



# Aqua-Scope Monitor for LoRaWAN

SKU: AQSLWE02

Version: 2.0.0



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## 1. Product Description

The Aqua-Scope water monitor **detects water leaks** and records the total **water consumption** in the house as well as the **pressure and temperature** of the water. The device applies advanced signal processing and analyzes the sound waves, which move in the domestic water distribution pipes when water is taken or there are leaks. Water is a very good conductor of sound. A **single sensor is therefore sufficient, to monitor the whole house** or apartment. However, a pressure reduction valve (PRV) must be installed in the home for proper measurements. In addition, to the sensor other peripheral devices such as valve motors or flood sensors can be associated to extend the functionality of the overall system.

The device consists of two parts:

- Main housing for signal processing and radio communication with battery compartment.
- The external sensor head is connected to the water pipe. The stainless steel sensor head has a silicon sensor mounted in silicone oil for highly accurate and low-noise pressure measurements in a wide operating range. The measuring range for pressure is between 1 and 10 bar. The sensor values are converted into digital values directly in the measuring head to suppress interference from the connection to the main housing. In addition, the temperature of the liquid medium is measured directly at the stainless steel diaphragm and is therefore very precise.

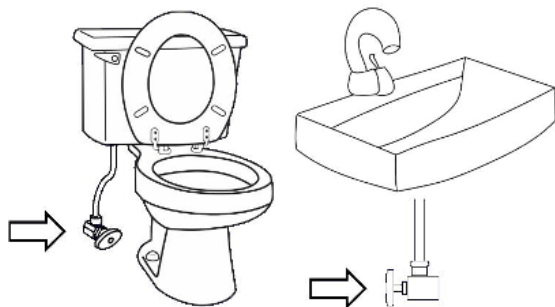
The sensor can send an alarm message if freely definable threshold values are exceeded or not reached. The sensor's polling frequency can be set between 0.1 second and several minutes and defines the battery life. For a measuring interval of 1 second, a battery life of approx. 10 years is calculated.

The device can be powered either by an external power supply with a USB-C adapter or by an optional internal ER26500 battery (Bobbin Cell C). Both the sensor head and the main housing are waterproof, allowing them to be used outdoors or in particularly damp and/or dirty environments.

The device is controlled via LoRaWAN commands and operates as a LoRaWAN Class A/C device. The use of the device requires LoRaWAN network coverage. Otherwise, you need to install and operate your own LoRaWAN gateway.



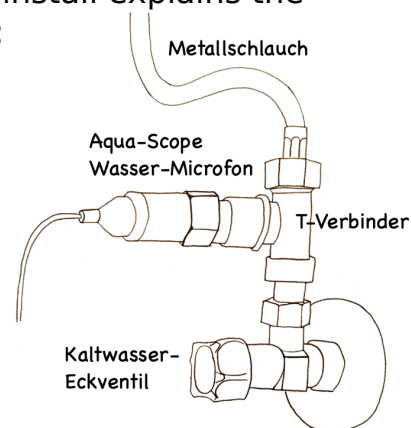
## 2. Installation



The Aqua-Scope sensor head must be connected to a single point in the house's piping system. Ideal connection points are angle valves located under sinks or next to toilets. Other options include 1/4-inch access openings at the pressure reducer, shut-off valves, or other installation devices. It is recommended to choose the lowest possible point in the apartment (ideally in the basement or on the first floor).

**Attention!** If a pressure reducing valve (PRV) is installed, the Aqua-Scope monitoring device must be installed between the pressure reducer and the individual outlets. If no PRV is present, the device can be installed anywhere, but the accuracy of the measurements will be lower. Details can be found in the section "Impact of Pressure Reducer."

To keep it short and simple, the video at [aqua-scope.com/install](http://aqua-scope.com/install) explains the installation of the Aqua-Scope water monitor step by step:



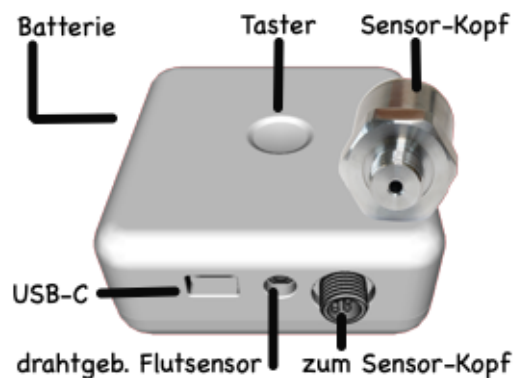
1. If two angle valves are present under the sink, please identify the cold water supply. Simply open hot water and check which valve warms up.
2. Close the tap and shut off the angle valve by turning clockwise.
3. Remove the metal hose from the angle valve with the provided 19mm wrench. Have a towel ready to catch the water coming out of the end of the hose.
4. Attach the T-shaped connector to the top of the angle valve and secure it with the 19mm wrench.
5. Connect the metal hose to the top of the connector and secure it with the



19mm wrench.

6. Screw the Aqua-Scope pressure sensor head into the side opening of the connector and secure it by hand. It is not necessary to tighten it too much.
7. Open the angle valve again by turning the knob counterclockwise.
8. Check all three connections for leaks for a few seconds.
9. Attach the Aqua-Scope to a suitable location with double-sided tape and connect the sensor head to the main device. Insert the flood sensor into the audio jack if necessary.
10. Turn on the device using the USB-C power plug. Please use the included power supply. This power supply has a very low harmonic distortion, which is necessary for precise measurements. Alternatively, insert a battery.

### 3. Device Operation



#### 3.1. Remote Access

The device is accessible via LoRaWAN commands. Please consult your LoRaWAN provider for details how to access the data. Please refer to the sections below for information on the payload and the payload decoding.

#### 3.2. Measurement Values and Alarms

The device **measures the pressure and temperature of the water** in the pipe where the sensor is installed multiple times per second.

Additionally, the sensor analyzes **all acoustic waves occurring in the water**. Since water is an excellent transmitter of acoustic waves, a single sensor is sufficient to capture all acoustic events in the house from a main water meter, pressure reducer, or pressure booster. These three devices block the transmission of sound waves in the water pipe. By analyzing the sound waves, the sensor distinguishes between normal water consumption and various anomalies, each reported as an alarm to the user.

The following alarms are possible:



1. One of the wired or wireless flood sensors has detected water. This is typically triggered by a leak near the respective sensor.
2. The water pressure has risen above the threshold set in the app or through configuration parameter 6. The reason for this alarm could be malfunctions of a pressure reducer or backflow preventer to the hot water system.
3. The water pressure has fallen below the threshold set in the app or through configuration parameter 7. The reason for this could be a pipe break; however, the water may have simply been turned off.
4. The external sensor is not connected to the main device.
5. The external sensor is connected to the main device but not connected to a pressurized water line.
6. The water temperature has either fallen below the value set in the app or configuration parameter 11 or risen above the value in the app or configuration parameter 16.
7. The Pipe-Check has detected a microleak. There is a separate chapter in this manual for 'Pipe-Check'.
8. The duration of water draw has exceeded the value set in the app or configuration parameter 10. This may indicate a leak or be triggered, for example, by filling a swimming pool.
9. A clogged toilet has been detected.
10. Water is beginning to flow, likely caused by a leak due to specific acoustics.

The alarm is transmitted to the app and forwarded there via push notification and (configurable in the app) as an email or voice message. If the condition that triggered the alarm has been resolved, the alarm will be automatically cleared. It is also possible to clear the alarm by double-clicking on the monitor's button, even if the alarm condition has not been resolved. The alarm will then remain locked until the next power-on.

### **3.3. Sensor Data**

The sensor measures water pressure, water consumption, and water temperature, and sends the values every 15 minutes, along with operating time, battery consumption, and battery voltage, via LoRaWAN.

### **3.4. Calibration**

To correctly evaluate acoustic signals in the water, the sensor must be calibrated. This happens automatically after the device is connected to the radio. The calibration process takes about 24 hours. During this time, water withdrawals may already be displayed, but they may still be roughly incorrect. Incorrect displays will occur, especially if the normal water pressure fluctuates significantly during the calibration period. This can happen if the target pressure of the pressure reducer is changed during this time or if the device is first tried on the table before being connected to the water line for final installation.



In this case, and also otherwise if needed, the calibration can be repeated. Please refer to the section LoRa Commands below for details on the command needed.

### 3.5. Effect of a Pressure Reducer

An installed pressure reducer (PRV) is common in modern European house water installations. Without a pressure reducer, the Aqua-Scope monitor is still usable, but some functions are restricted:

- No Restriction: Pressure monitor, temperature monitor, flood alarm, frost alarm, overpressure alarm, microleak test (Pipe-Check)
- Less Precise: Consumption alarm, water consumption measurement, clogged toilet

### 3.6. Pipe-Check

The detection of micro-leaks in the pipe system requires a special measurement method called 'Pipe-Check.' This process takes about 240 seconds, and during this time, the water system must be in a "rest" state, meaning no water withdrawal should occur. The 'Pipe-Check' should ideally take place at night as events like water withdrawal or water heating can disrupt the process without issues.

During the 'Pipe-Check,' water must be shut off. Therefore, it is recommended to install a retrofit motor that performs this task automatically at night. The time and days of the test can be set in the app as a timer (Configuration -> Timer) with 'Pipe-Check' as the action. If no retrofit motor is connected to the monitor, water can still be manually turned off, and the 'Pipe-Check' can be started manually in the app.

If the Pipe-Check indicates a micro-leak, there is no need to panic. In most cases, it will be a dripping faucet. If the result of a Pipe-Check shows a micro-leak over several days, it's time to investigate the cause. The alarm message provides further hints on where the leak may be located.

## 4. LED Indicator

The device features a tricolor LED (red/green/yellow) to signal different operational states. The LEDs only remain continuously lit when powered by an external source. In battery mode, the LEDs remain off after the startup sequence to conserve power.

- Yellow glowing or blinking in a sequence: Device is booting up
- Red/green blinking: The device is in the factory state or searching for a LoRaWAN network.
- Slowly breathing blue: Device is connected to the internet and in standby mode (only in external power mode).



- Flashing red: Alarm is active. The cause of the alarm was sent by LoRaWAN.

## 5. Button Operation

By pressing the button once, twice, or three times in quick succession, the following functions can be activated:

- Once:
  - In battery mode, the device is awakened, the green LED lights up, and additional commands can be entered.
  - In the wake-up state (external power, awakened from battery mode), pressing the button once sends a status message via WLAN.
- Twice: Existing alarms (LED blinking red) are cleared.
- Three times: Currently not assigned.

Note: In battery mode, the button must be held down for about 1 second (until the green LEDs light up) to wake up the device. Afterward, the second and third clicks can be performed as needed.

## 6. Battery Operation

The sensor can be operated with an external power supply, a battery, or both simultaneously. The status at the moment of powering on defines the device's operating mode. If mains voltage is present at the moment of powering on, the device will remain in power mode until the next status report (default every 15 minutes), even if mains voltage fails and a battery is inserted. The battery then operates as a backup.

If the sensor is started by inserting a battery, it will switch to battery mode. This means that some sensor functions are shut down to save power:

- The status LED remains dark.
- A local alarm is neither indicated acoustically nor by a red LED.
- The device responds only slowly to incoming commands (on average, about 10 seconds in power mode, up to one hour in battery mode).
- The device can no longer receive alarms from external wireless flood sensors.
- The sensor data is sent only hourly instead of every 15 minutes.
- If the device has LoRaWAN communication capability, it will attempt to join the LoRaWAN network only once (JOIN).

An estimate of battery life can be found in the app under "Devices". With a pressure reducer, the battery lasts about 8 to 10 years, without a pressure reducer in the water pipe, the lifespan is about 4 years.

## 7. Connection to LoRaWAN Network



This device, with its three keys (Dev EUI, Join EUI, Join Key), needs to be registered with a LoRaWAN network operator that covers the device's location with radio signals.

If you purchased the device directly from Aqua-Scope's online shop, use the email address used for the purchase and the public device key (Dev EUI) on the website <https://aqua-scope.com/lora>. You will receive a message with all three keys to the provided email address. The public key is also printed on the device as a 16-digit number and as a QR code for scanning. The QR code and 16-digit number are also printed on the outer packaging.

If you purchased the device from a dealer, the dealer will provide the three keys. If they do not, please contact [support@aqua-scope.com](mailto:support@aqua-scope.com) by email.

Immediately upon inserting the batteries or connecting a power supply, the device will attempt to connect to the LoRaWAN network using the three keys you provided. The LEDs will blink during this process. After approximately 25 seconds, this process, called 'JOIN,' will either be successful or aborted. In the latter case, the device immediately enters sleep mode.

If, for any reason, the sensor loses connection to the server, an automatic reconnection process, called 'Rejoin,' will take place. This process repeats whenever the device attempts to send a message to the LoRaWAN network.

Pressing the button always initiates a LoRaWAN communication, leading to a 'Rejoin' as explained above. Please observe the Duty Cycle regulation—sending messages or Rejoins too quickly in succession may be ignored by the LoRaWAN network.

## 7.1. LoRaWAN Payload Commands (Payload Format)

LoRaWAN commands can be daisy chained into the payload up to the defined maximum payload size of 51 bytes. This means that for all commands sent to a defined number of bytes in the payload is required to avoid misinterpretation of command and/or command values in the receiver side. **All uplink and downlink commands use FPort=10.**

- **Uplink Command Hardware Version Report: 0x03 - HW - CAP\_MSB CAP\_LSB (4 Byte):** This command reports the hardware version and a bitmap of the capabilities of the device. It is sent unsolicited as the first command during boot-up and as a replying command to a downlink command *Hardware Version Get*. HW is a single byte indicating the version of the hardware. The bitmap indicates the different capabilities of the device.
- **Uplink Command Configuration Report: 0x04 - IDX - VAL\_MSB - VAL\_LSB (4 Byte):** This command reports a configuration parameter of the device: IDX is the number of the configuration parameter. The 16 Bit VAL is



the parameter itself. Configuration parameters are always 16 Bit values. The table below describes the configuration parameters and their values.

- **Uplink Command Sensor Report: 0x06 - ID - VAL\_MSB - VAL\_LSB (4 Byte):** This command reports sensor values. The ID indicates the sensor type and defines the format of the 16-Bit VAL. The sensor types of this devices are listed below.
- **Uplink Command Device Status Report: 0x07 - STATE - VAL1\_MSB - VAL1\_LSB - VAL2\_MSB - VAL2\_LSB (6 Byte):** This command reports every single water flow event and the result of a Pipe-Check. STATE contains the status of the operation and defines the meaning of the two 16-bit values.
  - 0x00 Idle, YY/ZZ == 0x00
  - 0x01 Water Flow Ongoing, YY/ZZ == 0x00
  - 0x02 Pipe-Check - ok, YY/ZZ == 0x00
  - 0x03 Pipe-Check - alarm, YY = pressure diff/mbar, ZZ = elevation/cm
  - 0x04 Pipe-Check - aborted due to normal water take, YY/ZZ == 0x00
  - 0x05 Pipe-Check - aborted due to water heats up, YY/ZZ == 0x00
  - 0x06 Pipe-Check - aborted due to blocking valve, YY/ZZ == 0x00
  - 0x07 Pipe-Check - not started, water currently flowing, YY/ZZ == 0x00
  - 0x08 Pipe-Check - has started, YY/ZZ == 0x00
  - 0x09 Valve Closed, YY/ZZ == 0x00
  - 0x0e Water Flow Stop Event, YY flow time/sec, ZZ consumption in ml
  - 0x0f Water Flow Start Event, YY/ZZ == 0x00
- **Uplink Command Firmware Version Report: 0x0a - VER\_MSB VER\_2 VER\_3 VER\_LSB (5 Byte):** This command reports the 32-bit value of the current firmware. It is sent unsolicited as the first command during boot-up and as replying command to downlink command 'Hardware Version Get'.
- **Uplink Command Alarm Report: 0x0b - STATE - TYPE - VAL\_MSB - VAL\_LSB (5 Byte):** This command reports start and end of alarms. The STATE-Byte indicates the status of the alarm (0x01 = active, 0x00 = inactive). The TYPE Byte indicates the type of alarm and defines the content of the 16 Bit VAL. Possible alarm IDs and the values reported are listed below.
- **Uplink Command Battery Report: 0x12 - VOLT - BAT\_MSB - BAT\_LSB (4 Byte):** This command reports the status of the battery. VOLT is the measured voltage of the battery in 100 mV steps, the BAT value is the consumption of the current battery - as counted inside the system - in mAh.
- **Downlink Command System Command: 0x01 - CMD (2 Byte):** This command sends a system command to the devices. CMD defines the type of command:
  - CMD = 0x01: System restart
  - CMD = 0x02: System Reset - back to factory default
  - CMD = 0x03: Enter a While loop, can only be terminated by local power off/ob
- **Downlink Command Hardware Version Get: 0x03 - (1 Byte):** This



command calls for a Hardware Version Report sent upstream

- **Downlink Command Configuration Set: 0x04 - IDX - VAL\_MSB - VAL\_LSB (4 Byte):** This command allows setting configuration parameters of the device: IDX is the number of the configuration parameter. The 16 Bit VAL is the parameter itself. Configuration parameters are always 16 Bit Values. The table below describes the configuration parameters and its values.
- **Downlink Command Sensor Get: 0x06 - ID (2 Byte):** This command requests the report of sensor values. The ID indicates the sensor type. The sensor types of the devices are listed below.
- **Downlink Command Alarm Clear: 0x0b - TYPE (2 Byte):** This command clears an alarm. TYPE is the type of alarm to be cleared. Type = 0 clears all active alarms. For other types of alarms to be cleared please refer to the uplink command 0x0b.
- **Downlink Command Configuration Get: 0x14 - IDX (2 Byte):** This command allows reading the configuration value IDX. The device will respond with an upstream command Configuration Report

## 7.2. LoRaWAN Sensor Types

The following sensor types are supported by the Aqua-Scope Monitor.

- 0x01: Temperature: VAL is temperature in 1/10 Degree Celsius, (2-complement). *Example: 0x06 0x01 0x00 0xCD => Temperature 0x00CD = 205 = 20.5 C., 0x06 0x01 0xFF 0xEA => Temperature 0xFFEA = -20 = -2 C*
- 0x03: Uptime: VAL is the number of hours after last boot
- 0x10: Water Pressure: VAL is unsigned water pressure in mBar. *Example: 0x10 0x011 0x0D 0x48 => Pressure 0x0D48 = 3400 = 3.4 Bar.*
- 0x11: Water Consumption: VAL is water consumption in liters since last report

## 7.3. LoRaWAN Alarm Types

The following alarmtypes are supported by the Aqua-Scope Monitor.

- 1 (0x01): Flood Sensor Tripped. VAL is 0x01 or 0x00.
- 2 (0x02): Freeze/Frost Danger. VAL is actual temperature.
- 3 (0x03): Too Long Water Flow. VAL is the time in s.
- 4 (0x04): Heavy Flow - Pipe Break ? VAL is actual water pressure.
- 5 (0x05): Jamming Toilet Flap. VAL is 0x00.
- 6 (0x06): Water Overpressure. VAL is actual water pressure.
- 7 (0x07): Tripping Alarm. VAL is actual water pressure.
- 10 (0x0a): Strange Flow Alarm. VAL is actual water pressure.
- 12 (0x0c): Battery Low. VAL is 0x01 or 0x00.
- 13 (0x0d): Lost Mains Power. VAL is 0x01 or 0x00.
- 14 (0x0e): Sensor Head not connected to main device. VAL is 0x01 or 0x00.



- 15 (0x0f): Sensor Head not in contact with water. VAL is 0x01 or 0x00.

## 7.4. LoRaWAN Special Commands

The Command 0x01 0x03 (2 Byte) starts the Pipe-Check process.

## 7.5. LoRaWAN Configuration Parameters

All Configuration Parameters are 2 Byte values that can be set and read out using LoRaWAN 'Configuration Get' and 'Configuration Set' commands. Here is an overview of the configuration parameters currently used:

### **Parameter 1 (0x01): System Register (Default: 0x5bfe = dec 23550)**

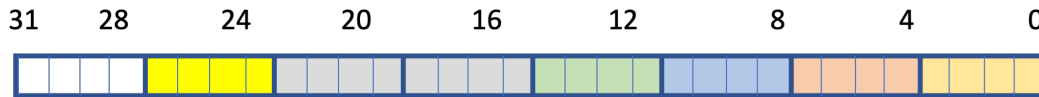
The bitmap defines the general behavior of the device. Bit = 1 means function enabled, bit = 0 means function disabled.

- 0x0001 (Bit 00) : Main Processor in Sleep Mode
- 0x0002 (Bit 01) : Power Status (Sleep/Main) is locked regardless of power state
- 0x0004 (Bit 02) : WIFI enabled (second bit beside COM register)
- 0x0020 (Bit 05) : Buzzer active
- 0x0040 (Bit 06) : LED active
- 0x0800 (Bit 11) : high frequency (1) versus low frequency(0)
- 0x1000 (Bit 12) : base operation interval msb
- 0x2000 (Bit 13) : base operation interval
- 0x4000 (Bit 14) : base operation interval
- 0x8000 (Bit 15) : base operation interval lsb

When High-Frequency Bit set to 1: 4 MSB defines interval in  $2^x$  ms from 2 - 32 ms (val 1 - 16).

When High-Frequency Bit set to 0: 4 MSB defines interval as 125 ms power of x, ranging from  $x = 1 = 125$  ms to  $x = 14 = 2048$  sec = 34 min ,  $x=15$  is not allowed.

### **Parameter 3 (0x03): LoRaWAN Register (Default: 0x0ffd = dec 4093)**



Bit 0...3: LoRaWAN MAC Control Bits

Bit 4...7: No of JOIN Retries

Bit 8...11: Interval for Confirmed Packets

Bit 12...15: LoRaWAN TX Power

Bit 16...23: LoRa Application Control Bits

Bit 24...27: LoRaWAN Frequency

The bitmap defines which commands are accepted on the LoRaWAN communication channel. Bit = 1 means function enabled, bit = 0 disables function

- 0x0001 (Bit 00) : CLASS C (default = Class A)
- 0x0002 (Bit 01) : ADR enabled, (default = off)
- 0x0004 (Bit 02) : Duty Cycle Control enabled, (default = off)
- 0x0008 (Bit 03) : not used
- 0x00f0 (Bit 04-07): No of Join retries, (default is 3)
- 0x0f00 (Bit 08-11): Interval for confirmed packets, (default = 10)
- 0xf000 (Bit 12-15): LoRaWAN TX Power (0 = 0 dB, 7 = 14 dB, >11 = 22 dB), (default = 14 db)

The upper 16 Bit of the register are not accessible via LoRaWAN but from serial console or WIFI only (whatever is available):

- 0x00ff0000 (Bit 16-24): Application Control Bits
  - 0x00010000 (Bit 16): Alarm Reporting and Clearing
  - 0x00020000 (Bit 17): Consumption Report
  - 0x00040000 (Bit 18): Sensor Value Report
  - 0x00080000 (Bit 19): Config Parameter Change
  - 0x00100000 (Bit 20): Pipe-Check
  - 0x00200000 (Bit 21): Periodic Config Reporting
  - 0x00400000 (Bit 22): Fixed Payload
  - 0x00800000 (Bit 23): not used
- 0xff000000 (Bit 25-31) : Frequency
  - 0: EU868
  - 1: US915
  - 2: AS923
  - 3: AU915
  - 4: CN779
  - 5: IN865
  - 6: KR920
  - 7: RU864

**Parameter 5 (0x05): Water Standard Pressure (Default: 0x0dac = dec 3500)**

This parameter is for information only. The pressure value is automatically set at initial calibration and may change from time to time as a result of ongoing calibration. The value is provided in mBar.

**Parameter 6 (0x06): Over-Pressure Alarmthreshold (Default: 0x1f40 = dec 8000)**

An overpressure alarm is sent as an uplink message when the current pressure exceeds this threshold. The threshold value is automatically set 24 hours after initial setup during calibration and may change from time to time as a result of ongoing calibration. The value is accepted in mBar.

**Parameter 7 (0x07): Under-Pressure Alarm threshold (Default: 0x07d0 = dec 2000)**

A heavy flow alarm is sent as an uplink message when the current pressure falls below this threshold for a certain time. The threshold value is automatically set 24 hours after initial setup during calibration and may change from time to time as a result of ongoing calibration. The value is accepted in mBar.

**Parameter 8 (0x08): Liter Translation (Default: 0x03e8 = dec 1000)**

The value of 1000 is an arbitrary value to translate the measured velocity of water into liters. This translation depends on the inner pipe diameter and this value can correct the translation.

**Parameter 9 (0x09): Jamming Toilet (Default: 0x00c8 = dec 200)**

This parameter defines the max time in seconds for 10 consecutive small water consumption event typical for jamming toilet flap. The default value of 200 means that the 11th event with a given 200 seconds time interval will cause a jamming alarm sent as uplink message. If your home has heavy water usage in general you may want to increase this value to avoid false alarms but keep in mind that the system will be less sensitive to find possible malfunctions.

**Parameter 10 (0x0a): Max. Water Take Time (Default: 0x0384 = dec 900)**

A Water Flow longer than this value will cause a Usage Alarm The value needs to be defined in  $0,43 * \text{seconds}$ . This means a desired cut-off of 15 minutes results in a value of 2093.

**Parameter 11 (0x0b): Frost Warn Threshold (Default: 0x0028 = dec 40)**

A frost alarm is sent as uplink message when the current temperature falls below the threshold. The threshold value is accepted in 1/10 degree Celsius. The default value is set to 4 degree Celsius.



**Parameter 13 (0x0d): Pipe-Check Duration (Default: 0x0258 = dec 600)**

This value defines how long (in seconds) a pipe check process shall take.

**Parameter 14 (0x0e): Pipe-Check Abort Drop (Default: 0x00c8 = dec 200)**

This value defines the maximum sudden loss in pressure during Pipe-Check to indicate water consumption. When hit, the Pipe-Check is aborted immediately and the valve is reopened. The value is provided in mBar.

**Parameter 15 (0x0f): Pipe-Check Alarm Drop (Default: 0x001e = dec 30)**

This value defines the maximum loss in pressure per minute during Pipe-Check in mBar. When hit, the Pipe-Check will continue for several more minutes to determine the elevation and the orifice size of the detected leak.

**Parameter 19 (0x13): Alarm Enable/Disable (Default: 0xd806 = dec 55302)**

The bitmap defines which alarm type is active and will cause an alarm status command 0x0b. Bit = 1 means function enabled, bit = 0 disables the function. The different alarm types are shown in the section 'LoRaWAN Alarm Types'.

**Parameter 29 (0x1d): Reporting Interval (Default: 0x0384 = dec 900)**

This parameter defines the interval in seconds the device automatically reports sensor values and heartbeat as an uplink message.

## 8. Scope of Delivery

- Water Monitor main device (without battery)
- Pressure sensor head with 80 cm cable
- 3/8 Inch water pipe connector (T-shaped)
- One external flood sensor with cable
- USB-C power cable and power supply
- 19 mm wrench to unfasten and fasten the 3/8 Inch connections of the pipe connector

## 9. Information related to Drinking Water Directive EU 98/83/EC

The t-shaped part of the device is exposed to drinking water and therefore subject to the European Drinking Water Directive. The certified used material is called CW509L, which is in the list of approved materials of the German Environment Agency (UBA) in the version from May 14th, 2020 under section 2.1.3.1.



## 10. Technical Data

- Power Supply: External USB Power Plug 5 V/ 1A
- Battery: Bobbin Cell C ER26500, Lithium-Thionyl Chloride
- Processor: ESP32-WROOM\_32E (Xtensa Dual Core 32 Bit, 240 MHz, 520 KB RAM)
- Wireless Connection:
  - LoRaWAN
    - Frequency EU868
    - Class A or Class, depends on battery status
    - LoRaWAN 1.0.3
  - Bluetooth 5 (LE)
    - UART Profile
- Pressure Sensor Head:
  - Range : 0 ... 1000 kPa (10 bar)
  - Overload: 150 Percent of maximum pressure
  - Connection: G 1/4 " female
  - Communication: I2C
  - Precision: < 1 Percent dynamically
  - Built-in High-Precision Temperature Sensor
- Dimensions (Main): 91 mm x 91 mm x 30 mm
- Weight (Main Device): 105 gr
- Weight (Sensor Head): 140 gr
- Protection: Main Device: IP 65, Sensor Head: IP 67
- User Interface: 4 colored LED, single touchless button
- Environmental Conditions:
  - Shipment and Storage: -65 °C ... 125 °C
  - Operation: - 20 °C ... 50 °C
  - Rel. Humidity: 0...90 %
- Minimal Flow Speed:
  - With Pressure Reduction Valve: < 250 ml /m
  - Without Pressure Reduction Valve : < 2000 ml / m
- Pipe-Check-Sensitivity: < 4ml/h

## 11. Support and Contact

Should you encounter any problem, please give us the opportunity to address it before returning this product. Please check our website [www.aqua-scope.com](http://www.aqua-scope.com) and particularly the support section for answers and help. You can also send a message to [info@aqua-scope.com](mailto:info@aqua-scope.com).

While the information in this manual has been compiled with great care, it may not be deemed an assurance of product characteristics. Aqua-Scope shall be liable only to the degree specified in the terms of sale and delivery. The reproduction and



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- Phone: +372 (0) 6248002
- eMail: [info@aqua-scope.com](mailto:info@aqua-scope.com)
- Web: [www.aqua-scope.com](http://www.aqua-scope.com)

## 12. Declaration of Conformity



Aqua-Scope Technology OÜ, Sakala 7-2, 10141 Tallinn, Republic of Estonia, declares that this radio emitting device works on the following frequencies:

**Български** С настоящото Aqua-Scope Technology OÜ декларира, че този тип радиосъоръжение AQSLWE02 е в съответствие с Директива 2014/53/ЕС. Цялостният текст на ЕС декларацията за съответствие може да се намери на следния интернет адрес: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce).

**Čeština** Tímto Aqua-Scope Technology OÜ prohlašuje, že typ rádiového zařízení AQSLWE02 je v souladu se směrnicí 2014/53/EU. Úplné znění EU prohlášení o shodě je k dispozici na této internetové adrese: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce).

**Dansk** Hermed erklærer Aqua-Scope Technology OÜ, at radioudstyrstypen AQSLWE02 er i overensstemmelse med direktiv 2014/53/EU. EUoverensstemmelseserklæringens fulde tekst kan findes på følgende internetadresse: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce).

**Deutsch** Hiermit erklärt Aqua-Scope Technology OÜ, dass der Funkanlagentyp AQSLWE02 der Richtlinie 2014/53/EU entspricht. Der vollständige Text der EU-Konformitätserklärung ist unter der folgenden Internetadresse verfügbar: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce).

**Eesti** Käesolevaga deklareerib Aqua-Scope Technology OÜ, et kesolev raadioseadme tüp AQSLWE02 vastab direktiivi 2014/53/EL nõuetele. ELi vastavusdeklaratsiooni tervik tekst on kttasaadav jrgmisel internetiaadressil: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**English** Hereby, Aqua-Scope Technology OÜ declares that the radio equipment type AQSLWE02 is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Español** Por la presente, Aqua-Scope Technology OÜ declara que el tipo de equipo radioeléctrico AQSLWE02 es conforme con la Directiva 2014/53/UE. El texto completo de la declaración UE de conformidad está disponible en la dirección Internet siguiente: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Ελληνικά** Με την παρούσα ο/η Aqua-Scope Technology OÜ, δηλώνει ότι ο ραδιοεξοπλισμός AQSLWE02 πληροί την οδηγία 2014/53/ΕΕ. Το πλήρες κείμενο της δήλωσης συμμόρφωσης ΕΕ διατίθεται στην ακόλουθη ιστοσελίδα στο διαδίκτυο: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Français** Le soussigné, Aqua-Scope Technology OÜ, déclare que l'équipement radioélectrique du type AQSLWE02 est conforme la directive 2014/53/UE. Le texte complet de la déclaration UE de conformité est disponible l'adresse internet suivante: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)



**Hrvatski** Aqua-Scope Technology OÜ ovime izjavljuje da je radijska oprema tipa AQSLWE02 u skladu s Direktivom 2014/53/EU. Cjeloviti tekst EU izjave o sukladnosti dostupan je na sljedećoj internetskoj adresi: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Italiano** Il fabbricante, Aqua-Scope Technology OÜ, dichiara che il tipo di apparecchiatura radio AQSLWE02 conforme alla direttiva 2014/53/UE. Il testo completo della dichiarazione di conformità UE disponibile al seguente indirizzo Internet: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Latviešu** Ar šo Aqua-Scope Technology OÜ deklarē, ka radioiekārta AQSLWE02 atbilst Direktīvai 2014/53/ES. Pilns ES atbilstības deklarācijas teksts ir pieejams šādā interneta vietnē: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce) Lietuvių Aš, Aqua-Scope Technology OÜ, patvirtinu, kad radijo įrenginių tipas AQSLWE02 atitinka Direktyvą 2014/53/ES. Visas ES atitikties deklaracijos tekstas prieinamas šiuo internet adresu: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Magyar** Aqua-Scope Technology OÜ igazolja, hogy a AQSLWE02 típus rádiberendezés megfelel a 2014/53/EU irányelvnek. Az EUMegfelelőségi nyilatkozat teljes szövege elérhető a következő internetes címen: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Malti** B'dan, Aqua-Scope Technology OÜ, niddikjara li dan it-tip ta' tagħmir tar-radju AQSLWE02 huwa konformi mad-Direttiva 2014/53/UE. It-test kollu tad-dikjarazzjoni ta' konformit tal-UE huwa disponibbli f'dan l-indirizz tal-Internet li ġej: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Nederlands** Hierbij verklaar ik, Aqua-Scope Technology OÜ, dat het type radioapparatuur AQSLWE02 conform is met Richtlijn 2014/53/EU. De volledige tekst van de EUconformiteitsverklaring kan worden geraadpleegd op het volgende internetadres: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Polski** Aqua-Scope Technology OÜ niniejszym oświadczam, że typ urządzenia radiowego AQSLWE02 jest zgodny z dyrektywą 2014/53/UE. Pełny tekst deklaracji zgodność I UE jest dostępny pod następującym adresem internetowym: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Português** O(a) abaixo assinado(a) Aqua-Scope Technology OÜ declara que o presente tipo de equipamento de rádio AQSLWE02 está em conformidade com a Diretiva 2014/53/UE. O texto integral da declaração de conformidade está disponível no seguinte endereço de Internet: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Română** Prin prezenta Aqua-Scope Technology OÜ declară că tipul de echipamente AQSLWE02 este în conformitate cu Directiva 2014/53/UE. Textul integral al declarației UE de conformitate este disponibil la următoarea adresă internet: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Slovensko** Aqua-Scope Technology OÜ potrjuje, da je tip radijske opreme AQSLWE02 skladen z irektivo 2014/53/EU. Celotno besedilo izjave EU o skladnosti je na voljo na naslednjem spletnem naslovu: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Slovensky** Aqua-Scope Technology OÜ týmto vyhlasuje, že rádiové zariadenie typu AQSLWE02 je v slade so smernicou 2014/53/EÚ. Úplné EÚ vyhlásenie o zhode je k dispozícii na tejto internetovej adrese: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Soumi** Aqua-Scope Technology OÜ vakuuttaa, että radiolaitetyypin AQSLWE02 on direktiivin 2014/53/EU mukainen. EUvaatimustenmukaisuusvakuutuksen täysimittainen teksti on saatavilla seuraavassa internetosoitteessa: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

**Svenska** Härmed försäkrar Aqua-Scope Technology OÜ att denna typ av radioutrustning AQSLWE02 verensstämmer med direktiv 2014/53/EU. Den fullständiga texten till Euförsäkran om verensstämmelse finns på följande webbadress: [www.aqua-scope.com/ce](http://www.aqua-scope.com/ce)

## 13. Disposal Guidelines



■ Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities. Contact your local government for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging health and well-being.