

# Water Level Sensor (LoRaWAN)

Erstellt von Werkstatt, zuletzt geändert von Tobias Kaupat am Feb. 08, 2023



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## New Version!

Sensors **bought in 2022 or later** are based on the [Hybrid Industrial Gateways](#). You'll find all information about the configuration under [Pressure Sensor Application](#).

### Major changes:

- The new probes are based on Modbus (this version only supports I2C probes)
- Modbus enables cable length of more than 15m
- Uplink is supported for NB-IoT and LoRaWAN



## Multiple different Variants

There are different kinds of Pressure Probes that use very different kinds of communication. As a consequence there exist different Variants of our Hardware for using Pressure Probes. Please take care that you only install the correct Variant of firmware on your device.



## Consider using the latest firmware on your hardware

- [See available firmware downloads](#)

## Target Measurement / Purpose

Precise liquid level measurement, e.g. for tanks, via LoRaWAN.

### Features

- Cable length 15m
- 0...15 mH2O (15m water level, 1.5 Bar)
- Resolution:  $\pm 0.5\%$  FSO (Full Scale Output)
- Long term stability:  $\pm 0.3\%$  FSO per year
- Waterproof IP66 Housing
- Multi-year Battery life, ultra low power design

## Order Information

- Type: LOB-S-PR-LW-BOX
- Articlenuer: 8000089

The (initial) configuration is normally done using our free [Lobaro Maintenance Tool](#) and the [USB PC configuration adapter](#).

Beside this the configuration can also be changed or read remotely in the field using LoRaWAN **downlink messages**, see [Downlinks](#) description.

## Specifications

- Measurement range: 0...15 mH2O (approx. 1.5 bar hydrostatic pressure)
- Accuracy:  $\pm 0.5\%$  FSO (Full Scale Output),  $\pm 0.0075$  Bar,  $\pm 7.5$ mBar,  $\pm 75$ mm,  $\pm 7.5$ cm
- Measuring principle: relative pressure measurement
- 15m feed line incl. cable feedthrough
- Additional temperature sensor in probe head
- Power supply: 3.6V via JST XH connector
- Housing: IP67, 122 mm (l) x 82mm (b) x 55mm (h)
- Incl. pressure compensating element (DAE) for outdoor installation
- Quick release screws in housing
- Operating temperature:  $-10^{\circ}$  C to  $+55^{\circ}$  C
- Rel. Humidity 20 - 70 % fR, non-condensing

## LoRaWAN Connection

### Advanced Lobaro LoRaWAN Stack

Some of the features listed here (LoRaWAN 1.1, Remote Configuration, ...) are only implemented for recent versions of our firmware. For the *Lobaro Sensor* this starts with v0.2.1, for the *Keller Sensor* it starts with v0.3.0. If possible, you should update your devices to our most recent firmware.

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
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

## Configuration

Configuration values defining the behaviour of the device. The Min and Max values will be preconfigured when receiving the device. In case of using "Restore Default" they will be reset to standard values and have to be set again using the values printed on the sensor or given separately.

name	description	example value
sendCron	Cron expression defining when to read and send	0 0/15 * * * * for every 15 minutes
rangeMin	min range in mh2o	in most cases 0
rangeMax	max range in mh2o	in most cases 15
outputMin	min digital output value of the sensor	in most cases 819
outputMax	max digital output value of the sensor	in most cases 11664

See also our [Introduction to Cron expressions](#).

## Payload Format

### Data Message

Port: 1, Payload: 8 Bytes

This message is sent everytime the cron expression given in the configuration triggers.

Non ADC-Values in the data message are encoded as **little endian**. The format is as follows:

```

PPPTTVVppttMMMM
PPPP: 00-03: 4 Byte, float32 LE, Pressure in Bar (for float encoding see image below)
TT: 04-05: 2 Byte, int16 LE, Temperature in the sensor probe in 1/100°C
VV: 06-07: 2 Byte, uint16 LE, Supplyvoltage in the Device measured in mV
pp: 08-09: 2 Byte, uint16 BE, Raw Pressure ADC value (no Unit) (since v0.3.3)
tt: 10-11: 2 Byte, uint16 BE, Raw Temperature ADC value (no Unit) (since v0.3.3)
MMMM: 12-13: 4 Byte, float32 LE, Level in meter H2O(for float encoding see image below) (since

```

#### NOTE

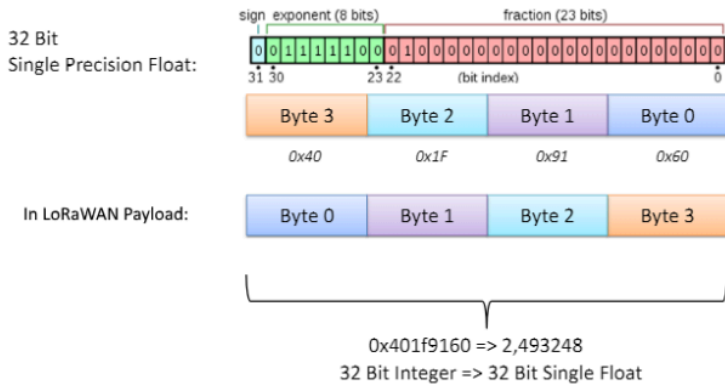
- 1.0 Bar approx. 10m water above probe
- 0.1 Bar approx. 1m water above probe
- Online converter: <https://www.convertunits.com/from/bar/to/meters+head>

To give an example (with bytes coded in hex):

cf91873b56076a0e

PPPP: cf91873b -> 0.004137254785746336 -> 0.0041 Bar (~41mm water level)  
TT: 5607 -> 0x0756 -> 1878 -> 18.78°C  
VV: 6a0e -> 0x0e6a -> 3690 -> 3.69V

### Float encoding:



## Status message

Port: 64, Payload: 13 Bytes

The Status Message communicates information about the device itself (starting with firmware 0.3.0). It contains information like the internal temperature of the device and the reason for the latest reboot. It is uploaded once a day along the data message uploads.

Values in the status message are encoded as **big endian**. The format is as follows:

```
PPBvvvSRFTTW
PPB: 00-02: 3Byte, ASCII, Firmware Identifier, constant 'PPB'
vvv: 03-05: 3Byte, uint8, Firmware Version, e.g. 0.3.1
S: 06-06: 1Byte, uint8, Status/Error condition, coded
R: 07-07: 1Byte, uint8, Reboot Reason, coded
F: 08-08: 1Byte, uint8, Final words, coded
VV: 09-10: 2Byte, uint16 BE, VCC in mV
TT: 11-12: 2Byte, int16 BE, internat device's temperature in 1/10°C
```

To give an example (with bytes coded in hex):

```
5050420003010006000e6a00d0

505042 -> Firmware identifier 'PPB'
000301 -> Firmware version 0.3.1
00 -> 0 -> Status "OK"
06 -> 6 -> Reset reason: EXTERNAL_RESET_PIN_RESET
00 -> 0 -> No final words
0e6a -> 3690 -> 3.69V supply Voltage
00d0 -> 208 -> 20.8°C internal Temperature
```

## Status Code

The status code indicates problems the device has detected. The possible values are:

Hex	Dec	Name	Explanation
0x00	0	OK	No problems detected
0x65	101	PROBE_ERROR	Device failed to communicate with the pressure probe

## Reset Reason Code

The reset reason reports what triggered the latest reboot (which might have happened month ago).

Hex	Dec	Name
0x01	1	LOW_POWER_RESET
0x02	2	WINDOW_WATCHDOG_RESET
0x03	3	INDEPENDENT_WATCHDOG_RESET
0x04	4	SOFTWARE_RESET
0x05	5	POWER_ON_RESET
0x06	6	EXTERNAL_RESET_PIN_RESET
0x07	7	OBL_RESET

## Final words

currently not used in this firmware.

## Supply voltage

The device measures the voltage of its power supply. This is useful for diagnosing the state of the battery.

The voltage is sent as a big endian unsigned 16 bit value measured in mV.

- Maximum Voltage: 3.7 V
- Minimum Voltage: 2.6 V

## Temperature

The device has an on board temperature sensor, to help diagnosing failures. **This is a different temperature sensor than the one used for the data message**, which is measured by the attached probe!

The temperature is sent as a big endian signed 16 bit value measured in tenth of °C.

## Payload Parser

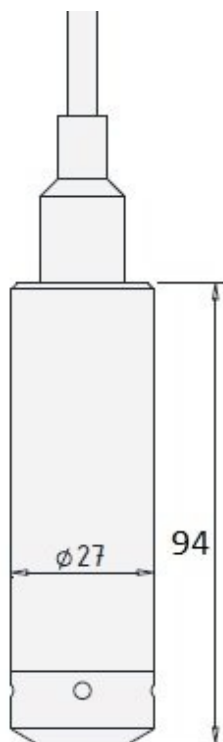
Our reference JavaScript parser can be found at [github](https://github.com). It works for our Lobar Backend, The Things Network (TTN), ChirpStack (ex LoRaServer) and niota.io (Digimondo)

**Reference Parser:** <https://github.com/lobaro/lobaro-parsers/blob/master/water-level-sensor/decoder.js>

There also exists a parser for Element-IoT (by Zenner IoT):

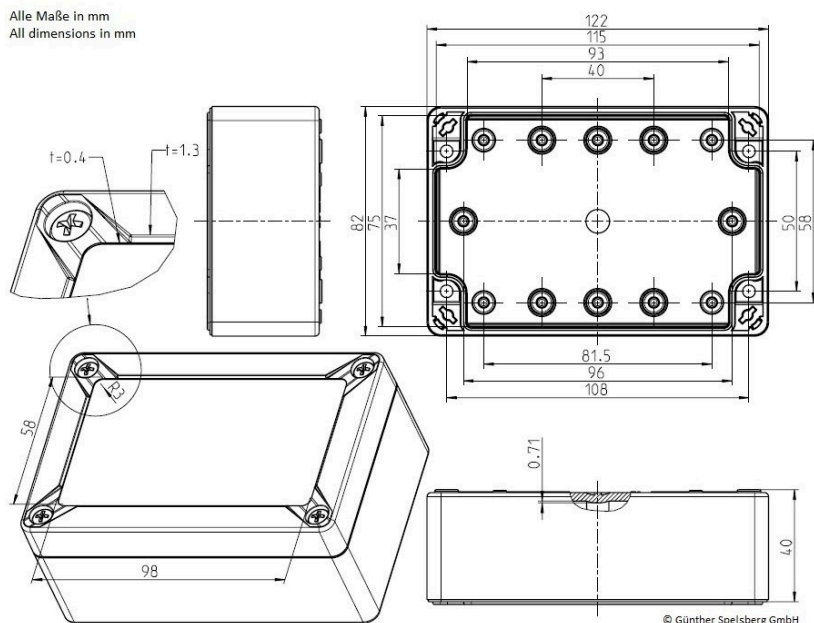
**Element-IoT:** <https://github.com/ZennerIoT/element-parsers>

## Device & Probe Dimensions



All dimensions in mm

Alle Maße in mm  
All dimensions in mm



## CE Declaration of Conformity

[CE Declaration of Conformity \(pdf\)](#).

## Disposal / WEEE / Entsorgung

[Information about the disposal of the Device](#).