Lobaro®

Industrial IoT Solutions

– LoRaWAN Humidity Sensor –

User Manual

Product Name: AM2305-LoRaWAN
Related Firmware: $\geq$ V0.0.1
Document Date: 2018-08-22

Contents

1. Overview

The Lobaro LoRaWAN Humidity Sensor AM2305-LoRaWAN is a battery powered radio transmitting sensor device that takes measurements at configurable intervals. Because of its low power consumption it can operate for multiple years with standard AA batteries. The LoRa radio technology allows it to take measurements in places that are hard to reach, and in its water prove casing it can be installed outdoors.

The device uses a AM2305 digital relative humidity and temperature sensor probe (also known as RHT05 or DHT44). It is powered by the base device and communicates via a one-wire connection.

Please read the manual carefully before operating the device. A safe operation of the device is only possible if you follow the guides provided in this manual. Using the device differently than intended by Lobaro my cause damage to people, the environment, or the device.
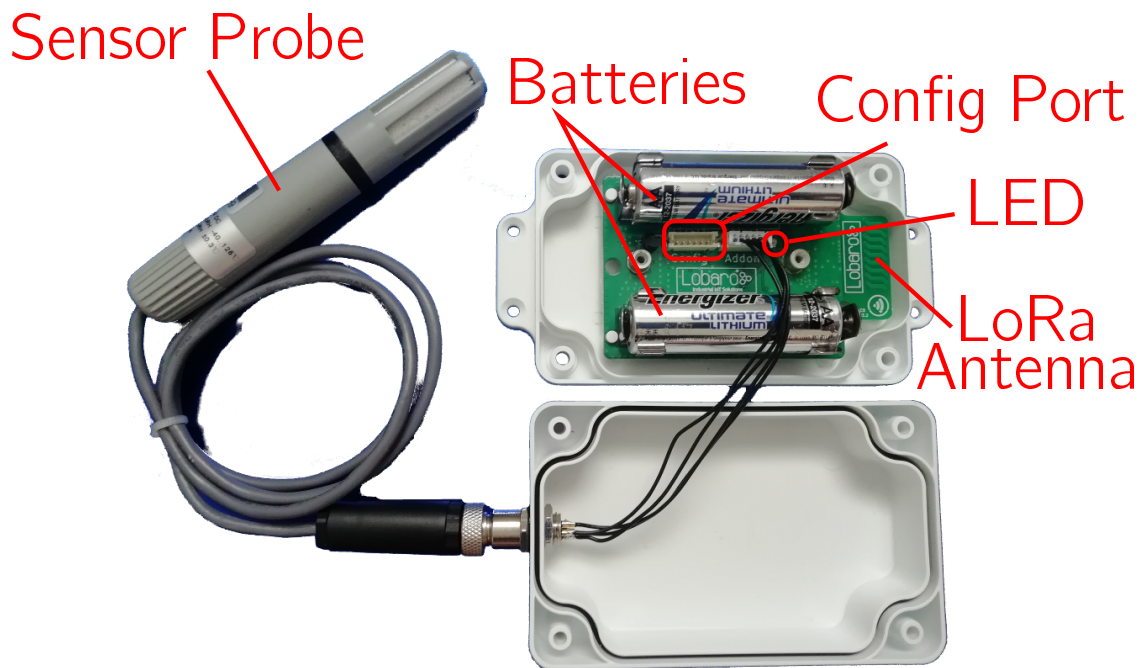
1.1. The Device

Figure 1: Device, opened

Figure 1 shows the Humidity Sensor with opened casing. It illustrates the locations of the LoRa antenna and or the configuration port used to connect the config adapter. The external sensor probe is the part that takes the measurements.

2. Operating the Humidity Sensor

The RHT05 sensor probe must be attached to the device on the external socket. Insert two 1.5V AA batteries into the slots. When the device starts, its LED flashes once. If it does not start, check that your batteries are still good and inserted the correct way. You can refer to figure 1 to check that everything is connected as it should be.

When the device is set up correctly and running, put the lid on the base and fasten it from the back using the supplied screws. Watch out that the cables are save inside the box and do not get stuck in the casing, or you might damage the cables and allow water to enter the casing. This can cause damage to the device!

Always close the lid so that the socket for the probe is on the opposing side of the antenna (as shown in figure 1, sensor probe on the left, antenna on the right). This way there will be less interference on the antenna and you will get the best connection possible.

2.1. Batteries

The LoRaWAN Humidity Sensor default power supply consists of two series connected off-the-shelf 1.5V 'AA' sized batteries. Be sure to get the polarity right, see the '+'-Symbol on the board. In general only AA cells of the types Alkali-Manganese (1.5V, LR6) and Lithium-Iron-Sulphide (1.5V, FR6) are allowed to be inserted in the device. Lobaro recommends the use of FR6 batteries like the *Energizer Ultimate Lithium* over LR6 types because of the higher capacity and better discharge properties.

Other Batteries or accumulators with a nominal voltage of more than 1.5V must not inserted into the device under any circumstances. In particular, lithium based cells with a nominal voltage of 3.6V or 3.7V must not be used on the AA battery slots!

On request we can supply custom product variants with special housings powered by even bigger batteries. For example a 3.6V C sized mono cell typically has a capacity of 9Ah with leads to a 3x increased battery life compared to the standard AA-cells. With D sized cells of typically 19Ah capacity this value can be doubled once again (6x). Also available on request are options with permanent external power supply (230V, 9-24V, 5V USB).

2.2. Installation

The device must be fixed on a flat surface using the lateral mounting holes of the case, see chapter 6.2 for a detailed description of all housing dimensions. Alternatively we offer as accessory a mounting clip for a standard 35mm DIN rail. The device can then easily snapped on a such rails. It can therefore be added to a variety of racks alongside other devices.

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 helix antenna can be identified by the winding pcb traces 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.
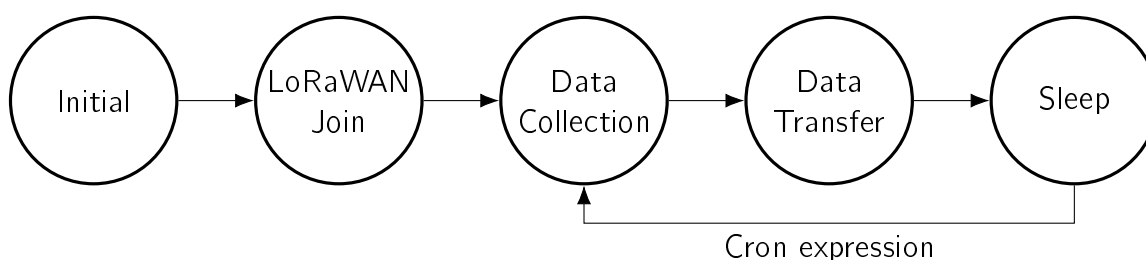
3. Work Cycle

Figure 2: The five phases of the Humidity Sensor Workflow

The Humidity Sensor has a simple work cycle that consists of five phases. It is illustrated in figure 2.

3.1. Initial Phase

This is the phase that is executed after the device is started of restarted. The LED flashes once and the configuration is evaluated. If successful, the LoRaWAN Join phase is executed next.

3.2. LoRaWAN Join Phase

If the Device 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 Device is configured to use ABP instead of OTAA, this phase is left immediately and the Data Collection Phase is entered.

3.3. Data Collection Phase

During the Data Collection Phase is the device activates the sensor probe and reads measured humidity and temperature. There will be up to three attempts to get a correct reading. The communication contains a checksum value to detect data corruption between the probe and the main device. After data collection, the probe is deactivated again to save power. The device then enters the Data Transfer Phase.

3.4. Data Transfer Phase

During the Data Transfer Phase the Bridge uploads the sensor values to the LoRaWAN network. The message contains the information if the measurement was successful.

In addition to the register 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 5.

3.5. Sleep Phase

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

4. Configuration

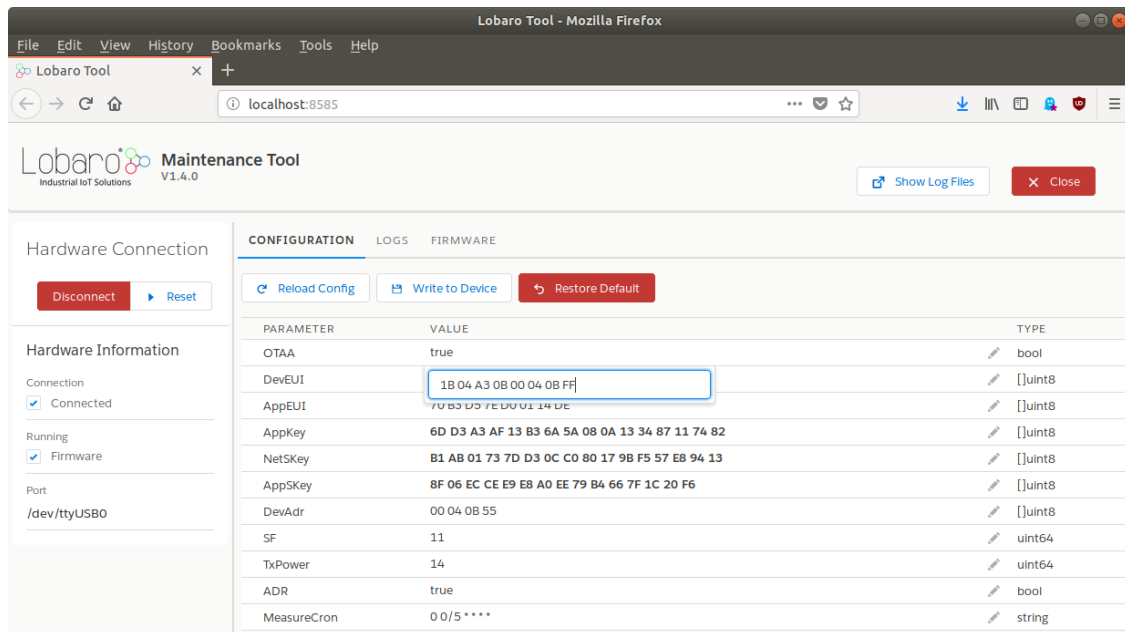## 4.1. The Lobaro Maintenance Tool

Figure 3: Lobaro maintenance tool (Windows, Linux, Mac)

The initial device configuration can be done very comfortably from your PC via the serial configuration interface. Beside the needed Lobaro USB to UART adapter the *Lobaro Maintenance Tool*[1] needs to be installed. This tool is freely available for various operating systems including Windows, Linux, Mac and Linux-ARM (e.g. Raspberry-PI) on and works with all Lobaro sensors.

Technically this software opens a webserver on port 8585 that runs in a background console window. The actual user interface can be accessed normally using a standard web browser at address `http://localhost:8585` (see fig. 3). Normally your default browser should be opened with this URL automatically after tool startup . Even remote configuration and log-observation over the Internet is possible, e.g. having a Raspberry PI via USB connected to the Lobaro device and accessing the maintenance tool from a remote machines browser over the Internet.

Additionally to the device setup the tool can also be used for firmware updates ('Firmware Tab') , watching real-time device diagnostic output ('Logs Tab') and initiating device restarts. **Please note that the device is automatically restarted each time the configuration has been changed!**

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[1]Lobaro Maintenance Tool free download: `https://www.lobaro.com/lobaro-maintenance-tool/`

4.2. Connecting the USB config adapter

For configuration and firmware updates we provide a special serial-USB adapter that can be connected as shown in figure 4. The corresponding connector on the PCB is marked with the word 'Config'.

The USB-adapter will add a virtual serial 'COM' Port to your system. Your operating system needs the *CP210x USB to UART Bridge*[2] driver installed. A download link is provided next to the 'Connect' button when you start the Maintenance Tool.

While the config adapter is connected, the device will be powered from the USB port with a regulated voltage of 3.3V. It is not necessary – although it would be no problem – having batteries inserted or a different supply connected while using the config adapter. All configuration parameters will be kept non-volatile regardless of the power supply.
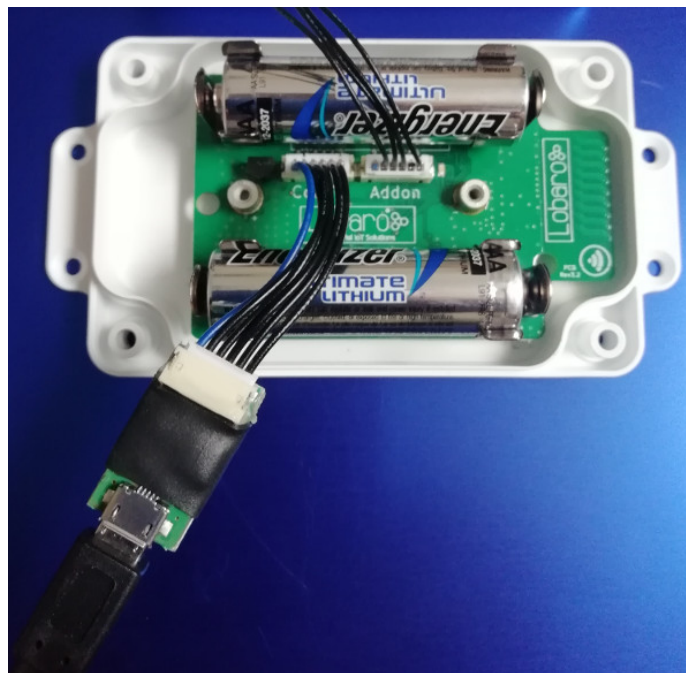

Figure 4: Connected Lobaro USB configuration adapter

4.3. System parameters

After being successfully connected to the hardware using the Lobaro Maintenance Tool you can press 'Reload Config' in the 'Configuration' tab to read the current configuration from the device. For every parameter a default value is stored non volatile inside the hardware to which you can revert using the 'Restore default' button in case anything got miss configured.

All LoRaWAN & other firmware parameters are explained in the following.

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[2] https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers

4.3.1. LoRaWAN network parameters

A large part of the configuration parameters are used to control the device's usage of LoRaWAN. Table 1 lists all of them. There are two different ways to use LoRaWAN: *over-the-air activation* (OTAA) and *activation by personalization* (ABP). Some configuration parameters are only used with one of those methods, others are used for both.

Name	Type	Used	Description
OTAA	bool	both	*true*: use over-the-air activation (OTAA) *false*: use activation by personalization (ABP)
DevEUI	bytes[8]	OTAA	the 8 byte long DevEUI is used with OTAA to identify the device on join. The default is predefined in the hardware and guarantees an ID that is unique world wide. Should not be changed unless required by the network provider. Hex format without 0x prefix.
AppEUI	bytes[8]	OTAA	ID defining the application used in the LoRaWAN network. Hex format without 0x prefix.
AppKey	bytes[16]	OTAA	Application Key as defined by the LoRaWAN network operator. This is used to encrypt communication, so keep it secret. Hex format without 0x prefix.
OTAADelay	int	OTAA	Seconds to wait for a new attempt after an unsuccessful OTAA join. The actual waiting time will be randomly increased by up to a third of that amount, in order to avoid devices repeatedly interfering with each other through bad timing. The default value is 300, which means the timeout between attempts is 300-400 seconds.
AppSKey	bytes[16]	ABP	App Session Key as defined by the LoRaWAN network operator. Hex format without 0x prefix.
NetSKey	bytes[16]	ABP	Network Session Key ad defined by the LoRaWAN network operator. Hex format without 0x prefix.
DevAdr	bytes[4]	ABP	Device Address as defined by the LoRaWAN network operator. Hex format without 0x prefix.
SF	int	both	Initial LoRa spreading factor used for transmissions. Valid range is 7-12. The actual spreading factor used might change during operation of the device if Adaptive Data Rate (ADR) is used.
TxPower	int	both	Initial transmission output power in dBm. The LoRaWAN protocol allows only specific values: 2, 5, 8, 11, 14. The actual power used might change during operation if Adaptive Data Rate (ADR) is used.
ADR	bool	both	*true*: use adaptive data rate (ADR) *false*: don't use adaptive data rate (ADR)

Table 1: LoRaWAN network parameters

4.4. Sensor configuration parameters

The only parameter outside of the LoRaWAN-configuration is a Cron expression used to control the frequency of how often the device takes measurements.

Name	Type	Description
MeasureCron	string	Expression defining how often the device executes a measurement. This parameter is set using a cron expression. Please refer to chapter 4.4.1 for an introduction.

Table 2: Sensor configuration parameters

4.4.1. Cron expressions

Cron expressions are used to define specific points in time and regular repetitions of them. The schedule for data collecting phases is defined using the Cron[3] format which is very powerful format to define repeatedly occurring events[4].

Standard Lobaro devices typically do not need to know the real time for proper operation. All times are relative to the random time when batteries are inserted. If needed by the target application Lobaro can deliver on request special hardware support for keeping data acquisition intervals based on a real time clock which stays in sync with the *real* time. Please contact Lobaro directly if you need such a custom product variant.

A cron expression consists of 6 values separated by spaces:

- Seconds (0-59)

- Minutes (0-59)

- Hours (0-23)

- Days (1-31)

- Month (1-12)

- Day of Week (SUN-SAT $\widehat{=}$ [0,6])

Examples of CRON definitions:
```
0 5 * * * *      Hourly at minute 5, second 0 (at 00:05:00, 01:05:00, ...)
0 1/10 * * * *   every 10 minutes from minute 1, second 0 (minutes 1, 11, 21, ...)
0 0 6 * * *      Daily at 6:00:00
0 0 13 1,15 * *  1st and 15th day of every month at 13:00:00
0 0 9 1-5 * *    Every month daily from day 1 till 5 at 9:00:00
```

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[3]For more information about Cron see https://en.wikipedia.org/wiki/Cron

[4]Online introduction: https://github.com/lobaro/docs/wiki/CRON-Expressions

4.5. Configuration and battery life

The time the LoRaWAN Humidity Sensor can operate on one set of batteries depends on the configuration of the device. Most of the time, the sensor remains in a sleep state, during which a very small amount of power is consumed (a current of about 20μA). Most power is used for sending messages via LoRa. One set of batteries lasts for about 30000 messages (depending on details like spreading factor and transmission power), so you can estimate the battery life for your configuration using the formula in equation 1. For example, if the device is set to send hourly updates, it will send 25 messages per day (including the status message). As illustrated in equation 2, the device should have a battery life of slightly over 3 years.

$$\frac{\text{total\_messages}}{\text{messages\_per\_day}} = \text{life\_in\_days} \tag{1}$$

$$\frac{30000\text{messages}}{25\frac{\text{messages}}{\text{day}}} = 1200\text{days} \approx 3.2\text{years} \tag{2}$$

5. LoRaWAN Data Upload Formats

After reading from the sensor probe, the device 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 Humidity Sensor.

Multi byte integers are transmitted as *big endian*. Values that would require decimal places are transmitted in smaller units (e.g. mV instead of V). Since data packets sent over LoRa can be lost, a timestamp is added to every data packet. Timestamps are encoded as signed 40 bit big endian integers and express the number of seconds passed since 00:00:00 January 1st, 1970 (UNIX timestamp). Timestamps are according to the devices internal clock, which might be set to an incorrect value. The timestamp always indicates the begin of the corresponding measurement phase.

We provide a JavaScript reference implementation of a decoder for the data packages on GitHub[5], which can be used directly for decoding in The Things Network[6].

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[5] https://github.com/lobaro/ttn-data-formats/blob/master/humidity-sensor/decoder.js
[6] The Things Network (TTN): An open source LoRaWAN network provider
  see https://www.thethingsnetwork.org/

5.1. Status Packet

Port 1 − In order to provide some information about the health of the device itself, the Modbus Bridge 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 fixed length of 14 bytes.
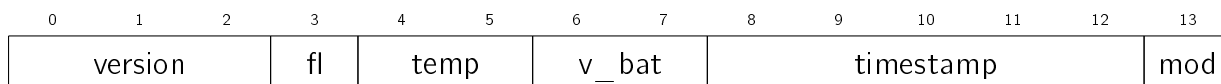
0	1	2	3	4	5	6	7	8	9	10	11	12	13
version			fl	temp		v_bat		timestamp					mod

Figure 5: Bytes, port 1 − Status Packet

name	type	description	example
version	uint8[3]	Version of the firmware running on the device	1, 0, 4 ≡ v1.0.4
fl	uint8	Status flags, for internal use	0
temp	int16	Temperature measured inside the device in $\frac{1}{10}$ °C	246 ≡ 24.6 °C
v_bat	uint16	Voltage currently supplied by power source in mV	3547 ≡ 3.547 V
timestamp	int40	Internal date/time at creation of the packet	1533055905
mod	uint8	Operation mode the device runs	1

Table 3: Fields port 1 − Status Packet

5.2. Data Packet

Port 2 − The data packet is used to transmit the measured environmental values. It includes a timestamp and the information if the measurement was successful. The data packet has a fixed length of 10 bytes. Please remember that the timestamp is always in reference to the devices internal clock, which normally does not know the real time it is still usable to put data points into real time context if you take one reference and calculate the offset of the devices clock to real time. Figure 6 explains the bytes in inside the data package, table 4 explains the fields.
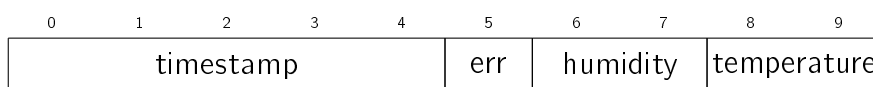
0	1	2	3	4	5	6	7	8	9
timestamp					err	humidity		temperature	

Figure 6: Bytes, port 2 − Data Packet and an individual data pack

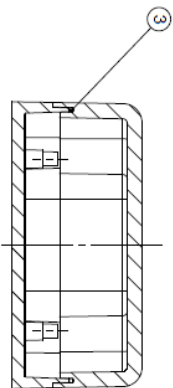| name	type	description	example
timestamp	int40	UNIX timestamp for measurement	1533055905
err	uint8	Error indicator. 0=success, 1=error	0 ≡ success
humidity	uint16	Rel. humidity $\frac{1}{10}$ %	318 ≡ 31.8 %
temperature	int16	Temperature in $\frac{1}{10}$ °C	−105 ≡ −10.5 °C

Table 4: Fields port 2 − Bytes of a single data pack

6. Technical characteristics

6.1. Datasheet

Product	
Type name	AM2305-LoRaWAN
Description	LoRaWAN Humidity Sensor
RF transceiver	
Type	Semtech SX1272
Frequency	863 MHz to 870 MHz
Max. TX Power	max. +14 dBm
Typical RF Range	≤2 km
Ideal RF Range	≤10 km (free line of sight)
LoRa communication	
Protocol	Class A LoRaWAN 1.0.1 EU868
Activation method	Over-the-air activation (OTAA)
	Activation by personalization (ABP)
Encryption	AES128
Power	
Power supply	2×AA sized battery, 1.5 V, LR6/FR6
Supply voltage	$U_{Nom} = 3.0\,V$, $U_{Min} = 2.2\,V$, $U_{Max} = 3.7\,V$
Capacity	∼ 30000 LoRaWAN messages @SF11
Humidity Sensor (Probe)	
Range	0 %rH to 100 %rH
Accuracy	±2 %rH (max ±5 %rH)
Resolution	0.1 %rH
Temperature Sensor (Probe)	
Range	−40 °C to 80 °C
Accuracy	±0.3 °C
Resolution	0.1 °C
Mechanical features	
Dimensions, box	114.30 mm × 59.30 mm × 26.80 mm
Dimensions, probe	100 mm × 16 mm⌀
Environmental Requirements (Box)	
Operating temperature	−20 °C to 55 °C
Max installation height	2 m
Standards	

6.2. Housing Dimensions

SCHNITT A-A

Isometrische Ansicht
Maßstab 1:2
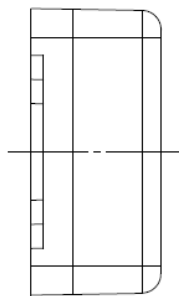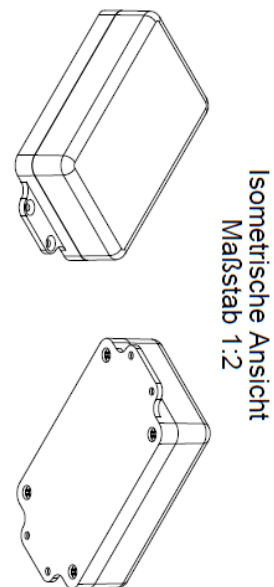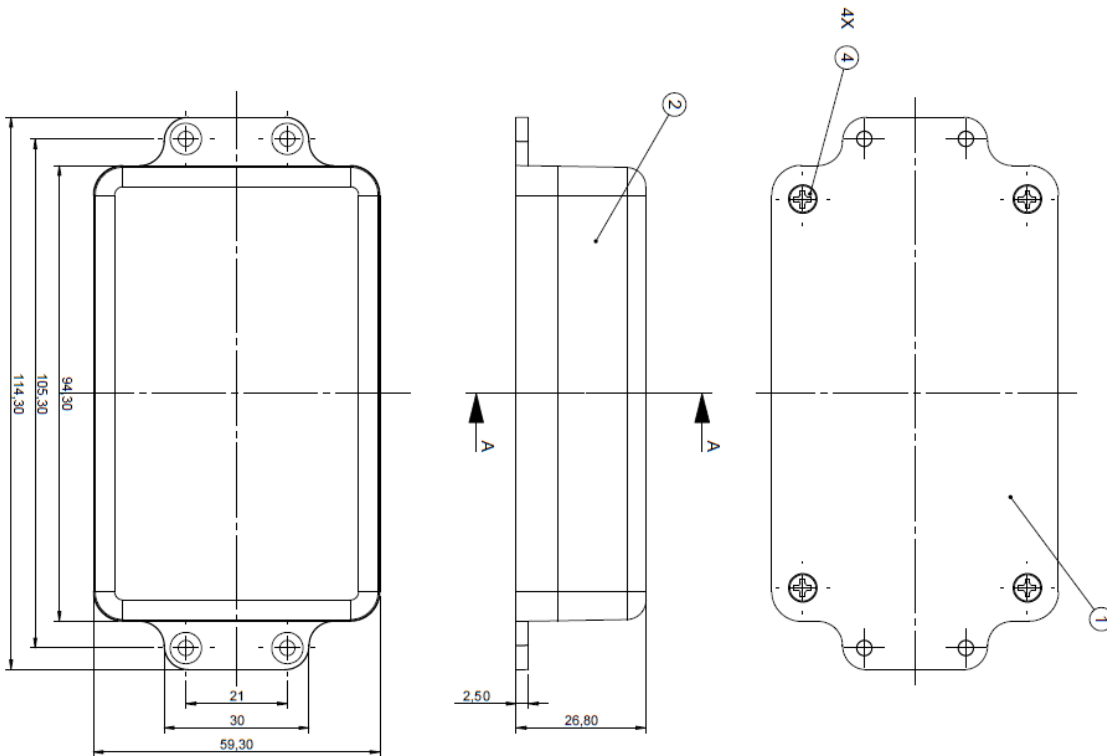
All dimensions in mm

6.3. AM2305 sensor probe

5.1 Relative humidity

Table 2： AM2305 Relative humidity performance table

Parameter	Condition	min	typ	max	Unit
Resolution			0.1		%RH
Range		0		99.9	%RH
Accuracy [1]	25℃		±2		%RH
Repeatability			±0.1		%RH
Exchange	Completely interchangeable				
Response [2]	1/e(63%)		<5		S
Sluggish			±0.3		%RH
Drift [3]	Typical		<0.5		%RH/yr

Pic2: At25℃ The error of relative humidity

5.2 Temperature

Table 3： AM2305 Relative temperature performance

Parameter	Condition	min	typ	max	Unit
Resolutio			0.1		℃
n			16		bit
Accuracy			±0.3	±0.4	℃
Range		−40		125	℃
Repeat			±0.2		℃
Exchange	Completely interchangeable				
Response	1/e(63%)		<5		S
Drift			±0.1		℃/yr
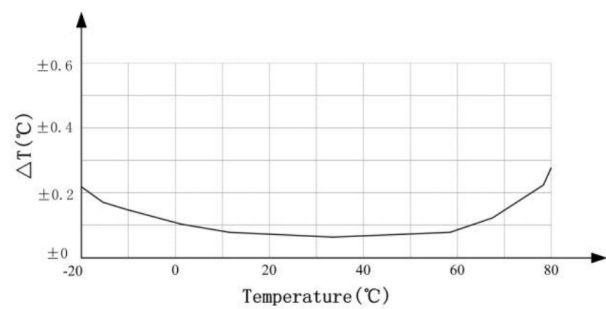
Pic3：The maximum temperature error

Figure 7: AM2305 probe specification

A. CE Declaration of Conformity

Declaration of Conformity

RED directive (2014/53/EU)
RoHS directive (2011/65/EU)

We, the manufacturer

Lobaro GmbH
Tempowerkring 21d
21079 Hamburg
Germany

declare on our sole responsibility that the product with following identification:

AM2305-LoRaWAN

to which this declaration relates is in conformity with the essential requirements and other relevant requirements of the RED directive (2014/53/EU) if used for its intended purpose and in accordance with the manufacturers operating instructions. The mentioned product is also compliant to the RoHS directive (2011/65/EU).

The following norms, standards, or documents have been applied:

Health and safety (RED Art. 3(1)(a)):
      IEC 62368-1:2014 (Ed. 2) + Cor.:2015
      IEC 62479:2010
EMC (RED Art.3(1)(b)):
      ETSI EN 301 489-1 V1.9.2 (V2.2.0)[†]
      ETSI EN 301 489-3 V1.6.1 (V3.2.0)[†]
      IEC 61000-6-2:2005
Radio spectrum (RED Art. 3(2)):
      ETSI EN 300 220-1 V3.1.1 (2017-02)
      ETSI EN 300 220-2 V3.1.1 (2017-02)

[†]Referenced newer standard versions in parenthesis will supersede its predecessors. At time of testing the newer standards were not harmonized yet. All tests were carried out successfully in accordance to the already harmonized standards as well as to the superseding ones.

Hamburg, 27.07.2018
Place and date of issue

Dipl.–Ing. Theodor Rohde
Managing Director Lobaro GmbH

B. Disposal

This chapter informs you on our policy in respect to EU 'Waste electrical and electronic equipment Directive' 2002/96/EC, implemented in German law by the 'Gesetz über das Inverkehrbringen, die Rücknahme und die umweltverträgliche Entsorgung von Elektro- und Elektronikgeräten (Elektro- und Elektronikgerätegesetz – ElektroG)' The following statements about the disposal of retired Lobaro devices are binding for customers in Germany. Customers in other countries should contact there local authorities in order to acquire equivalent information for their respective country.

It is a major goal of EU directive 2002/96/EC reduce the amount of retired electronic devices disposed in household waste, but have them gathered in special facilities instead for recycling and orderly disposal. Electronic devices often contain hazardous substances which are harmful to the environment as well as to human health. Under no circumstances should they be disposed in household trash.

B.1. WEEE

The WEEE-directive is the EU-directive 'Waste of Electrical and Electronic Equipment' (2002/96/EC). It aims to reduce the growing amount of electrical and electronic waste created by disposed electronic devices. The goal is to avoid and reduce disposal, and to make the disposal more friendly for the environment, by including the manufacturer in a broader responsibility.

B.1.1. Proper disposal of Lobaro B2B devices

Lobaro develops and manufactures devices for professional use. Because of this, our products have been recognised by the responsible agency 'Stiftung EAR' (Elektro-Altgeräte Register) as B2B (business to business) products. Lobaro GmbH is registered under DE18824018.

Classification as B2B implies that Lobaro is not required to pick up disposed electronic devices from local recycling points, as the law 'ElektroG' dictates manufacturers of consumer electronics to do.

Consequently, our products may not be disposed in this way.

Instead, we offer our customers to take back retired Lobaro devices and dispose them properly free of charge. Devices to be disposed must be sent to Lobaro GmbH postpaid and marked with the words 'ZUR ENTSORGUNG'.

B.2. RoHS

As a manufacturer of industrial devices of information and telecommunication technology we are producing conforming to RoHS as specified in the EU-directive 2011/65/EU.

B.3. Batteries

Conforming to the German law about the disposal of used batteries (§ 12 Satz 1 Nr. 1-3 BattV (Verordnung über die Rücknahme und Entsorgung gebrauchter Batterien und Akkumulatoren (BattVO) vom 27. März 1998 (BGBl. I S. 658))), we as the manufacturer advise you, that the customer and end-consumer is required by law to return used batteries for a proper disposal. After usage, batteries can be returned to the vendor or at a place close proximity free of charge. If used batteries are sent to the vendor, parcels must be sent fully postpaid.

The following symbol indicates, that a battery contains heavy metal or other hazardous substances, and that it must not be disposed in common household or industrial waste. The abbreviations under the symbol stand for: 'Cd' (Cadmium), 'Li' (Lithium) / 'Li-Ion' (Lithium-Ion), 'Ni' (Nickel), 'Mh' (Metal Hydride), 'Pb' (Lead), 'Zi' (Zinc).
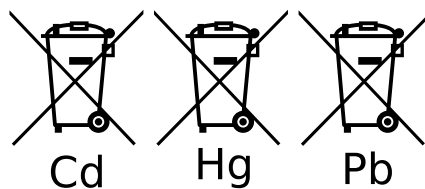
C. Entsorgung (German)

Dieses Kapitel informiert Sie über das Vorgehen der Lobaro GmbH in Bezug auf die EU Richtlinie 2002/96/EC über Elektro- und Elektronikaltgeräte (engl. WEEE), umgesetzt in deutsches Recht durch das „Gesetz über das Inverkehrbringen, die Rücknahme und die umweltverträgliche Entsorgung von Elektro- und Elektronikgeräten (Elektro- und Elektronikgerätegesetz – ElektroG)". Die nachfolgend gemachten Aussagen über die Entsorgung von außer Gebrauch genommenen Lobaro Geräten gelten verbindlich nur für Kunden innerhalb Deutschlands. Kunden in anderen Ländern sollten ihre örtlichen Behörden kontaktieren, um entsprechende Informationen zu erhalten.

Ein vordringliches Ziel der EU Richtlinie 2002/96/EC ist es, die Entsorgung von Elektro-/Elektronikaltgeräten zusammen mit dem unsortierten Hausmüll zu minimieren und einen hohen Grad an getrennter Sammlung und Verwertung von Elektro-/Elektronikaltgeräten zu erreichen. Elektronische Geräte können Stoffe enthalten, die schädlich für die Umwelt und die menschliche Gesundheit sind und auf keinen Fall zusammen mit dem Hausmüll entsorgt werden sollten.

C.1. WEEE

Die WEEE-Richtlinie (von engl.: Waste of Electrical and Electronic Equipment; deutsch: Elektro- und Elektronikgeräte-Abfall) ist die EU-Richtlinie 2002/96/EC zur Reduktion der zunehmenden Menge an Elektronikschrott aus nicht mehr benutzten Elektro- und Elektronikgeräten. Ziel ist das Vermeiden, Verringern sowie umweltverträgliche Entsorgen der zunehmenden Mengen an Elektronikschrott durch eine erweiterte Herstellerverantwortung.

C.1.1. Ordnungsgemäße Entsorgung von B2B Lobaro Geräten

Lobaro Geräte werden für den professionellen Gebrauch entwickelt und vermarktet. Dementsprechend sind sie von der zuständigen deutschen Agentur Stiftung EAR (Elektro- Altgeräte Register) als B2B (business to business) Produkte anerkannt worden. Die Lobaro GmbH ist dort unter der Nr. DE18824018 registriert.

Die B2B Klassifizierung bedeutet, dass Lobaro nicht zur Abholung von Elektro-/Elektronikaltgeräten bei den kommunalen Sammelstellen verpflichtet ist, wie es das ElektroG den Produzenten von für den Konsumenten-Markt bestimmten Elektro-/Elektronikgeräten vorschreibt.

Folglich dürfen unsere Produkte auch nicht auf diesem Wege entsorgt werden.

Stattdessen bieten wir unseren Kunden an, nicht mehr gebrauchte Lobaro Geräte zurückzunehmen und auf unsere Kosten ordnungsgemäß zu entsorgen.

Geräte zur Entsorgung müssen mit bezahltem Porto an die Lobaro GmbH eingesendet werden und mit der Kennzeichnung „ZUR ENTSORGUNG" versehen sein.

C.2. RoHS

Als Hersteller von industriellen Geräten der Informations- und Telekommunikationstechnik produzieren wir RoHS konform, gemäß den Inhalten der EU-Richtlinie 2011/65/EU.

C.3. Batteriegesetz

Gemäß § 12 Satz 1 Nr. 1-3 BattV (Verordnung über die Rücknahme und Entsorgung gebrauchter Batterien und Akkumulatoren (BattVO) vom 27. März 1998 (BGBl. I S. 658)) weisen wir als Verkäufer darauf hin, dass der Kunde als Endverbraucher zur Rückgabe gebrauchter Batterien gesetzlich verpflichtet ist. Batterien können nach Gebrauch beim Verkäufer oder in dessen unmittelbarer Nähe unentgeltlich zurückgegeben werden. Werden Batterien an den Verkäufer übersandt, ist das Paket ausreichend zu frankieren.

Das nachfolgende Symbol bedeutet, dass es sich um schwermetallhaltige, schadstoffhaltige Batterien handelt, die nicht mit dem einfachen Haus- oder Gewerbeabfall entsorgt werden dürfen. Die unter dem Symbol befindlichen Abkürzungen bedeuten: „Cd" (Cadmium), „Li" (Lithium) / „Li-Ion" (Lithium-Ionen), „Ni" (Nickel), „Mh" (Metallhydrid), „Pb" (Blei), „Zi" (Zink).
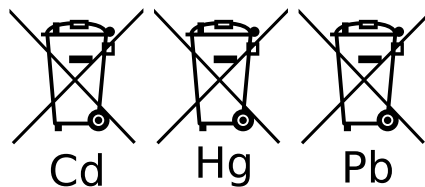
D. Document Versions

Changes to this document:

- *2018-09-05* – Correct max temperature range of probe

- *2018-08-22* – Add more detailed install instructions

- *2018-08-13* – Initial public version.