjustment of consumption through new LED usage</li></ul>

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## Power Consumption - Overview



In general, it is difficult to make a statement regarding the life time of a battery driven device. This applies especially to devices that operate within a radio network. The availability of the network has a significant influence on the radio settings and thus on the power consumption of the device.

For the Wireless M-Bus Range Extender device we therefore describe and evaluate different operating scenarios. The calculation of the power consumption of the Range Extender is based on several assumptions and is mainly influenced by the number of received wireless M-Bus packets and the radio settings of the device.

It is assumed that a wireless M-Bus packet consists of 50 bytes and that all stored wireless M-Bus packets are uploaded via the LoRaWAN network. The upload is handled by confirmed data transfers. For this consideration it is assumed that all data packets and confirmations are received. In addition, two further functions of the Range Extender are also considered. Firstly, the Range Extender has the possibility to synchronize its local time with that of the LoRaWAN network. For this purpose a request is sent to the Network Server. It is assumed that the response from the Network Server is received, so that no retransmissions become necessary. Furthermore, for monitoring purposes the Range Extender can send a confirmed Status Packet. It is assumed that this message is also received and acknowledged by the LoRaWAN network without retransmissions.

Within the following the different scenarios are described and the corresponding power consumptions are given.

# Power Consumption - Electrical Characteristics / Assumptions

Unless otherwise specified, all characteristics are applied for T = 25°C, VDD = 3.6V and are typical consumption values.

All used consumption values were determined with the following firmware.

Firmware Information	
Firmware	WMBus_LoRaWAN_Bridge
Version	V1.0
Build Count	118
Build Date	06.11.2020

Electrical Characteristics	
Power Supply (VDD)	Lithium battery (Li-SOCI2) SL-2880 with connector PHR-2
	3.6V, 19Ah, Size D
Current Consumption (typ.)	Transmit Mode: 35mA
	Receive Mode: 13mA ; 20mA during active packet reception
	Sleep Mode: 3µA (RTC on)
Data Memory	8 MBit Flash

Assumptions	
Wireless Sensors	50 Byte Payload
	Wireless MBus C-Mode Format B
Lithium Battery	Effective usable capacity 80% of the battery
LoRaWAN	Confirmed Upload: No retransmissions necessary
	Confirmed Send Status: No retransmissions necessary
	Network Time Request: No retransmissions necessary

# Power Consumption - Scenario 1

## Description

In this scenario the Range Extender is configured with a daily receive window of 11 minutes in C/T mode to cover wireless sensors with a transmission period of up to 10 minutes.

The wireless M-Bus packet filter within the Range Extender is used, so we assume that from 200 wireless M-Bus packets received within the receive window only 20% are stored within the internal data memory.

We furthermore assume that a wireless M-Bus packet consists of 50 bytes and that all stored wireless M-Bus packets are uploaded via the LoRaWAN network once a week.

For monitoring purpose the Range Extender transmits a Status Packet daily and the time from the LoRaWAN network is requested also once per week.

## Configuration of the Calendar Events

Calendar Event	Duration	Period
Recording Wireless M-Bus packets in C/T Mode	11 Minutes	once per day
Stop recording and start upload of recorded Wireless M-Bus packets	until data transfer is completed and all packets are received	once per week
Get & Synchronize Network Time over LoRaWAN®	until Range Extender received timestamp	once per week
Send Range Extender Status over LoRaWAN®	completed after Range Extender received acknowledge	once per day

## Receiving Data

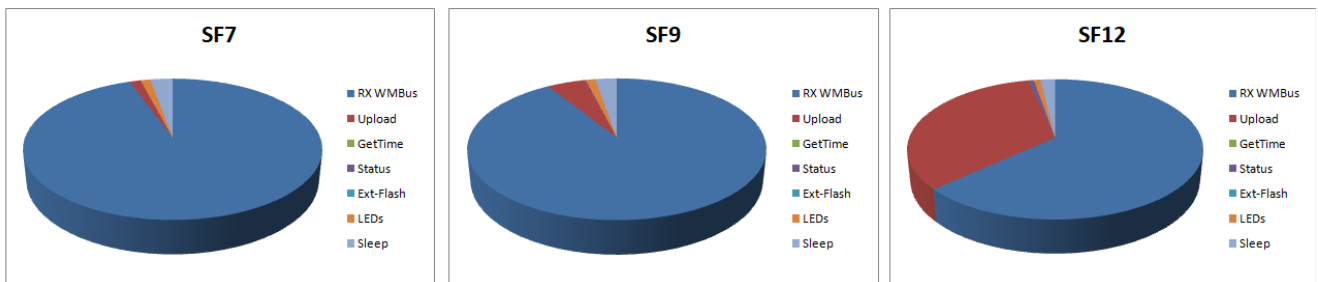
Received Wireless M-Bus packets of 50 bytes during one receive window	
Received	200
Rejected due to WM-Bus Filtering	160
Stored within data memory and uploaded	40

## Consumption

To evaluate the power consumption of the LoRaWAN communication three scenarios with different spreading factors are considered.

	SF7	SF9	SF12
Consumption per year	921 mAh	956 mAh	1376 mAh
Life Time in years	16,5	15,9	11

## Distribution



## Power Consumption - Scenario 2

### Description

Scenario 2 is nearly the same as Scenario 1, but instead of receiving 200 wireless M-Bus packets the Range Extender receives 400 wireless M-Bus packets within 11 minutes receive window. Again of those 400 packets only 20% are stored within the data memory due to wireless M-Bus packet filtering.

### Configuration of the Calendar Events

Calendar Event	Duration	Period
Recording Wireless M-Bus packets in C/T Mode	11 Minutes	once per day
Stop recording and start upload of recorded Wireless M-Bus packets	until data transfer is completed and all packets are received	every second day
Get & Synchronize Network Time over LoRaWAN®	until Range Extender received timestamp	once per week
Send Range Extender Status over LoRaWAN®	completed after Range Extender received acknowledge	once per day

### Receiving Data

Received Wireless M-Bus packets of 50 bytes during one receive window	
Received	400
Rejected due to WM-Bus Filtering	320
Stored within data memory and uploaded	80

## Consumption

To evaluate the power consumption of the LoRaWAN communication three scenarios with different spreading factors are considered.

	SF7	SF9	SF12
Consumption per year	946 mAh	1015 mAh	1845 mAh
Life Time in years	16,06	14,98	8,24

## Distribution

