LOB-GW-WMBUS-LW2 (LoRaWAN)

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Lobaro Wireless M-Bus Bridge V2 (for LoRaWAN®)

> **THIS PRODUCT HAS BEEN FUNCTIONALLY REPLACED BY ITS SUCCESSOR (LOB-GW-HYB-WMBUS) AND WILL ONLY CONTINUE TO BE PRODUCED FOR EXISTING CUSTOMERS ON REQUEST.**

Version **v2.x** *(since 2020-02-18)*
This is the latest version. The previous v1.x documentation can be found here: doc v1.x.

Deutsches Quick-Start LOB-GW-WMBUS-LW2 (DE)

Overview

The Lobaro Wireless M-Bus Bridge V2 (Model: LOB-GW-WMBUS-LW-2) is a cost-effective & energy efficient bridge / range extender, that receives, caches and transparently forwards wireless M-Bus (C1, T1, S1 modes) and Sensus RF BUP metering data from utility meters via any LoRaWAN® network onto the Internet. The metering data will not be decrypted by the device instead an unchanged 1:1 forwarding takes place via one or more LoRaWAN® packets (depending on the wMBUS telegram byte size). Thus the end-to-end encryption of sensitive wireless M-BUS consumption data is preserved.

LoRaWAN® is a mark used under license from the LoRa Alliance®.

Key Features

✅ LoRaWAN 1.0.2+ and 1.1 (experimental) network servers supported

✅ LoRaWAN Class A operation

✅ LoRaWAN time synchronisation

✅ Wireless MBus S1, C1 and T1 modes (868 MHz) compatible

✅ Sensus RF BUP (868 MHz) compatible

✅ Configuration via USB or remotely via LoRaWAN downlink

✅ Big 19Ah size "D" battery for 10 years+ possible battery lifetime

✅ IP67 outdoor housing with pressure compensating element

✅ Quick closing screws with cover retainer on housing

✅ Optional: Lobaro wireless MBUS parsing REST API (free for testing)

✅ Optional: complete Lobaro IoT Platform integration

Introduction

Many gas, water, electricity and heat meters can be read wirelessly using the common short range 868 MHz wireless M-Bus / OMS industry standard. Because such wMBUS enabled meters use the classical energy saving FSK radio modulation, the wireless range is designed for less than 50m and therefore requires the use of additional longer-range radio technologies to forward the metering data over larger distances onto the Internet. The advanced LoRa radio modulation used inside the Lobaro wMBUS to LoRaWAN Bridge is one of such a key technologies.

You can find details about LoRaWAN in our background article.

Note: The Lobaro IoT platform is fully optional! Image shows product with design cover accesssory.

⚠️ **Please use always the latest firmware on your lorawan wmbus bridge!**

- **Check latest firmware releases available for download**

Compatible meters

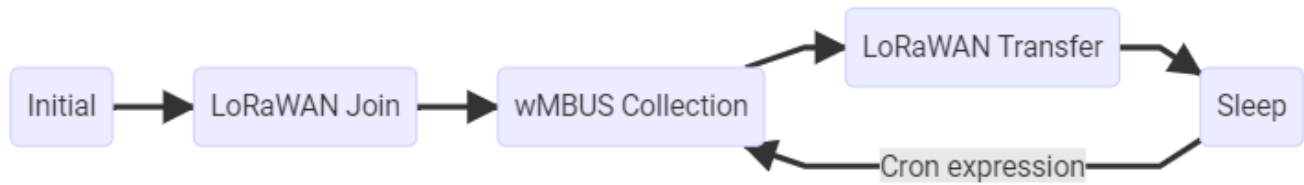The Lobaro wMBUS Gateways are working with **every meter** using standard 868 MHz wMbus:

- wireless MBUS S1, C1 or T1 mode (unidirectional 868 MHz modes following DIN EN 13757-4)
- Open metering specification (OMS) v3 & v4
- Sensus RF Bubble UP - Manufacturer specific radio protocol

ⓘ For more details please refer to our Wireless M-BUS article on doc.lobaro.com.

Work Cycle

The Bridge has a simple work cycle that consists of five phases.

Initial Phase

This is the phase that is executed after the device is started of restarted. The Bridge performs a quick self test which you can easily spot by the green internal LED flashing. After that, the configuration is evaluated. If successful, the LoRaWAN Join phase is executed next.

LoRaWAN Join Phase

If the Bridge is configured to use over the air activation (OTAA), the OTAA join is performed at this point. The device will repeatedly try to join its LoRaWAN network until the process is successful. It then enters the Data Collection Phase. If the Bridge is configured to use ABP instead of OTAA, this phase is left immediately and the Data Collection Phase is entered according to the cron configuration.

The **retry** for the LoRaWAN Join **starts at 30 seconds** plus a random jitter of up to 10 seconds and doubles with every try up to a **maximum of 8 Hours** plus a random jitter of up to 10 minutes.

Data Collection Phase

During the wMBUS collection phase the device receives any wireless M-Bus data with valid CRC and stores it (without DLL CRCs) for the following LoRaWAN upload phase but only if the received telegram passes the user defined white list filters. Similar telegrams of one identical meter may be received multiple times during this phase. In this case the newest telegram with the same id, type and length will replace the previously received one. Only the latest telegram will be uploaded via LoRaWAN. After the configured amount of time for collecting data the LoRaWAN data transfer phase is entered.

Data Transfer Phase

During the Data Transfer Phase the Bridge uploads all previously stored wMBUS data using LoRaWAN. All wMBUS DLL (Data Link Layer) CRCs are removed before the LoRaWAN upload since LoRaWAN has it own data integrity checks. Depending on original wMBUS telegram byte sitze this can require multiple LoRaWAN messages to be sent. Since LoRa requires any device to respect a strict duty cycle, it is possible, that the Bridge will need to wait before sending its messages. If this happens, the device will enter a power saving modus while waiting for the next message. It is possible that transferring all data will take several minutes. In addition to the wireless M-Bus data, the Bridge sends a status packet once a day during this phase. The status packet will always be transmitted prior to any data packets. For a detailed description of the data sent refer to chapter "Data Packet".

Sleep Phase

After transferring all data packets the Bridge enters the Sleep Phase. During this it is completely inactive to avoid wasting power. It remains sleeping until one of the cron expressions given in the configuration triggers. When that happens, it enters the Data Collection Phase again.

The wMBUS LoRaWAN Bridge

Hardware revision 2.x (active since 2020)

LOB-GW-WMBUS-LW-2, PN: 8000095 (white) & 8000138 (gray)

Hardware revision 1.x (active since 2017)
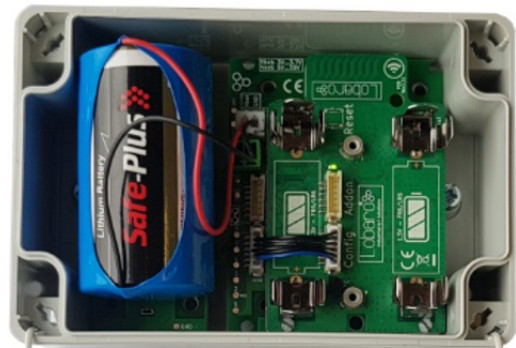
> ⓘ **Please note revisions 1.x are no longer the default variant since 02/2020**
>
> The v1 hardware revisions are still active but only on special sales inquiry!
>
> Please contact Lobaro if you are interested in revisions 1.x hardware.

Hardware differences

The main differences between hardware revision 1.x and revision 2.x are:

- HW1.x has an additional on board temperature sensor (seldom used)
- HW1.x is available in a 2x AA cell (1.5V) variant with compact housing (rarely requested)
- HW1.x may be combined with external power supply addon (5V...30V)

So the main reason to request revision 1.x is the smaller housing with two AA batteries or the need for an external power supply. The same firmware will always provided for both hardware revisions.

Device installation
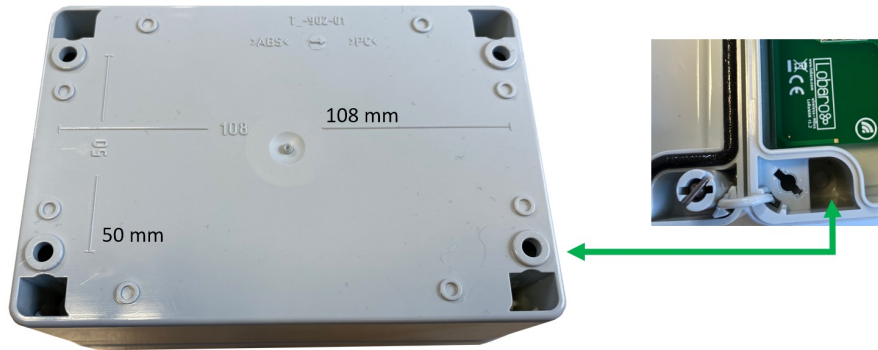
The device must be fixed on a flat surface using the lateral mounting holes of the case, see chapter "Housing Dimensions" for a detailed description of all housing dimensions. Alternatively we offer as accessory a mounting clips.

> ⚠️ **Mounting height**
>
> Under any circumstances the device must not be mounted higher than 2 meters above ground to avoid any risks in case of falling down!

For optimal RF performance (e.g. LoRa range) any metal obstacles near the internal antenna should be avoided. In this case 'near' is defined as keep-out distance of about 3-5 centimeters around the antenna. The internal quarter wave monopole antenna can be identified by the pcb trace near the white printed encircled 'connectivity' symbol. In any case a device mounting directly on top of a metal surface is not advisable since it will degrade the possible RF range. Stone walls, wood or plastic standoffs are perfectly ok.

In case of challenging installation locations (e.g. in basements) or unavoidable long distances to the next LoRaWAN gateway, Lobaro offers on request custom product variant equipped with a 'SMA' connector to support a external antenna connection.

Power Supply

The wMBUS over LoRaWAN Bridge default power supply consists of one connected 3.6V 'D' sized battery equipped with a JST XH 2pin connector.

- Size: D-Cell (34mm x 61.5mm)
- Connector: JST XH series
- Voltage: 3.6V
- Operating temperature: -55°C...+60°C
- Li-SOCl2 (not rechargeable)

> ⚠️ **Battery warning**
>
> Other Batteries or accumulators with a nominal voltage of more or less than 3.6V must not used with the device under any circumstances. In particular, lithium based cells with a nominal voltage of 3.7V must not be used!
> On request we can supply custom product variants with with permanent external power supply (230V, 9-24V, 5V USB) or smaller AA batteries.
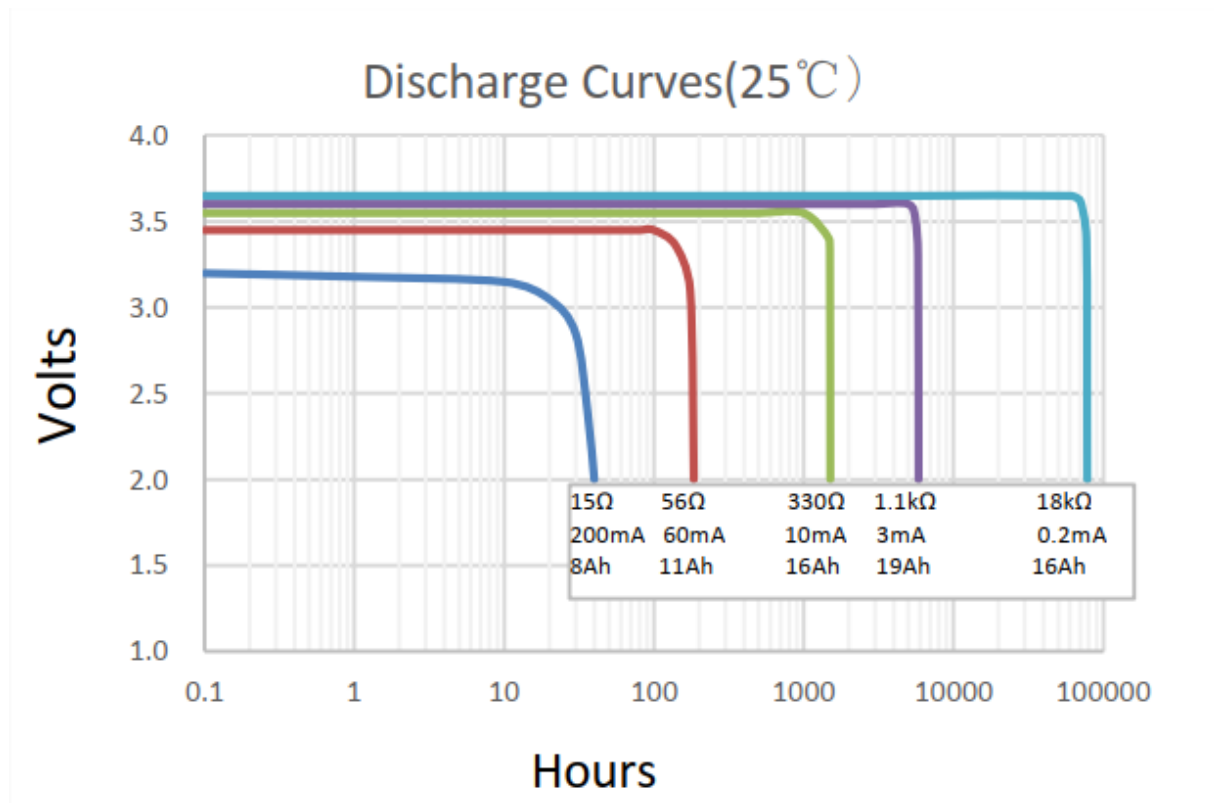
Battery life time

The battery life time of the wireless M-Bus to LoRaWAN Bridge can not be specified trustworthy without knowledge of the detailed installation scenario. At least estimations for the following custom project based parameters have to be known:

- Meter count per single wMBUS bridge, e.g. 10 different meters.
- Needed LoRaWAN transmission interval, e.g. daily uploads.
- Average wireless M-Bus telegram size in bytes, e.g. 35 byte.
- Wireless M-Bus telegram transmission interval of the meter, e.g. every 10 seconds.
- Typically used LoRa Spreading Factor / LoRa link quality, e.g. SF10.

Depending on these parameters battery life times from a few months to over 15 years can be achieved. You may send us your use-case details as described above to support@lobaro.com and we will return to you a custom battery lifetime calculation, a recommendation for the best power supply scheme and the needed minimal battery capacity.

The device will operate with a minimum Voltage of 2.5V. The battery discharge curve is not linear. A reasonable alarm threshold is between 2.7V and 3V.

Discharge Curves(25°C)

15Ω	56Ω	330Ω	1.1kΩ	18kΩ
200mA	60mA	10mA	3mA	0.2mA
8Ah	11Ah	16Ah	19Ah	16Ah

Example calculation

In this battery lifetime calculation scenario the target meters send a 35 byte long ('L-Field') wireless M-Bus telegram constantly every 10 seconds. A real world image of a 4:1 (4 meters, 1 bridge) configuration can be found at the top of this documentation. The meter transmission interval is for example very similar to a 'Hydrus' ultrasonic water meter of **Diehl Metering**. The Diehl meter itself has a specified battery life time of 12 years.

Because of the mentioned 10 second send interval it is sufficient to configure the bridge for a wireless M-Bus listen period of 20 seconds by setting the bridge configuration parameter cmodeDurSec to a value of 20 (refer to section "Configuration"). This will ensure that all four meters of interest send their consumption telegrams at least once during the configured listen period of the bridge.

For this example battery-lifetime calculation the weakest and best possible LoRaWAN connectivity will be compared. Weak means to reach a LoRaWAN Gateway the Lobaro bridge has to send its LoRaWAN uplinks very slowly (2 seconds) and redundant by using LoRa spreading factor 12 (SF12). Estimations for the opposite situation with a excellent LoRa link quality and thus the possible usage of SF7 have been calculated too. In both coverage scenarios covered the actual usable battery capacity has been set to 80% of the nominal value of 19Ah for the "D" sized mono 3.6V cell. The resulting worst-case minimal battery-life times in years for both coverage situations are presented below:

Worst-Case Battery life with **daily uploads** of x meters using LoRa SF12 and SF7:

Collected meters	Battery life @ SF12	Battery life @SF7
1	24.3	40.0
5	15.0	38.1
10	9.1	35.2
20	5.1	30.6
40	2.7	24.3
80	1.4	17.2

All battery life numbers denote years		

Usage scenario recommendations

As a simple rule of thumb using the Lobaro wireless M-Bus over LoRaWAN bridge is a good fit in applications that require daily (or less often) consumption values of 1 to 40 installed wireless M-Bus meters. For installations with a higher meter count simply more Lobaro bridges may be used.

Another key factor for high battery lifetime is to select or configure your wireless M-Bus meters in a way that they send short telegrams very frequently, proven good values are periods smaller than 30 seconds and telegram sizes smaller 50 bytes. This helps to minimize the needed wMBus listening time period and avoids the need for multiple LoRaWAN packets per single telegram (data splitting).

Beside this the bridge is naturally most economical when multiple meters per single bridge can be collected and forwarded via LoRWAN. Although for some applications a 1:1 setup, e.g. one bridge per meter, may deliver enough benefits to justify the invest.

For hourly or even more frequent meter data uploads, as requested by some of our customers, LoRaWAN isn't the perfect match from a technology point of view. The same holds for scenarios where hundreds of meters are expected to be transferred by a single bridge, e.g. in 'sub-metering' applications with tons of installed heat cost allocators. For such more demanding cases Lobaro can offer better solutions using higher bandwidth transmission techniques like NB-IoT (Narrowband IoT).

Configuration

The (initial) configuration is normally done using our free Lobaro Maintenance Tool and the USB PC configuration adapter to be connected to the "config" connector on the hardware.

Beside this the configuration can also be changed or read remotely in the field using LoRaWAN downlink messages.

LoRaWAN

The connection to the LoRaWAN network is defined by multiple configuration parameters. This need to be set according to your LoRaWAN network and the way your device is supposed to be attached to it, or the device will not be able to send any data.

For a detailed introduction into how this values need to be configured, please refer to the chapter LoRaWAN configuration in our LoRaWAN background article.

Name	Description	Type	Values
OTAA	Activation: OTAA or ABP	bool	true= use OTAA, false= use ABP
DevEUI	DevEUI used to identify the Device	byte[8]	e.g. 0123456789abcdef
JoinEUI	Used for OTAA (called AppEUI in v1.0)	byte[8]	e.g. 0123456789abcdef
AppKey	Key used for OTAA (v1.0 and v1.1)	byte[16]	
NwkKey	Key used for OTAA (v1.1 only)	byte[16]	
SF	Initial / maximum Spreading Factor	int	7 - 12
ADR	Use Adaptive Data Rate	bool	true= use ADR, false= don't
OpMode	Operation Mode	string	A= Class A, C= Class C
TimeSync	Days after which to sync time	int	days, 0=don't sync time
RndDelay	Random delay before sending	int	max seconds
RemoteConf	Support Remote Configuration	bool	true=allow, false=deactivate
LostReboot	Days without downlink before reboot	int	days, 0=don't reboot

wMBUS bridge

name	description	values	since
payloadFormat	wMBUS Bridge LoRaWAN Payload Format	0= Encoding in ports, 1= prefixed with time, 2= prefixed with time and rssi	
loraMaxMsgSize	Max. LoRa msg size before split (Payload Format 0 only)	10-50 (bytes)	
listenCron	Cron expression[†] defining when to rx wMBUS	0 0/15 * * * *(every 15 minutes)	
cmodeDurSec	Duration (Seconds) of C1/T1-mode receive	0= Do not collect C1/T1 mode	
smodeDurSec	Duration (Seconds) of S1-mode receive	0= Do not collect S1 mode	
xmodeDurSec	Duration (Seconds) of Sensus-RF-BUP-mode receive (Xylem)	0= Do not collect Sensus RF BUP	v2.6.0
mFilter	wMBus manufacturer filter sep. by , e.g. dme,itw	blank= no filter	
typFilter	wMBus device type filter e.g. 08,07 for Heat Cost and Water	blank= no filter	
devFilter	wMBus id filter e.g. 88009035,06198833 (8 digits)	blank= no filter	
ciFilter	wMBus CI-Field filter e.g. 8a,71 (2 hex digits)	blank= no filter	v2.7.0

Uplink Payload formats

After collecting wireless M-Bus telegrams over the air, the Bridge starts uploading data via LoRaWAN. There exist two data formats that are transmitted over different LoRaWAN ports. As LoRaWAN can only transmit very short messages, the message formats contain only data bytes. The meaning of a byte is determined by its position within a message. The following describes the package formats used by the wireless M-Bus Bridge.

M-Bus telegrams can be longer as the maximal size of a LoRaWAN-Message. For this cases, the Bridge needs to split a telegram into multiple pieces and upload it using multiple LoRaWAN-Messages. There are two different methods this is done, according by the Payload Format you set in the Bridge's configuration.

Payload Format `0` is focused on easy reassembly of the pieces. The parts are encoded by port numbers and the data can just be concatenated together. Payload Formats `1` and `2` add additional information to the telegram. They focus on putting as much of a telegram in a single LoRaWAN-Message as possible with respecting the current Spreading Factor.

Port	PayloadFormat	Message
1	any	Status message
11-99	0	Default PayloadFormat. Part of split telegrams is encoded in Port (e.g. Port 24 = Telegram 2 of 4).
101	1	Data Message without timestamp. Part of split telegrams is encoded in payload.
102	2	Data Message with timestamp. Part of split telegrams is encoded in payload.

Status Packet (Port 1)

Port 1 - In order to provide some information about the health & connectivity state of the device itself, the device sends a status update at a daily basis. The status packet is sent on the first upload phase after activation of the device (after reboot) and then repeatedly in every upload phase that takes place a day or longer after the previous status packet. It has a length of 7 or 8 bytes. The battery voltages and ambient temperature are encodes as 16 bit integer using little endian encoding.

name	type	bytes	description	example
version	uint8[3]	0-2	Version of the firmware running on the device	1, 5, 1 v1.5.1
v_bat	uint16	3-4	Battery voltage in mV	2947 2.947V
temp	int16	5-6	Temperature measured inside the device in 1/10 °C	246 24.6°C
flags	int8	7	Bit 7 (e.g. 0x01) = No wMbus Telegram received (**added in v2.5.0**)	0x01

> ⚠ **Temperature Sensor**
>
> The temperature sensor is not present anymore on dedicated V2 hardware, instead 0xffff will be returned.

We provide a JavaScript reference implementation of a decoder for this status packet on GitHub, which can be used directly for decoding in The Things Network.

Data Packet (Port 11-99, PayloadFormat 0) - Default

After each wMBUS collecting phase, all saved telegrams (up to 500 can be stored) will be uploaded via LoRaWAN uplink messages as fast as possible. The received wMBUS telegrams that did pass the configured white list filters will be uploaded without any modification in one or more LoRaWAN messages. If a wMBUS telegram is bigger than the bridge configuration parameter loraMaxMsgSize the transmission will be done using multiple LoRaWAN messages. This parameter is limited to 50 bytes due to LoRaWANs maximum payload size restrictions. In case of telegram splitting is needed the receiving backend application server as to reassemble the original wMBUS telegram before decryption & parsing of the meter data. This is done by simply joining the messages together in the order of receive. The LoRaWAN port encodes identifies a LoRaWAN fragment of the original wireless M-Bus telegram. This way partial messages can be identified using the LoRaWAN Port:

- 10 < LoRaWAN Port < 100 (Part Number | Total Parts)

Gaps in the LoRaWAN Frame Counter are giving a hint for missing telegram parts which can happen in LoRaWAN since it's a ALOHA based protocol, e.g. collisions and some packet losses are accepted by principle of operation. In case the backend noticed a missing packet the wMBUS telegram can't be assembled anymore as described before.

> ⓘ **Note**
>
> **Reference Implementation in GoLang**

Examples

Examples (with `loraMaxMsgSize` = 50):

- A 48 Byte wMBUS telegram will be send on LoRaWAN port 11. Port 11 says it is the first message of only one message (no splitting).
- A 75 byte wMBUS telegram will be send in two messages on LoRaWAN ports 12 and 22. Port 12 means this part one of a wMBUS telegram that got splitted into two LoRaWAN messages. Port 22 means that this data is the 2nd part of the original wMBUS data. Both parts have to been concatenated in the order of receive by the backend.
- A 101 byte wMBUS telegram will be send in three messages on LoRaWAN ports 13, 23 and 33. Port 13 means this part one of a wMBUS telegram that got splitted into three LoRaWAN messages. Port 23 means that this data is the 2nd part of the original wMBUS data. Port 33 means that this data is the 3rd part of the original wMBUS data. All three parts have to been concatenated in the order of receive by the backend.

Data Packet without Timestamp (Port 101, PayloadFormat 1)

When using Payload Format 1, collected telegrams are uploaded on a single Port: 101. For each telegram there will be added the timestamp of reception. The first byte of messages on Port 101 encodes splitting of messages as follows.

Splitting

Every Uplink on Port 101 is prefixed with a single byte, where the least significant Bit indicates if that Uplink is the first part of a message, and the second least significant Bit indicates if that Uplink is the last part or a message. So there are 4 different possible values for the first Byte of an Uplink on Port 101:

Value	Meaning
`0x03`	This Uplink is both first and final part of a message. So the remaining Bytes in this Uplink contain the whole message.
`0x02`	This Uplink is the last but not the first part of a message. There has been at least one Uplink before this one, that contained data that needs to be prepended to the current Uplink in order to get the full Message
`0x01`	This Uplink is the first but not the last part of a message. There follows at least one Uplink that contains more data to be appended to the current's data in order to get the full message.
`0x00`	This Uplink is neither first nor last part of a message. There has been at least one Uplink before this one that contains more data of the current Message, and there follows at least one more Uplink with data for this Message.

So each message sent on Port 101, whether it is contained in a single Uplink or spread over multiple ones, starts with an Uplink where the least significant Bit of the first Byte is set. Each Message ends with an Uplink where the second least significant Bit of the first Byte is set. In cases where the Message fits in a single Uplink, that Uplink is both first and last Uplink, and therefore both Bits are set.

The combination of those two Bits and the Frame Counter of the Uplinks makes it possible to upload Messages of any length while allowing the receiving side to now exactly, if a Message has been transferred completely, or if part of it is missing (when there are Frame Counter values missing).

The Bridge puts as many Bytes in each Uplink as possible for the current Spreading Factor, even if the Spreading Factor changes between Uplinks because of ADR.

When the data of all Uplinks that are part of a single Message are appended in order of reception (after removing the first Byte of each Uplink), you get the payload Data of a full message.

Payload (Format 1)

The Payload Data after reassembly of the split parts consists of a 5 Byte Timestamp, that marks the point in time the Bridge did receive that telegram, followed by the Data of the Telegram. The Timestamp follows the convention of all our 40bit-Timestamps; you can find the details under Timestamp in our LoRaWAN Background Information.

Examples

For easier understanding, the wMBus-Telegram in the examples will always be `0102030405060708090a0b0c0d0e0f`.

A message sent in a single Uplink

```
# An Uplink of 21 Bytes on Port 101:
'03005e53f31a0102030405060708090a0b0c0d0e0f'
# Analised:
'03' -> First and Last Uplink of Message -> complete Message in this Uplink
'005e53f31a' -> Unix Timestamp 1582560026 -> 2020-02-24T16:00:26 UTC
'0102030405060708090a0b0c0d0e0f' -> wMBus Telegram
```

A message split over two Uplinks

```
# An Uplink of 11 Bytes on Port 101, Frame Counter 341:
'01005e53f31a0102030405'
'01' -> First Uplink of Message, more Uplinks follow
'05e53f31a0102030405' -> First Part of Message Data.
# Another Uplink of 11 Bytes on Port 101, Frame Counter 342:
'02060708090a0b0c0d0e0f'
'02' -> Last (but not first) Uplink of Message.
'060708090a0b0c0d0e0f' -> Second and final Part of Message Data.
# We Received a 'first' Part with Frame Counter 341 and a 'last'
# Part with Frame Counter 342, so we know we did not miss any
# Parts in between. We can now assembly the complete payload:
'05e53f31a0102030405060708090a0b0c0d0e0f'
# Payload anaylsed:
'005e53f31a' -> Unix Timestamp 1582560026 -> 2020-02-24T16:00:26 UTC
'0102030405060708090a0b0c0d0e0f' -> wMBus Telegram
```

A message split over three Uplinks

```
# An Uplink of 8 Bytes on Port 101, Frame Counter 519:
'01005e53f31a0102'
'01' -> First Uplink of Message, more Uplinks follow
'05e53f31a0102' -> First Part of Message Data.
# Another Uplink of 8 Bytes on Port 101, Frame Counter 520:
'0003040506070809'
'00' -> Middle Part of Message, there have been some Parts already, more Uplinks follow
'03040506070809' -> Second Part of Message Data.
# Another Uplink of 7 Bytes on Port 101, Frame Counter 521:
'020a0b0c0d0e0f'
'02' -> Last (but not first) Uplink of Message.
'0a0b0c0d0e0f' -> Third and final Part of Message Data.
# Frame Counters are consecuetive, so the complete Message is:
'05e53f31a0102030405060708090a0b0c0d0e0f'
```

Uplinks with a missing a Part

```
# An Uplink of 8 Bytes on Port 101, Frame Counter 123:
'01005e53f31a0102'
'01' -> First Uplink of Message, more Uplinks follow
'05e53f31a0102' -> First Part of Message Data.
# Another Uplink of 7 Bytes on Port 101, Frame Counter 125:
'020a0b0c0d0e0f'
'02' -> Last (but not first) Uplink of Message.
'0a0b0c0d0e0f' -> Third and final Part of Message Data.
# Frame Counter indicates, that a Part in the middle is missing,
# so we have to drop the Message.
```

Data Packet with Timestamp (Port 102, PayloadFormat 2)

Upload Format 2 works like Upload Format 1, with the same logic for splitting messages, but uploads are sent on Port 102. The Payload consists of a 5 Byte Timestamp marking the time of reception, followed by a `uint_8` that holds the (negated) RSSI value for that reception, followed by the Data of the Telegram.

Examples

```
# An Uplink of 22 Bytes on Port 102:
'03005e53f31a3f0102030405060708090a0b0c0d0e0f'
# Analised:
'03' -> First and Last Uplink of Message -> complete Message in this Uplink
'005e53f31a' -> Unix Timestamp 1582560026 -> 2020-02-24T16:00:26 UTC
'3f' -> 63 -> RSSI of wMBus reception = -63
'0102030405060708090a0b0c0d0e0f' -> wMBus Telegram
```

Upload Speed / Duration

The bridge has to work in compliance with the European SRD 868 1% duty-cycle regulations. This implies as a rule of thumb the device can upload at most wMBUS telegrams via LoRaWAN for 36 seconds every hour.

The actual transmit time ('ToA: time on air') for each LoRaWAN message depends on the byte size and the used LoRa spreading factor (SF) which defines how redundant LoRa data is send. This means a device with good connectivity and consequently using LoRa SF7 (ToA 0,050s) can upload much faster more data than a node using LoRa SF11 (ToA 1s) due to a hard to reach LoRaWAN gateway. The bridge will upload in conformity with the regulations automatically as fast as possible. When it has to wait it enters a low power sleep mode until the next transmission is possible again. The next data collection phase will be started only after completion of the previous upload phase in respect to the configured `listenCron` parameter. Because of this it is advisable to define the cron parameter with an estimation of the upload duration in mind. This will avoid unexpected 'skipping' of data collection phases.

Downlinks

Port	Message
128	Remote Confiuration
132	wMbus Bridge Commands

Remote Configuration (Port 128)

Update of Configuration parameters is documented in our LoRaWAN downlink messages documentation.

Supported downlink messages:

Char	Command	Parameter	Hex	Version required
?	Request firmware and version	None	3F	
g	Get config parameter value	`<name>`	67	
r	Reset config parameter value	`<name>`	72	
s	Set config parameter value	`<name>=<value>`	73	
S	Set config parameter value + Save and reboot	`<name>=<value>`	53	???
a	Append to config parameter value	`<name>=<value>`	61	
b	Reboot device without saving	None	62	
w	Save config and reboot device	None	77	

- <name> is the ASCII encoded name of the parameter
- <value> is the ASCII encoded value

wMbus Bridge Commands (Port 132)

Port	Action	FW Version	Payload (ASCII)	Payload (Hex)	Payload Base64
132	Ad-hoc readout	**> 2.4.0**	`read`	`72656164`	`cmVhZA==`

Ad-hoc readout

A downlink that triggers an Ad hoc readout, independent of CRON triggers. The Ad-hoc readout is using the same parameters (filters and listening duration) as a CRON triggered readout.

Decoding wMBUS telegrams

After receiving the raw wireless M-Bus telegrams from your LoRaWAN network provider the actual metering data has to be decrypted and decoded by a backend service for further processing. The details of this are described in the EN 13757 norm and the newer **OMS** specification, which is a clarification of the original underlying norm.

A universal wireless M-Bus decoder is a relatively complicated piece of software if you start implementing it from scratch since the norm covers many different use cases, units, meter types and data formats. If you know in advance the exact telegram format of the deployed meters in your setup a hard coded data decoding may be a feasible approach. This is because wireless M-Bus devices often send the same telegram format in every transmission. Please contact the manufacturer of your meters for the needed telegram format details.

An an alternative to support a quick evaluation of our hardware Lobaro offers a easy to use webservice which is designed to decode all sorts of wMBUS input data including decryption if the correct key has been provided. You can access the decoder service for free during testing. The API can be licensed for production usages.

⊘ **Your meter fails to parse correctly?**

Since wireless MBUS is a complex and grown specification some meters may fail to decode correctly. We try to fix any decoding issues as quickly as possible if you report us problems with your specific wMBUS device.

Optional: Lobaro IoT Platform

The bridge can also be integrated in the Lobaro IoT platform with the following benefits:

- wMBUS data reassembling from raw (partial) LoRaWAN uplinks
- Wireless MBUS data decryption
- Device management including remote configuration
- Std. Web APIs to connect external services
  - REST
  - MQTT
  - HTTP Push
  - CSV Exports
- LoRaWAN data import from many common LoRaWAN network servers:
  - TheThingsNetwork (TTN)
  - ShirpStack
  - Element-IoT
  - Actility
  - Loriot
  - Firefly
  - Everynet

Technical characteristics

See Datasheet

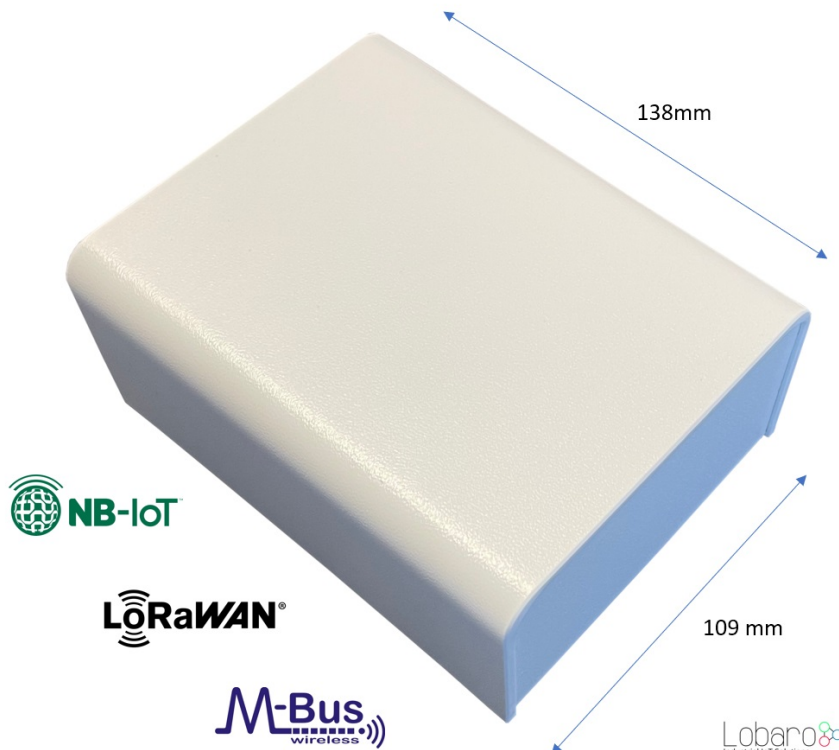## Housing Specification & Accessories

blocked URL

The Lobaro wireless Mbus bridge uses the TG PC 1208-6-o feature rich IP67 housing from Spelsberg.

For the housing the following accessories are available on request:

Housing Design Cover

For a cleaner look of the device a addon design cover is available. Order number: 8000140

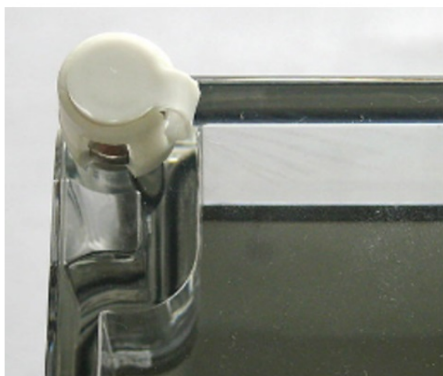### External fixing lugs (TG ABL):

Allow the mounting without opening the (sealed) cover. Order number: 3000104

Sealing kit (TG PST1):

May be used to seal the box to complicate unauthorized access to the device.

TG ABL

TG PST1

CE Declaration of Conformity

LOB-GW-WMBUS-LW-2_CE.pdf

- CE Declaration of Conformity - Rev1 HW

LoRaWAN Alliance certificate (HW2)

LoRaWAN Certifi...e V2_082120.pdf

Example Parser

TTN / Chripstack / Lobaro Platform / niota (see wrapper functions)

```
        function readVersion(bytes, i) {
    if (bytes.length < 3) {
        return null;
    }
    return "v" + bytes[i] + "." + bytes[i + 1] + "." + bytes[i + 2];
}

function parse_sint16(bytes, idx) {
    bytes = bytes.slice(idx || 0);
    var t = bytes[0] << 8 | bytes[1] << 0;
    if( (t & 1<<15) > 0){ // temp is negative (16bit 2's complement)
        t = ((~t)& 0xffff)+1; // invert 16bits & add 1 => now positive value
        t=t*-1;
    }
    return t;
}

function Decoder(bytes, port) {
    // Decode an uplink message from a buffer
    // (array) of bytes to an object of fields.
    var decoded = {};

    if (port === 9) {
        decoded.devStatus = bytes[0];
        decoded.devID = bytes[1] | bytes[2] << 8 | bytes[3] << 16 | bytes[4] << 24;
        decoded.dif = bytes[5];
        decoded.vif = bytes[6];
        decoded.data0 = bytes[7];
        decoded.data1 = bytes[8];
        decoded.data2 = bytes[9];
    }

    // example decoder for status packet by lobaro
    if (port === 1 && bytes.length == 9) { // status packet - old
        decoded.FirmwareVersion = String.fromCharCode.apply(null, bytes.slice(0, 5)); // byte 0-4
        decoded.Vbat = (bytes[5] | bytes[6] << 8) / 1000.0; // byte 6-7 (originally in mV)
                decoded.Temp = parse_sint16(bytes,7) / 10.0; // byte 8-9 (originally in 10th degree C)
        decoded.msg = "Firmware Version: v" + decoded.FirmwareVersion + " Battery: " + decoded.Vbat + "V
Temperature: " + decoded.Temp + "°C";
    } else if (port === 1 && bytes.length >= 7) {
        decoded.FirmwareVersion = readVersion(bytes, 0); // byte 0-2
        decoded.Vbat = (bytes[3] | bytes[4] << 8) / 1000.0; // originally in mV
        decoded.Temp = parse_sint16(bytes,5) / 10.0; // byte 8-9 (originally in 10th degree C)
        decoded.msg = "Firmware Version: " + decoded.FirmwareVersion + " Battery: " + decoded.Vbat + "V
Temperature: " + decoded.Temp + "°C";
        if (bytes.length == 8) { // added in v2.5.0
            decoded.Flags = bytes[7];
        }
    }

    return decoded;
}

// Wrapper for Lobaro Platform
function Parse(input) {
    // Decode an incoming message to an object of fields.
    var b = bytes(atob(input.data));
    var decoded = Decoder(b, input.fPort);

    return decoded;
}

// Wrapper for Loraserver / ChirpStack
function Decode(fPort, bytes) {
    return Decoder(bytes, fPort);
}
```

```
// Wrapper for Digimondo niota.io
// Uncomment only when used in niota!
/*
module.exports = function (payload, meta) {
    const port = meta.lora.fport;
    const buf = Buffer.from(payload, 'hex');

    return Decoder(buf, port);
}*/
```