



AAQ – Atmospheric Air Quality probe installation manual

Ver	Date	Update
V1	15/06/2019	Initial Version
V2	23/08/2022	New generation with NFC
V3	10/07/2023	Wiring details

Summary

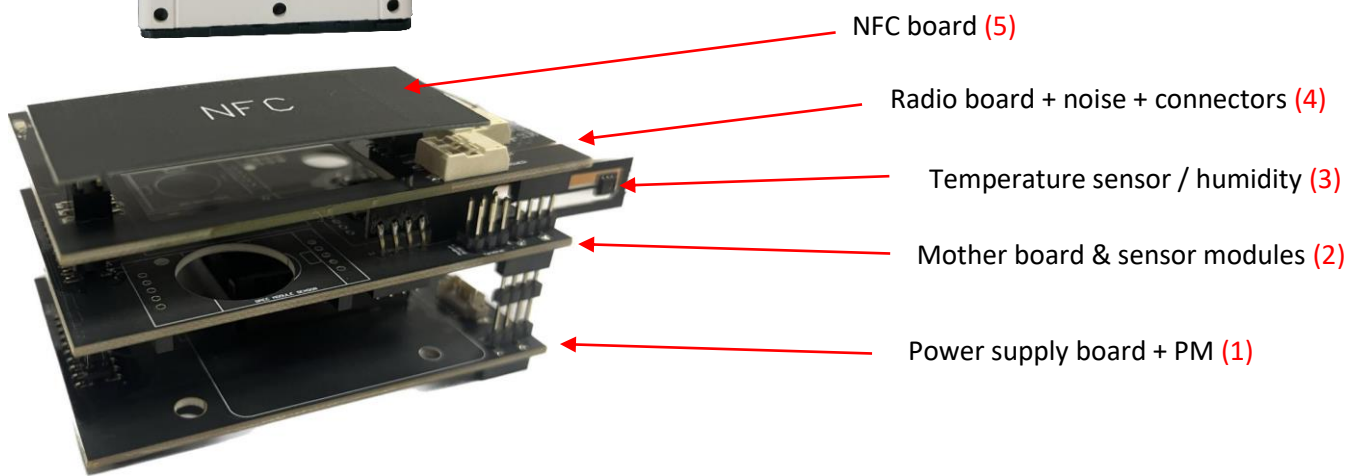
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1. AQQ probe content

Box



Antenna (with LoRaWAN or EnOcean optional radio)



NFC board (5)

Radio board + noise + connectors (4)

Temperature sensor / humidity (3)

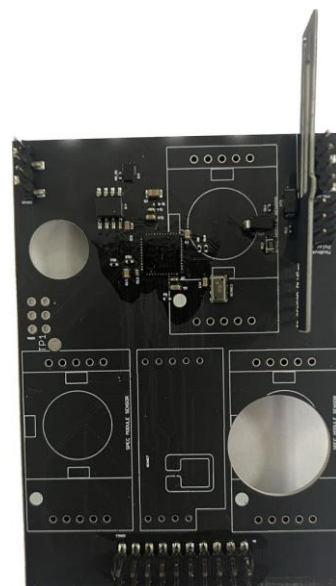
Mother board & sensor modules (2)

Power supply board + PM (1)

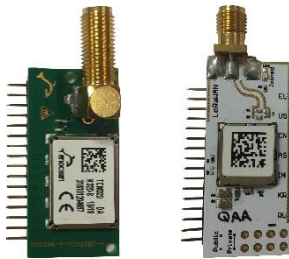
Power supply board (1)



Mother board (2)



LoRa or EnOcean radio module

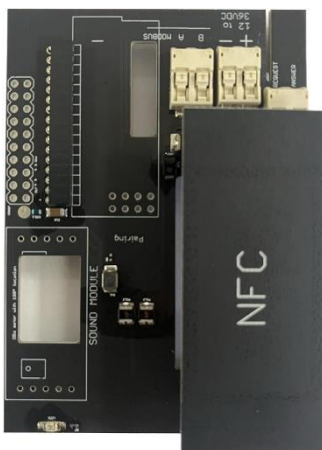
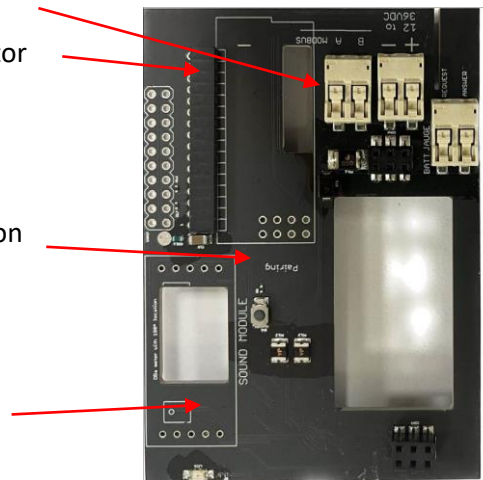


Radio board + noise + connectors (4)

Connectors
Radio modules connector

EnOcean pairing button

Noise Module



NFC board (5)

Optional digital sensors modules: Noise, NOX, Ozone...



2. Security



WARNING

Life-threatening risks, electrocution risks and fire!
Installation must be done by a qualified electrician!

In order to install power supply cables correctly and to put the device into operation, the state of the art and the standards in place must be respected.

Every intervention or modification brought up to the device is leading to a loss of every right on warranty.

- Do not use this probe for security related gas measurements!
- Supply this probe with the low voltage specified on the datasheet!

3. Positioning

AAQ (Atmospheric Air Quality) probe positioning is most important regarding measurements quality (namely regarding temperature and humidity).

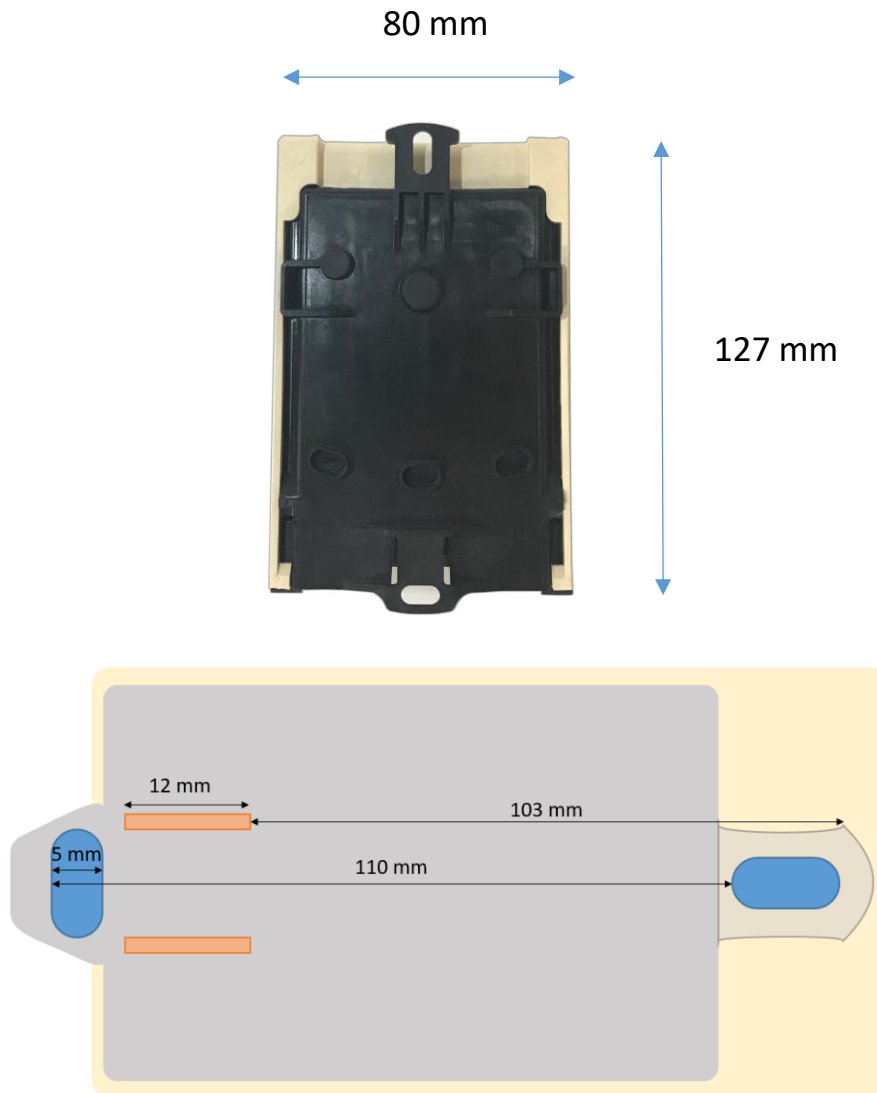
- The probe is designed to measure external air quality, the probe needs to be placed on a building facade, a telegraph pole, a street lamp ...
- The probe should be placed between 2 or 3 m altitudes. At this height, the probe will be far enough to avoid vandalism and close enough to be in the pedestrian respiration zone. The measurement can then be extrapolated regarding the altitude.
- If installed inside a mast, make sure that the access door has a sufficient ventilation grid to prevent water infiltration (not for the probe itself but for the equipment located below (Power supply, Fuses, etc.)
- If installed inside a mast, the probe can be pre-mounted on the hatches itself with the probe capturing the gases from below. The probe must in this case been mounted above the grid.
- Install the probe on the northern exposed façade, thus the temperature and humidity measurement will not be distorted. If there is no northern facade, the probe can be placed in the shadow.
- If temperature and humidity measurement are not critical, the probe can be placed on any side of the building.

Any intervention that does not comply with the present documentation or any modification brought up to the device is leading to a loss of any right to the warranty.



4. Fixing and size

Here is the example of the fixing and size of the AAQ:



5. Connection

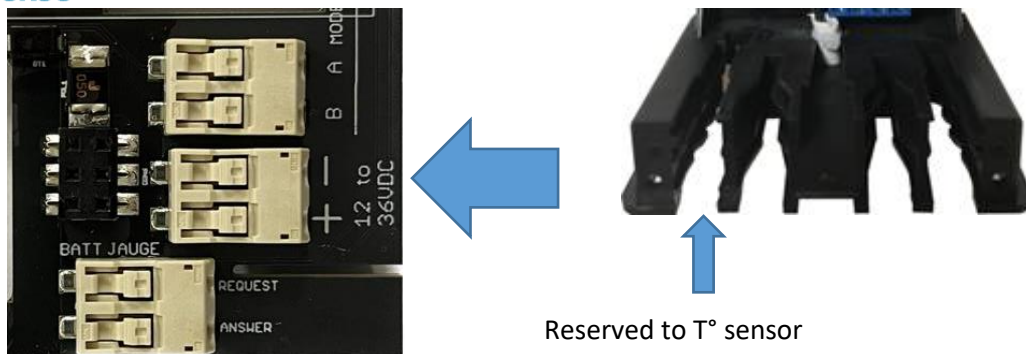
5.1. Opening

Antenna Unscrewed, slide the cover upwards (no tools required), Carry out all the following operations with the power off.

5.2. Power supply

The power supply must be continuous (DC) and must be between 12 and 30V (24V nominal).

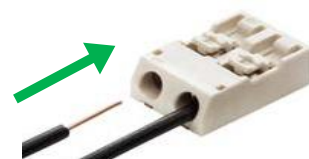
To access the power connector, you must first remove the cover.



Connect the power supply (observe polarity) by passing the cable through the nearest slot in the box.

Connectors are specified for 18 to 24 AWG (1 to 0.5mm diameter) rigid or 20 to 22 AWG (0.8 to 0.65mm diameter) twisted cable.

The connectors accept two 0.8mm cables on the same terminal in order to chain several probes. Be careful of line losses, a 0.8mm cable has a resistance of 21Ω per km.



Type of cable	Diameter in mm	Surface in mm ²	AWG
Rigid	0,5	0,20	24
Rigid / Twisted	0,65	0,33	22
Rigid / Twisted	0,8	0,50	20
Rigid	1	0,79	18

To prevent the cable from being torn off, it is possible to add a Serflex around the power cable inside the box.

Check the power supply voltage once the probe is powered on.

5.3. ModBus

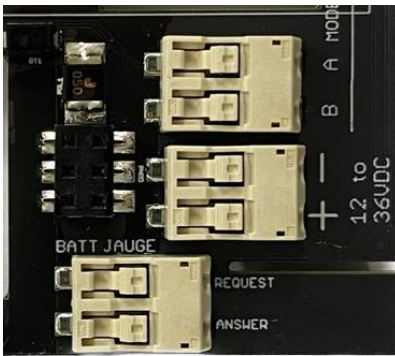
ModBus is not an option, it is the native communication mode of this probe.

To communicate with the probe via ModBus, connect the cables as shown in the image (A & B).

Check the direction of the BUS (A & B) and if necessary, reverse the wiring (non-destructive). Use a Serflex as for food.

Query the probe registers using its address. (See Modbus documentation).

/!\ Be careful not to connect the power supply to the Modbus, this will damage the device. /!\



The address, speed and other Modbus settings can be modified via NFC using the Smartphone Application for Android.

The smartphone application is available on the Play store (search for NanoSense).

5.4. Reassembly

Reposition the cover.

The 3 holes in the cover are intended for Serflex or equivalent to prevent opening by vandals.

6. ModBus

RS485 Modbus connection is not optically isolated. Therefore, you must pay special attention during the installation procedures that they do not cause communication failures or does not damage the RS485 coupler. Follow the points in the table below to ensure proper operation of your communication.

- 1 Use a shielded bus cable and connect one end of the shield to ground. Make sure, wherever possible, that there is no break in the cables. If this is not possible, you must have shield continuity consistent with the EMC at the connection points.
- 2 Keep RS485 cables away from other cables like power cables for example.
- 3 Connect the shielding to one end grounded to ensure equipotentiality of the shield.
No other grounding is required.

The "Shield" terminal of the power supply terminal block is isolated and is intended to facilitate the continuity of shielding.

THE SHIELD BUS MUST NOT BE CONNECTED TO THE “-“ OF THE BUS.

Warning: If you do not comply with above, the interface may be destroyed.

- 4 Make sure electrical signals are correct for the bus cable. This sets the resting level of the signal between two posts and is important for identifying the beginning of a message. The EP0000 probe produces a 5V electrical signal. The voltage between the data lines + (B) and - (A) should be between 0.5 and 1V.
- 5 For bus cable lengths over 100m, make sure to activate a bus termination at both ends with a 120Ω resistor (provided on demand with initial delivery)
- 6 The polarization of the bus is also highly recommended using the two other jumpers. RS485 standard requires a differential level of 200 mV for the signal detection. If the RS485 is not polarized, this level will not be reached at rest (without communication on the line) and then the operation will not be guaranteed. For this, a bias is applied to only one point of the bus. It is preferably applied to the master side.

6.1. Bus Termination

Cut the legs of the 120Ω resistor to a length between 17 and 20mm on each side.



Insert the legs into the connector of the last probe on the bus.
 The connector can still accommodate the bus cable.
 Do not forget to put an identical resistor or activate the load on the master side.

6.2. Programming the physical address

The bus address of the probe can be configured using the smartphone application and the NFC link (up to address 255). The default address is between 1 and 33.

6.3. Other Modbus settings

Thanks to the smartphone application, it is possible to select the speed of the bus and parity.

6.4. Choosing Cable Bus

The RS422 standard recommends 24AWG (0.23mm²) twisted pair cable with a capacity of 16 pF shunt per foot and 100 Ohms characteristic impedance. Although the standard does not specify anything for RS485 wiring, this cable can perfectly be used for RS485.

Another possibility is to choose a cable commonly used in Ethernet cabling. This cable is commonly referred to as Category 5 cable, it is widely available and very inexpensive, often less than half the price of 24AWG. This cable has a maximum capacitance of 17 pF per foot (14.5 pF typical) and a characteristic impedance of 100 Ohms.

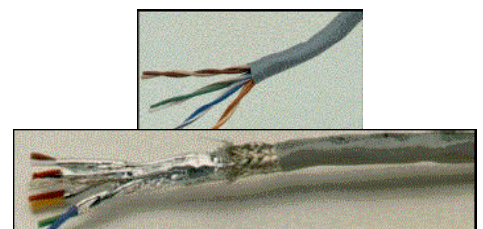
Category 5 Ethernet cable is available as shielded or unshielded twisted pair and generally exceeds recommendations for RS422 making it an excellent choice for RS485 systems.

6.5. Shielding

It is difficult to say whether shielding is needed in a particular system or not, until issues arise. We recommend that you use shielded cable for added safety. In addition, the shielded cable is not much more expensive than the unshielded one.

Name:
 Unshielded Twisted Pair: **UTP** (Unshielded Twisted Pair)

Shielded Twisted Pair: **STP** (Shielded Twisted Pair)



The lines are disturbed by electric and magnetic fields, all the more so if the ventilation motors are controlled by variable speed drives.
 To limit disturbances, you must:

- Separate the power lines from the bus cables by metal screens, and pass through separate sheaths (more than 30 mm from the power cables) or with other low current cables,
- Arrange very cleanly and align the cables in solid metal paths,
- Attach the bus cables to press them against the metal supports, without deforming them,
- Regularly (every 5 m) connect the cable trays to the earth with a large section wire,
- Use the appropriate cable,
- Respect the radii of curvature and the mechanical constraints provided.

To benefit from the shielding, it is essential to ensure continuity from one box to another.

The shielding consists of either a foil screen with screen wire, or a braid. Continuity is ensured by connecting either screen wires or braids. Note that the EP5000 probe's does not have a terminal block dedicated to the shielding.

It is recommended to earth the shielding of the building. Ungrounded shielding is more catastrophic than no shielding at all.

6.6. Wiring precautions

Be careful when stripping not to injure the copper core. A wire damaged when stripping is a weakened wire, it is a risk of breakage.

6.7. Maximum distance

The maximum distance between the PLC and the last device connected to the bus is 1200 meters.

6.8. Number of devices

The maximum number of peripherals connected to the bus depends on the probes and PLC couplers:

For a standard coupler: 31 subscribers

For a 1/2 impedance coupler: 63 subscribers

For a 1/4 impedance coupler: 127 subscribers

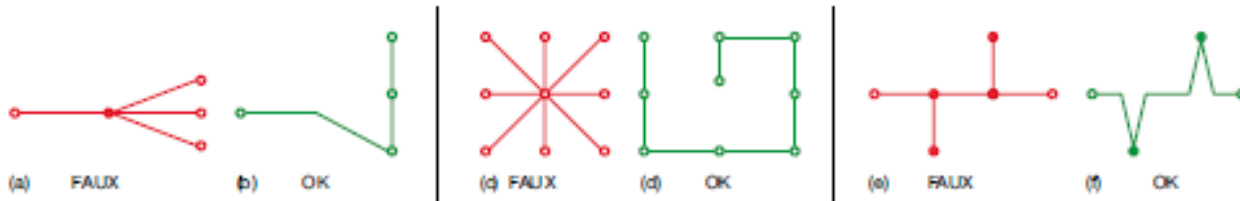
For a 1/8 impedance coupler: 255 subscribers

The AAQ probes have an 1/2 impedance coupler.

6.9. Topology

The topology of RS485 cabling must be observed. The cable must go to the first bus coupler device, leave the first device to the second, etc. .. until the last device.

The topologies in tree, branch or star are not allowed.



7. Radio options

Carry out all these operations with the power off

7.1. LoRa Option

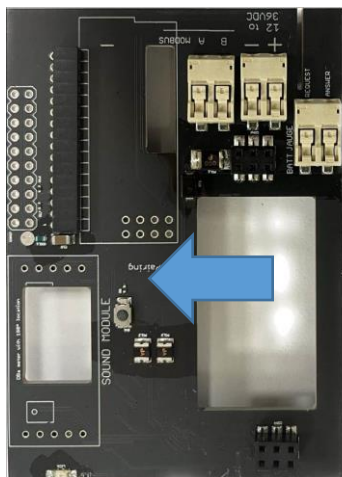
When the probe is in LoRa mode, it does not require any pairing to operate. All you need to do is power on the probe to join the LoRaWAN network and send data.

It will be necessary to enter the LoRaWAN keys identified by the DevEUI code printed in the form of DataMatrix on the radio module via the WEB platform of the network. You will then need to enter the CODEC or use the example provided in the QAA LoRa documentation in order to "decode the frame".



7.2. EnOcean Option

Check the presence of the EnOcean module and its antenna.



Put the destination device (actuator, IAQ NanoSense probes, gateway, home automation box, PLC, etc.) in listening mode for inclusion.

To send the pairing frames from the probe in EnOcean mode, press the pairing button on the front of the board.

All the pairing frames for the EEPs concerning the sensors present are sent afterwards.

Repeat the action as many times as necessary until you have paired all the desired EEPs if the receiving device can only register one EEP at a time.

If the destination device allows it, check the strength of the reception signal (RSSI in dbm) and the feedback or use the Dolphin View software (Free).

The pairing button can be duplicated by a remote EnOcean button which must be paired beforehand.

The QAA probe can then remain on the facade of the building for remote pairing.

See the EnOcean QAA probe pairing manual for more details.

