MICA/MICA Lite 2023

User Manual

inBiot

V1.2 10/02/2023

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1. General product description

MICA is a smart monitor that measures indoor air quality continuously. This device measures up to 9 parameters: temperature, humidity, carbon dioxide, suspended particles (PM10, PM4.0, PM2.5, and PM1.0), formaldehyde, and volatile organic compounds.

The device communicates wirelessly with the My inBiot web platform, allowing the user to know the indoor air quality of the room in a given period, consult the history of values and obtain information of interest for each parameter.

Depending on the version of the MICA, the device can be placed on a tabletop or installed on a wall.

In addition, the MICA device connected to the dashboard allows users to view the evolution of air quality in real-time, access weekly reports, and receive alerts, tips, and insights about managing indoor air quality when problems arise.

There are two device “models”: MICA, which measures all parameters, and MICA Lite, which only measures temperature, humidity, CO_2 and PM2.5.

Each of these models can be found in two versions: Desktop, which is prepared to stand on a desk or flat surface and is connected via USB Type C, and the Wall version, which is prepared to be installed either embeded to que wall with an electrical box or screwed directly into the wall, with alternate power.

MICA

MICA Lite

Wall

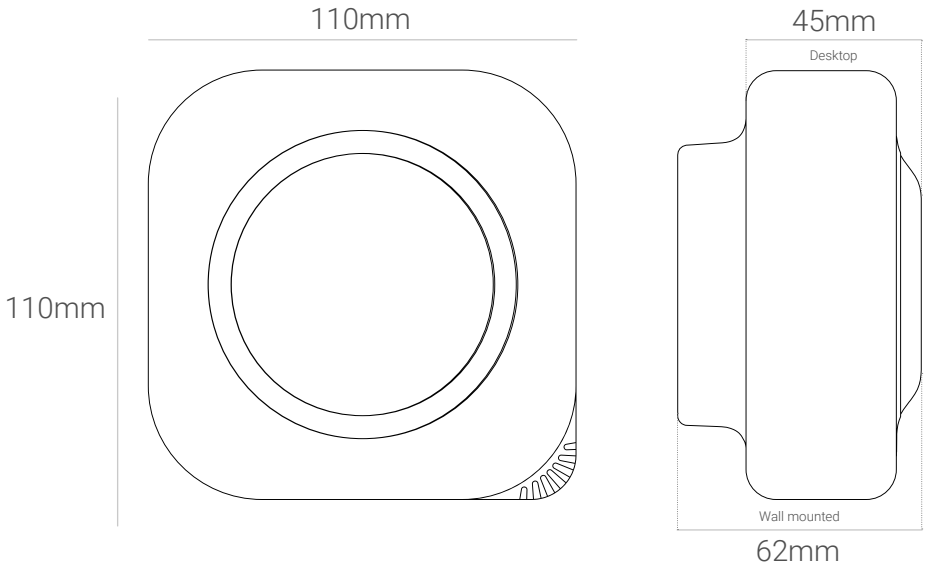
Desktop

2. Technical characteristics

Features

MICA 2023 version.
For indoor use.
Material: PC-ABS plastic with UV protection.
Multifunction touch button.
Status light LED ring.

Dimensions and weight



Weight: 250 grams

Power

USC type C connector (5V) (desktop use).
Fast 110 - 240V AC 50 Hz 0.2A connector (wall installation).
Fast 8 - 36V DC 2A 10W conncetor (wall installation).

Connectivity

Wi-Fi (2.4 GHz up to 150 Mbit/s).
GSM (2G SIM) (wall installation).
LoRaWAN (wall installation).

Communication

Modbus RTU (wall installation).
Modbus TCP (wall installation).

3. Sensors

MICA Lite

Temperature

Unit: ºC / Range: -40 - 145 ºC
Precision: ± 0,5 ºC

Humidity

Unit: %RH / Range: 0 - 100 %RH
Precision: ± 2 %RH

CO_2

Sensor technology: NDIR
Unit: ppm / Range: 0 - 5.000 ppm
Precision: ±(50 + 3% m.v.) ppm
Lifespan[1]: >10 years

$PM_{2,5}$

Sensor technology: Particle laser
Unit: µg/m^3 / Range: 0 - 1.000 µg/m^3
Precision: ±5% m.v. & 5 µg/m^3 (0 -100 µg/m^3), ±10% m.v. (101-1000 µg/m^3)
Lifespan: >10 years

[1] Lifespam is based on the average lifetime of the sensor, at which the specified accuracy is guaranteed. After the indicated years, it is recommended to replace the sensor to guarantee the accuracy of the measurement.

MICA

Temperature

Unit: ºC / Range: -40 - 145 ºC
Precision: ± 0,5 ºC

Humidity

Unit: %RH / Range: 0 - 100 %RH
Precision: ± 2 %RH

CO_2

Sensor technology: NDIR
Unit: ppm / Range: 0 - 5.000 ppm
Precision: ±(50 + 3% m.v.) ppm
Lifespan[1]: >10 years

Formaldehyde

Sensor technology: Electrochemical
Unit: µg/m^3 / Range: 0 - 1228 ug/m^3
Precision: ±25 µg/m^3 or ±20% m.v., whichever is higher.
Lifespan: >6 years

COVs

Sensor technology: MOx
Unit: ppb / Range: 0 - 60.000 ppb
Precision: ± 15%
Lifespan: >10 years

$PM_{2,5}/PM_{1,0}$

Sensor technology: Particle laser
Unit: µg/m^3 / Range: 0 - 1.000 µg/m^3
Precision: ±5% m.v. & 5 µg/m^3 (0 -100 µg/m^3), ±10% m.v. (101-1000 µg/m^3)
Lifespan: >10 years

PM_4/PM_{10}

Sensor technology: Particle laser
Unit: µg/m^3 / Range: 0 - 1.000 µg/m^3
Precision: ±25 µg/m^3 (0 -100 µg/m^3), ±25% m.v. (101 - 1000 µg/m^3)
Lifespan: >10 years

[1] Lifespam is based on the average lifetime of the sensor, at which the specified accuracy is guaranteed. After the indicated years, it is recommended to replace the sensor to guarantee the accuracy of the measurement.

4. Indicators

My inBiot indicators

IAQ

MICA has an Air Quality Indicator (IAQ), which calculates the air quality based on the device's parameters: temperature, humidity, carbon dioxide, suspended particles, formaldehyde, and volatile organic compounds. The indicator provides a score on a scale from 0 to 100:

- 100 - 81 IAQ Very good
- 80 - 61 IAQ Good
- 60 - 41 IAQ Medium
- 40 - 21 IAQ Poor
- 20 - 0 IAQ Very poor IAQ

Ventilation

Both MICA and Mica Lite also have a Ventilation Indicator, which measures the real time need for ventilation in an indoor space, represented in 3 levels and based on the CO_2 levels of the space.

Virus

Lastly, both devices have a Virus Indicator too. This indicator measures real time probability of a virus spread in an indoor space, represented on a scale from 1 to 10, and based on temperature, relative humidity, CO2 concentration and Particulate Matter (PM) of up to 2.5 microns.

Light Indicator

MICA and MICA Lite devices have an LED ring indicator at the front, which indicates the actions that need to be taken based on the CO_2 lavels of the space.

Ventilation is not necessary

Ventilation is recommended

Ventilation is required

5. Levels and Recommendations

Temperature

A comfortable temperature range is 21 to 25ºC, according to the RITE (Spanish Thermal Installations Regulation), 21 - 23°C in winter and 23 - 25°C in summer; however, these parameters can be increased and/or decreased depending on the rest of the variables that condition comfort.

My inBiot ranges:

- GREEN: 20 - 23°C
- YELLOW: 24 - 26°C / 18 - 20°C
- RED: > 26°C or < 18°C

Humidity

The ideal relative humidity for a normal indoor temperature in a living space is between 45 and 50% humidity, with a recommended range between 40 and 60%.

My inBiot ranges:

- GREEN: 40 - 60 %
- YELLOW: 30 - 40% / 60 - 70%
- RED: < 30 % or > 70%

Carbon dioxide (CO_2)

In outdoor environments, the CO_2 concentration level is approximately 350 - 400 ppm (parts per million). An environment is considered “loaded” at values above 800 - 1,000 ppm. Above 2,000 ppm it is considered highly charged and symptoms related to headache, fatigue, and general apathy occur. The most serious effects occur at 5,000 ppm and above, when fainting may occur.

My inBiot ranges:

- GREEN: < 800 ppm
- YELLOW: 800 - 1.500 ppm
- RED: > 1.500 ppm

Formaldehyde

The limits established in Spain for short-term occupational exposures (VLA- EC) are 0.3 ppm or 370 µg/m³. However, there is no reference value for residential interiors. The technical standard for measurement in Bioconstruction SBM2015 lists the following indicative values for formaldehyde concentration in indoor air for sleeping areas:

- Not significant: < 20 µg/m³.
- Weakly significant: 20 - 50 µg/m³.

- Strongly significant: 50 - 100 µg/m³.
- Extremely significant: > 100 µg/m³.

The ranges of values used in the MICA device as indicators are collected considering the SBM values for resting areas as well as the values above which allergic and sensitizing reactions occur:

My inBiot ranges:

- GREEN: < 70 µg/m³.
- YELLOW: 70 - 120 µg/m³.
- RED: > 120 µg/m³.

Volatile organic compounds (VOCs)

The AGÖEF (German Association for Ecological Research) has been working since 1993 to develop reference values for chemical compounds in both air and dust samples.

The recommended limits are:

- P50 - 50th percentile. Normal value. Not considered sufficient evidence for urgent action TVOC < 360 µg/m³.

- P90 - 90th percentile. Attention value. Emitting source present - TVOC < 1,572 µg/m³.

- Guidance values - Reference value equivalent to values derived from toxicological risk TVOC = 1,000 µg/m³.

The ranges of values used in the MICA device as indicators are collected considering the values of the German Federal Environmental Agency, above which, depending on the exposure time, may result in allergic and sensitizing reactions, hypersensitivities, or diseases of various pathologies.

My inBiot ranges:

- GREEN: < 220 ppb.
- YELLOW: 220 - 660 ppb.
- RED: > 660 ppb.

Suspended Particulate Matter (PM1.0, PM2.5, PM4.0 & PM10)

Current EPA (U.S. Environmental Protection Agency) standards recommend maximum values for PM2.5 of 35 µg/m³, although they reduce the total annual values to 12-15 µg/m³. The EU sets maximum limits of 25 µg/m³ for PM2.5, although with the prospect of increasing the restriction.

My inBiot ranges:

PM1.0, PM2.5 & PM4
- GREEN: < 15 µg/m³.
- YELLOW: < 35 µg/m³.
- RED: PM2.5 >= 35 µg/m³.

PM10
- < 50 µg/m³.
- < 100 µg/m³.
- >= 100 µg/m³.

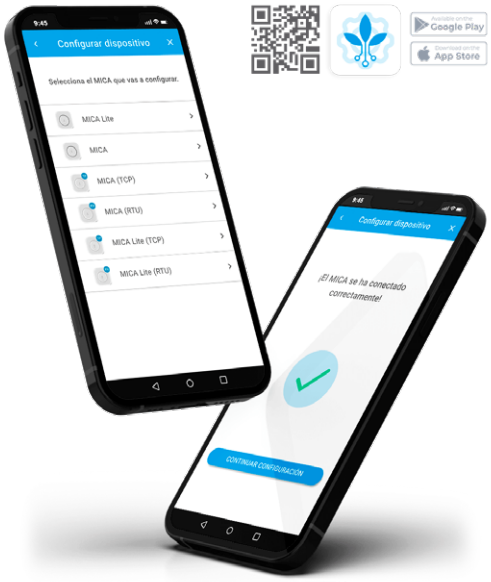
6. Instalation

To install the MICA on a wall, follow the steps found in the Installation Manual. This manual can be found at inbiot.es/soporte in the “Documentation” tab.

7. Configuration

Configuring MICA

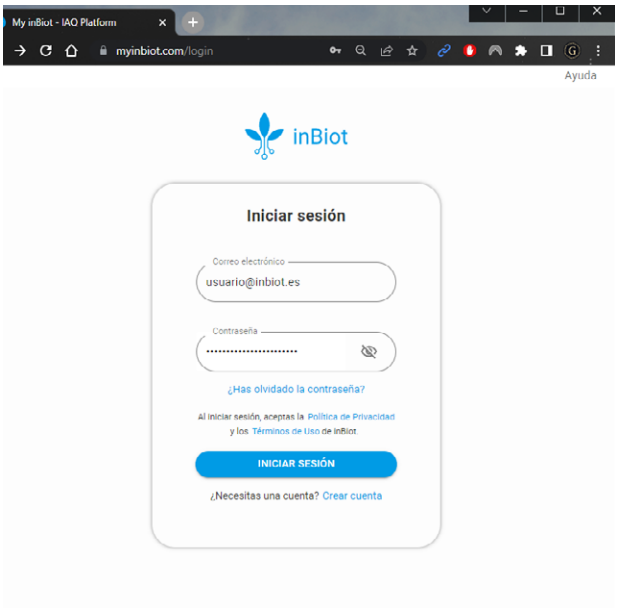
To configure MICA, you must download the configuration app and follow the steps indicated. If you need help you can watch the video tutorial available at inbiot.es/support in the “Configuration” tab.



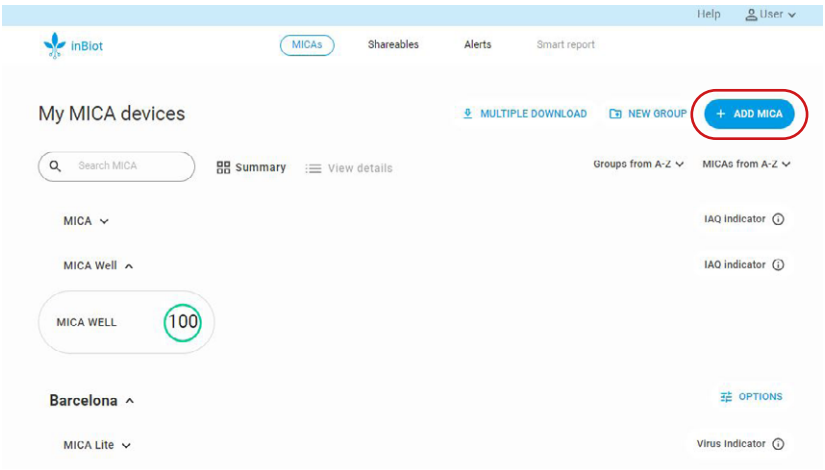
Adding MICA to My inBiot

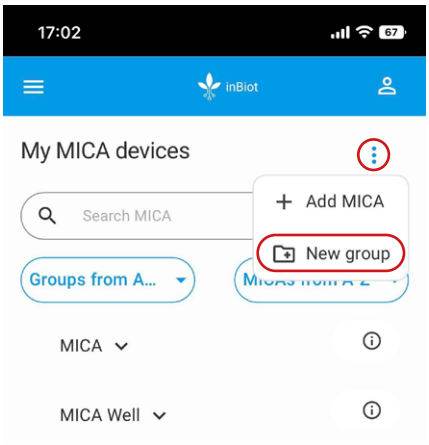
Once the MICA is configurated, it can be added to the My inBiot web platform as follows:

1. Go to myinbiot.com and log in or create an account if you do not have one.



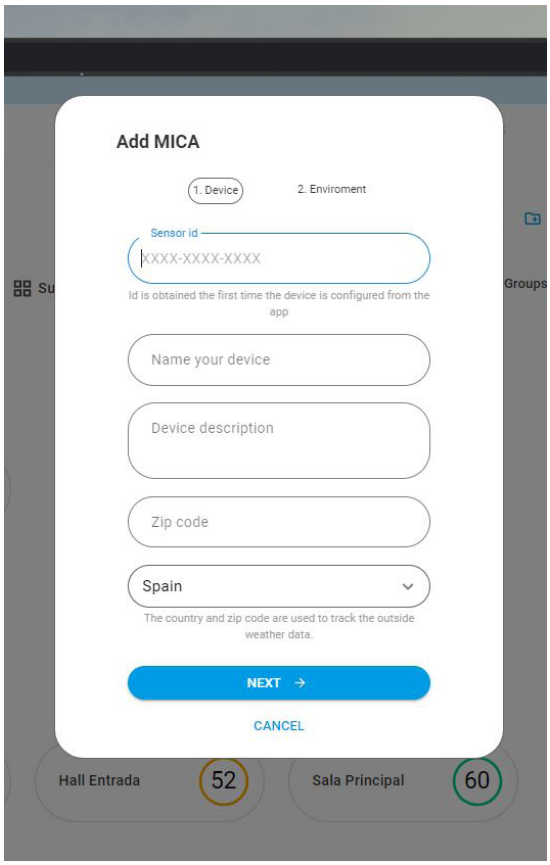
2. On the My inBiot home page, click on the “ADD MICA” option. For mobile devices, click on the three dots ⋮ next to “My MICA devices”.

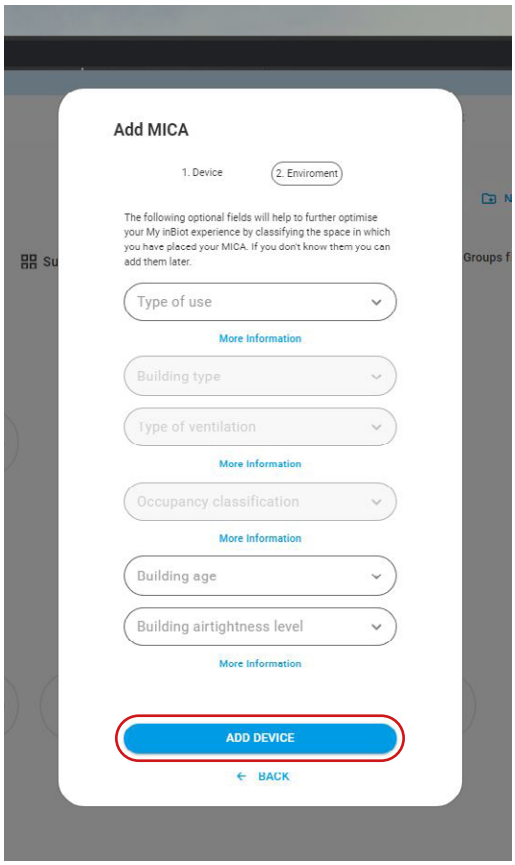




3. Fill in the requested information and click on “ADD DEVICE”.

Note: The sensor ID was obtained earlier when finalizing the MICA configuration in the app.





8. Device operation

Powering MICA

The first time you plug in the device, the white LED ring will light up and start flashing until the following happens:

1. A) If the MICA has been previously configured:

    - If the connection to the Wi-Fi network fails: It goes into access point mode with the LED ring turning blue.

    - If the connection to the Wi-Fi network is successful: It flashes green 3 times and then turns white (reading data) until it turns into another color depending on the indoor air quality (green, yellow or red).

    B) If it has never been configured before: It switches to the access point with the LED ring turning blue for 5 minutes.

2. Access point: Lasts for 5 minutes and is indicated by the LED ring turning blue: 

    - If the user's connection to the device through the app fails: flashes red 3 times and then returns to the access point.
    - If 5 minutes pass and no action is taken: flashes blue 3 times, then the LED ring turns off for X seconds and turns on again depending on indoor air quality (green, yellow, red) without being connected to the platform (no data sent or received).
    - If the user's connection to the device through the app is successful: It will stay steady blue until the configuration is finished.

4. If everything went well when the configuration is finished the LED ring will turn white until the device reads the indoor air quality.

5. Once the device reads the indoor air quality, the LED ring will turn to the corresponding color: green, yellow, or red.

Connection status

To check if the device is connected to the Wi-Fi network, press twice in succession the touch button located on the MICA logo.

- If connected: The LED ring flashes green 3 times (and returns to the previous state).
- If not connected: The LED ring flashes red 3 times (and returns to the previous status).

Note: This indicates if the device is connected to Wi-Fi, not to My inBiot.

Sending data

To send data to My inBiot manually, press once the touch button located on the MICA logo.

Upon pressing the button, the LED ring will turn white and then return to the previous state.

Updates

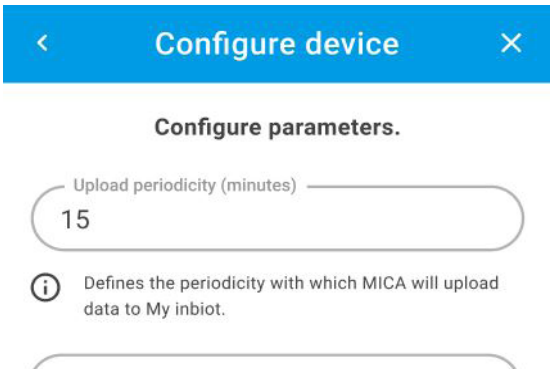
When the device is updating, the LED ring will turn pink.

Taking measurements

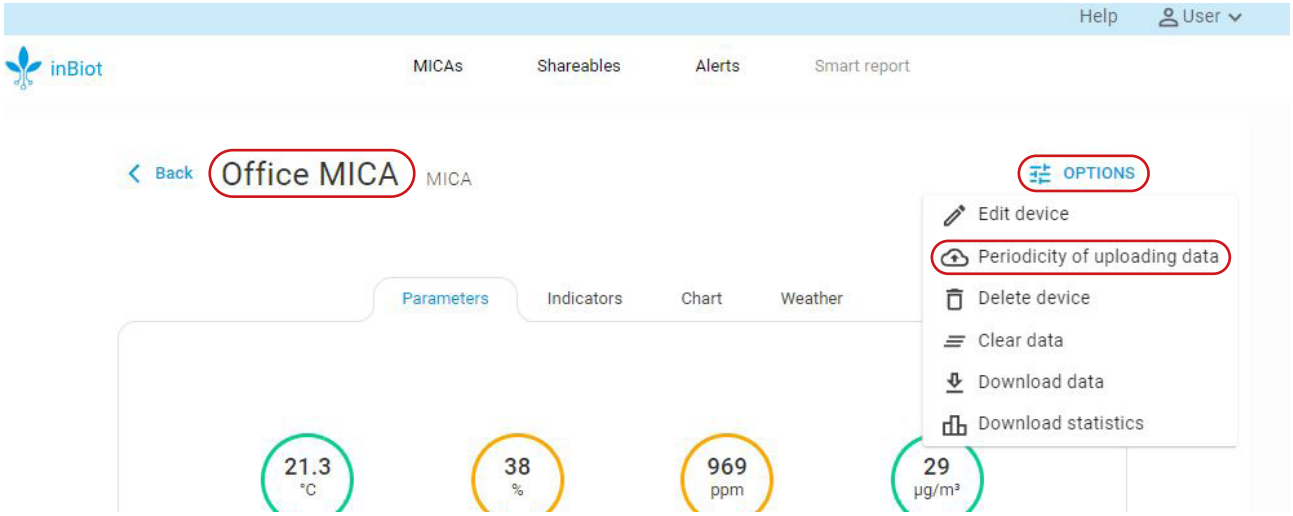
The MICA device will record the measured parameters in the web platform with the selected time interval. Depending on the type of account you have, you can choose a longer or shorter time interval. The Basic account allows settings between 10 and 15 minutes, whereas the Business account allows settings between 1 and 15 minutes for WiFi connectivity and between 3 and 15 minutes for GSM connectivity.

The process of configuring the upload periodicity can be done from two places.

1. When the device is configured for the first time, there is a section that says “Upload periodicity (minutes)”. Here, you can select the upload time interval you want for your data to be uploaded to My inBiot.

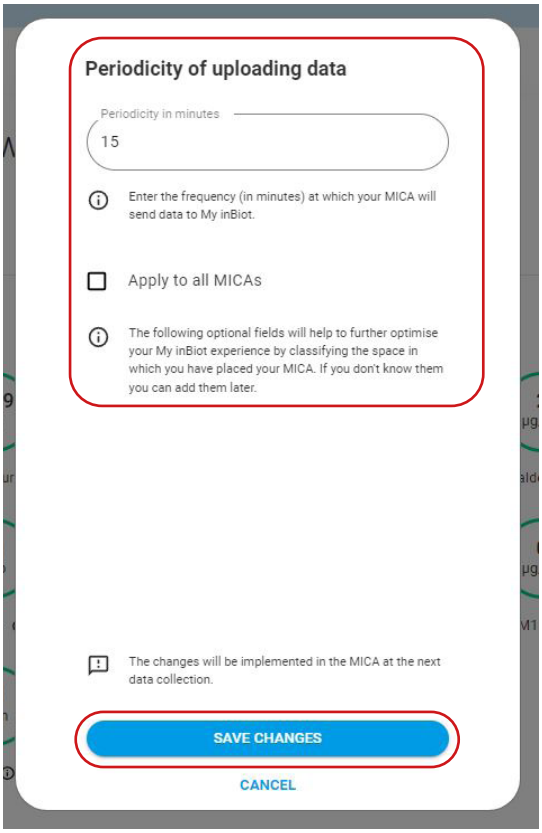


2. Within the My inBiot platform: Go to the device you want to change the upload periodicity and select “OPTIONS” in the upper right margin. Then, select the “Periodicity of uploading data” option.



Up next, a new window will appear where you can define the time between data uploads and select this setting for all devices or only the current one.

Finally, select 'SAVE CHANGES'.



9. My inBiot Web Platform

You can access My inBiot Web Platform through the following link: www.myinbiot.com/login.

The first time you access the platform, you will need to create an account and password, which you will use to log in each time you access the platform. Within an account, you can have as many devices as you wish.

In the My inBiot web platform you will be able to:

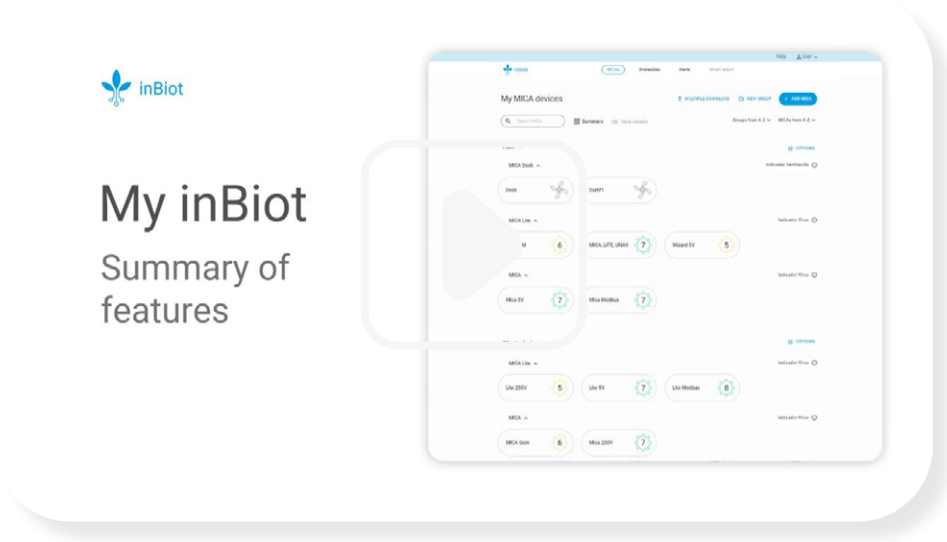
- Consult the parameters in real time.
- View the evolution of the parameters over time: hours, days, and weeks.
- Consult the information on each parameter to know its effects on health, the possible sources of contamination, and recommended ranges.
- Download data for analysis in another application.
- Give access to several clients through a shareable link, which you can also use to display the data on screens for events or offices.

Additionally, the My inBiot Business account gives access to more functionalities. This option has an annual subscription fee and includes:

- The ability to configure data collection from 1 minute onwards.
- The ability to download historical data without time limitations.
- The ability to perform multiple downloads of several devices in weekly groups of up to one week.
- To be able to create groups of devices to organize them.
- To be able to create customized alerts when exceeding a certain value previously configured.
- To be able to download statistics.

Using My inBiot

To learn about the basic functionalities of the platform and the pages that compose it, access the video Summary of features.



10. Calibration

The calibration process of MICA devices has several phases, from the manufacturer's warranty of the sensors, remote correction of some sensors, and modular design for sensor replacement based on the life span of eachspecific sensor.

This process allows for:

- Regular maintenance according to the specific requirements of each user.
- The reduction of measurement variations between different devices, both in the short and long term.
- Long-term stability of measurements.

Manufacturer's warranty

The design of MICA devices includes a curated selection of specific sensors. All sensors are calibrated by the sensor manufacturer itself, with a corresponding warranty.

Self-calibration of sensors

Additionally, some sensors, such as CO_2 or VOC, have an automatic self-calibration process by software.

- Carbon dioxide

  MICA's carbon dioxide sensor is an NDIR (non-dispersive infrared) sensor, which uses gas spectrometry to measure CO_2 concentrations. NDIR sensors are not susceptible to the physical degradation of the sensor, as they do not produce chemical reactions on their surface.

  Like any sensor, NDIR sensors will begin to drift over time. However, it is possible to use the 400-ppm outdoor air reference for self-calibration or remote correction. Depending on the type of ventilation selected in the MICA device configuration, an automatic self-calibration period of between 24 and 48 hours will be set, correcting the lowest average value during this period in relation to the outdoor reference.

  The CO_2 sensor also requires at least one complete cycle of 24-48 hours of continuous use to activate this automatic self-calibration. Once this period has elapsed, the device saves the setting and does not need to be recalibrated in the event of a power failure.

  During the initial period of calibration activation, the readings will fluctuate, and once completed, the data measured by the MICA will be automatically adjusted.

- Volatile Organic Compounds

  The VOC sensor requires an initial 12 h calibration and has a bi-weekly automatic calibration with exposure to outside air for 30 minutes. Unlike the CO_2 sensor, calibration data is not saved in case of power failure. Therefore, it is necessary to respect the 12 hours of calibration in order to have reliable reading values.

11. Safety instructions

Cleaning and storage

- To clean the device, you should use a damp cloth and mild detergent. Do not use solvents or abrasives.
- The device is intended for indoor use only and is not suitable for outdoor use.
- Store it in an area with moderate temperature and humidity: -5 °C to 50 °C (23 °F to 122 °F) and less than 90% relative humidity.
- Do not put the device in water.

Important safety notes

- The MICA device is developed for general-purpose air quality monitoring only and has not been certified for use in accordance with local or state carbon monoxide monitoring or alarm requirements.
- The MICA device has not been tested by an independent laboratory for compliance with UL 2034 or IAS 6-96. CO15-en-EN_v1.0 7/17 3.
- It is the customer's responsibility to obtain and apply current local, state, and national regulations regarding CO alarms, monitoring, and testing.

Indications - Warranty

The device comes with a 3-year warranty for products sold in Spain, 2 years for products sold within the EU/UK, and 1 year for those sold in the US/CAN and other countries.

If, after purchasing the device, you find any defect that is the responsibility of inBiot and not due to misuse, please contact our Customer Service team at support@inbiot.es and indicating the device ID, proof of purchase, date of purchase, and description of the fault. As soon as possible we will contact you to proceed with the repair or replacement of the device.

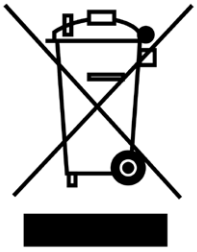
For devices that are out of warranty, we will be happy to repair or replace them according to inBiot's repair rates. Please contact our Customer Service team for more information.

In the event of damage caused by non-compliance with this manual, the warranty claim will be extinguished provided that:

- Has been modified by any party other than inBiot.
- Has been subject to accident or misuse.
- Hs been damaged during the installation of the product.
- Has been damaged by the system with which the product is used.
- Has been damaged by liquids.
- Has been damaged during transport to our facilities.
- Has been damaged in the interface or charging connections.
- Has been counterfeited: The warranty will only apply to products with an inBiot brand, serial number, and logo identifying it as such. The warranty does not apply to any product that was not manufactured by or with the permission of inBiot.

End of life

In the European Union, electronic equipment may not end up in household waste: it must be disposed of properly in accordance with Directive 2002/96/EC OF THE EUROPEAN PARLIAMENT AND THE COUNCIL of 27 January 2003 on waste electrical and electronic equipment (WEEE). At the end of its useful life, please dispose of this device in accordance with the legal regulations in force.



inBiot

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