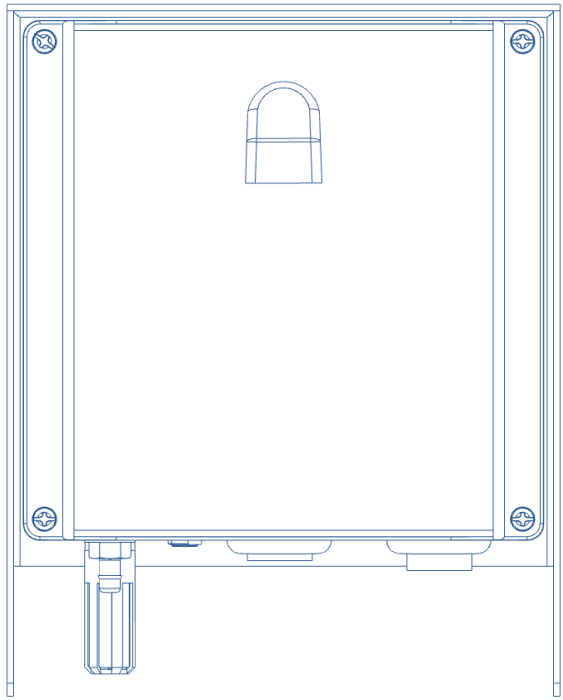
AQY 1
User Guide



O_3 Ozone

PM Particulate Matter ($PM_{2.5}$ & PM_{10})

NO_2 Nitrogen Dioxide

Temperature Humidity & Dewpoint

airmet Work with Confidence

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User Guide Revision History

Date	Revision	Description of change
Jun 2018	1.0	First release.

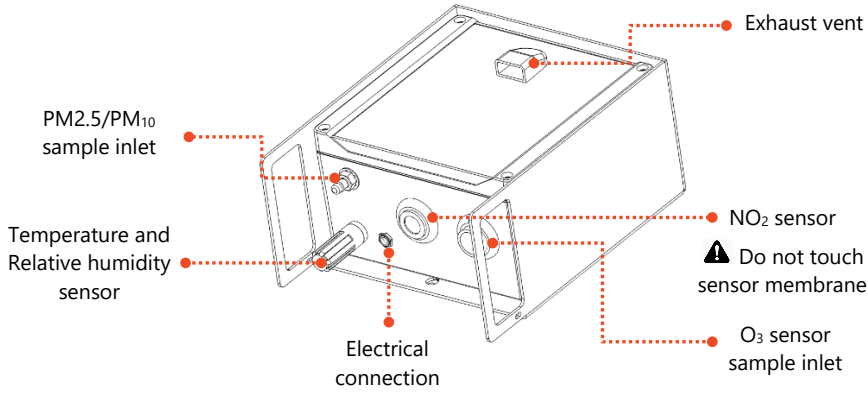
Contents

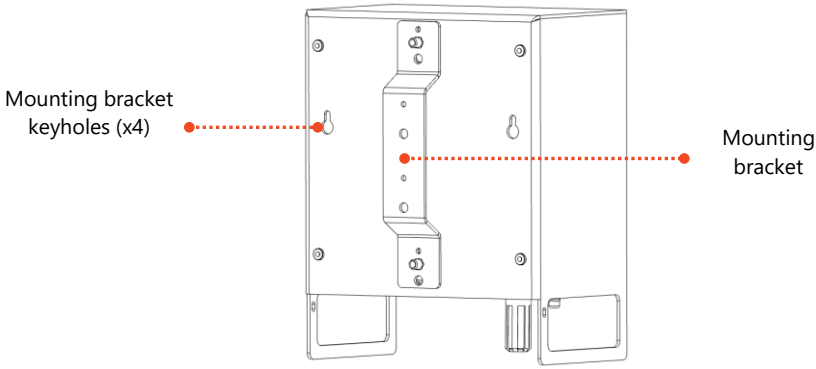
In the Box

The AQY comes with:

- 12VDC plug pack (90 to 260 VAC input) 24W with 5 m cable
- AQY 1 mounting bracket and screws
- Cable ties for securing power cable/modem
- USB stick with reset files and user guide
- User Guide

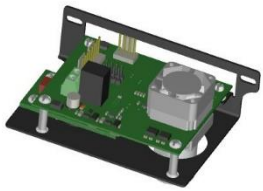
External Features





How your AQY 1 Works

The AQY 1 does all measurement on the instrument; there is no correction of the data on the cloud. We believe this ensures the integrity of the data and helps to maintain confidence in the measurement. It is also in keeping with the IoT trend for increased 'processing at the edge'.



Fans of our ozone sensors will be pleased to know that we're still using our patented world class GSS ozone sensor. Outside of the AQM and AQS products, the GSS ozone sensor still performs extremely well in the AQY 1 as various independent evaluations have shown.

The NO_2 measurement is also unique. We're using our selective ozone sensor to correct for ozone interference on the electrochemical NO_2 sensor (a technique patented by Aeroqual). What this means is that the AQY 1 delivers a real NO_2 measurement rather than an approximation of NO_2 as delivered by all other devices that use an electrochemical NO_2 sensor. This is because all electrochemical NO_2 sensors are cross sensitive to ozone, and all electrochemical ozone sensors are cross sensitive to NO_2. Because we use a GSS ozone sensor which is highly selective to ozone, it allows us to use this technique to provide a highly accurate NO_2 measurement. The algorithm is embedded in the device itself and occurs in real-time.

The $PM_{2.5}$ and PM_{10} measurements are delivered by an optical particle counter which uses a well-known light scattering method to size and count particles and then convert them to a mass fraction. In humid conditions light scattering is susceptible to humidity artefacts which over-report particulate levels due to 'fogging' where the particles are encapsulated by moisture and appear larger to the sensor than they actually are. We correct for this effect by way of a humidity correction algorithm.

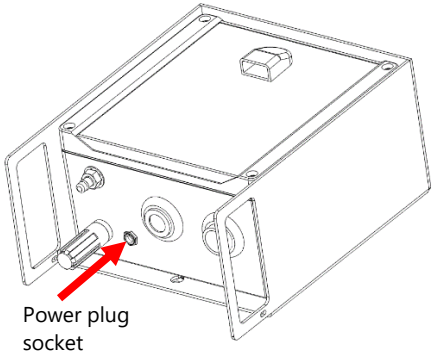
Find out more about Aeroqual's technology:
https://www.aeroqual.com/company/our-technology

Powering up your AQY 1

⚠ Before powering up your AQY 1

- If you have a modem fitted, please insert the SIM card before first powering up. This will ensure the AQY 1 automatically connects to Aeroqual Cloud at start up. See SIM Card Installation on page 8.
- If you do not have a modem and/or SIM card, when the unit powers up you can connect to the AQY 1 using WIFI. See Aeroqual Connect (via Direct WIFI) on page 11.

Plug the power adaptor into your mains power socket. Plug the supplied power jack into the power socket on the bottom of the AQY 1.



A green light should flash for 60 seconds then will stay on. After 60 seconds you should hear the internal fan switching on, then on and off every seconds. This indicates successful power on.

Power requirements

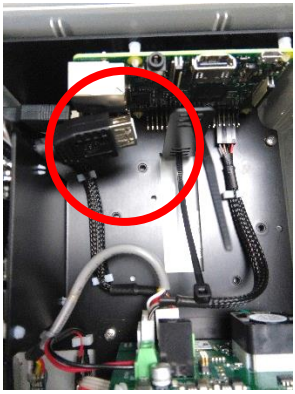
The AQY 1 requires 12VDC / 24W to operate and is supplied with a power pack with mains power plug.

The AQY 1 can be powered by solar electricity as long as the supply output is compatible with the factory supplied power pack or delivers 12VDC / 24W / 2A.

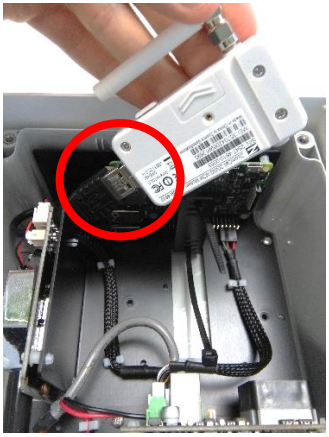
Modem Installation

If a modem is supplied separately or removed during sensor replacement, follow the steps below to install it.

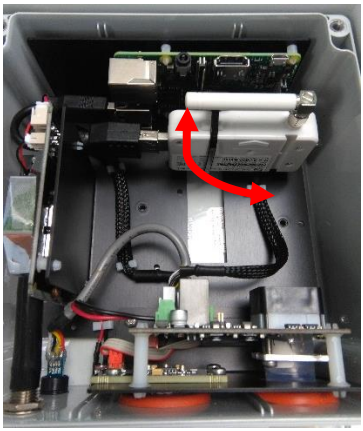
❶ Remove the front cover.



❷ Feed one of the supplied cable ties (connector head facing down) into the lowest slot of the vertical upright, leave ~ 2 in (50 mm) remaining.



❸ Connect the modem to the AQY 1 using the USB connection as shown above. Position the modem against the vertical upright with the pointed end of the cable tie extending out on the top side.



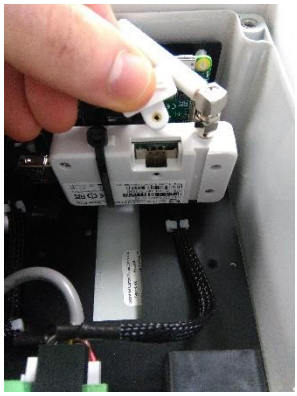
❹ Rotate the modem aerial down, bend the pointed end of the cable tie over the modem and feed through its connector, pull tight and trim excess. Rotate the aerial back to the horizontal. When replacing the front cover ensure the vent is at the top with the opening facing down.

SIM Card Installation

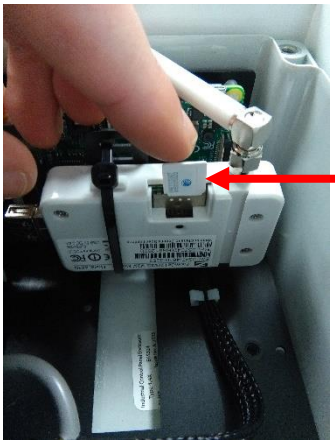
⚠ Insert the SIM card before first powering up. This will ensure the AQY 1 automatically connects to Aeroqual Cloud at start up. If the AQY 1 does not appear in Aeroqual Cloud after powering up, see Connect your AQY 1 to Aeroqual Cloud via Modem on page 13.

The standard modem takes a Micro SIM (12 x 15mm).

❶ Remove the front cover.

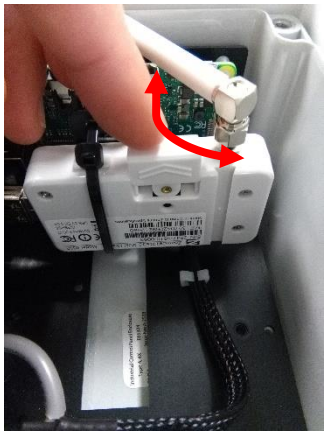


❷ Rotate modem aerial up to access the SIM card cover (the retaining screw is removed in the factory). Slide the cover up to remove it.



Micro SIM installation orientation

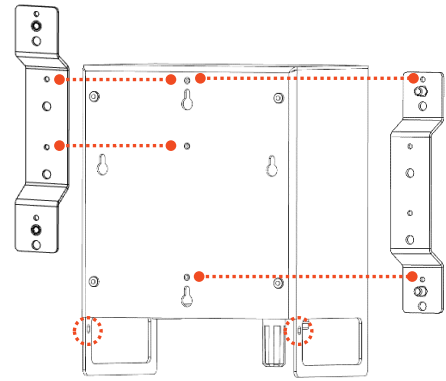
❸ Orientate and push in the Micro SIM with the connector face facing up and bevelled corner on the right as shown above.



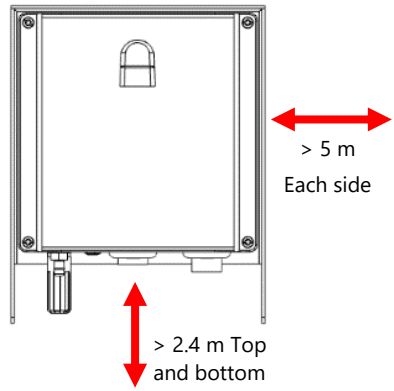
❹ Rotate the aerial back to the horizontal. When replacing the front cover ensure the vent is at the top with the opening facing down.

Mounting your AQY 1

The AQY 1 is weatherproof (IP33), no further shelter is required. It comes with a mounting bracket for mounting to a wall or pole. The back plate of the AQY 1 has "key-holes" to allow the bracket to be used vertically or horizontally, or you can fix the bracket using the M3 screw mount points. The DC side of the power adaptor has a 5 m cable to allow connection to an indoor mains power socket.



Cable tie points to secure power cable
M3 screw bracket mount points



Installation Clearances

- Choose a location with good airflow.
- Secure the power cable using cable ties.
- Install away from specific point sources e.g. kitchen vents, A/C units.

Installation examples

Connecting to your AQY 1

There are two ways to connect to your AQY 1:

- **Aeroqual Connect** for initial set up and when access to the internet is limited;
- **Aeroqual Cloud** for remote access, visibility of all your AQY 1 stations, and remote technical support from Aeroqual Care.

Aeroqual highly recommends every AQY 1 is connected to Aeroqual Cloud for the best user experience, additional data features, and Aeroqual Care.

Data Security

The data belongs to you. We look after it in the same way that a bank looks after your money. Who you let access your data is entirely up to you – our job is to carry out your instructions.

If you do choose to store data with us, then here are some of the security assurances we provide:

- We use only ISO 27001 approved data centres
- Infrastructure is monitored and protected 24/7
- Data is accessed via a secure website with 256-bit SSL encryption
- User defined passwords

Aeroqual Connect (via Direct WIFI)

No internet connection is required for Aeroqual Connect. Aeroqual Connect is always running on the AQY 1 and can be accessed via an internet browser on any device, there is no software to install.

1. Connect your AQY 1 to Aeroqual Connect via Direct WIFI

After a few minutes of power on, you should see a new Wi-Fi network in your device's list of Wi-Fi networks. The Wi-Fi name (SSID) will match your AQY 1 serial number, connect to this network using the password below.

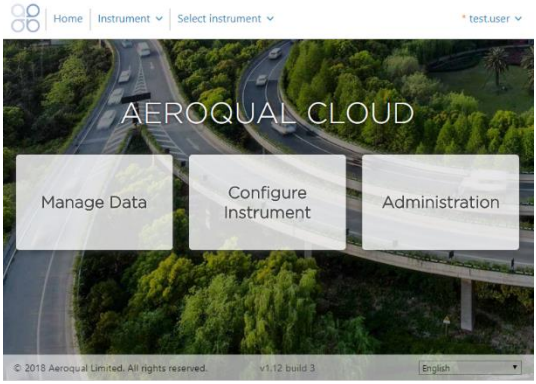
- Wi-Fi SSID: **AQY-AA000**
- Password: **Aeroqual**

2. Access your AQY 1 on Aeroqual Connect

After connecting your AQY 1 to your device, open an internet browser window and enter **10.10.0.1** in the address bar. You should see the Aeroqual Connect login screen. Log in with the default user name and password provided.

- Username: **administrator**
- Password: **aqmadmin**

After logging in to Aeroqual Connect, you will be presented with a screen with three 'apps'; Manage Data, Configure Instrument and Administration. You are now accessing your AQY 1 in "Access point" mode.



After logging in go to the Administration app and create a new user and secure password, then delete the default username and password.

Click on the **Manage Data** app to immediately see your data. In access point mode you can view and download data and make changes to the AQY 1 settings. The Wi-Fi range is approximately 10 meters. Data is automatically saved on-board the AQY 1 and can be accessed and downloaded over the direct Wi-Fi connection.

Aeroqual Cloud (via Network WIFI / Modem)

Data from your AQY 1 can be viewed or downloaded by you or your authorised users, remotely from anywhere in the world using Aeroqual Cloud.

1. Connect your AQY 1 to Aeroqual Cloud via a WIFI Network

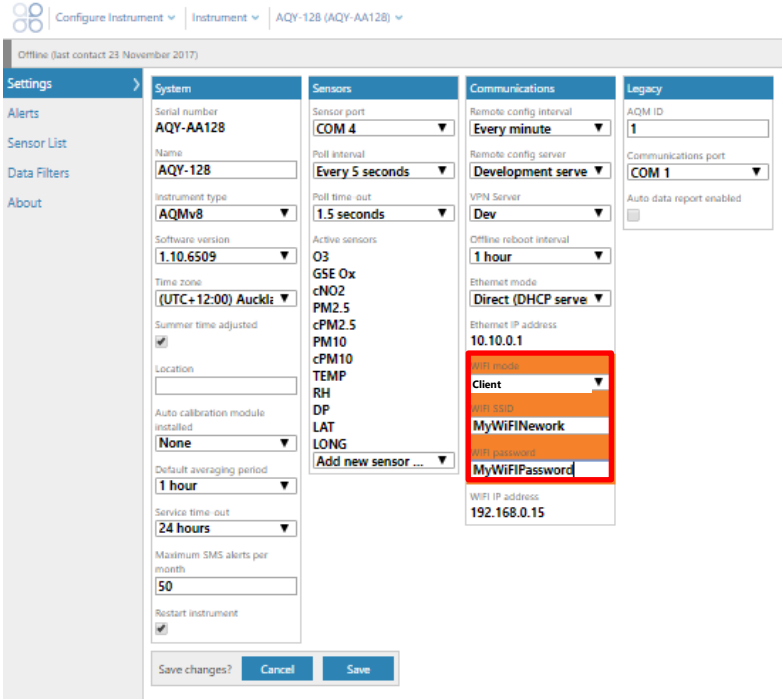
NOTE: If you haven't already done so you will need to first connect to your AQY 1 via Aeroqual Connect.

To use Aeroqual Cloud you need to connect to it through either an internet connected WIFI network, or by using the AQY 1 modem.

Open Aeroqual Connect as per step 2 in the previous section. Click on the **Configure Instrument** app to modify the connection settings.

⚠ In the next step the access point will be disabled, take extra care entering the SSID and password, or you may need to reset the AQY 1 – see Resetting your AQY 1 on page 26.

Change the WIFI mode from "Access Point" to "Client", type in the name of your internet connected WIFI network SSID, then type in your internet connected WIFI network password and click save. Your device will lose contact with the AQY 1 and the AQY 1 will connect to the internet.

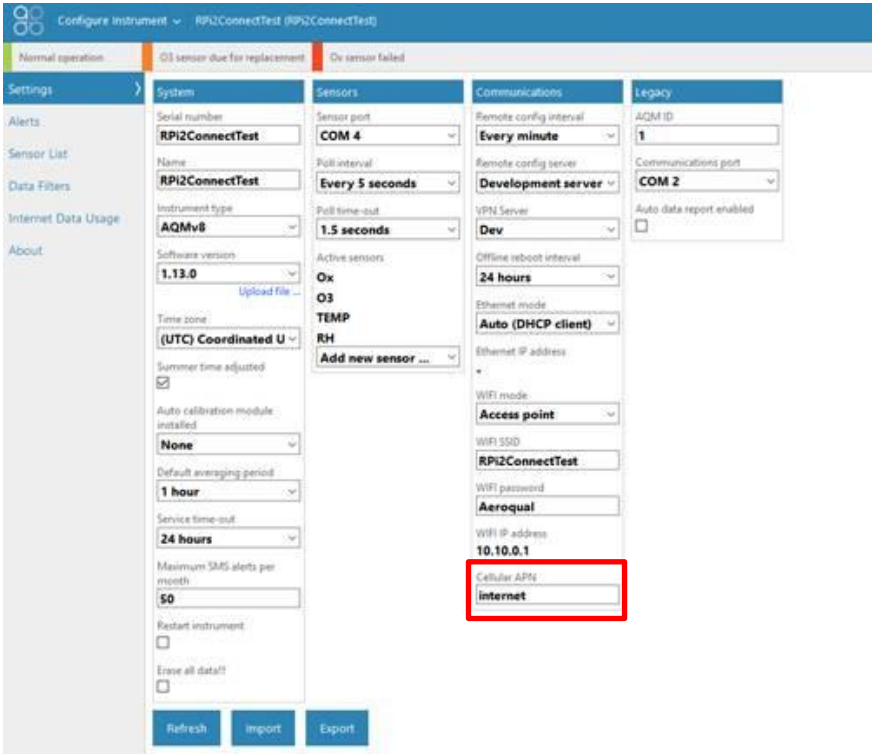


2. Connect your AQY 1 to Aeroqual Cloud via Modem

The AQY 1 modem supplied is configured to work with most cellular networks. When the network SIM card is installed in the modem prior to powering on it should detect the correct access point name (APN).

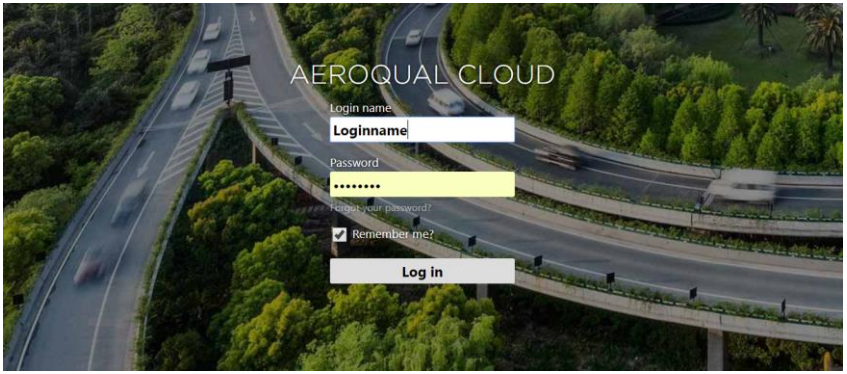
If your AQY 1 does not become available in your Aeroqual Cloud after inserting your SIM card and powering on, then you may need to change the Access Point Name (**APN**) which may be unique to your chosen cellular provider.

1. To change the APN you will need to access you AQY 1 through Aeroqual Connect. To do this refer to Aeroqual Connect (via Direct WIFI) on page 11.
2. Once logged in open **Configure Instrument**. Under the "Communications" column you will need to change the "Cellular APN" to match that of your cellular provider. The default is "*internet*". A list of cellular providers APNs is available at the following website: http://wiki.apnchanger.org.

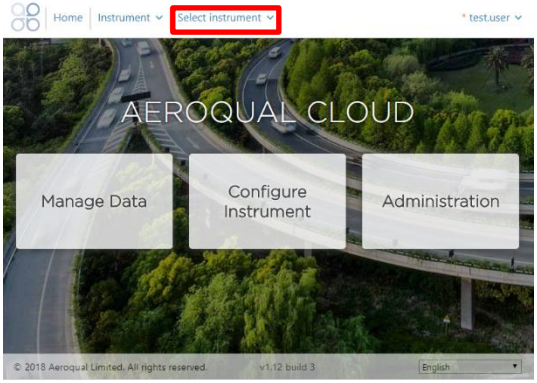


3. Access your AQY 1 on Aeroqual Cloud

Go to https://cloud.aeroqual.com. Enter the username and password provided by Aeroqual. For assistance email technical@aeroqual.com.



After logging in to Aeroqual Cloud, you will be presented with a screen with three "apps"; Manage Data, Configure Instrument and Administration. You can now access your AQY 1 through Aeroqual Cloud from anywhere in the world.



Click on **Select Instrument**. If your AQY 1 has successfully connected, you'll see "Normal Operation" reported in the banner at the top of the screen. If there is a connection error then check your APN as per the steps under Aeroqual Cloud (via Network WIFI / Modem) on page 12.

NOTE: If you have more than one instrument connected to Aeroqual Cloud, enter the Serial Number (AQY-AA000) of the AQY 1 you want to access.

If you have Administrator privileges then you can create other users (in the Administrator App) and these users can log on and download data from the AQY 1 also. You can view and download data using the Cloud Manage Data app.

Your AQY 1 Data

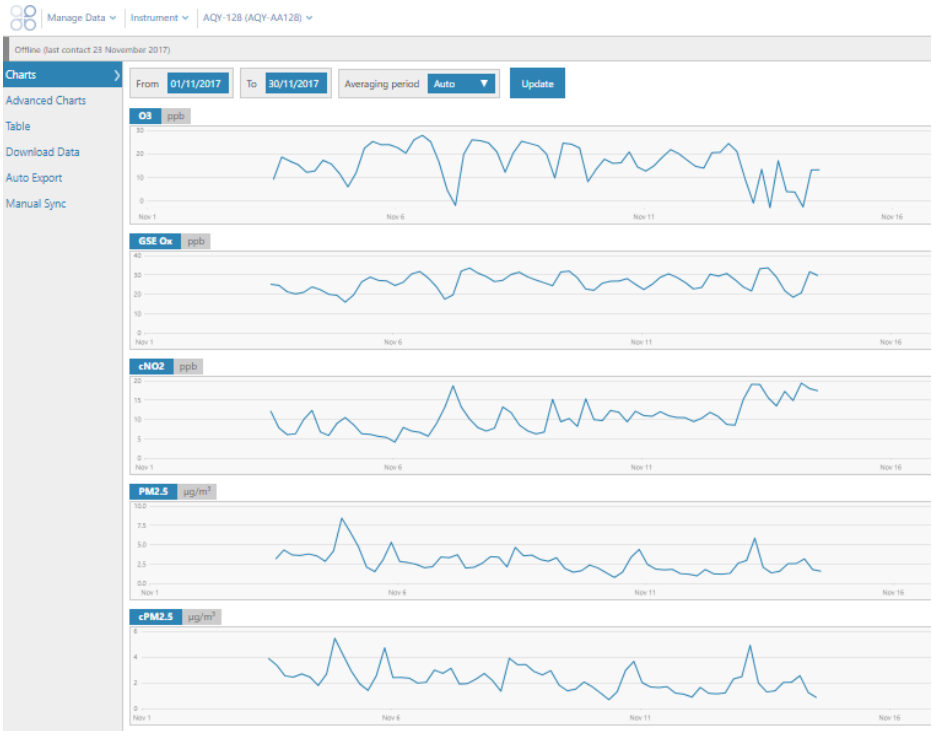
Once you are connected to your AQY 1 you can start viewing your data!

Data can be viewed and managed in either Aeroqual Connect or Aeroqual Cloud under “Manage Data”.

Manage Data

Under “Manage Data”, you can view your data in *Charts*, *Advanced Charts*, *Table* format, or use *Download Data* to see your data in a .csv file. For other features such as *Auto Export* and *Manual Sync*, please contact technical@aeroqual.com.

All data captured on the instrument is retained from the first measurement. Under *Charts*, adjust the **From** and **To** date range and **Averaging period** as required.



Commissioning your AQY 1

For most users, simply turning on the AQY 1 is enough. Data will start flowing. The AQY 1 comes factory calibrated and will report measured air quality parameters accurately.

For some users, with high data quality objectives, calibration against a 'reference' station is the best way to ensure highest correlation between AQY 1 and reference. To do this install the AQY 1 at the reference station (within 10m of the reference station inlet) allow it to run for minimum 72 hours then contact us for further instructions (technical@aeroqual.com).

Looking after your AQY 1

The sensors supplied with your AQY 1 are intended to provide trouble free operation during the useful life of its sensors subject to geographical location.

WHO annual average PM_{10} (ug/m^3)	Example Cities	Useful AQY 1 life (months)*
0 - 50	Sydney, Los Angeles, London, Hong Kong, Berlin, Singapore, Sao Paulo, Tokyo, Moscow	10 - 14
51 - 100	Seoul, Bangkok, Istanbul, Shanghai, Johannesburg	8 – 12
101 – 150	Beijing, Medina, Kuwait, Lagos	6 – 10
151 - 200	Delhi, Mumbai,	4 – 8

*Useful life means the time from installation until the point when the sensor can no longer be remotely calibrated.

Calibration

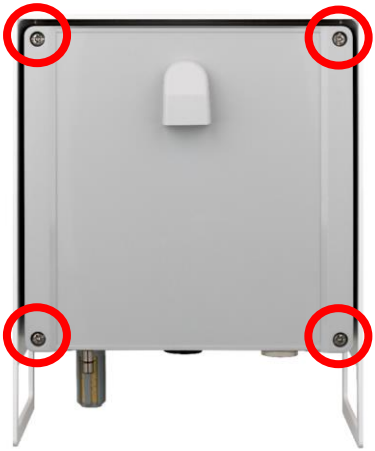
Calibration parameters for the NO_2, O_3 and $PM_{2.5}/PM_{10}$ sensors are stored on the associated sensor board so the sensors and connected board need to be replaced with factory calibrated sensors for either calibration or in the case of sensor failure.

To replace the sensors refer to the next section.

Sensor Replacement

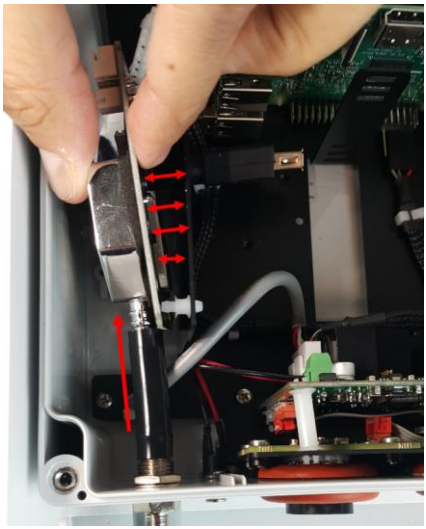
1. Replacing the $PM_{2.5}$/PM_{10} Sensor

❶ Disconnect the power supply at the bottom of the AQY 1 unit.

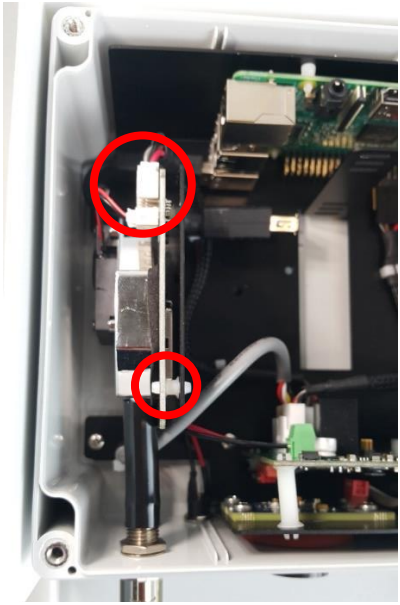


❷ Loosen all 4 screws (they will not come out of the casing)

❸ Disconnect white connector at the top of the PM sensor.



❹ Separate the PM sensor from the metal bracket by disconnecting the white spacers. Pull the sensor out of the sample tube (wiggling or rotating may be required).



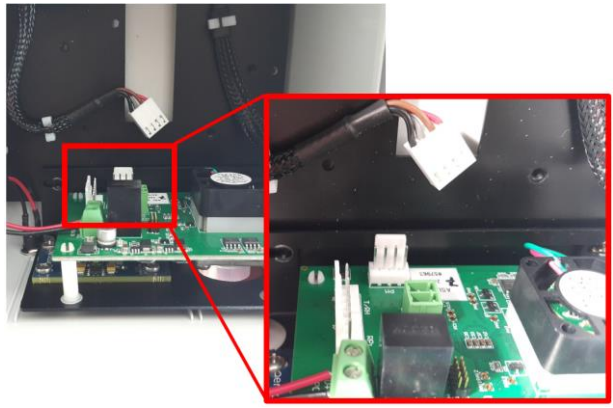
❺ Insert the new PM sensor into the sample tube.

Connect using the white spacers back to the metal bracket.

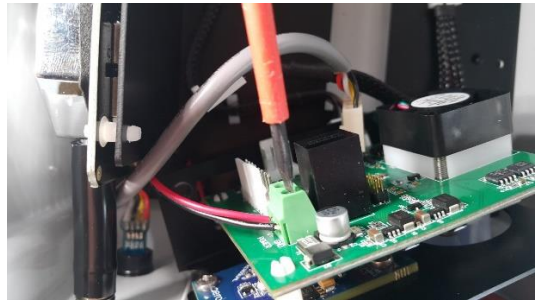
Connect the white connector at the top of the new sensor.

NOTE: If you are only changing the PM sensor then you still need to program the calibration parameters for this sensor, refer to section 3 Setting the $PM_{2.5}$/PM_{10} sensor calibration parameters.

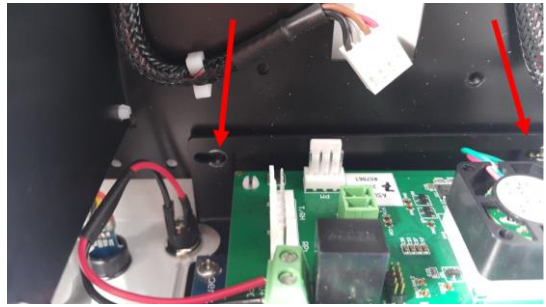
2. Replacing NO_2 and O_3 combined sensor cartridge



❶ Disconnect the 3 white data connections from the O_3/NO_2 sensor module. The connections are labelled PM, T/RH and RPi.



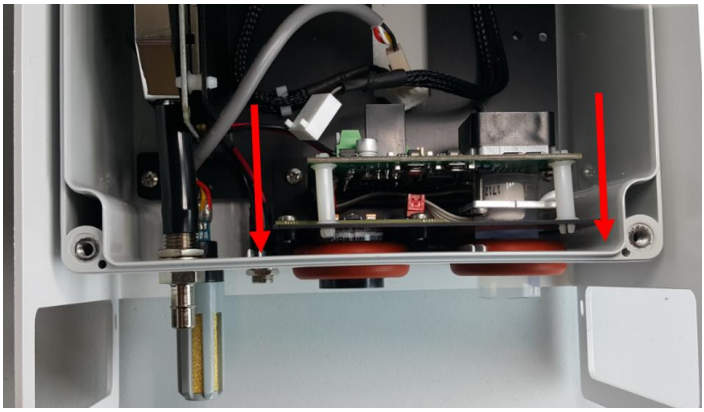
❷ Unscrew the positive and negative power supply cables from the O_3/NO_2 sensor module.



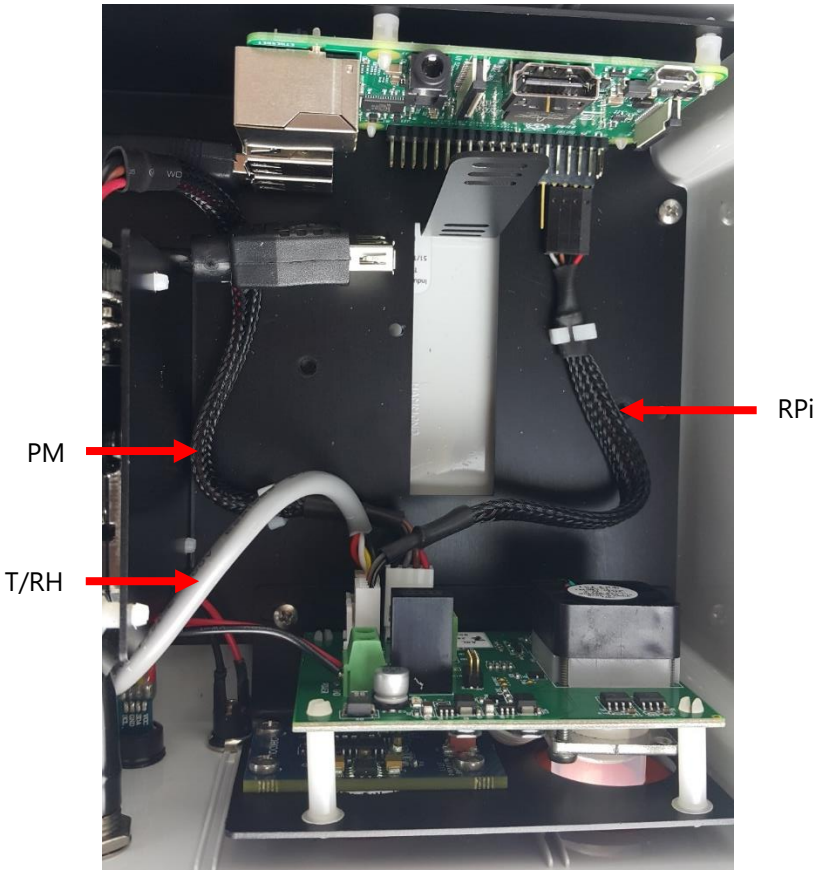
❸ Unscrew the entire sensor module from the AQY 1 back plate. The sensor module can now be removed by pulling vertically, gently pull the sensors free from their grommets.

❹ Never directly touch the exposed NO_2 sensor at the bottom. If for any reason the sensor becomes disconnected from your replacement sensor assembly only grip the sides of the sensor when reconnecting.

❺ Connect the positive and negative power supply cables to the replacement O_3/NO_2 sensor module. Ensure you double check the polarity

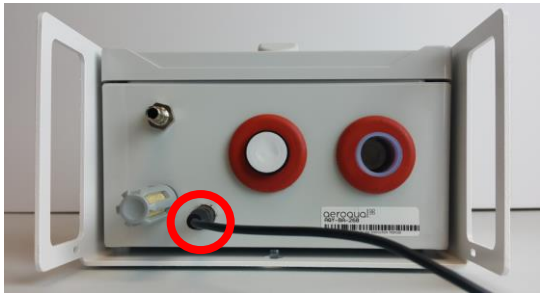


❻ Align the NO_2 and O_3 sensors with the appropriate holes in the base and place the sensor module in position.



❼ Re-attach the sensor board to the back plate with your screws

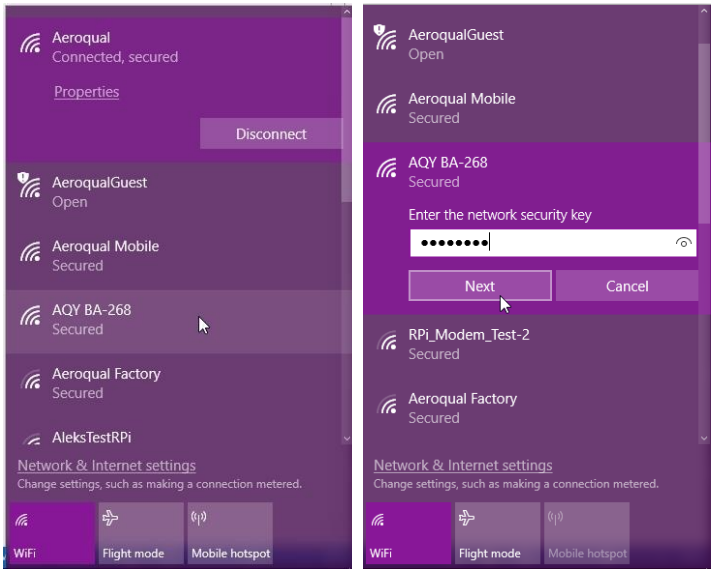
Ensure you connect the data connections to the correct terminals on the sensor board.



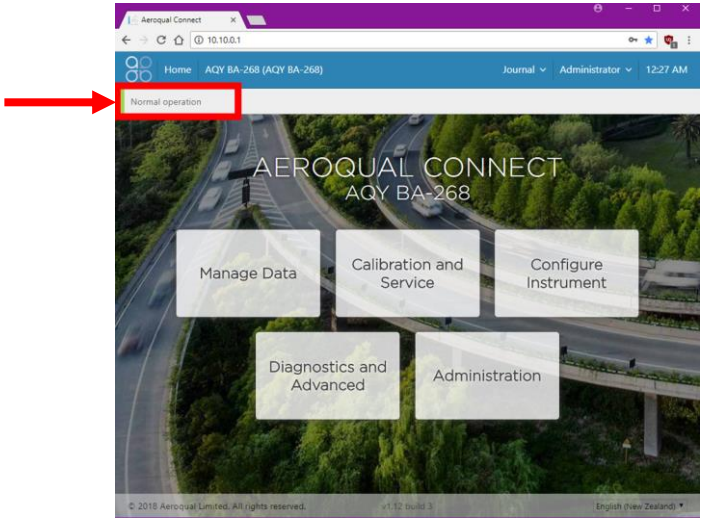
❽ Replace the front cover ensuring the front vent is at the top with the opening pointing down, then reconnect the power supply.

3. Setting the $PM_{2.5}$/PM_{10} sensor calibration parameters

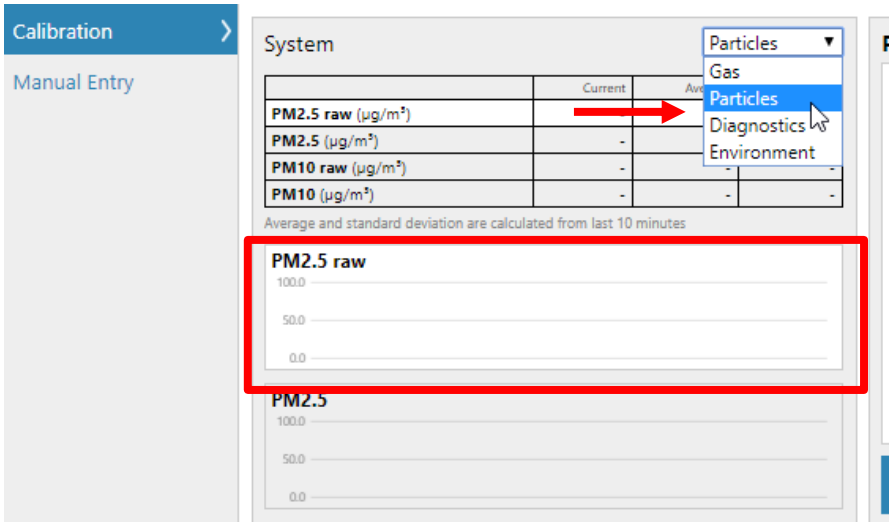
After replacing the $PM_{2.5}$/PM_{10} sensor the sensor calibration parameters need to be checked and reset.



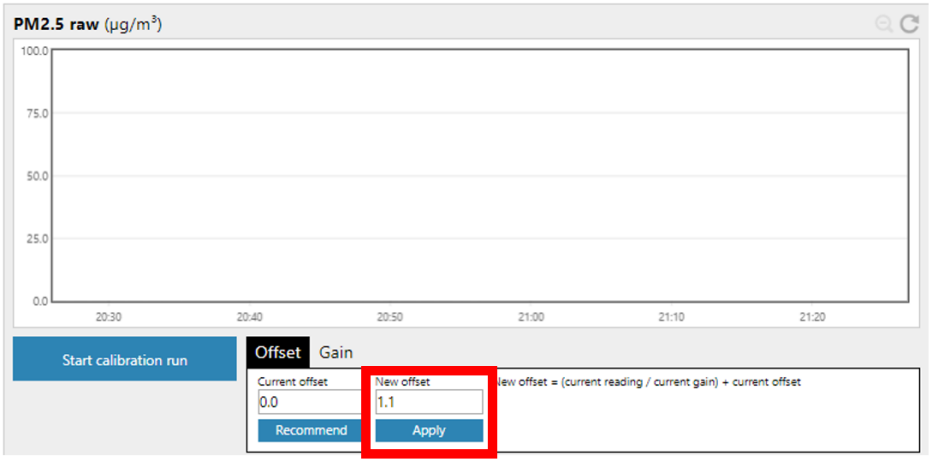
❶ Connect to the instrument's access point or alternatively view the unit on Aeroqual Cloud.



❷ Ensure that the instrument is in **Normal operation** and not displaying an error message. If an error is displayed return to step 5 of section 1Replacing the PM2.5/PM10 Sensor, and ensure the connections are correct.



❸ Select Calibration and Service and toggle the drop-down selection to "Particles"



❹ Select the "PM2.5 raw" channel input the offset provided on your calibration certificate and press apply. Select Gain and input then apply the gain for the "PM2.5 raw" channel.

Repeat this for the "PM10 raw" channel.

Do not adjust theses parameters on the other particle channels.

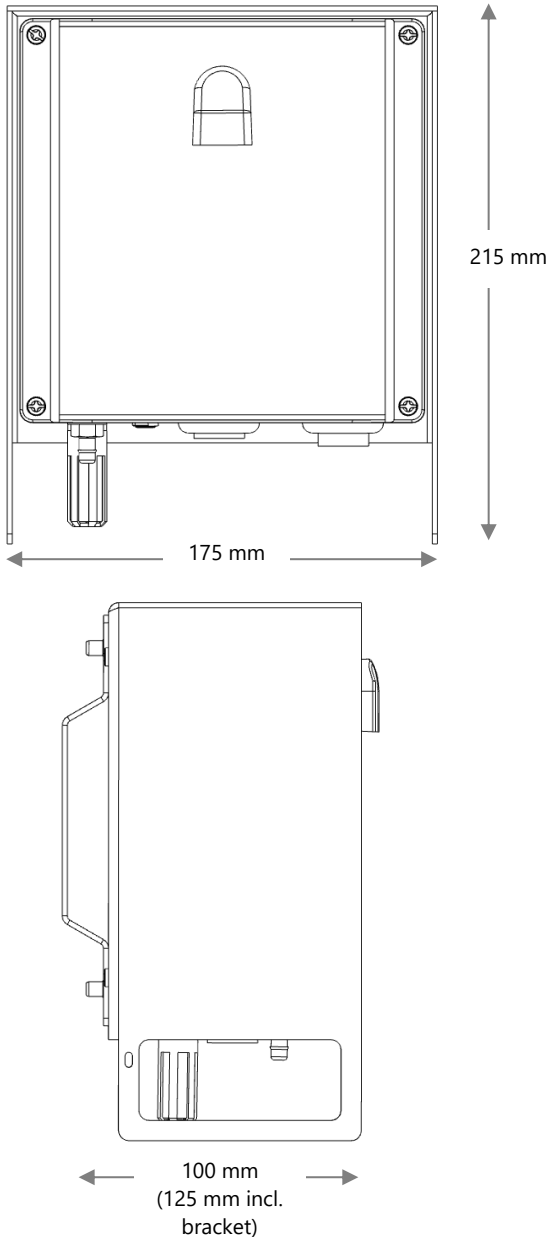
Specifications

PARTICLE SENSING	SIZES	RANGE	ACCURACY	LOWER DETECTABLE LIMIT (2σ)
Laser scattering	$PM_{2.5}$	0 to 1000 µg/m³	<±(10 µg/m³ + 5% of reading)	<1 µg/m³
	PM_{10}	0 to 1000 µg/m³	<±(10 µg/m³ + 10% of reading)	<1 µg/m³

GAS SENSING	RANGE (ppb)	RESOLUTION / ppb	NOISE	LOWER DETECTION LIMIT / ppb	PRECISION	LINEARITY (% OF FS)	DRIFT 24 HOUR
			ZERO / ppb; SPAN % OF READING				ZERO / ppb; SPAN % OF FS
Ozone (O_3)	0-200	1	<1 <2%	1	<4% of reading or 4 ppb	<3%	<2; 1%
Nitrogen Dioxide (NO_2)	0-500	1	<2 <4%	2	<8% of reading or 8 ppb	<6%	<4; 1%

SYSTEM SPECIFICATIONS	
Control System	Single board computer, 1.2GHz quad-core, 1GB SDRAM, 16GB SDHC Storage, Linux Operating System
Communications	Standard: WIFI, 3/3.5/4G cellular modem
Software	Connect: for setup and field service. Installed on device and accessed via web browser Cloud: for instrument and data management. Runs on secure 'cloud' servers, accessed via web browser. Features: configuration, diagnostics, journal, calibration and data acquisition, plus SMS and email alerts, auto data export via FTP and email, and data export API
Data logging	16GB SDHC Storage (>2 years data storage)
Averaging period	1 min, 5 min, 10 min, 15 min, 20 min, 30 min, 1 hr, 2 hr, 4 hr, 8 hr, 12 hr, 24 hr
Power system	12VDC plug pack (90 to 260VAC input) 24W (rated for -10°C to 40°C) Cable: 5m
Enclosure	Weather proof IP33 with solar shield
PM Sampling System	Inlet: 4cm anti-static inlet Sampling: 5V DC fan
Gas Sampling System	Inlet: Teflon, stainless steel Sampling: 5V DC fan
Dimensions	215H x 170W x 125D mm (including solar shield armour & mounting brackets)
Weight	<1 kg
Environmental operating range	-10°C to +40°C
Mounting	Mounting bracket included for pole, tripod or wall
Life expectancy	System: 5 years Sensors: ~12 months based on 0-50 µg/m³ annual average PM_{10}
Other measurements	Temperature: -40°C to 125°C; Relative Humidity: 0 to 100%; Dewpoint: -30°C to 50°C

Dimensions



Troubleshooting

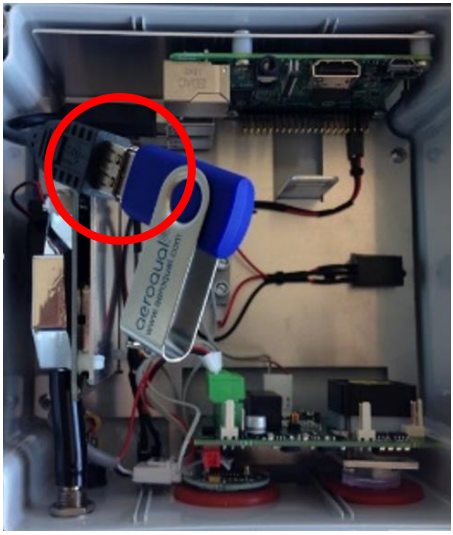
Resetting your AQY 1

If you don't see the "Normal Operation" status after 10 minutes when first connecting, or you have incorrectly entered your network details, follow these instructions to reset your AQY 1 back to factory settings.

The AQY 1 will return to Access Point mode, which will broadcast a WI-FI network with SSID called "Aeroqual AQM", password is "Aeroqual".

The USB stick that came with your AQY 1 has a file in the root directory called **.resetnetwork.aqm** (note the "dot" at the beginning). You can create this file on a FAT32 encoded USB stick by creating a new .txt document and naming it **.resetnetwork.aqm** (the file extension must be **.aqm**, not **.aqm.txt**).

To reset your AQY 1 remove the lid, and plug the USB stick into the USB ports as shown in the image below – if you have a modem fitted you will need to unplug the modem to use the USB connection. After several minutes, the computer will reset and you should see "Aeroqual AQM" Wi-Fi network appear on your device list of available Wi-Fi connections. Connect to the AQY 1 with the password "Aeroqual".



For all other technical issues contact technical@aeroqual.com

The Legal Stuff

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This product is warranted according to Aeroqual Ltd's Terms of Trade. For further warranty information, please refer to the standard Product Warranty Policy as published on the Aeroqual website at www.aeroqual.com.

Statements of Compliance

- The Aeroqual AQY 1 complies with EN 50082-1:1997
- The Aeroqual AQY 1 complies with EN 50081-1:1992
- The Aeroqual AQY 1 complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) these devices may not cause harmful interference, and (2) these devices must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

We hope you enjoy using your AQY 1 as much as we enjoyed making it!

For your notes

Just a handful of customers who chose Aeroqual

aeroqual

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