



# Rain Level Sensor

RANLWE01



This rain sensor **measures the amount of rain at the location of the sensor** in ml within a 15 minute interval and transmits it via LoRaWAN. In case of **heavy rain (more than 15 l/h), an alarm** message is issued.

The device is powered by two AAA batteries. The supplied high-quality VARTA, batteries allow a runtime of over 8 years.

## Setup

Please register the device with its three keys with your LoRaWAN server before commissioning. You will find the Device EUI printed on the device. Enter this key on <https://aqua-scope.com/lora> to get the missing keys.

Open the sensor by turning the housing counterclockwise against the housing base. Now remove the communication module as shown in Figure 2.

After inserting the batteries, the LED next to the button flashes red/green (see Figure 1), indicating an active JOIN process. This is terminated with a successful JOIN on the network or after 20 seconds. The LED will indicate whether the JOIN process was successful by glowing red or green. If no network connection has been established, the device will switch to internal Aqua-Scope communication mode and can communicate directly with Aqua-Scope monitor devices even without a LoRaWAN network. The LoRaWAN JOIN process can be restarted using the button and a paper clip.

**When changing the battery, please remove the battery, then press the button, wait for about 20 seconds and re-insert new batteries.**

After plugging in the communication mode, you can simulate rain by moving the rocker and thus test whether and how such rain is reported by the sensor. Please note that the flat side of the communication module must be on the side of the water rocker.

## Functions

Now place the sensor on a horizontal surface. A sight glass in the bottom of the housing will help with alignment.

When rain falls, the sensor will transmit the corresponding amount of rain every 15 minutes. The minimum resolution of the sensor is 0.5 mm water column. Please note that this amount of rain can only be measured exactly at the sensor.

Already a few meters away from it, other rain amounts can occur. In case of heavy rain, a corresponding alarm is sent within approx. 2 minutes, which is deleted again when the rain intensity falls below the threshold. The threshold value for start rain can be defined in configuration parameter 3. It is preset at the factory to 15 liters/hour.

If no rain is measured within a 15-minute interval, no radio transmission will take place to save the battery. The measuring interval can be freely defined via configuration parameter 1. Even without rain, the sensor will report regularly and transmit its uptime. By default, this wake-up interval is set to 6 hours and can be defined with configuration parameter 2.

In addition to the heavy rain alarm, the device sends an alarm when the battery is almost exhausted. In this case, however, you still have several months to replace the batteries.

## General Information reg. metering of rain

Rain is measured either in mm water column above a point or as a quantity in liters on an area of 1 square meter. 1 liter/square meter corresponds to a water column of 1 mm. In the case of snowfall, this 1 mm water column corresponds to a snow depth of about 1 cm of snow.

Professional meteorological institutes use standardized rain gauges with an opening of at least 200 mm (specified in Chinese national standard GB/T 21978.2-2014 "Instrument for precipitation observation. Part 2: Tipping bucket rainfall sensor"). In contrast, this sensor has an aperture of only 130 mm, which allows sufficient measurement accuracy and still does not take up too much space.

## Technical Data

- Platform: STM32WLE5CCU6
- LoRaWAN
  - Frequency: EU868
  - Join process: OTAA
  - Class A
  - Standard: LoRaWAN 1.0.3
  - Range: > 10km (TX 22 dB).
- Temp. range: -40 ... 85 deg C
- Water protection: IP 55
- Dimension: 132x132x139 mm
- Dims. packed: 140x140x150 mm
- Weight: 219 gr.

# Regenmengen-Sensor



Dieser Regensensor misst die **Regenmenge am Ort des Sensors in ml innerhalb eines 15 Minuten-Intervalls** und überträgt diese per LoRaWAN. Im Falle von **Starkregen (mehr als 15 l/h)** wird eine **Alarmmeldung** ausgegeben.

Das Gerät wird mit zwei AAA-Batterien betrieben. Die mitgelieferten hochwertigen VARTA, Batterien ermöglichen eine Laufzeit von über 8 Jahren.

### Inbetriebnahme

Bitte registrieren Sie das Gerät vor Inbetriebnahme mit seinen drei Schlüsseln bei Ihrem LoRaWAN-Server. Sie finden den Device EUI auf dem Gerät aufgedruckt. Geben Sie diesen Schlüssel auf der Website <https://aqua-scope.com/lora> ein und erhalten damit die beiden anderen Keys. Nach dem Einlegen der Batterien blinkt die LED neben dem Taster rot/grün (siehe Abbildung 1) und zeigt damit einen aktiven JOIN-Prozess an. Dieser wird mit einem erfolgreichen JOIN am Netzwerk oder nach 20 Sekunden beendet. Die LED wird durch rot oder grünes Leuchten anzeigen, ob der JOIN-Prozess erfolgreich war. Wurde keine Netzwerkverbindung hergestellt, schaltet das Gerät in den internen Aqua-Scope-Kommunikationsmodus und kann direkt mit Aqua-Scope Monitorgeräten auch ohne LoRaWAN-Netzwerk kommunizieren. Mittels des Tasters und unter Zuhilfenahme eine Büroklammer kann der LoRaWAN- JOIN-Prozess erneut gestartet werden.

Nach Einstecken des Kommunikationsmodus kann durch Bewegung der Wippe Regen simuliert. Bitte beachten Sie, dass die flache Seite des Kommunikationsmoduls auf der Seite der Wasserwippe sein muss.

**Bei Batteriewechsel bitte Batterie entnehmen, danach den Taster drücken, 20 Sekunden warten und dann neue Batterien einsetzen.**

### Funktion und Betrieb

Stellen Sie nun den Sensor an einer waagerechten Fläche auf. Ein Schauglas im Gehäuseboden hilft bei der Ausrichtung.

Wenn Regen fällt, wird der Sensor alle 15 Minuten die entsprechende Regenmenge übertragen. Die minimale Auflösung des Sensors beträgt 0,5 mm Wassersäule. Bitte beachten Sie, dass diese Regenmenge nur genau am Sensor gemessen werden kann. Bereits wenige Meter davon entfernt können andere Regenmengen auftreten.

Im Falle von Starkregen wird innerhalb von ca. 2 Minuten ein entsprechender Alarm gesendet, der bei Unterschreiten der Regenintensität wieder gelöscht wird.

### Communication Protocol

*Note: This description refers to the latest firmware in <https://github.com/aqua-scope/lorain> or firmwares 221001 and up. Your device in hand may have an older firmware with different settings.*

*The device can be controlled directly via LoRaWAN. For this purpose, different commands are defined, which are used either 'uplink', i.e. from the device to the LoRa network, or 'downlink', i.e. from the LoRa network to the device. Commands can be cascaded up to the maximum number of 52 bytes. All values of the command descriptions are bytes, unless otherwise specified.*

### Downlink-Commands (using FPort 10):

Der Schwellwert für Startregen kann im Konfigurationsparameter 3 definiert werden. Er ist werksseitig auf 15 Liter/Stunde voreingestellt.

Wenn innerhalb eines 15-Minuten-Intervalls kein Regen gemessen wird, wird keine Funk-übertragung stattfinden, um die Batterie zu schonen. Das Mess-Intervall kann über den Konfigurationsparameter 1 frei definiert werden. Auch ohne Regen wird sich der Sensor regelmäßig melden und dabei seine Uptime übertragen. Werksseitig ist dieses Aufweck-Intervall auf 6 Stunden eingestellt und kann mit dem Konfigurationsparameter 2 definiert werden.

Neben dem Starkregenalarm sendet das Gerät einen Alarm, wenn die Batterie fast erschöpft ist. In diesem Falle haben Sie jedoch noch mehrere Monate Zeit, die Batterien zu ersetzen.

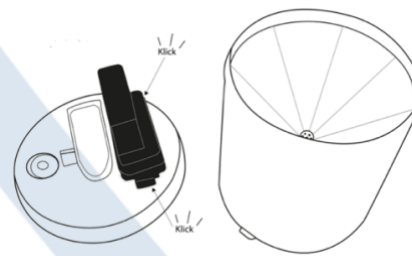


Fig 1

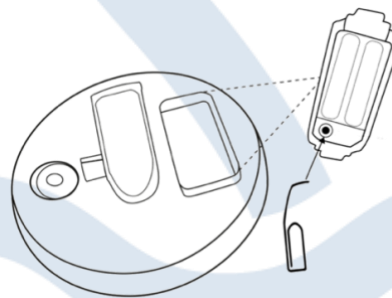


Fig 2

### Technische Daten

- Plattform: STM32WLE5CCU6
- LoRaWAN
  - Frequenz: EU868
  - Join-Prozess: OTAA
  - Class A
  - Standard: LoRaWAN 1.0.3
  - Reichweite: > 10km (TX 22 dB)
- Temp.-Bereich: -40 ... 85 Grad
- Wasserschutz: IP 55
- Abmessung: 132x132x139 mm
- Verpackung: 140x140x150 mm
- Gewicht: 219 gr

- **0x03:** Get hardware ID, device answers with uplink command 0x03
- **0x04 PP VV\_MSB VV\_LSB:** Set configuration parameter PP for new 16 Bit value VV
- **0x1a:** Get firmware version, device answers with uplink command 0x03a
- **0x14 PP:** Get configuration parameter PP, device answers with uplink command 0x04

### Uplink-Commands (using FPort 10):

- **0x03 XX YY\_MSB, YY\_LSB:** Report hardware version XX and device capabilities bitmap YY
- **0x04 PP VV\_MSB VV\_LSB:** Report 16 Bit Value VV of configuration parameter PP
- **0x06 YY VV\_MSB VV\_LSB:** Report 16 Bit Sensor Value
  - YY=0x01: Temperature in 0.1 degree Celsius. Please note, the temp sensor is based on uncalibrated NTC. Therefore, it only gives a rough estimate of the temperature.
  - YY=0x03: Uptime in days
  - YY=0x81: Rain level in measurement steps of 0,5 mm water level (example YY = 0x06 0x81 0x03 means 1.5 mm water or 1.5 l/m3).
- **0x0a YY\_MSB YY YY\_LSB:** Report firmware version as 32 Bit value
- **0x0b XX YY ZZ\_MSB, ZZ\_LSB:** Report alarm state XX (1 or 0) of alarm type YY with optional value Z. Current alarm types are
  - XX=0x03: sensor alarm (Z is seconds between two events: 0.5 mm within Z s.),
  - XX=0x0c: battery alarm
- **0x12 XX YY\_MSB, YY\_LSB:** Battery status, XX = voltage in 100 mV, YY Consumption since reboot in mAh

### Configuration Parameters

#### **Parameter 2 – Heartbeat Interval**

This parameter defines after how many measurement intervals the sensor will send a report regardless of rainfall. The factory default is 24 which translates together with the default value of parameter #4 (900 seconds = 15 minutes) into  $24 * 15 \text{ minutes} = 6 \text{ hours}$ .

#### **Parameter 3 – Heavy Rain Threshold**

This parameter defines the heavy rain level as time interval (in seconds) for 0.5 mm rain. The default value of 120 means that 0.5 in 120 seconds or less will cause heavy rain alarm. This translates into 15 liter/h.

#### **Parameter 4 – Measurement Interval in Seconds**

Rain Level is only measured within. Certain time interval. This parameter defines the time interval for these reports in sec. The default is 900 = 15 minutes. The value range is 10 – 60000.

#### **Parameter 5 – Calibration of Temperature Sensor**

This parameter allows a linear correction of the reported temperature value. The default value is 100.

## Support and Contact

Should you encounter any problem, please give us an 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)

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**Phone:** +372 (0) 624 8002  
**Mail:** [support@aqua-scope.com](mailto:support@aqua-scope.com)  
**Web:** [www.aqua-scope.com](http://www.aqua-scope.com)

## Declaration of Conformity

Aqua-Scope Technology OÜ, Sakala 7-2, 10141 Tallinn, Republic of Estonia, The radio emitting device works on frequency 868...869 MHz with output power of 22 dBm. (158 mW)

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## 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.

