



WWW.ELICHENS.COM

User manual – Wireless Gas Leak Detector, avolta

July 22



Outline

1. Introduction	3
2. Features.....	3
3. avolta at a glance.....	4
3.1. Global view	4
3.2. Test button.....	4
3.3. LEDs.....	4
4. Outline.....	5
5. Battery and start-up sequence	5
6. Alarms.....	6
6.1. Gas alarm.....	6
6.2. Temperature alarm	6
6.3. Battery/electronics alarm	6
7. LoRaWAN join request.....	7
8. Payload format.....	7
9. Downlink commands	8
10. Web data access (eLichens gateway or TTN)	9
10.1. Account creation.....	9
10.2. Associate a device	9
10.3. Devices access	10



1. Introduction

Avolta is a wireless, battery-operated, Natural Gas leak detector. It embeds the Foxberry CH4NB sensor from eLichens, a cutting-edge NDIR (Non-dispersive Infrared), dual-channel sensor designed specifically to detect Methane, and only Methane. The sensor ultra-high selectivity has been validated by the Chicago Gas Technology Institute (GTI) and prevents the generation of false alarms by volatile hydrocarbons. The Foxberry CH4NB sensor is based on eLichens' patented technology including a proprietary IR micro-source, patented optical design and advanced signal processing algorithms. It provides the lowest power consumption on the market and is a key differentiator for battery-powered safety products. Avolta leak detector is battery-powered, and has an autonomy of more than 10 years, with the sensor constantly ON and a LoRaWAN heartbeat message sent every 8 hours.

2. Features

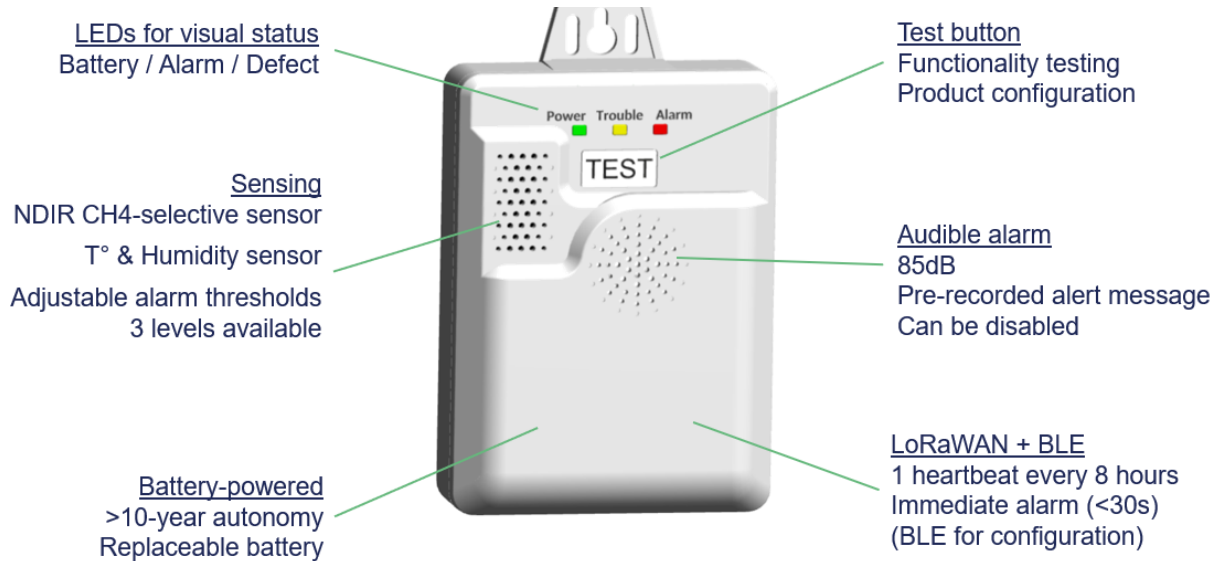
- Ultra-low power NDIR sensor
- Ultra-high CH₄ selectivity: No false alarm
- Best sensitivity, detection as low as 5%LEL
- LoRaWAN + BLE connectivity
- Battery operated, 10-year lifetime
- Driftless, no recalibration required
- Fast response time
- Temperature & Humidity sensor
- Audible & visual alarms, test button
- UL1484 & EN50194 compliant
- Ingress protection IP54





3. avolta at a glance

3.1. Global view



3.2. Test button



- Short press:** Battery test
3 LEDs blinking (one by one) + Beep if battery is OK
- Long press (>3s):** Alarm test
Beep + Pre-recorded message + red LED blinking during the message
- Long long press (>10s):** LoRaWAN join request
Beep after 3s + 2 beeps after 10s + Network join request (even if already joined),
LoRaWAN heartbeat message sent to the network

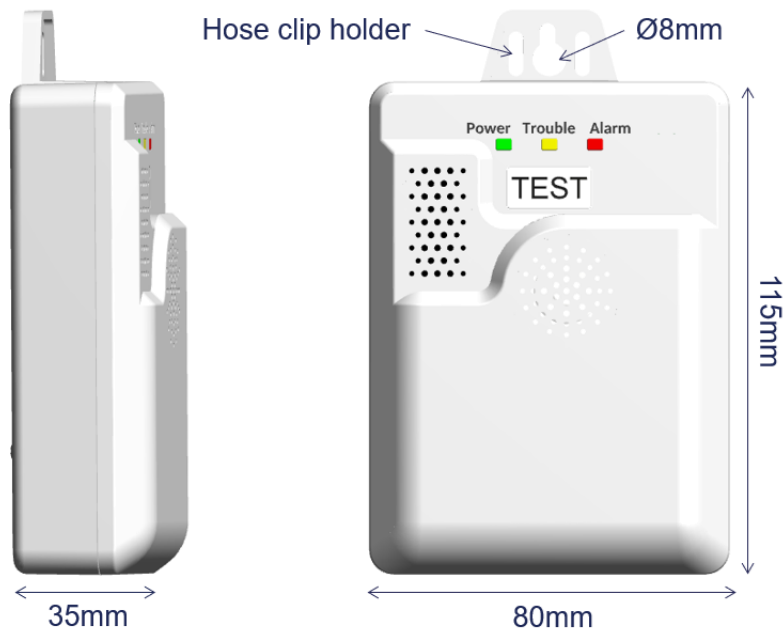
3.3. LEDs



- Green:** Battery and network status
Blink every minute when battery lifetime is low
Blink during LoRaWAN join request & blink 3 times if join request succeeded
- Yellow:** Product or network error
Blink every minute when a sensor fault is detected
Blink 3 times if LoRaWAN join request failed
- Red:** Gas alarm
Blink every minute when gas concentration is above threshold



4. Outline



5. Battery and start-up sequence

Avolta is powered by a 3.6V primary lithium thionyl chloride battery pack with a capacity of 11.6Ah. The battery is non-rechargeable and lasts 10 years.

Battery replacement needs to be performed by a trained operator only.

At delivery, the battery is inside the product but disconnected. Just unscrew the transparent battery cover and plug the battery connector. Put the cover back in place and tighten the screws to ensure water tightness.

After first battery installation, the product will initialize, the LEDs will blink one by one and the green LED will blink every 3 seconds until the product is connected to the network. If connection is successful, the green LED will blink three times and stop. If it fails, the yellow LED will blink three times and stop.

The product will then need 6 more minutes to be fully functional. **Be sure to keep the product in a methane-free environment during these 6 first minutes**, as the sensor is initializing.



Transparent battery cover



6. Alarms

Several alarms are integrated in the product: gas level, temperature level, battery or electronics alarm.

6.1. Gas alarm

An alarm is triggered if the measured gas level goes above one of the three thresholds programmed in the product: small leak, alarming leak, large leak. Note that the levels can be reprogrammed using downlink commands.

Threshold	Default value	Consequence
Small leak	10%LEL	<ul style="list-style-type: none"> Alarm message sent through LoRaWAN, with acknowledge, every 5min Red LED blink + Beep + Pre-recorded message, every minute Stops when gas level drops below threshold for >5 minutes and a LoRaWAN message is sent
Medium leak	20%LEL	<ul style="list-style-type: none"> Alarm message sent through LoRaWAN, with acknowledge, every 5min Red LED blink + Beep + Pre-recorded message, every minute Stops when gas level drops below threshold for >5 minutes and a LoRaWAN message is sent
Large leak	50%LEL	<ul style="list-style-type: none"> Alarm message sent through LoRaWAN, with acknowledge, every 2min Red LED blink + Beep + Pre-recorded message, every minute Stops when gas level drops below threshold for >5 minutes and a LoRaWAN message is sent

6.2. Temperature alarm

An alarm is triggered if the measured temperature rises at a rate superior or equal to 3°C every 2 minutes (=37F every 2 minutes).

Threshold	Default value	Consequence
T° rise	3°C / 2min (37F / 2min)	<ul style="list-style-type: none"> Alarm message sent through LoRaWAN, with acknowledge, every 2min Red LED blink + Beep, every minute Stops automatically after 15 minutes

6.3. Battery/electronics alarm

The product is constantly self-testing itself, so if a problem is detected an alarm is immediately raised.

Alarm type	LoRaWAN	Product
Low battery	Alarm message sent through LoRaWAN, with acknowledge, every 30min	Yellow LED blink, every minute Beep, every minute
Electronics		



7. LoRaWAN join request

To connect the device to a LoRaWAN network, a join request must be initiated. To do this, just press the test button for more than 10 seconds. After 3 seconds, a first beep will sound, and after 10 seconds two beeps will sound, you can release the button.

Green LED will blink every 3 seconds during the join sequence. If join is successful, the green LED will blink twice quickly and stop blinking. If the join sequence failed, the yellow LED will blink three times quickly and stop. If the join request fails, try again, it can sometimes take 2 to 3 tries before working. Else, just let the product ON and it will automatically retry every 8 hours (heartbeat message interval) or if an alarm is raised.

Note: An automatic join request is performed at battery connection, so if everything went fine at startup, this “manual” join request is not useful and the LEDs sequence described above happens right after startup.

8. Payload format

Avolta sends two types of LoRaWAN payloads:

- A heartbeat payload every 8 hours to notify that the product is ON and fully functional.
- An alarm payload in case one of the thresholds is reached (CH₄ level or temperature) or if an issue has been detected in the product (low battery or electronics failure). The product is constantly self-checking itself and the CH₄ sensor is always ON, so if any alarm payload is sent in less than 30 seconds.

The payloads format is described in the tables hereafter (please note that all words are MSB first).

Heartbeat: every 8 hours on LoRaWAN port 1, without acknowledge.

Payload version	Runtime since power ON	Averaged gas concentration	Temperature	Relative Humidity	Battery voltage
Always = 0x01	Unit: hours	Unit: %LEL Averaged 1hour	Unit: 0.1°C Averaged 1hour	Unit: %	Unit: 0.01V
1 byte	4 bytes	1 byte	2 bytes (signed)	1 byte (unsigned)	1 byte (unsigned)

Alarm: every 2-5 minutes in case of an alarm on LoRaWAN port 2, with acknowledge. If acknowledge fails, retry (max 3 times).

Payload version	CH ₄ level	T°	Alarm status	CH ₄ alarm
Always = 0x02	Unit: %LEL	Unit: °C	1 st bit: 1 gas concentration alarm / 0 no gas alarm 2 nd bit: detector error 3 rd bit: battery level error 4 th bit: temperature alarm	0x00: no gas alarm 0x01: small leak (≥10%LEL) 0x02: medium leak (≥20%LEL) 0x03: large leak (≥25%LEL) 3 th ...8 th bit: reserved
1 byte	1 byte	1 byte	1 byte	1byte



9. Downlink commands

Downlink commands can be sent through the LoRaWAN network. Please see hereafter for their description. Note that the frame counter can be kept to zero.

Read commands

Name	Description	Frame request	Frame answer
Read Gas thresholds	Get concentration thresholds (small, alarming, high) in %LEL	[0]: Frame counter [1]: 0x92	[0]: Frame counter [1]: 0x92 [2]: small gas leak threshold (%LEL) [3]: medium gas leak threshold (%LEL) [4]: large gas leak threshold (%LEL)
Read payload	Get the payload through BLE service	[0]: Frame counter [1]: 0x95	[0]: Frame counter [1]: 0x95 [2]: Payload version [3-6]: running time in hours [7]: Last gas concentration [8-9]: Last temperature value [10]: Humidity [11]: Battery voltage
Speaker status during alarm	Speaker status during an alarm	[0]: Frame counter [1]: 0x96	[0]: Frame counter [1]: 0x96 [2]: 0 sound alarm is disabled; 1 sound alarm is enabled during an alarm

Write commands

Name	Description	Frame request	Frame answer (if frame request is correct)
Gas thresholds	Set the values of the concentration alarms (small, alarming, high)	[0]: Frame counter [1]: 0x82 [2]: small gas leak threshold (%LEL) [3]: alarming gas leak threshold (%LEL) [4]: large gas leak threshold (%LEL) Check: [2] ≤ [3] ≤ [4]	[0]: Frame counter [1]: 0x82
Request LoRa payload	Send a LoRa payload, if not join, will generate a join	[0]: Frame counter [1]: 0x84	[0]: Frame counter [1]: 0x84
Speaker status during alarm	Enable/Disable the speaker during an alarm (enabled by default)	[0]: Frame counter [1]: 0x86 [2]: 0 disables the speaker during alarm, 1 enables the speaker during alarm	[0]: Frame counter [1]: 0x86

Errors

Name	Description	Frame request	Frame answer
Error return			[0]: Frame counter [1]: 0x32 command unknown (SDCS_V2_FAIL_INVALID_CMD) 0x33 missing arguments (SDCS_V2_FAIL_INVALID_DATASIZE) 0x34 incorrect parameters (SDCS_V2_FAIL_INVALID_VALUE)



10. Web data access (eLichens gateway or TTN)

If you are using a gateway provided by eLichens or if your area is covered by The Things Network (TTN), all the collected data are directly accessible through a dedicated web interface, available here:

<https://lab.elichens.com/dashboard>

10.1. Account creation

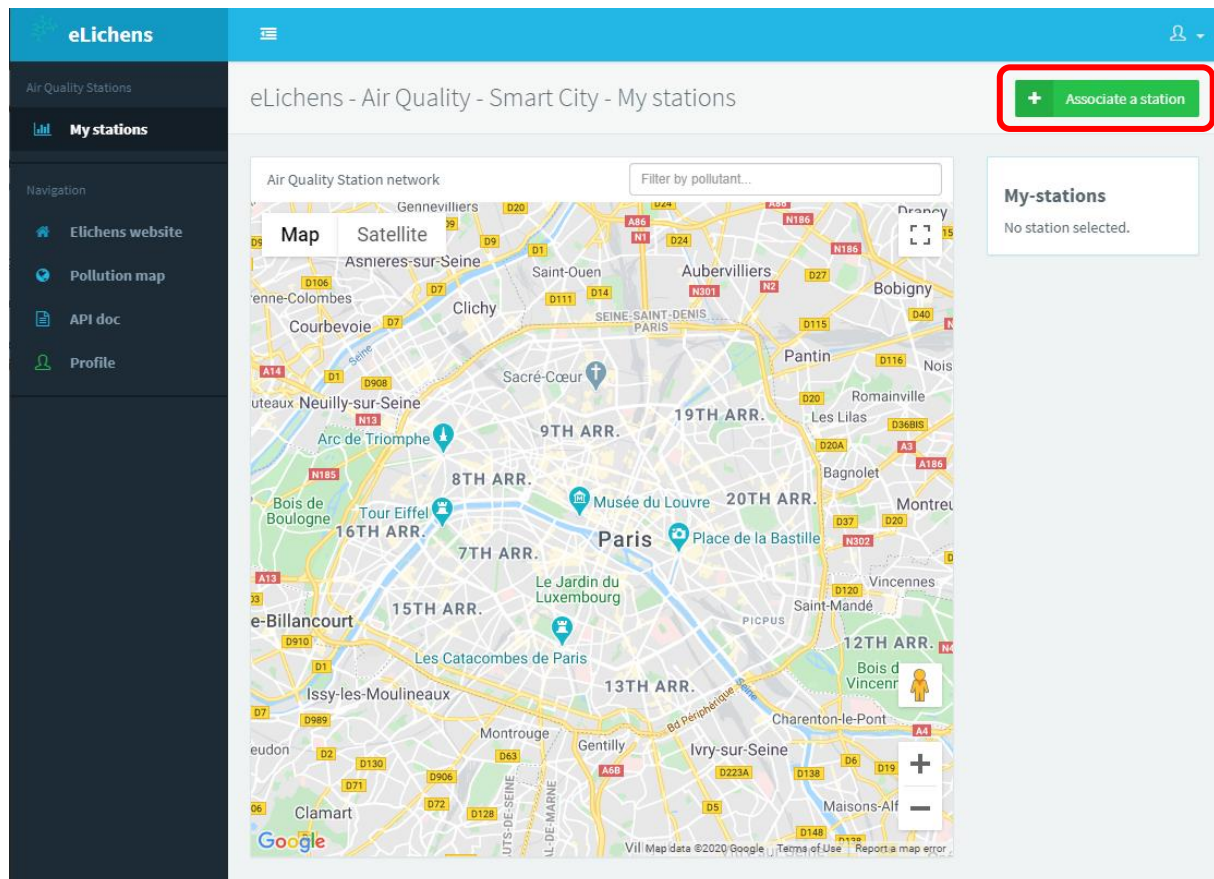
To access it, connect to <https://lab.elichens.com> and create an account.

Please take care of the strong password policy as you will need to enter a password with:

- at least 8 characters
- at least 1 upper case [A-Z]
- at least 1 lower case [a-z]
- at least 1 digit [0-9]
- at least 1 special character [\$@!%*#?&,;:]

10.2. Associate a device

In the left menu, select « My stations ». At your first visit, no station is visible. Select « Associate a station » at the top right corner of the page (green button on the picture hereafter).





To go further, you need to enter the **token** provided by your eLichens' contact or inside the package you received. It is a unique code in the format AAA-BBB-CCC. Enter this code in the dedicated space and select « Associate the station ».

My profile

Associate a station

You are about to associate a station to your account.

Station token

Please provide the token that has been shared with you by email. Format: 'ABC-DEF-GHJ'.

[Associate the station](#) [Cancel](#)

The following confirmation message will display (see next figure).

My profile

Station 'O AQM_29' is now associated to your account

My account

Username
[REDACTED]

Email
[REDACTED]

My stations

O AQM_29

[+ Associate a station to my account](#) [See my stations](#)

My groups

No group

My API key
[REDACTED]
[Reset my API key](#)

Password
[Change my password](#)

10.3. Devices' access

All the connected devices are accessible through the left column. The buttons on the bottom right side of the interface are used to change the history length and a click on



“Advanced view” brings the user to an advanced dashboard where data can be exported in a .CSV file.



For more information, please contact us:

eLichens SA
17 rue Félix Esclangon
38000 Grenoble
FRANCE

info@elichens.com
www.elichens.com