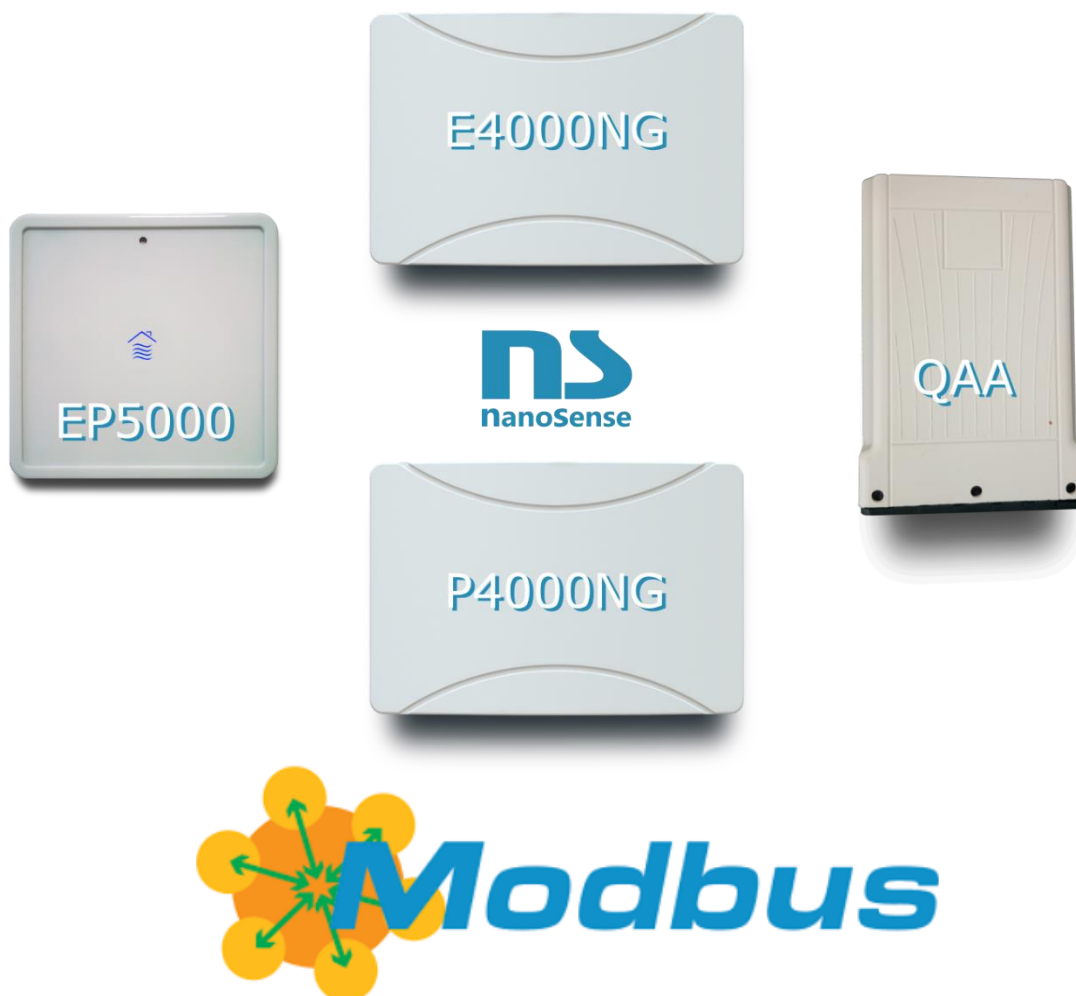


Data Logger Java



Ver	Date	Update
V1	23/07/2021	Initial Version
V3	10/05/2023	Installation added, EP5000MMx specificity
V4	17/05/2023	Complements

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1 Foreword

The "NanoSense Tools" PC software is mainly dedicated to "datalogger" via Modbus of NanoSense air quality probes. This tool allows integrators to validate their code developed for PLCs (programmable logic controller). It also allows to test the probes. The data saved on the PC is in CSV format. This is a universally applicable format for spreadsheets, like Excel.

Another function of this tool is to update the Firmware's probe via Modbus.

The tool also allows production of tests, exclusive to manufacturers (not described in this document).

2 Necessary items

2.1 PC

It is necessary to have a PC with Windows 7 or higher.

This software has been designed to work on both distributions, but it has only been tested on 64-bit Windows, if you have any problem installing it on a 32-bit configuration, please contact NanoSense: infos@nano-sense.com

2.2 USB Dongle

It is necessary to have a USB Modbus dongle to connect the ModBus link of EP5000Mx probes with a PC.

If you don't already have your own USB / ModBus dongle, it is possible to purchase one from NanoSense.

/!\ Some USB dongles require the driver's installation.

(This is not the case of the CH340 provided by NS whose Driver is normally already in the Windows basic libraries).

Example photo CH340 NanoSense:



You can also go to the following URL to get the driver (CH340):

<https://www.arduinoed.eu/ch340-windows-10-driver-download/>

2.3 ModBus Probes

To be able to communicate with NanoSense Datalogger, it is necessary to use the ModBus port of these devices:

- QAA
- E4000NG
- EP5000Mx (not compatible with VP versions: 0-10V)

Warning: The E4000NG probe is in Modbus master mode if it has a radio module. Disconnect it to switch it to Modbus slave mode.

/!\ For BELIMO ModBus Master versions (EP5000MMx), an additional necessary step is required to put the sensors in slave mode, see the corresponding chapter /!

3 Data logger NS installation

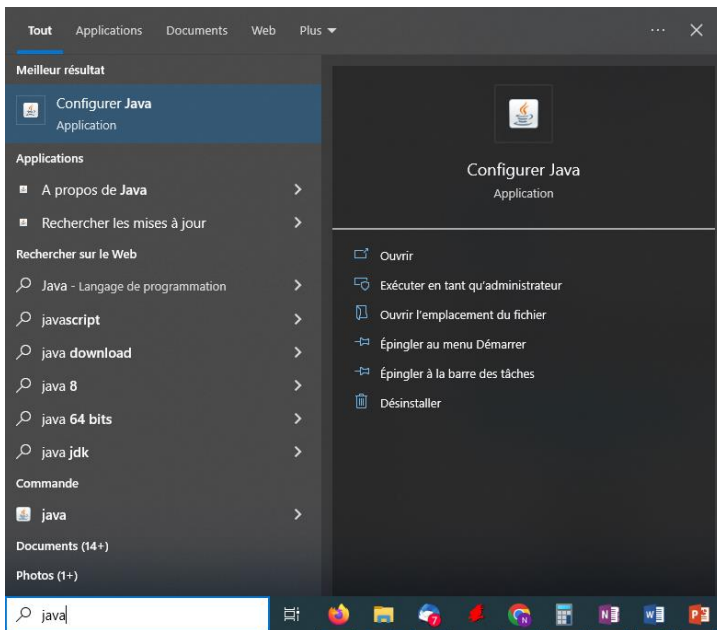
3.1 Install JAVA

NanoSense Datalogger needs JAVA to run.

Install the latest version of JAVA:

<https://www.java.com/fr/download/>

To check if JAVA is already installed, you can type "JAVA" in the Windows search box.



To check the version of JAVA already installed,
Open command prompt (Windows key + "cmd")
Type the command: Java -version

```
C:\> Invite de commandes

Microsoft Windows [version 10.0.19045.2965]
(c) Microsoft Corporation. Tous droits réservés.

C:\Users\R&D03>java -version
java version "1.8.0_281"
Java(TM) SE Runtime Environment (build 1.8.0_281-b09)
Java HotSpot(TM) 64-Bit Server VM (build 25.281-b09, mixed mode)
```

Here's an example

3.2 Install the NanoSense Toll software

Once Java is installed, launch the file NsToolsSetup_Vxxx.exe

Follow the installation steps.

It is possible to leave the installation folders proposed by default.

However, if there are any problems with launching the Datalogger, it is possible that the "standard" installation folders are protected. In this case, we recommend you to install the Datalogger in a more "accessible" area.

Example: C:\NS_Tools

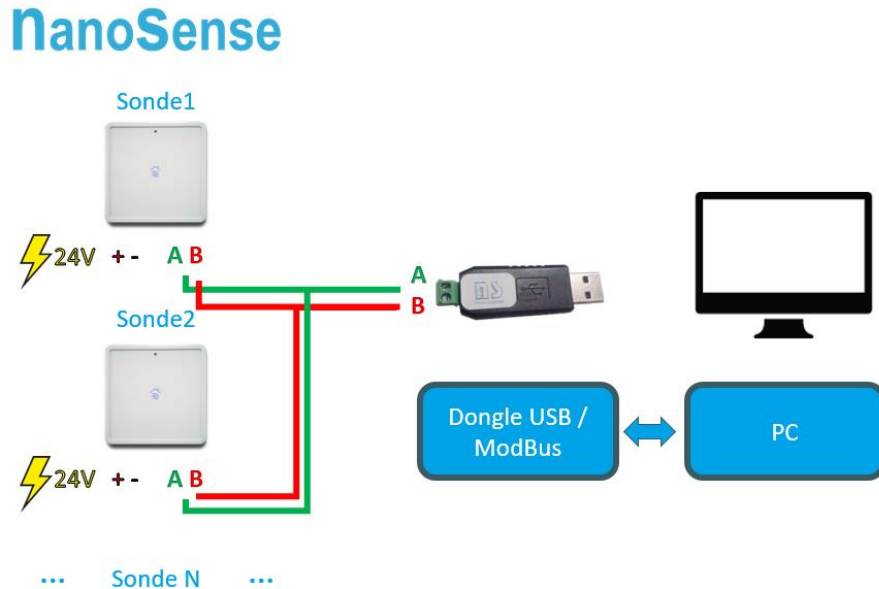
If a problem is encountered during these steps, please contact NanoSense.

Please note that the interface of NanoSense Datalogger is exclusively in English.

4 Wiring

The probes need to be powered (12-24V), wired (BUS) and have different Modbus Address, if many, and equivalent BUS parameters to operate on the same bus (BUS speed, parity ...).

Here is a scheme explaining the connection of N probes on a BUS:



BUS parameters of the EP5000, QAA and E400NGV2 probe can be changed using NanoSense NFC Application:

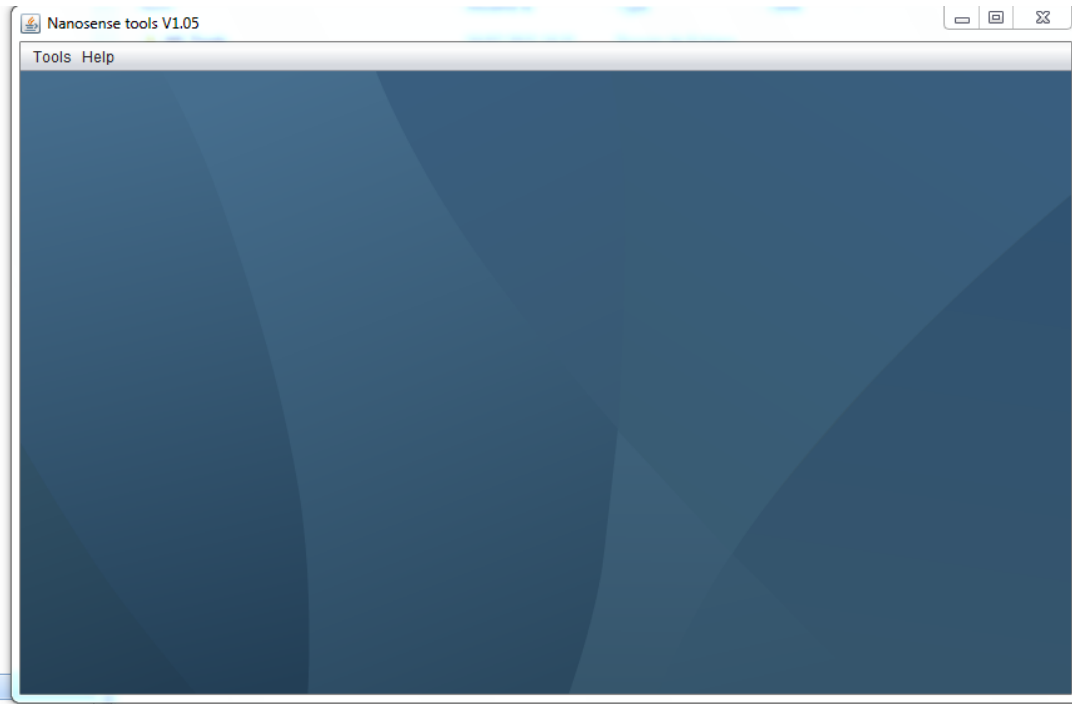
<https://play.google.com/store/apps/details?id=com.nanosense.nanosensev2&hl=fr&gl=US>

For E4000NG and P4000NG probes, the bus Address and type (RTU) can be changed using an LCD tool (speed and others for the P4000).

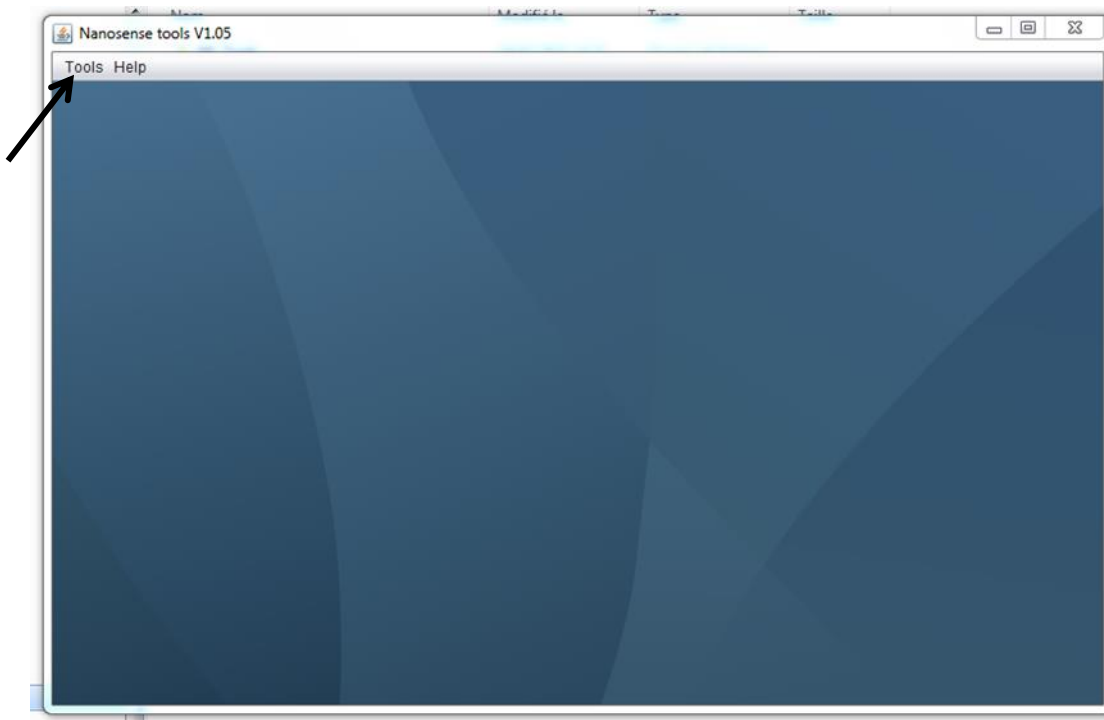
In case you mix up the port A and port B, this is not harmful for the devices, and in case the devices are not detected following a SCAN, even though they are well powered etc... Then it is possible to reverse the bus wiring and start all over again.

5 Datalogger Configuration

Once the software is installed and launched, the window opens on this empty page with two tabs (Tools and Help).



Click on the Tools tab to set up the software.



5.1 Choose the probe's Model

In the Tools tab, click on the "Loggers" tab and select the type of probes to communicate with.

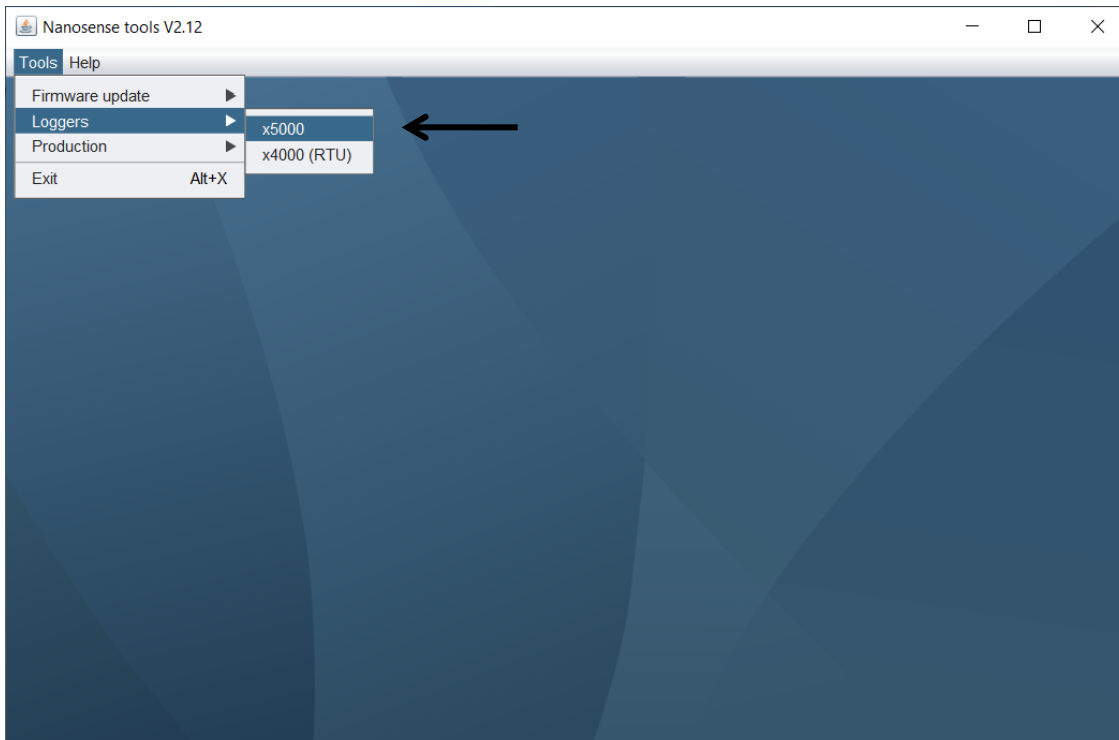
If X5000 is selected, it is possible to query:

- E5000XX probes.
- QAA probes.

If X4000 is selected, it is possible to query:

- E4000 and E4000NG probes.
- P4000NG probes.

In the example below, the EP5000XX probes are selected.



It is possible to:

- Connect EP5000MX and QAA probes on the same bus
- Connect E4000NG and P4000NG probes on the same bus
- Configure a serial port for EP5000MX and QAA
- Configure another serial port for E or P4000NG
- Probes on the same bus must be configured with the same bus speed, parity, etc.

After selecting the type of the probe, here is the section for setting up the data transmission between the probes and the software:

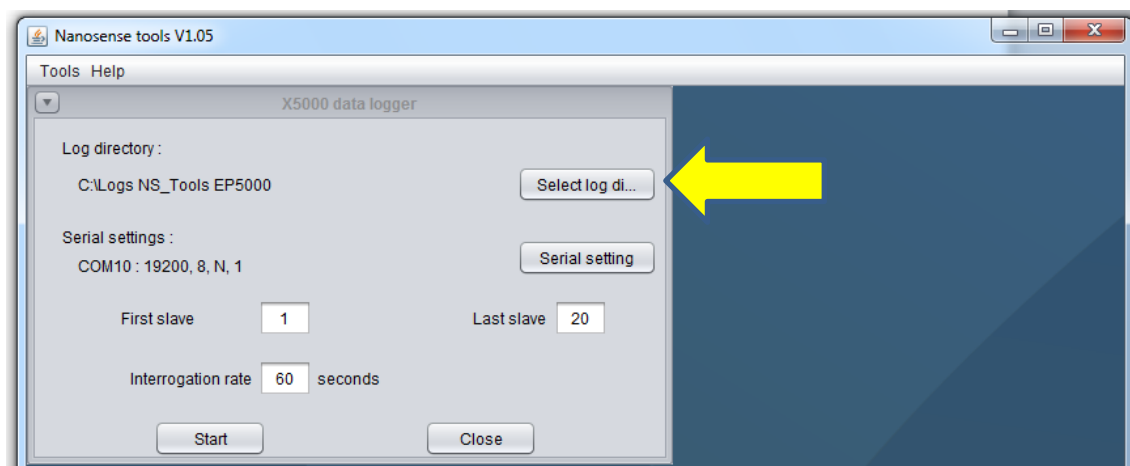
5.2 Choose the data storage folder

Before starting:

Select the folder in which you want to save the log file. (Select Log directory button).

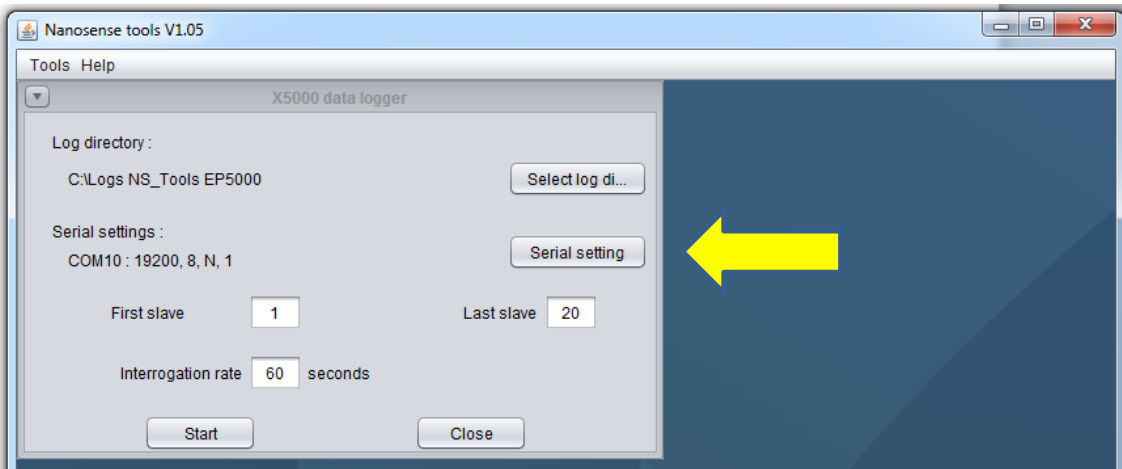
The name of the file will be generated automatically according to the following format:

YYYYMMDD_hh_mm_ss_probe.csv, example: 20210309_11_33_47_Ep5000.csv

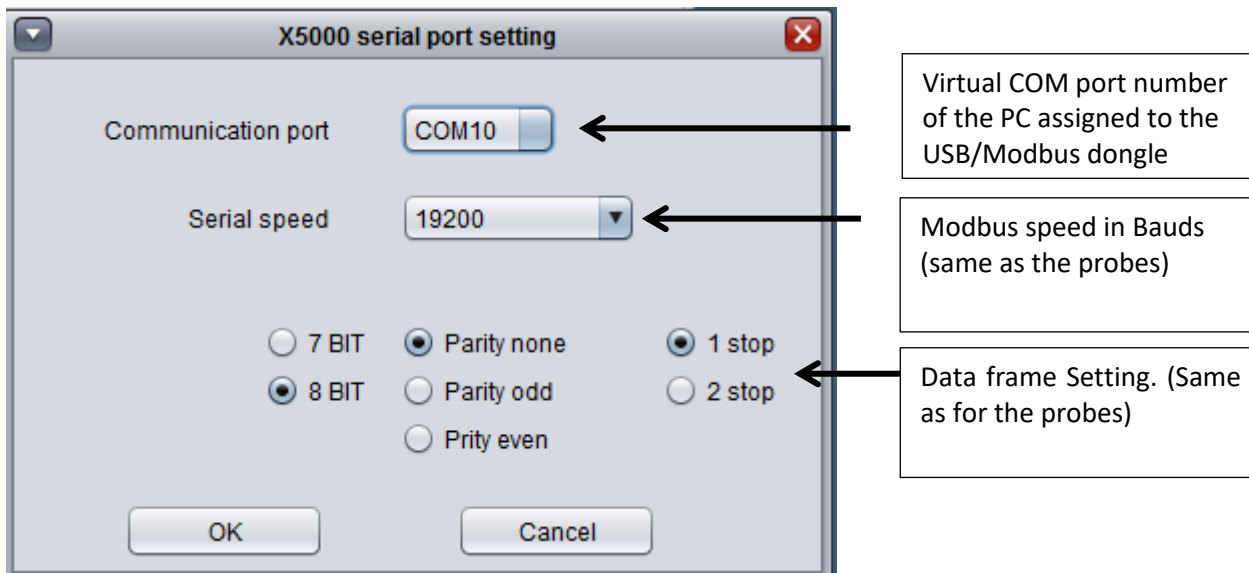


5.3 Serial Bus settings

The "serial settings" button concerns the Modbus master settings.



In "serial setting" there are various settings that ensure the proper transmission of information.



By default, the EP5000 & QAA probes are set as shown in the above picture:

Speed: 19200 bauds

Parity: None

Bit: 8

Stop: 1 STOP

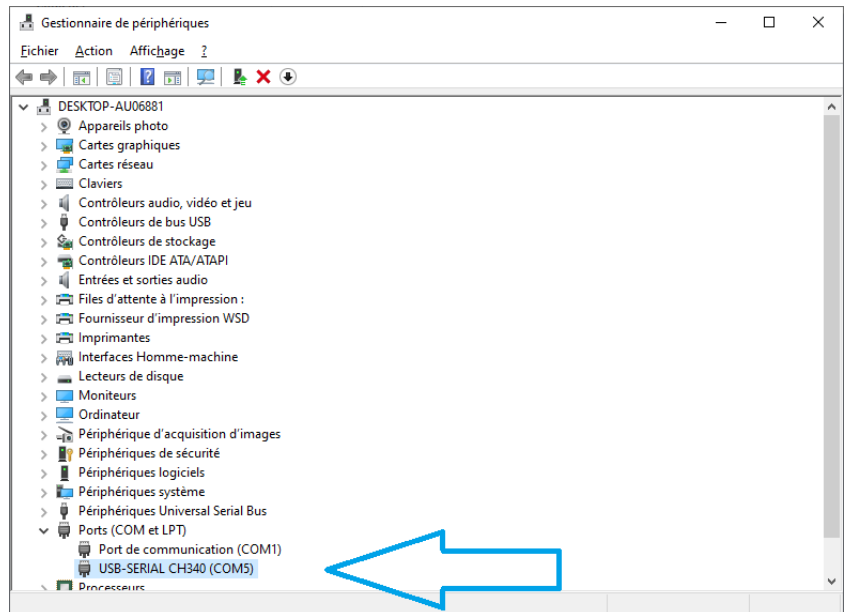
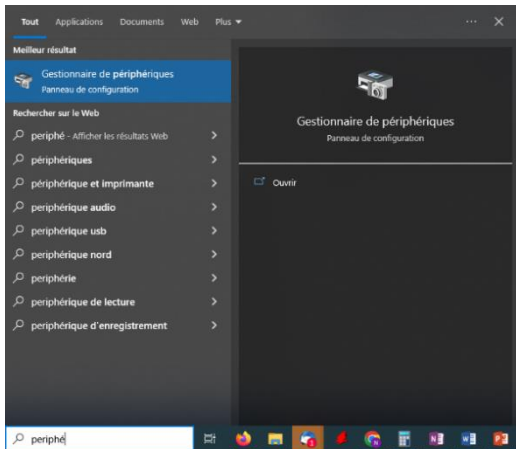
6 Identify the virtual COM port used

The list of used COM ports available in the Datalogger contains very few items and normally the right COM port is selected.

If you are still in doubt or if you have several USB dongles on the computer you are using, you can check the devices connected to a computer using the "Device Manager":

Look for the submenu "COM port and LTP".

In the hereunder example, the USB Dongle is identified as "CH340" and refers to COM port 5



It is quite possible to run several Datalogger instances that query several BUSES on several USB ports identified by different COM ports.

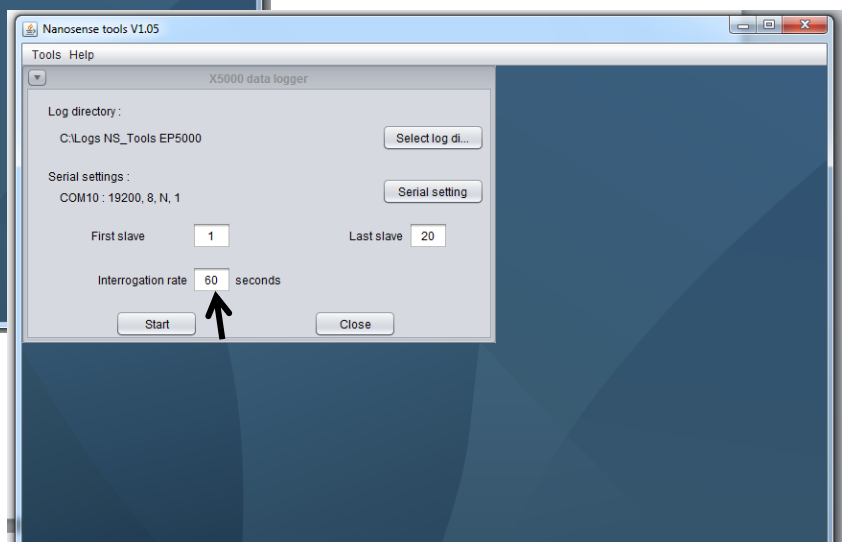
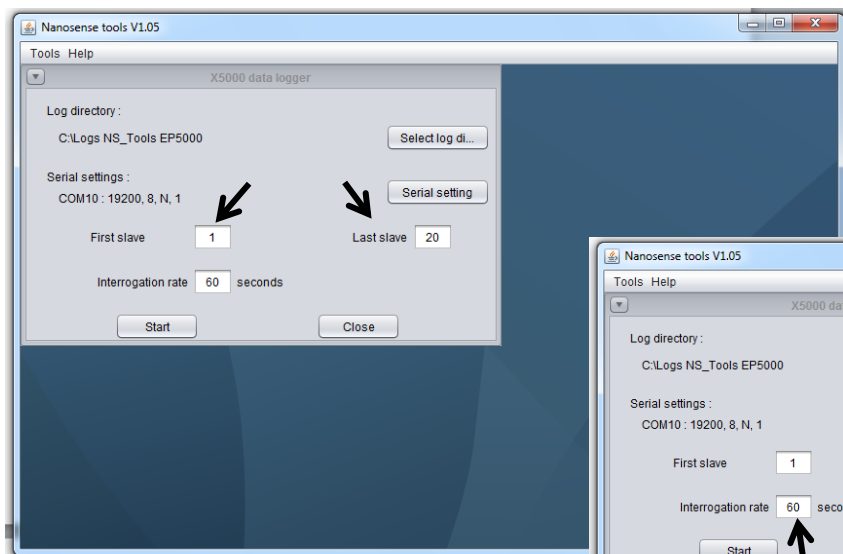
In this case, to identify the correct Dongle, disconnect and reconnect a Dongle and refresh the Device Manager page to identify the one that disappears/reappears.

7 Probe's Scan

After setting the bus parameters, you must enter the "First slave" and "Last slave" fields. These two boxes refer to the Modbus Address of the probes that will be interrogated starting from the "First Slave" to the "Last Slave".

For example: Here the first Modbus slave Address is 1, and the last is 20. The probes from 1 to 20 will be interrogated successively.

To assign or read ModBus addresses of the probes, it is possible to read and/or set them with the smartphone application for the EP5000XX & QAA or the LCD tool for the E&P4000NG.

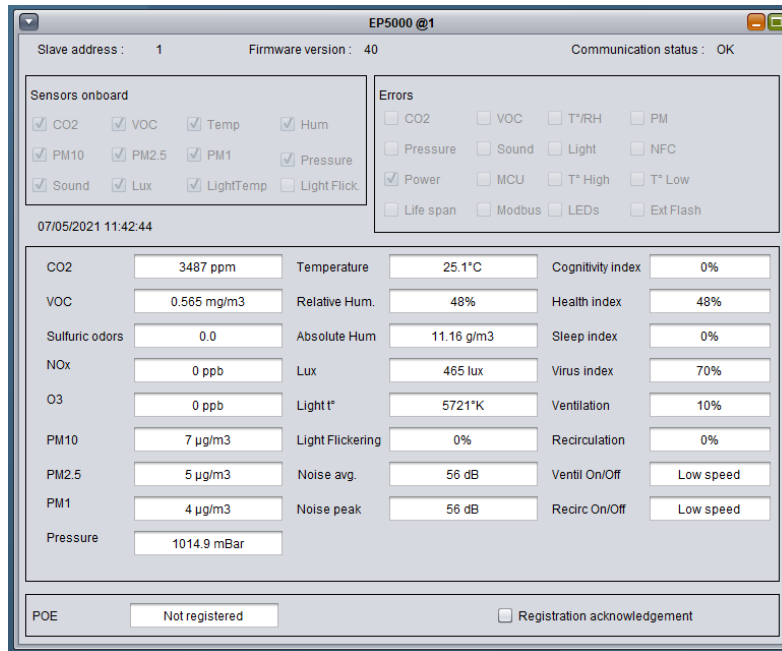


The minimum interrogation time between two slaves is 1 second but it is better to wait 2 to 3 seconds if the selected speed is slow, so if 4 slaves are to be logged, the minimum interrogation rate will be 5 x one second to ensure that the selected time is respected for each slave.

(Minimum time in seconds = number of slaves + 1)

Each probe that responds appears at the bottom of the desktop window.
By clicking on the orange button, the window is enlarged and the data of the probe is displayed.

8 Example of EP5000 probe window



The screenshot shows the EP5000 probe window with the following details:

- Slave address:** 1
- Firmware version:** 40
- Communication status:** OK
- Sensors onboard:**
 - ☒ CO2, ☒ VOC, ☒ Temp, ☒ Hum
 - ☒ PM10, ☒ PM2.5, ☒ PM1, ☒ Pressure
 - ☒ Sound, ☒ Lux, ☒ LightTemp, ☐ Light Flick.
- Errors:**
 - ☐ CO2, ☐ VOC, ☐ T°/RH, ☐ PM
 - ☐ Pressure, ☐ Sound, ☐ Light, ☐ NFC
 - ☒ Power, ☐ MCU, ☐ T° High, ☐ T° Low
 - ☐ Life span, ☐ Modbus, ☐ LEDs, ☐ Ext Flash
- Date/Time:** 07/05/2021 11:42:44
- Measurement Data:**

CO2	3487 ppm	Temperature	25.1°C	Cognitivity index	0%
VOC	0.565 mg/m3	Relative Hum.	48%	Health index	48%
Sulfuric odors	0.0	Absolute Hum	11.16 g/m3	Sleep index	0%
NOx	0 ppb	Lux	465 lux	Virus index	70%
O3	0 ppb	Light t°	5721°K	Ventilation	10%
PM10	7 µg/m3	Light Flickering	0%	Recirculation	0%
PM2.5	5 µg/m3	Noise avg.	56 dB	Ventil On/Off	Low speed
PM1	4 µg/m3	Noise peak	56 dB	Recirc On/Off	Low speed
Pressure	1014.9 mBar				
- POE:** Not registered
- Registration acknowledgement:** ☐

On this screen the Measurement areas appears (including measurements, commands and physiological impacts), sensors present that correspond to the setup of the probe, the firmware version of the probe (very useful during updates via the Datalogger), sensors present and eventual errors as well as the ModBus communication status.

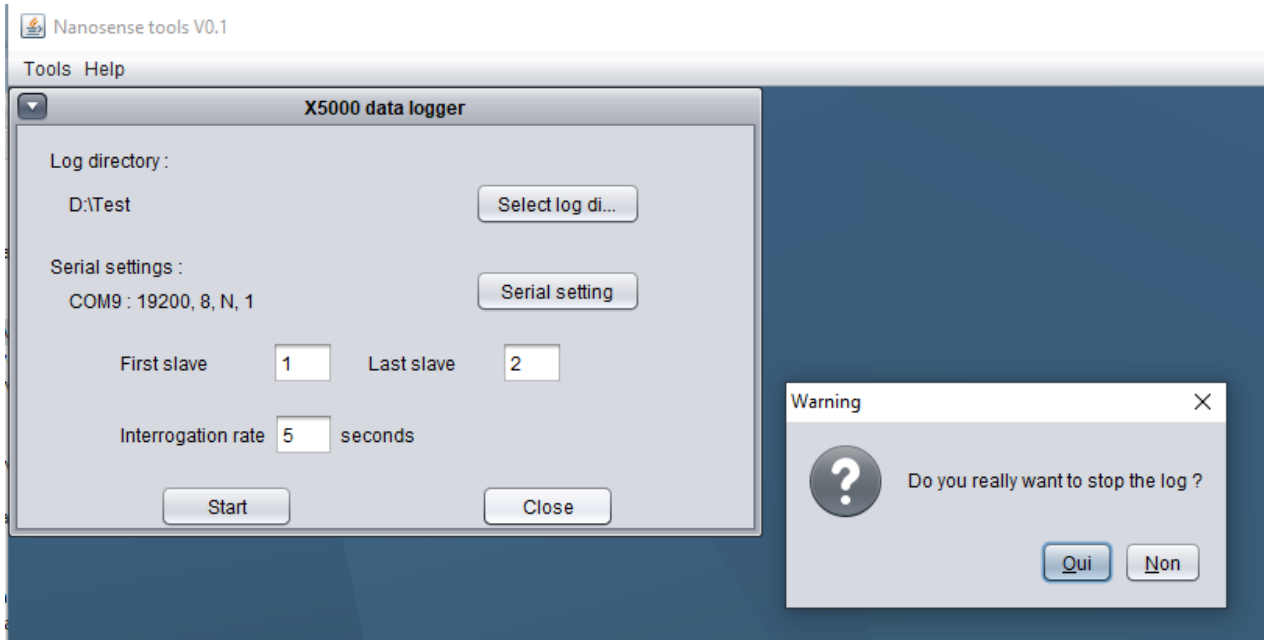
The POE part is used in production for a specific OEM version, and it does not concern other versions.

Each sensor that has responded to the initial scan will have a dedicated window and its address is identified at the top of the window.

This makes it easy to check data in the real time for each probe. Those data will be updated according to the interrogation cycle with the intervals set in the Datalogger configuration.

To have access to the history/log of the data for the whole duration of the recording, you must get the CSV file saved on the path specified in the Datalogger configuration.

To stop the logging, click on Close in the Datalogger window and select Yes to close the recording.



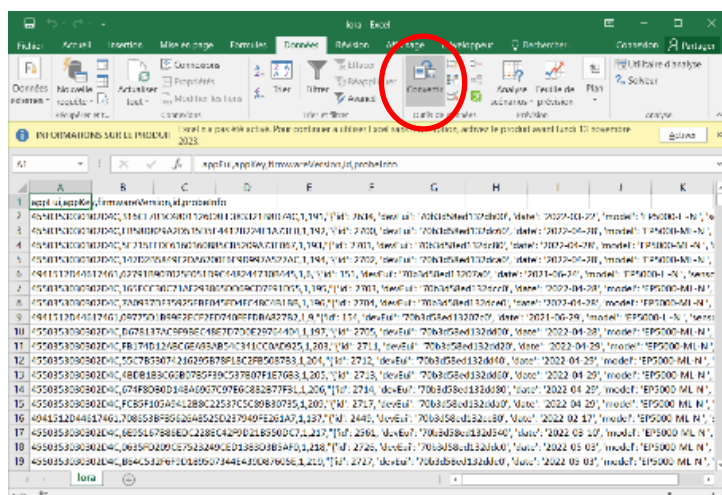
The CSV file is located in the directory of the selected log.

It is possible to get the CSV file without stopping recording by copying it to another folder. For example, it will continue to be incremented with new data in the parent directory.

9 Example of a CSV file EP5000

Time Date	Address	Firmware	CO2 ppm	VOC (mg/m	Sulfuric odc	NOX (ppb)	O3 (ppb)	PM10 (µg/r	PM2.5 (µg/r	PM1 (µg/m³	Pressure (m	Temperatur	RH (%)	Absolute h	Lux	Light temp
06/04/2021 11:22:27	1	37	634	0.179	0.0	0	0	6	5	4	51.4	22.4	40	7.97	131	6864
06/04/2021 11:22:32	1	37	634	0.179	0.0	0	0	6	5	4	51.4	22.4	40	7.97	143	7054
06/04/2021 11:22:37	1	37	633	0.179	0.0	0	0	6	5	4	51.4	22.4	40	7.97	139	7007
06/04/2021 11:22:42	1	37	633	0.179	0.0	0	0	6	5	4	51.4	22.4	40	7.97	134	6950
06/04/2021 11:22:47	1	37	632	0.173	0.0	0	0	6	5	4	51.4	22.4	40	7.97	135	6957
06/04/2021 11:22:52	1	37	632	0.173	0.0	0	0	6	5	4	51.4	22.4	40	7.97	135	6993
06/04/2021 11:22:57	1	37	632	0.173	0.0	0	0	6	5	4	51.4	22.4	40	7.97	143	7133
06/04/2021 11:23:02	1	37	632	0.173	0.0	0	0	6	5	4	51.4	22.4	40	7.97	136	7028
06/04/2021 11:23:07	1	37	633	0.17	0.0	0	0	6	5	4	51.4	22.4	40	7.97	137	7034
06/04/2021 11:23:12	1	37	633	0.17	0.0	0	0	6	5	4	51.4	22.4	40	7.97	147	7126
06/04/2021 11:23:17	1	37	633	0.17	0.0	0	0	6	5	4	51.4	22.4	40	7.97	137	7064
06/04/2021 11:23:22	1	37	633	0.17	0.0	0	0	6	5	4	51.4	22.4	40	7.97	145	7099
06/04/2021 11:23:27	1	37	632	0.17	0.0	0	0	6	5	4	51.4	22.4	40	7.97	142	7070

A CSV file can be opened in Excel or any other spreadsheet program.



Use the Convert button on the Data tab to recreate columns if the column separator is not correct. The separators in the CSV file are commas.

Be careful, depending on the configuration of your Excel, it may be necessary to replace the periods (.) by commas (,). Use the replace tool.

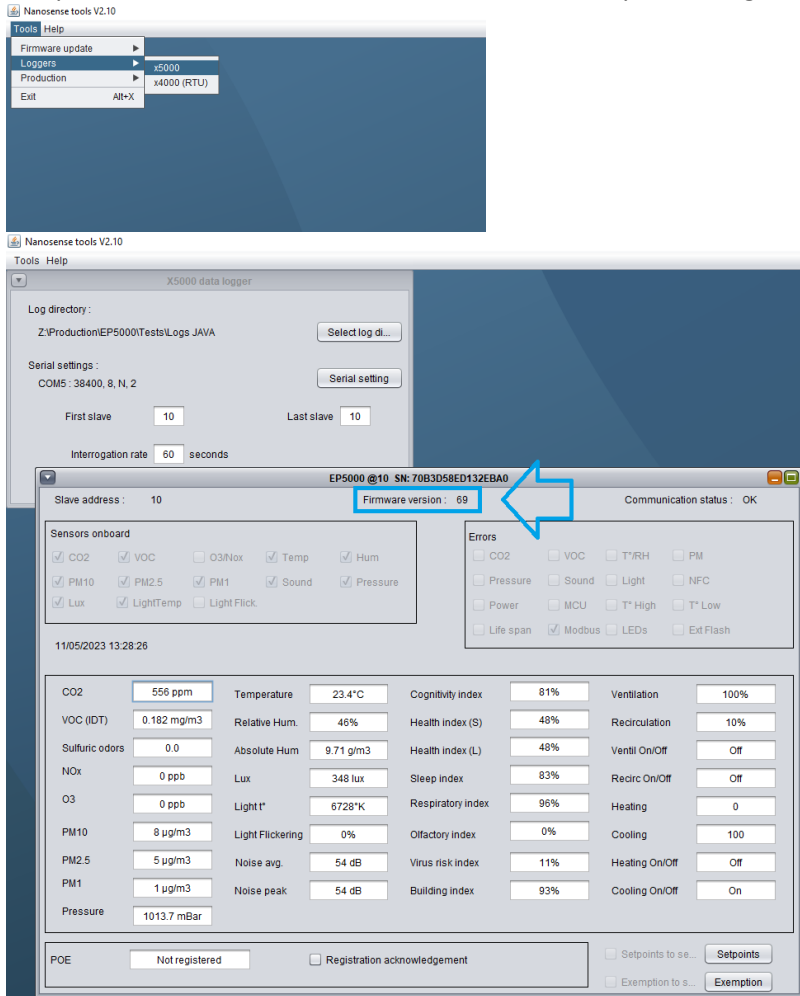
10 Firmware update via OTC (Over The Cable)

10.1 Preparation

It is important to check the connection and wiring of the probes BEFORE any update.

It is strongly recommended to refer to the previous chapter and to check that the probes that have to be updated are responding and displaying Data.

It is possible to check the firmware version BEFORE performing an update.



In this example, the Firmware version BEFORE update is 6.9. And there are no communication errors or sensor errors.

10.2 Probe's Firmware

It is possible to update the main firmware of the EP5000xx probe as well as the VOC module (6 possible versions can be uploaded).

To be able to load a firmware, make sure you have access to the right firmware number in binary format: xxxVx.bin

10.3 Steps

A firmware update is done in 2 steps.

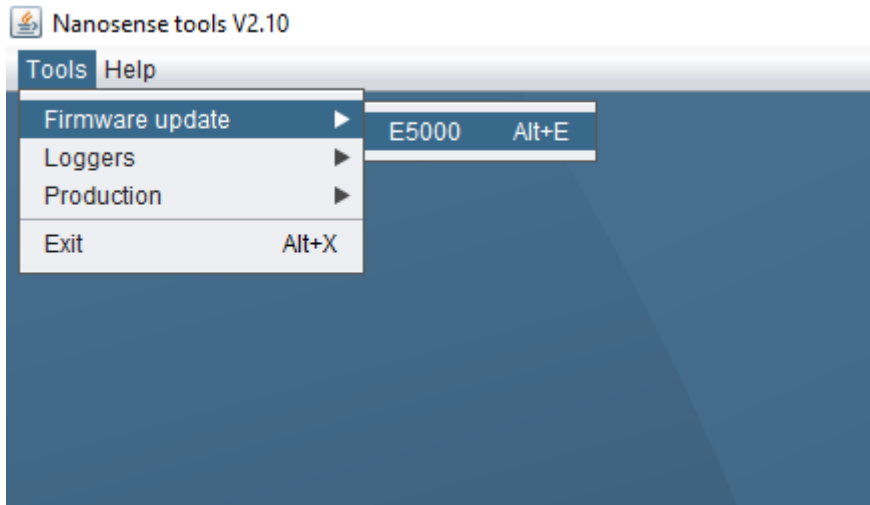
1. Loading the firmware into the probe: The program will be loaded into a buffer memory but not applied.
2. Send a command to replace the current firmware with the buffered one to implement the latest loaded firmware.

10.4 OTC update of a probe

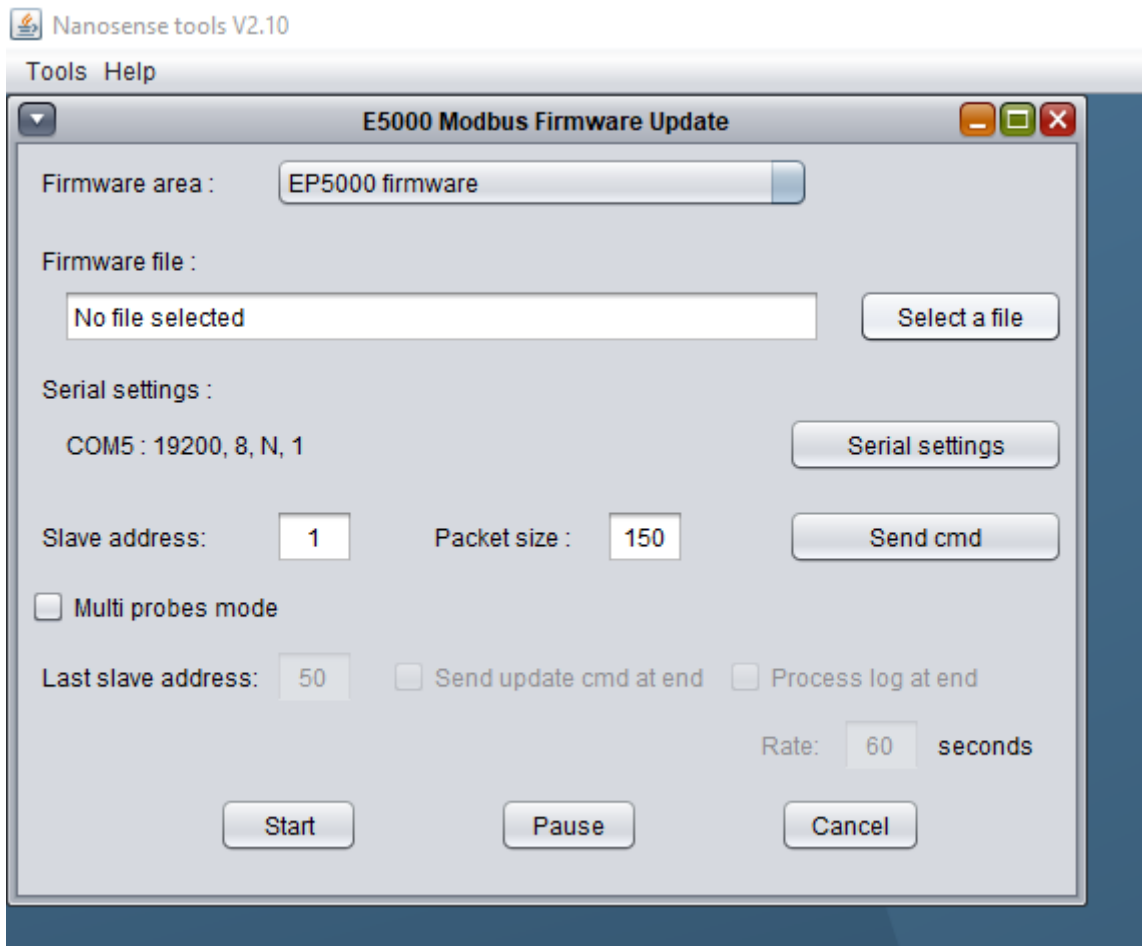
10.4.1 Loading the Firmware

This feature is only available for EP5000XX probes.

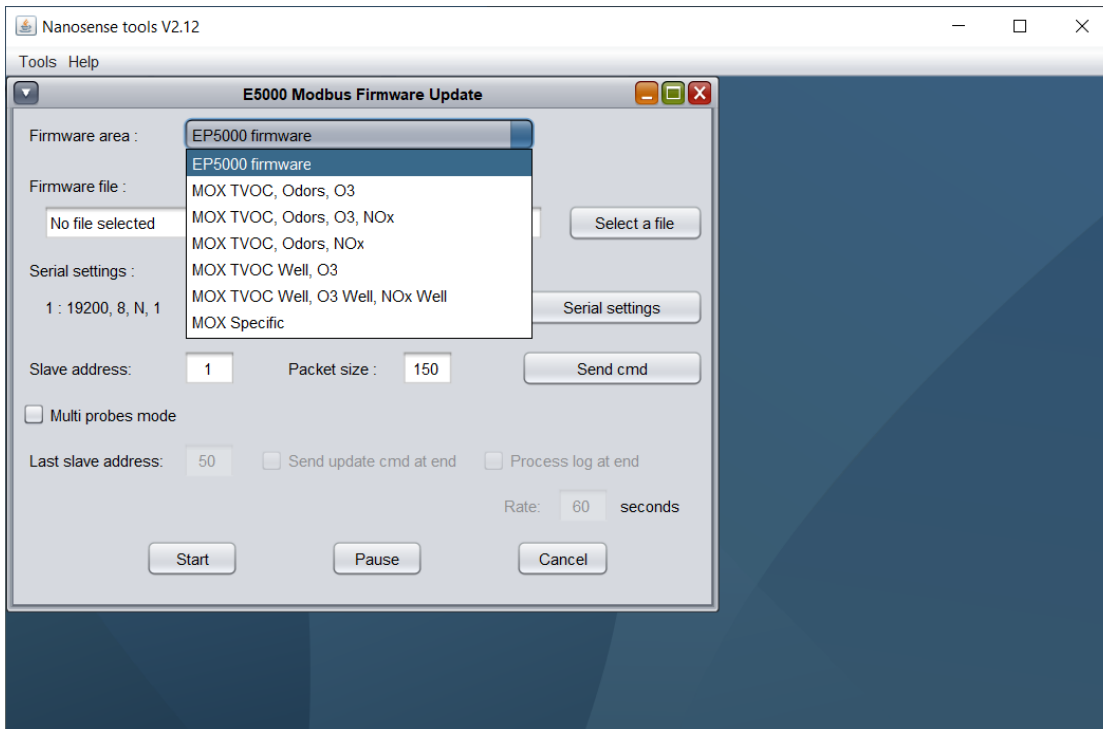
Once the connection has been confirmed, click on Firmware Update / E5000.



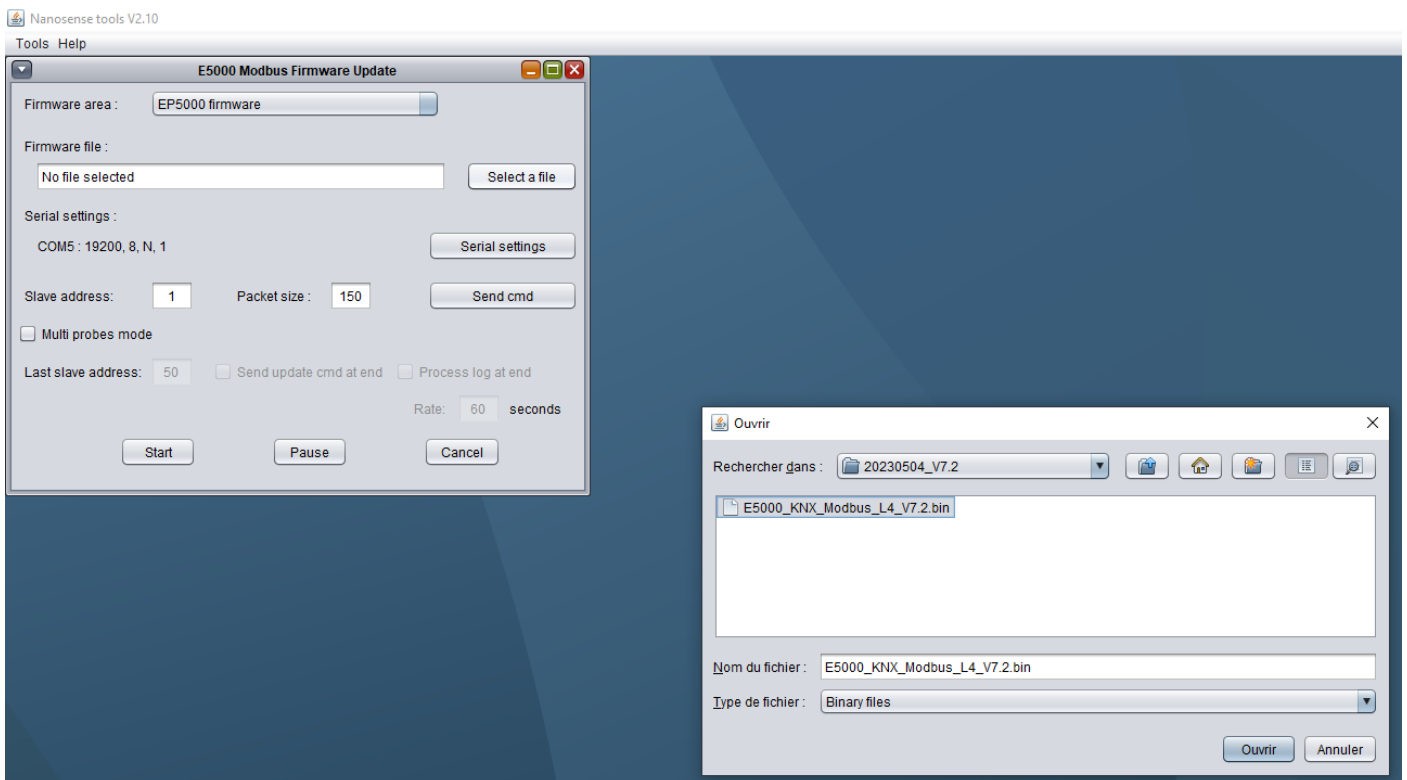
The following window will open:



If you wish to update the firmware of the EP5000 probe, then set the first field on "EP5000 Firmware". Otherwise, select from the list the type of MOX (Metal Oxyde) module firmware you want to update:



Click on "No file selected" to choose the firmware in .bin format to download:



Make sure that the serial link parameters are correct (use the same as when you scanned the probes)

For the update functions of several probes use the "Multi-probe Mode" feature, see the relevant chapter.

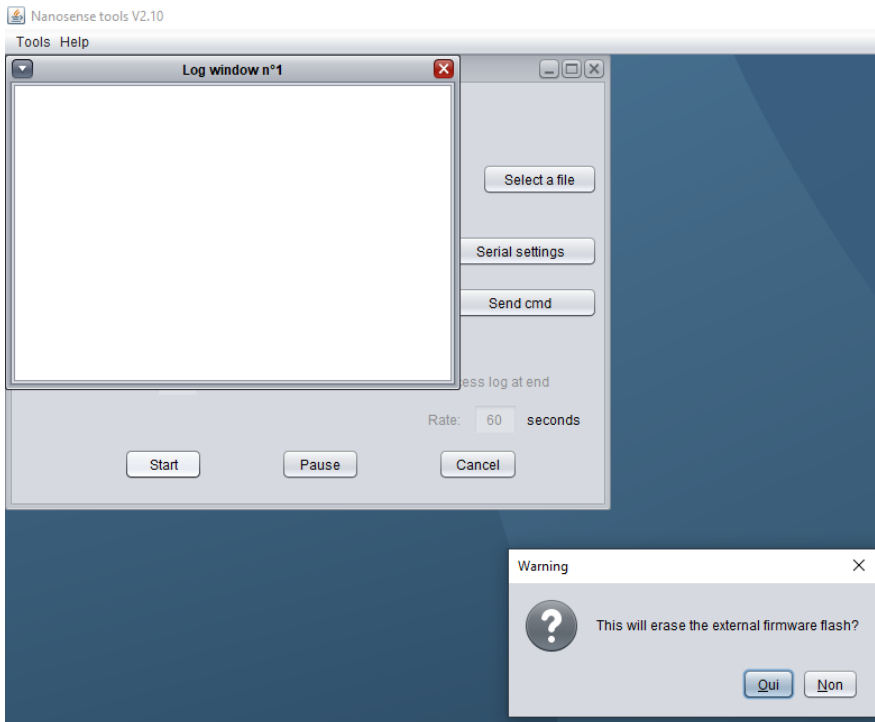
Enter the address of the probe.

Keep the 'Packet size' field at 150 by default.

Click on " Start " when everything is ready to download the firmware.

./!\ At this stage, do not use the "send command" button. It will be used AFTER the firmware has been uploaded to the buffer memory, at the second stage of the update to send the firmware application command. ./!\

An alert message will appear:

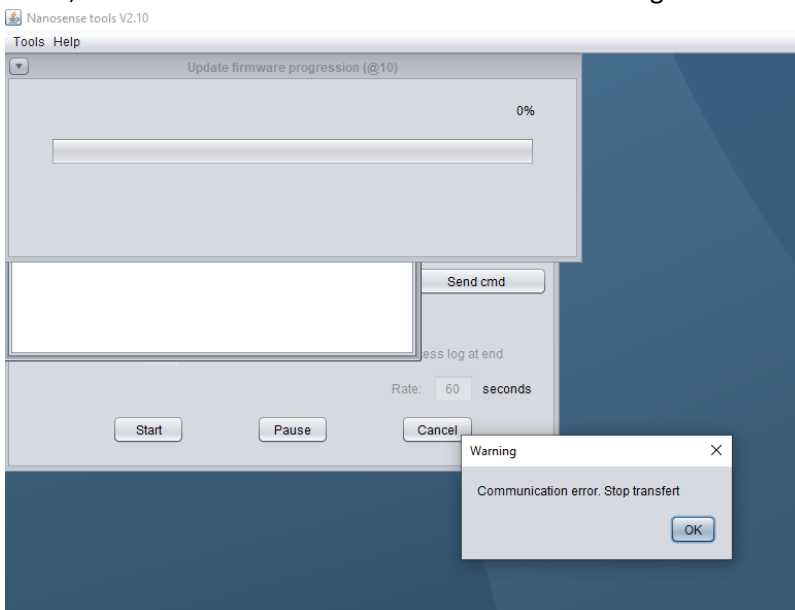


Click on YES.

Even if the message may be alarming, it will only delete the contents of the buffer memory. At this stage, it is not the main firmware that will be crushed, so you can repeat this step if it is not the correct firmware that has been uploaded. This will not affect the operation of the probe as long as step 2 of the update has not been completed.

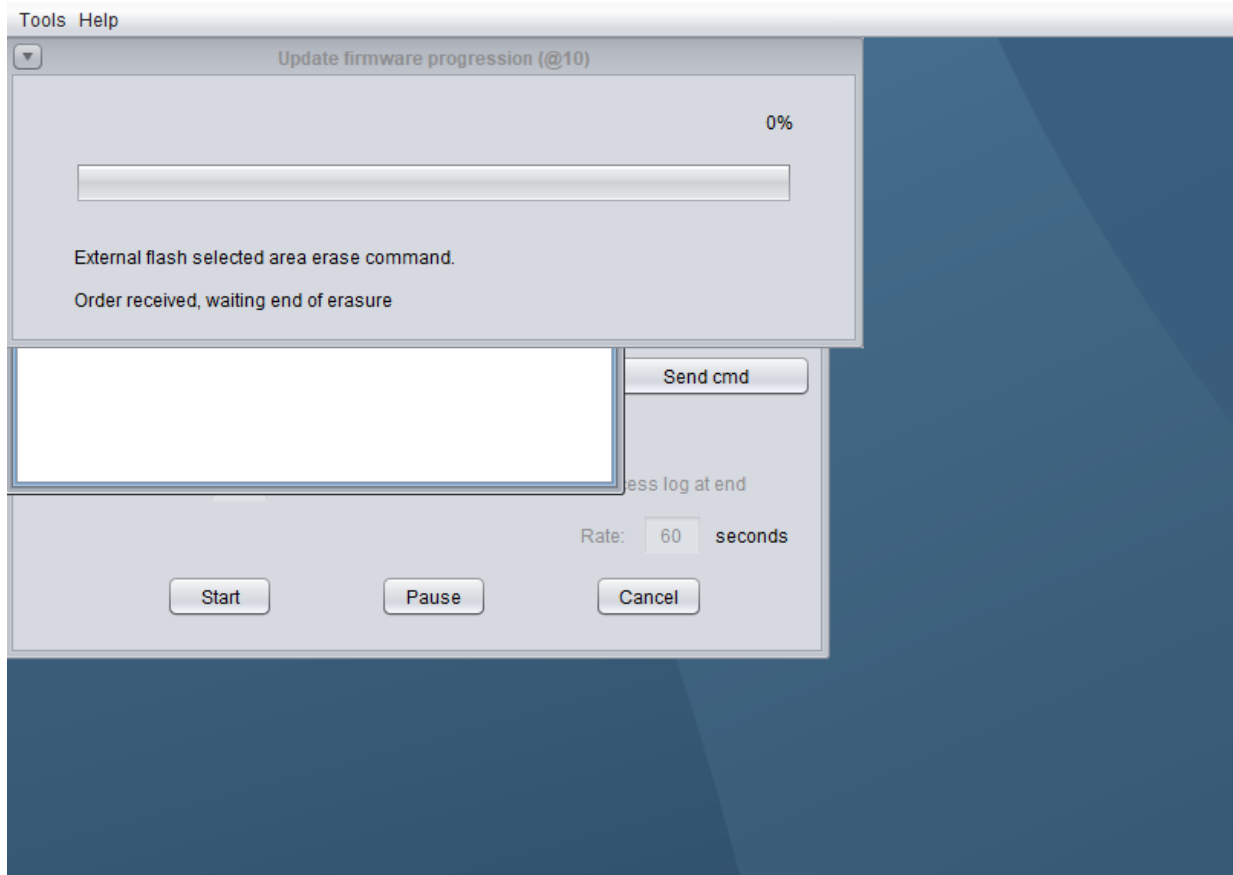
If the following error message appears, check that the correct probe address is selected, and possibly go back to the previous verification steps (SCAN, ...)

If not, disconnect and reconnect the USB Modbus dongle to reinitialize the dongle driver.

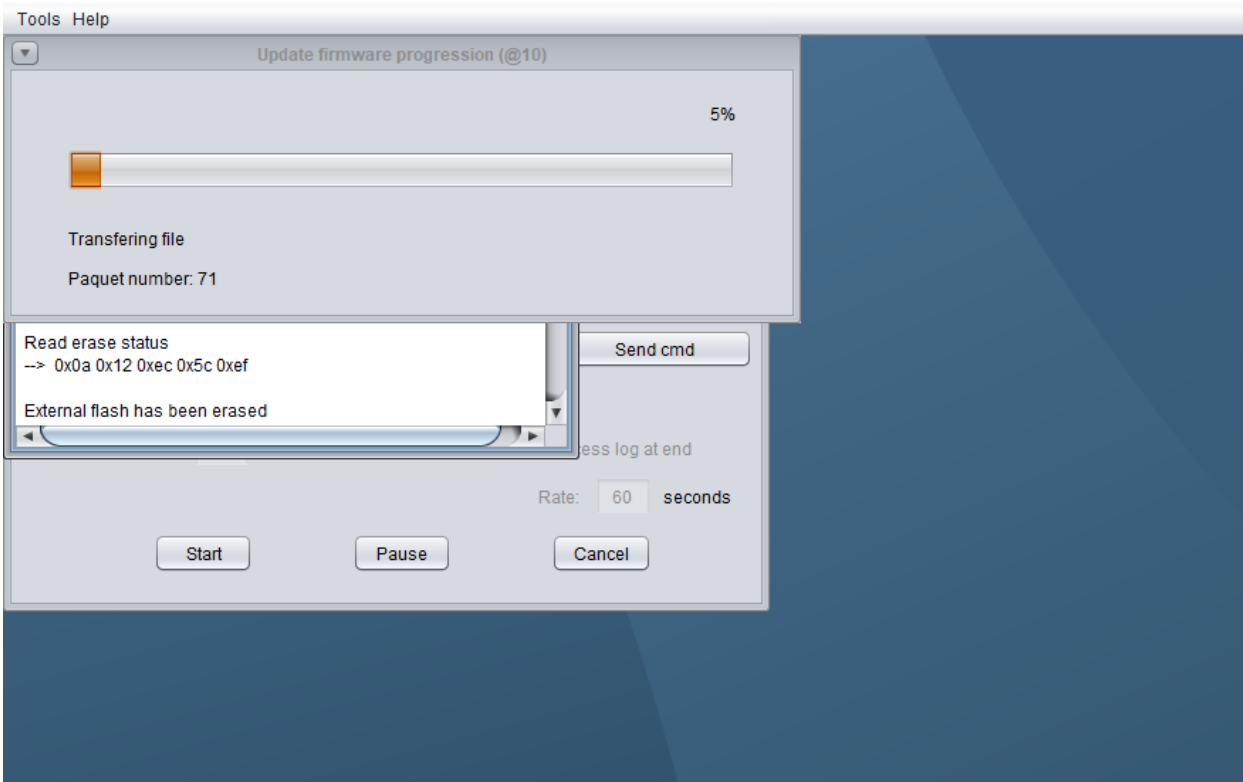


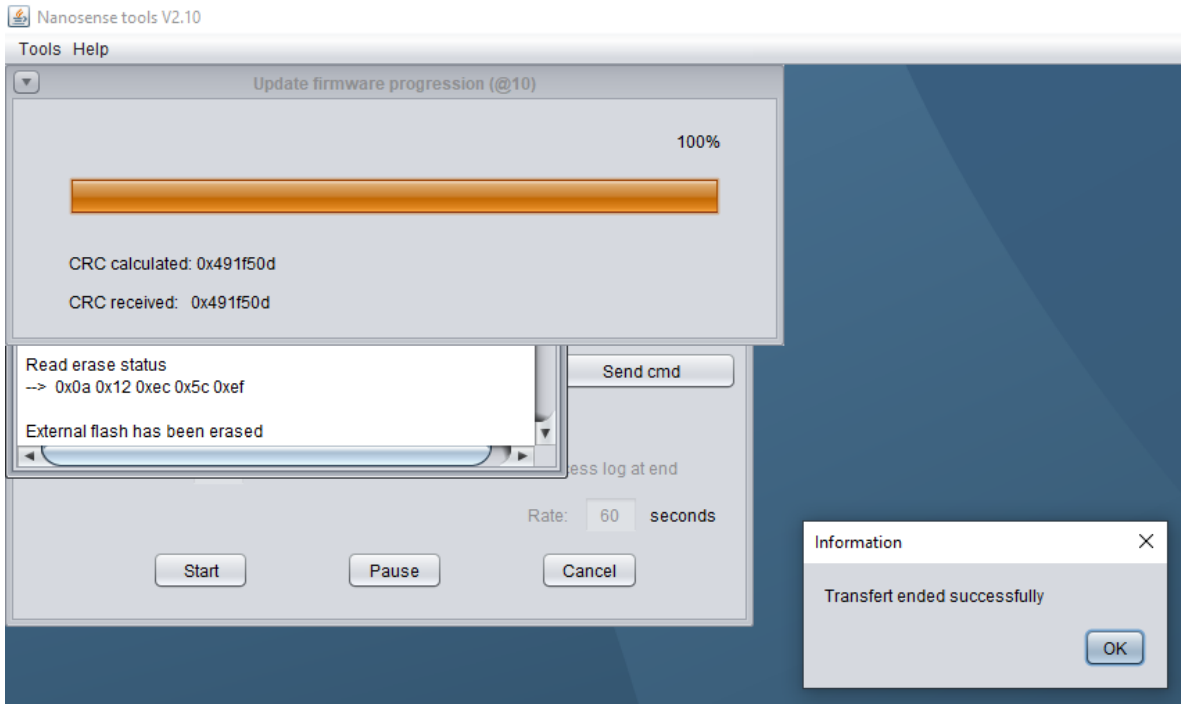
If the Modbus communication is correct, a progression line will appear and a LOG window to track the different steps of the upload.

Nanosense tools V2.10



Nanosense tools V2.10

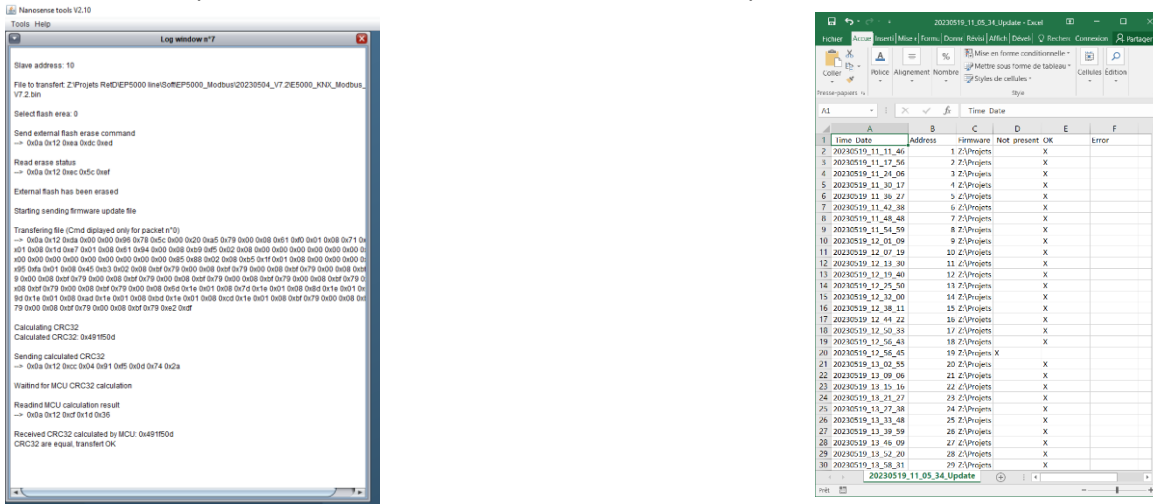




Wait until you see the "Transfer ended successfully" window that pops up.

/\ This process will take **about 7 min** at 19200 Bauds depending on the size of the firmware you load and it should not be interrupted /\

Here is an example of a detailed LOG window of a successful update:



Note that the software also generates a csv file in the same folder tahn the firmware (.bin) which summarizes the file transfers for an update. In the above example, the probe at address 19 has not been updated (communication error).

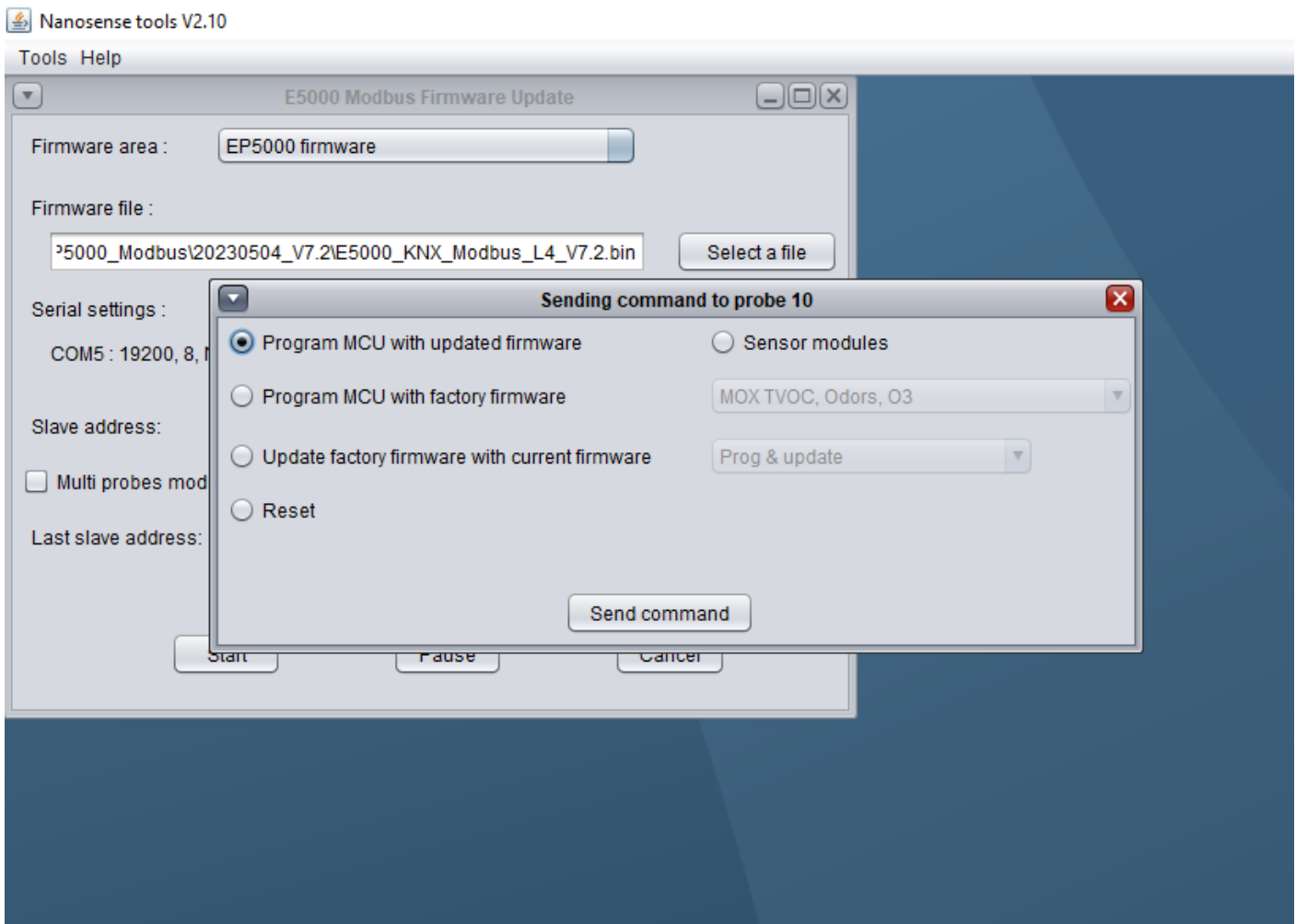
The two logs shown above are the only way to know the version of the uploaded firmware. Indeed, it is not possible to read the firmware version stored in the buffer memory. It is only visible once implemented (applied to the microprocessor).

10.4.2 Apply the downloaded firmware

The firmware has now been uploaded to the buffer memory and can now be applied.

Click on "Send command".

A dialog box will open:



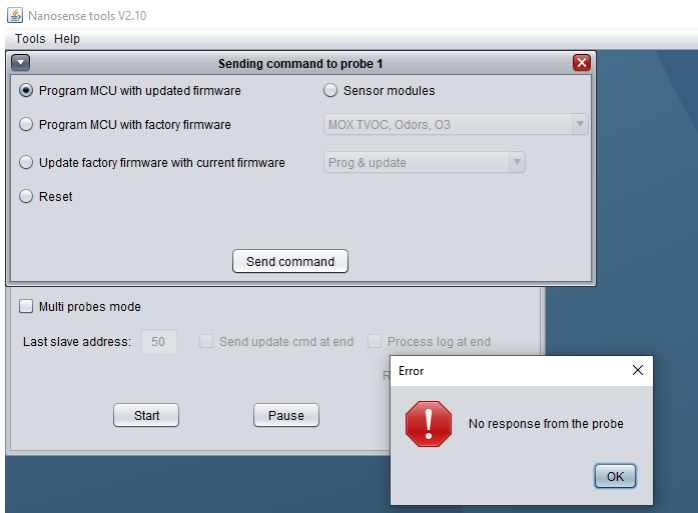
For EP5000 Firmware:

- ➔ Program the MCU (Microprocessor Unit) of an EP5000 probe with a new firmware.
- ➔ Program the MCU of an EP5000 probe with the factory firmware already stored in the probe.
- ➔ Update the factory firmware of EP5000 probe using the current firmware.
- ➔ Reset to restart the probe.

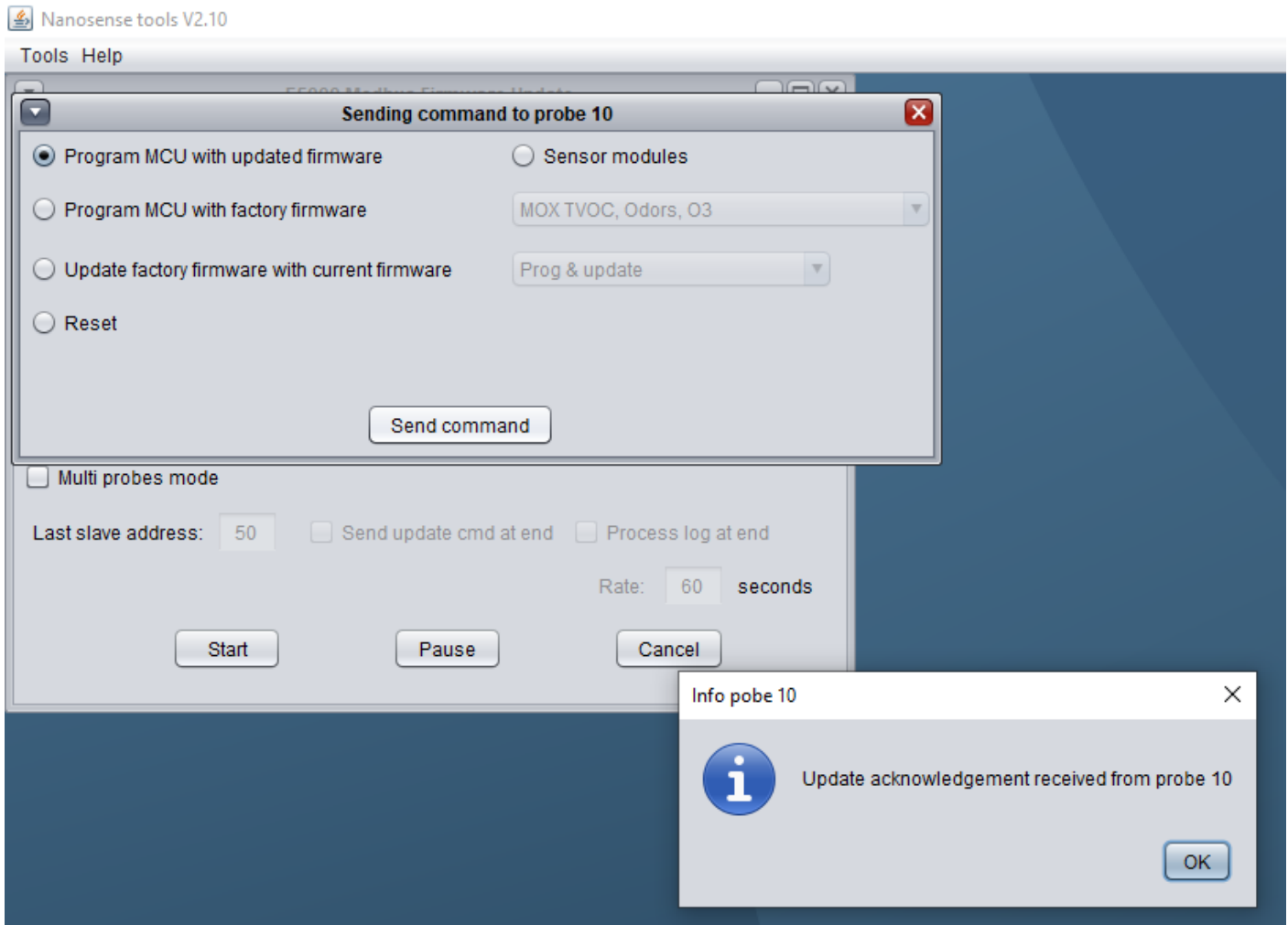
It is also possible to apply one of the MOX module firmware.

Select the chosen action. Keep "Program MCU with updated Firmware" for an update of the main firmware.

If the following error message appears, recheck the connection, the sensor address and the BUS parameters.



Otherwise the following confirmation message appears:

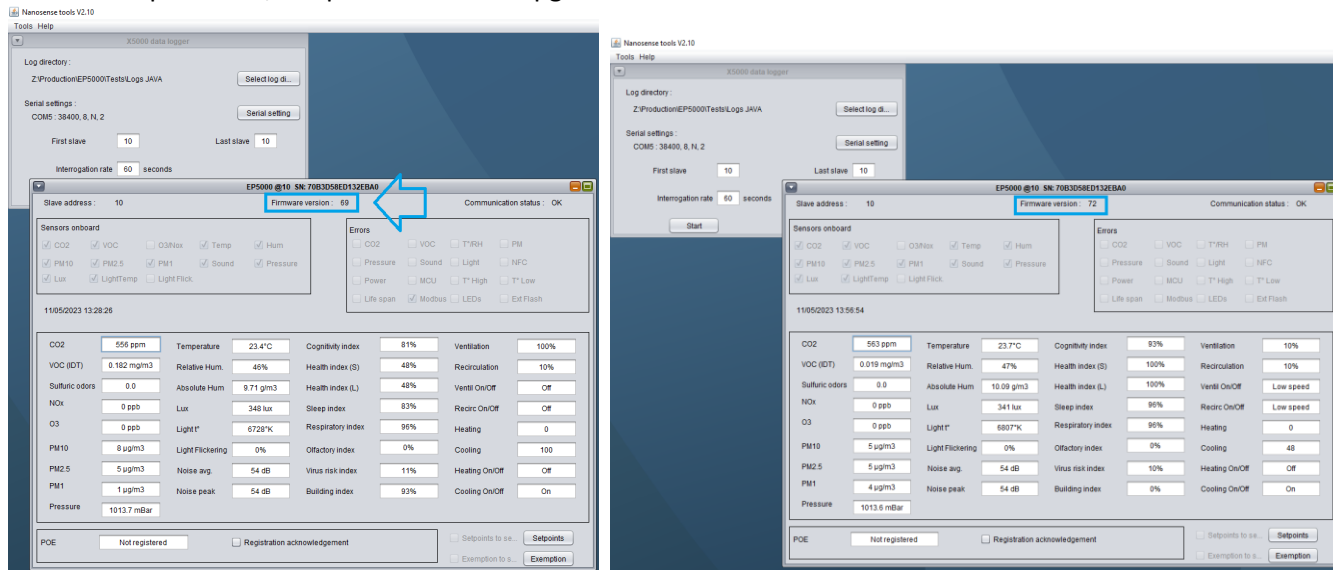


The red and central LEDs of the probe will then start flashing while the current firmware is replaced by the one in the buffer memory. The duration is about 10 seconds then the probe will restart.

Note that this command can also be launched through the Android App by clicking on the Firmware number shown in the INFO tab.

It is recommended to check that the update has been completed by double-checking the firmware version using the Datalogger or the Mobile Application.

In the example below, the probe has been upgraded from version 6.9 to version 7.2 :

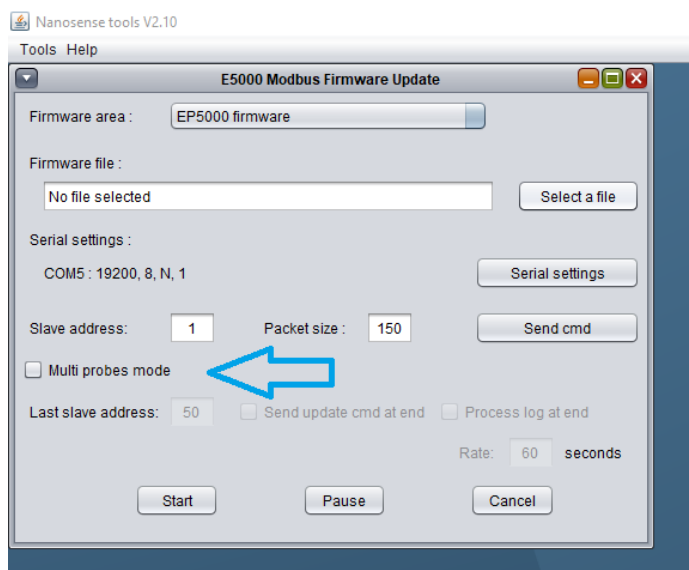


10.5 OTC update of multiple probes

The "multi probes mode" feature allows you to do both steps successively on several probes, but beware that it will take some time.

$X \text{ probes} \times \sim 7\text{min} = \text{time to update } X \text{ probes}$

!/ \ This feature will apply updates to ALL probes one after another between address 1 and the address entered. It is therefore important that they all be updated. !/ \



Note that the EP5000 firmware is universal and covers different versions of EP5000 probe version's: Modbus, LoRa, EnOcean. It is therefore possible to mix the update of different versions of the sensor.

In order to limit the operations to be executed at the end of the downloads to apply the last Firmware (step 2 of the previous chapter), it is possible to check the boxes " Send Update cmd at end ".

Thus, the two steps will have been linked by clicking on "send update command".

It is also possible to run a LOG at the end of the procedure to check that ALL the probes in question have been updated.

11 Specific case: EP5000MMx from BELIMO

11.1 Initial checks

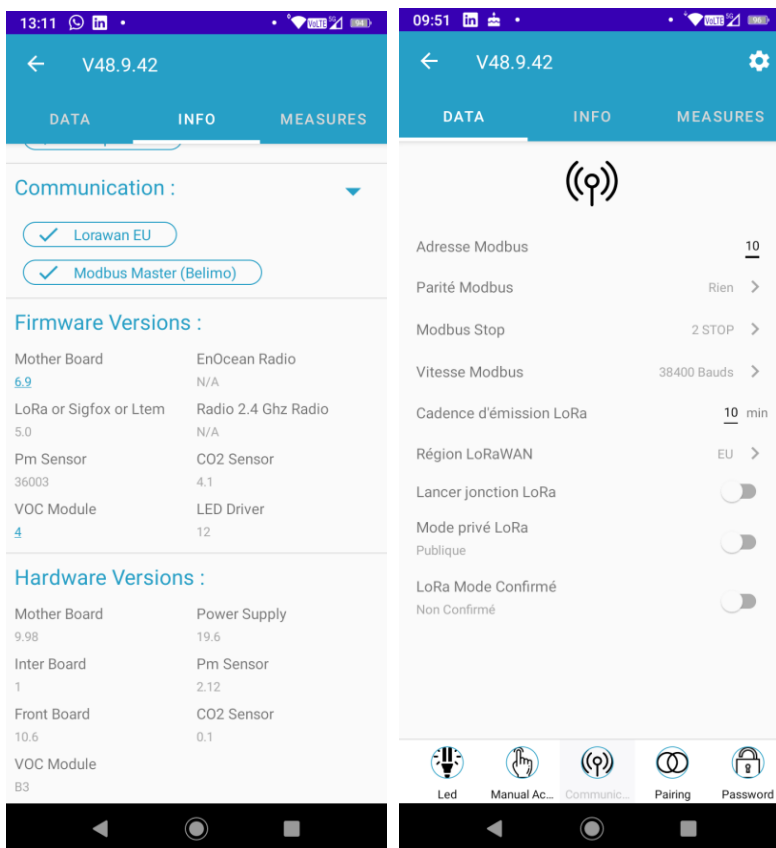
Perform the following verifications before the OTC Update:

- Check the Modbus setting: be careful EP5000MMx probes have a specific default bus setting as shown in the picture below.

- o BUS speed: 38 400 bauds
- o ModBus STOP: 2 STOP
- o Parity: None

- Check the firmware version.

- Check the Modbus address of the probe. Even if the probe uses the zero address as a Master, the address indicated below will be used in slave mode.

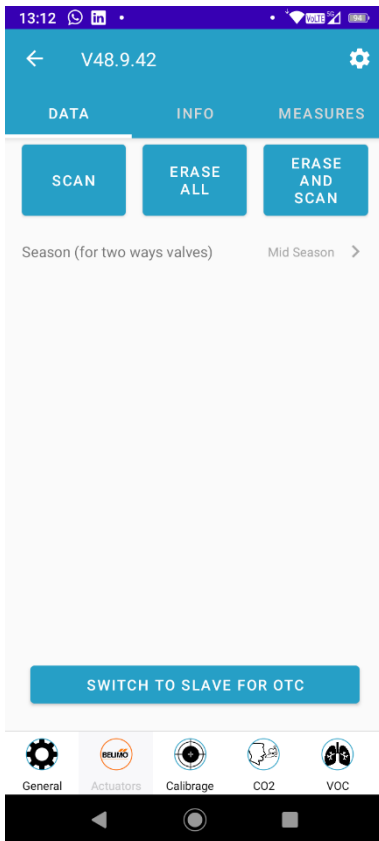


11.2 Setting the probe to a temporary slave mode

The EP5000MMx versions are in Modbus Master mode for driving Modbus servomotors, which does not allow them to be interrogated and transmit data.

To overcome this problem, a command allows to temporarily switch the probe in slave mode.

To do this, use NanoSense NFC Application, synchronize the NFC memory, then go to BELIMO tab in the bottom banner of the window.



Click on the "Switch to Slave Mode for OTC" button.
As long as the probe is in a slave mode, the blue LED flashes rapidly.

It is recommended to perform a LOG to check if the Modbus parameters and wiring are correct.

For 20 minutes, the probe will act as a regular slave ModBus probe and it will be possible to save its data and update its firmware.

This time is long enough to start a firmware update via OTC.
The 20-minute timeout will be extended as long as the OTC download is in progress.
The bus will come back to master again after the firmware update which does not allow multiple updates.

11.3 Update

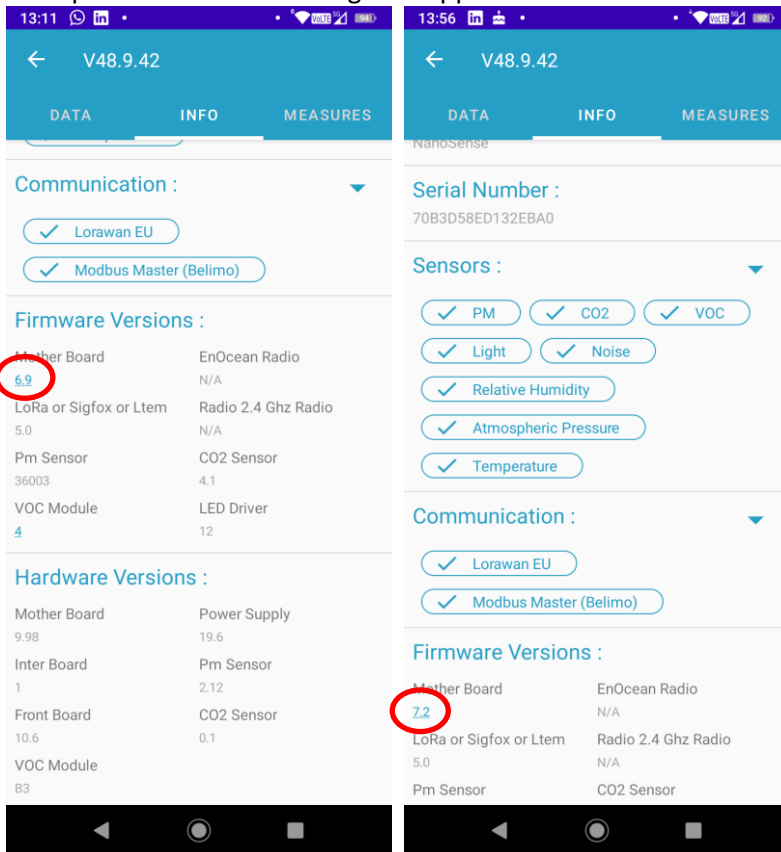
Once the probe is in a temporary slave mode, the BUS parameters and the slave address have been checked, the update procedure is the same for the other probes.

Refer to the chapter OTC update and follow the different steps.
Do not forget to send the firmware replacement command (step 2 of the OTC update)

/ !\ at the very end of the NFC update, the probe will restart and go back to ModBus Master mode, to check on the BUS or restart a LOG, it will be necessary to go to a temporary slave mode again via NFC application (see related chapter)/ !\

11.4 Final check

Example from 6.9 to 7.2 using NFC Application.



Example of a verification via the ModBus interface:

