eLICHENS

User manual – LoRaWAN CO2 sensor, Aura-CO2

1. Introduction

Aura-CO2 is a five-year battery-operated CO2 monitor that measures in real time Carbone Dioxide concentration, temperature, pressure and relative humidity. Data is displayed on a large e-Paper screen and on the online dashboard when Aura-CO2 is connected to the LoraWAN network. End users can customize sound & visual alarms through the eLichens Aura smartphone application.

Aura-CO2 embeds the eLichens Foxberry CO2 gas sensor, a cutting-edge dual-channel NDIR (Non-dispersive Infrared) gas sensor integrated in a small and compact form factor. It is based on eLichens' patented technology including a proprietary IR micro-source, patented optical design and advanced signal processing algorithms. Using the auto calibrated Foxberry gas sensor ultra-low power mode, Aura-CO2 reaches more than 5 years on battery without recharging, maintenance or calibration.

Studies showed that there is a relationship between the ambient CO2 level and the need for air renewal. The CO2 level is linked to the number of people in a room. The higher the level, the greater the risk of transmission of pathogens and viruses such as coronavirus. Aura-CO2 alerts you when the CO2 level is too high. By optimally adjusting the ventilation and air conditioning system, the user can ensure good indoor air quality at all times and prevent the transmission of pathogens. This reduces the risk of infection by diseases such as COVID-19.

2. Features

2.1.   Product

• CO_2, ambiant temperature, relative humidity and atmoshperic pressure sensors

• ePaper screen for a clear display of relevant information

• Configurable visual and audible CO2 level alarms

• LoRaWAN & BLE connectivities

• Compact size, wall mounted and battery powered for an easy installation

• Maintenance free

• Battery lifetime >5 years

2.2.   Ecosystem

• Easy configuration with our iOS and Android mobile application and BLE

• Unlimited cloud storage, accessible through API and dashboards

• Web and mobile data visualization applications

2.3.   Applications

• Indoor air quality monitoring for schools, offices, homes, stores, …

• Air purification control

• Demand control ventilation

• HVAC management

3. Specifications

Operating conditions	
Temperature range	0-50°C
Humidity range [1]	0-95%RH

[1] Non-condensing

Power supply	
Battery type	2 x 3.6V AA Lithium Batteries
Battery Lifetime [2]	>5 years

[2] Contact eLichens for replacement batteries.

Mechanical	
Dimensions	92 x 60 x 30 mm
Mounting options	Wall-mounted (anti-theft system option) Stands on a flat surface table
Screen dimensions	73mm (2.9'')

CO_2 Sensor	
Technology	Proprietary dual-channel low-power NDIR
Measurement Range	400-5000ppm
Absolute Accuracy	±30ppm ±3% of reading
Output Resolution	10 ppm

Aura is equipped with Foxberry CO2 gas sensor, the eLichens best in class ultra-low power NDIR sensor, already used by key players in HVAC, safety and industrial markets.

Foxberry sensors are designed to accurately monitor Air Quality over time with ZERO drift through its innovative self-calibration system.

Temperature Sensor	
Absolute Accuracy	$\pm$0.5°C at 25°C and $\pm$1.0°C in the full range
Output Resolution	0.1°C

Humidity sensor	
Absolute Accuracy	±3% RH
Output Resolution	1% RH

Pressure sensor	
Absolute Accuracy	±1 hPa
Output Resolution	1 hPa

LoRaWan	
Protocol version [3]	LoRaWAN 1.0
Device class	A
Features	OTAA, ADR, Adaptative Channel Setup
Regions	US (902-928), EU (863-870), AS (923)
Report interval	4 data points sent every hour by LoRaWAN= 15 min data rate.
Payload	Status CO2 Temperature Humidity Pressure Battery

[3] Disable by default. Activation via the app.

With the LoRaWAN network, Aura is connected anywhere to the cloud, NO WIFI is required.

BLE	
Protocol version	BLE V4.2
Services	- Do the LoRaWAN provisioning - Get device information - Get measures - Set CO2 alarm threshold - Enable/Disable audible alarm - Synchronize date and time - Set date format - Set Temperature unit - Upload 14 days offline data - Upgrade Firmware

With BLE connectivity, Aura communicates directly with any Bluetooth connected device and allows users to access settings.

4. Aura-CO2 at a glance

CO2 visual alarm (blinking)
- Green: healthy air
- Orange: close to alarm threshold
- Red: air renewal required

Ambient CO2 level

Date & Time

Room temperature

Ambient humidity

Functions' status
- Bluetooth ON (visible icon) or OFF (no icon)
- LoRa ON (visible icon) or OFF (no icon)
- Audible alarm ON △ or OFF ⧸△

User button
- Short press: instantaneous CO2 measurement
- 3-second press: Bluetooth activation
- 10-second press: product shutdown
  (short press to turn it ON)

CO2 audible alarm
Snooze with a short press on the user button

Two AA Lithium batteries provide more than 5 years of autonomy to Aura-CO2. The batteries are already installed, a short press on the user button and the device will start. Air quality data will automatically be collected in the room and send through the LoRaWAN network.

5. Configuration

Configuration of the product can be performed thanks to a mobile application available on Android and iOS. The links are hereafter, or it can be found by using the keywords "elichens aura".

GET IT ON Google Play — https://play.google.com/store/apps/details?id=com.elichens.auraco2

Download on the App Store — https://apps.apple.com/fr/app/aura-co2/id1565190899

Note: Smartphone Bluetooth must be ON.
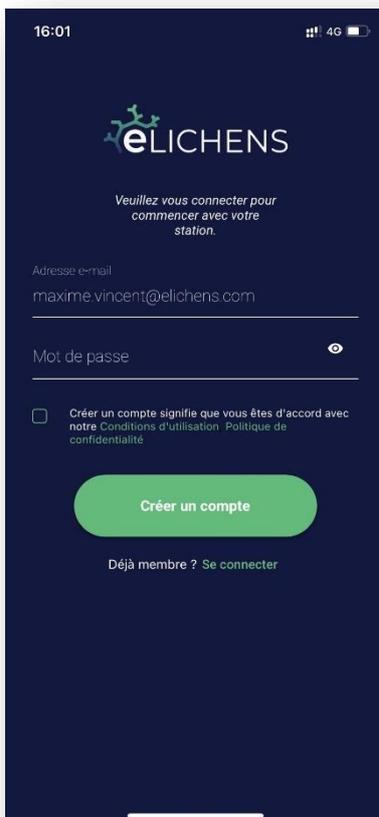
To use the mobile application, an account needs to be created, or an existing eLichens account can be used.

When choosing a password, the following rules have to be followed:

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

The account can be created directly on eLichens' Cloud too:

https://lab.elichens.com/register/

Station connection is performed through Bluetooth, by selecting "Add a new station" on the "Stations" screen.

After having selected "Add a new station", Bluetooth needs to be turned ON on the station. To do so, a long press (>3 seconds) on the user button is required. A short beep will be heard and the Bluetooth icon will be displayed on the station's screen.
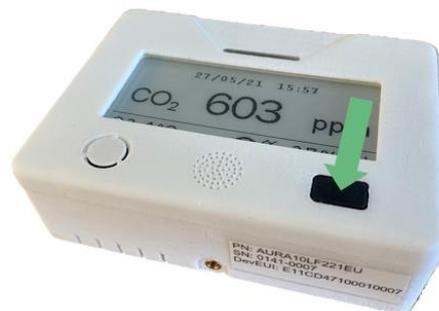
Long press (>3 seconds)
on the user button to
activate Bluetooth
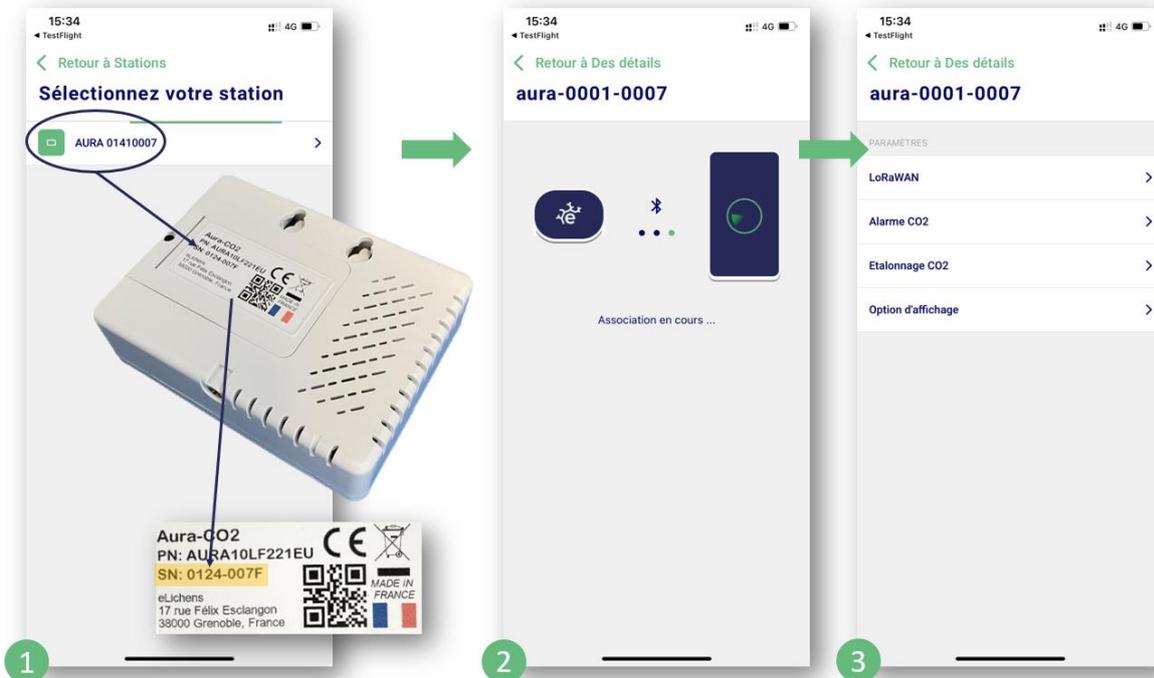
(1) Station ID will display in the browse menu,
(2) Station pairing is performed (it can take up to 10 seconds),
(3) The settings page opens, allowing the user to configure the station.

6. **Station settings**
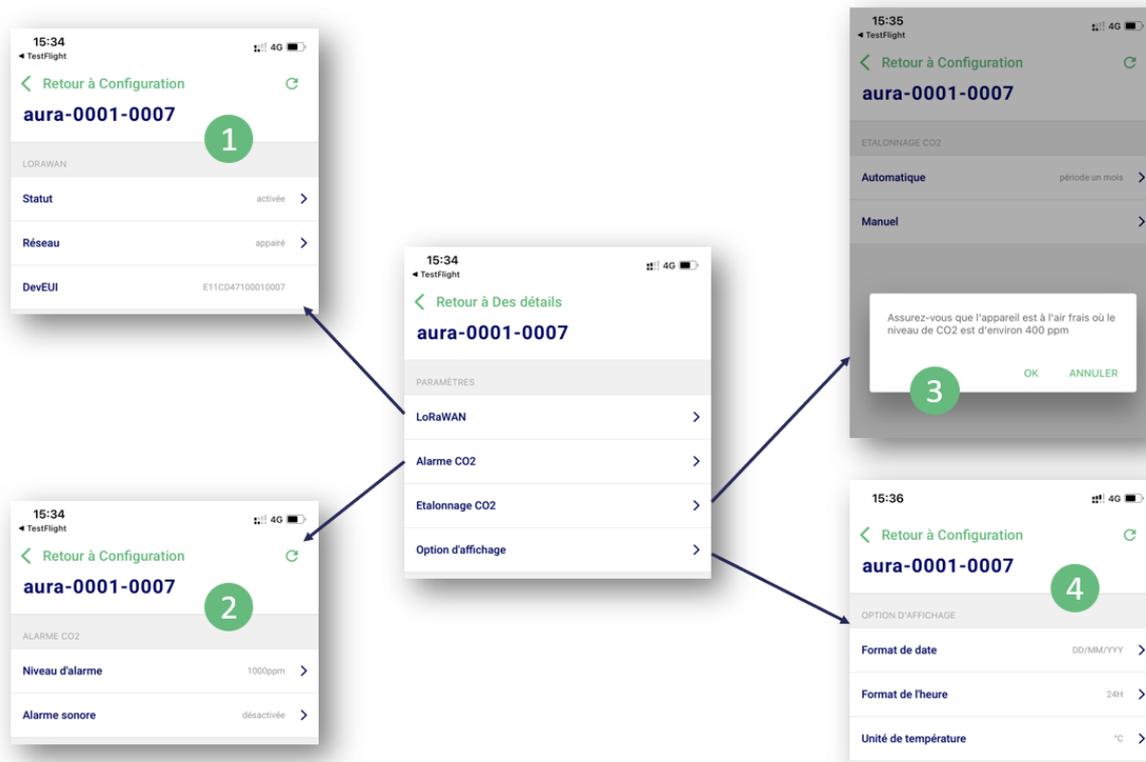
(1) LoRaWAN settings: the second line "Network" allows the user to pair the station with the LoRaWAN network. This step has to be performed at the first station installation, and every time the station is moved to a new place.

(2) CO2 alarm configuration. Alarm threshold can be configured, and audible alarm can be turned ON or OFF.

(3) CO2 sensor calibration: an automatic calibration check is performed every month. A manual calibration is possible too, in case an issue is detected. To perform it, place the station outside during a few minutes and then select "Manual" and select "OK".

(4) Date, time and temperature unit can be configured.

7. Main screen

The main screen is organized as follow:

Station location

CO2 level in the room (clickable)

Outdoor air quality index (0 – 100).
Low index = good outdoor air quality

Humidity, Temperature and Pressure measurements (clickable)
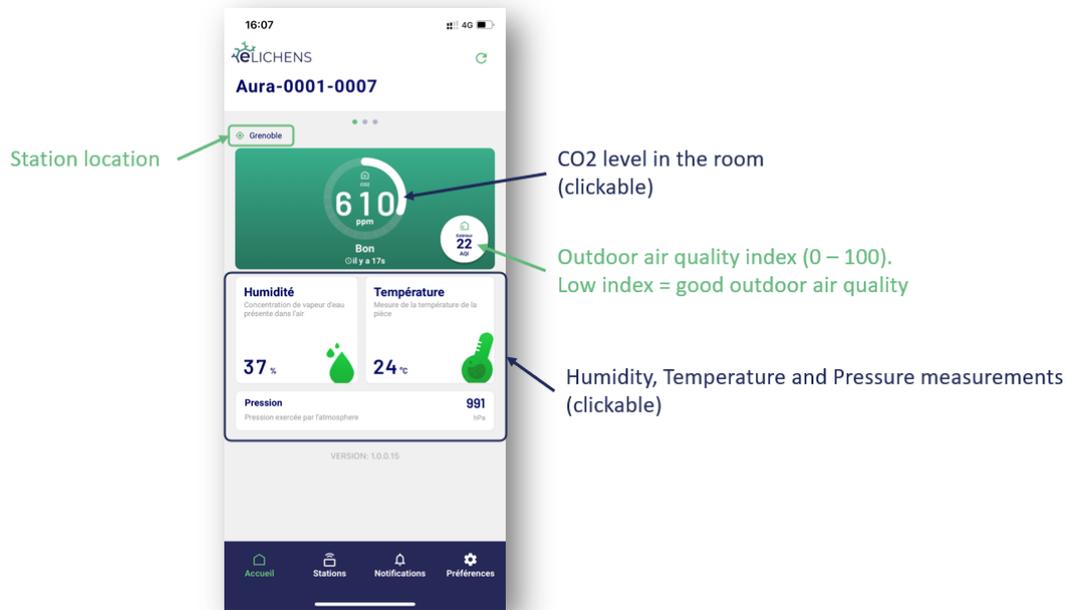
Navigation between screen can be performed as follow:

Lateral swipe: Navigation between stations

Stations' settings

Data history

(each block is clickable)
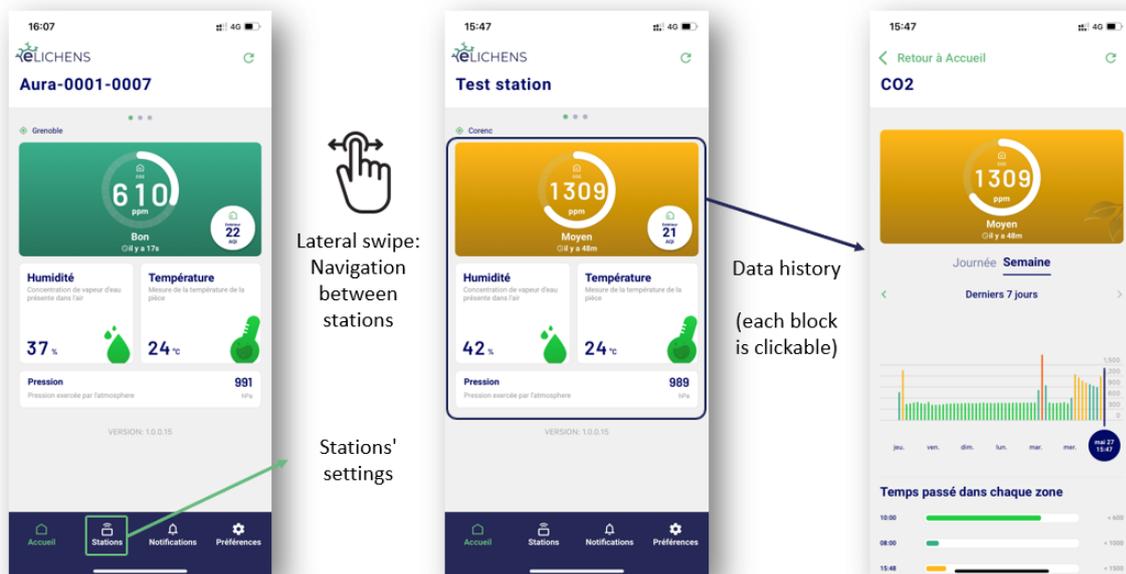
8. Station Fixation

The station is fixed either with 2 screws or with an optional anti-theft adapter.

8.1.   Standard Fixation

2x M4 screws, counterskunk head

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8.2.   Anti-theft Fixation (optional)

2 or 3 M4 screws, countersunk head

Anti-theft support
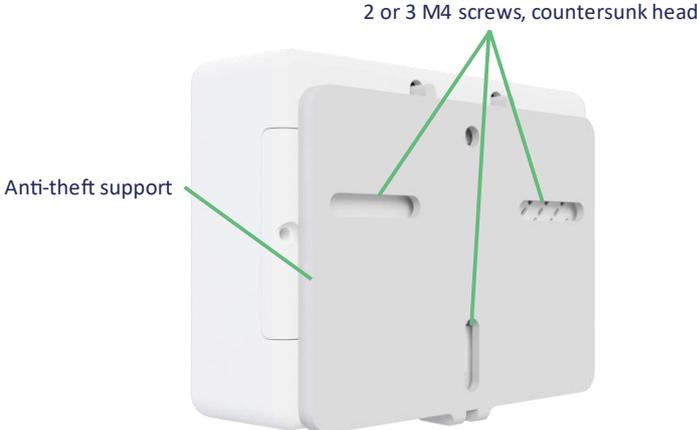
9. Maintenance

No maintenance processes are needed, AURA CO2 station was designed to work more than 10 years without any maintenance or calibration process, except for battery replacement.

This replacement must be done by formed employee and batteries must be those specified by supplier.

Please contact us for exact references.

10. LoRaWAN Frames

10.1. Uplink Frames

Sent every hour on port 1 without acknowledge.

Sensor information	CO2 H-45min	CO2 H-30min	CO2 H-15min	CO2 H-0mim	Temperature	Humidity	Pressure	Battery level
1 byte 1st bit: alarm (1=on alarm) 2nd bit: detector error (1=error detected in last hour) 3th bit: reserved 4..7: payload version = 2 WARNING: bits are MSB first	Unit: ppm/10 10 bits * 4 (5 bytes, unsigned) WARNING: each CO2 value is coded on 10 bits, MSB first.				Unit: 0.1°C 9 bits unsigned WARNING: bits are MSB first	Unit: % 7 bits unsigned WARNING: bits are MSB first	Unit: hPa 2 bytes unsigned	Unit: 0.01V (subtracted 1.50V) 1 byte unsigned

10.2. Downlink Frames

The product is configurable thanks to downlink frames. All app setups are available with those commands. Those frames are referenced and downloadable following this link. Answer on port 3, without acknowledge.

11.   Web data access

All the collected data can be accessed through a dedicated web interface too, available here:

https://lab.elichens.com/

All the connected stations 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.

12. Upgrade Firmware

To have the latest Firmware, please connect a smartphone with AURA app to the concerned station. Then choose "Upgrade" menu:
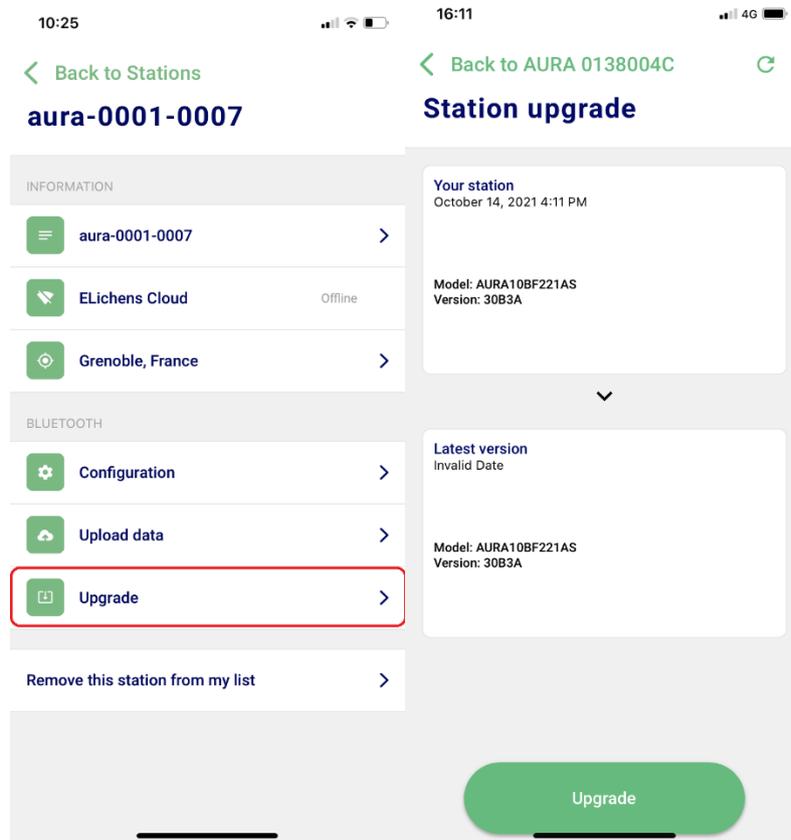
A warning message pop up on the screen warning about not interrupting update procedure (by disconnecting Bluetooth, rebooting phone, low-battery shutting down, closing app …). Once ready, select "Start".
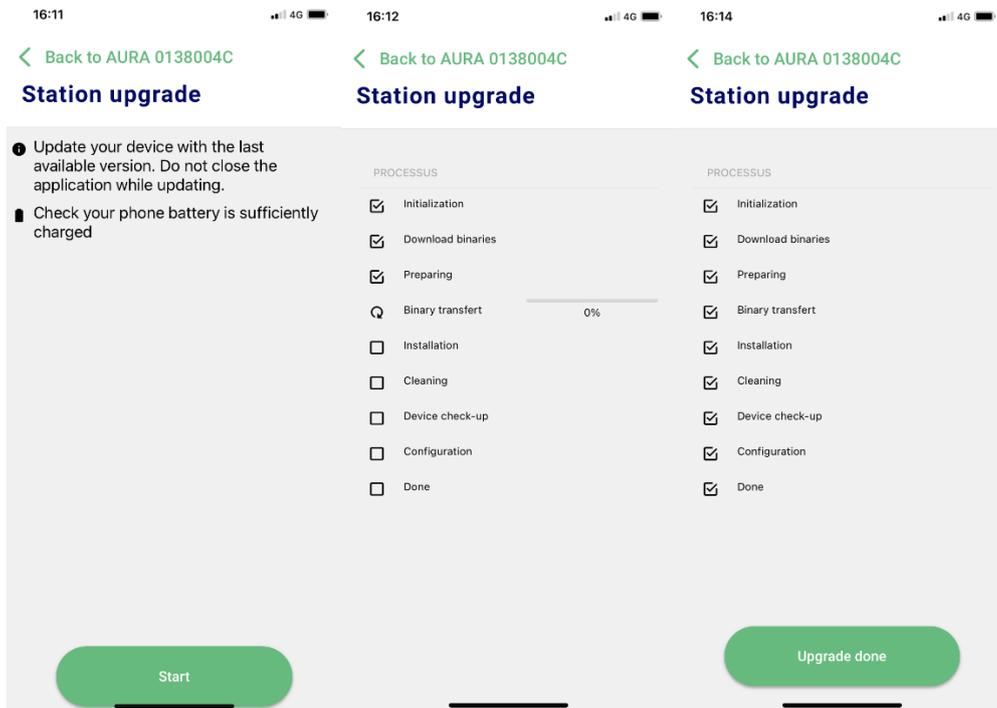
The upgrade process will go on. Once done, click on the button labelled "Upgrade done".

13. Data Update

To update the last 14 days of AURA CO2 data, please connect a smartphone with AURA app to the concerned station. Then choose "Upload data" menu:
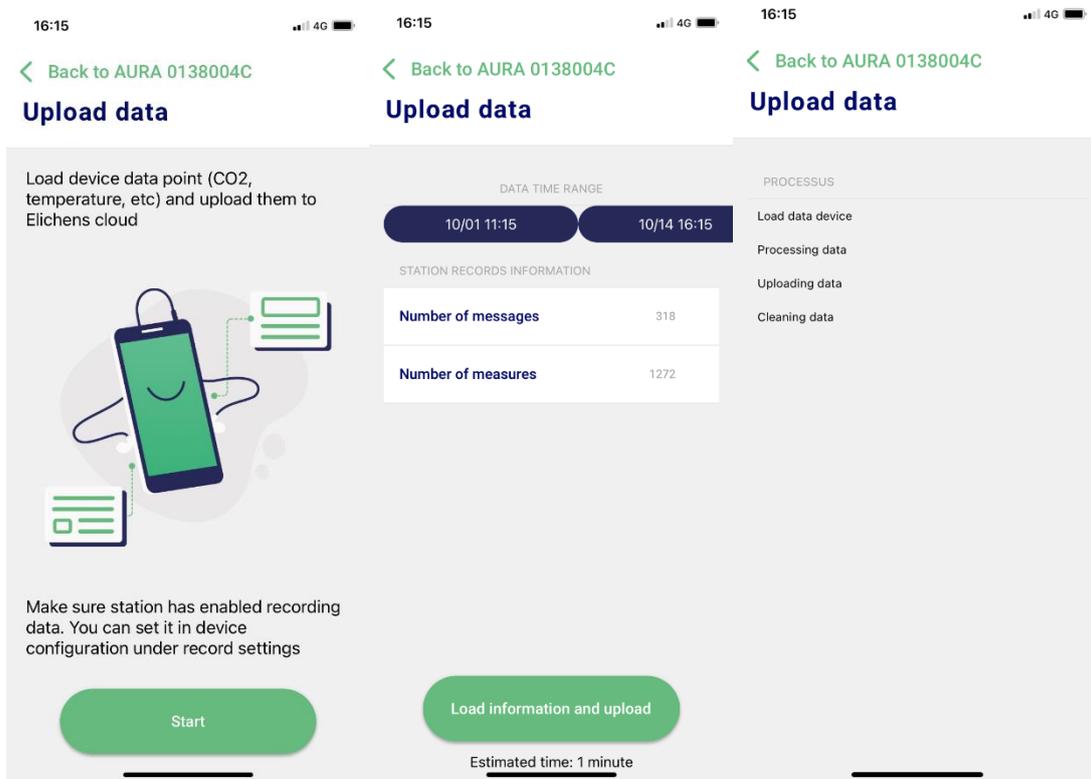
A warning message pop up on the screen warning about not interrupting update procedure (by disconnecting Bluetooth, rebooting phone, low-battery shutting down, closing app …). Once ready, select "Start".

For more information, please contact:

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