

AQMesh Operating Manual



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Manual guidelines

1.1 Document history

Issued by	Issue date	Change control ID	Issue No.	Reason for change
A.Randle	24/7/13	OMAQM	1.0	Development of installation guide. New document
A.Randle	01/10/13	OMAQM	1.1	Spare parts added
A.Randle	03/10/13	OMAQM	1.2	Further minor edits
A.Randle	08/10/13	OMAQM	1.21	Further minor edits
J. Burniston	24/10/2013	OMAQM	1.22	Minor formatting edits
J.Burniston	05/08/2014	OMAQM	1.23	Minor correction of a section number
J.Burniston	28/08/2014	OMAQM	1.24	Updated to reflect sun shield

1.2 Hyperlinks


Hyperlinks to other sections of this manual, websites or email addresses are in the following format:

www.aqmesh.com

1.3 Notes

Important /useful information and instructions are shown clearly throughout the manual in a note format.


For example:

 Note: For further information please contact AQMesh technical support by emailing support@aqmesh.com or contacting your distributor.
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1.4 Safety related information

Safety related information

Information in this manual that may affect the safety of users and others is preceded by the following symbol:


 Warning

Failure to follow this information may result in physical injury which in some cases could be fatal.

Introduction

This manual explains how to install and operate the AQMesh outdoor air quality monitor.

The AQMesh outdoor air quality monitor is designed to measure atmospheric gases in ambient environments. It has been developed to incorporate the latest design and technology, providing the user with an extremely simple-to-use and flexible monitor that is intended for use in a number of applications.

 Note: Whilst robust in design the monitor is a sensitive piece of scientific equipment and should be treated as such.

1.5 The AQMesh monitor

The monitor has the following features:

- ppb measurements
- Two years sensor and battery life, depending upon data frequency and transmission rates
- NO gas measurement in the range 0 to 2ppm
- NO₂ gas measurement in the range 0 to 200ppb
- O₃ gas measurement in the range 0 to 200ppb
- Optional CO gas measurement in the range 0 to 5ppm

- Optional SO₂ gas measurement in the range 0 to 10ppm
- Pressure measurement range 0 to 1500 mb
- Pod temperature measurement range -20 to +100 °C
- Humidity measurement range 0 to 100 %RH
- Wireless communications
- Secure mounting
- Rugged, waterproof IP65 case design
- Battery powered
- Simple installation
- Low cost
- Large or small networks – single unit to 100s
- Data automatically downloaded to secure server
- Easy access to data via web
- Data tables and graphs
- Data export
- Secure data storage

1.6 Applications

- Site perimeter monitoring
- Traffic hot spot monitoring
- Fugitive emission monitoring
- General quality monitoring

1.7 General

If practical, protect the analyser from strong direct sunlight as this will quickly raise the temperature of the analyser beyond its operating range. AQMesh has provided a sun shield to help with the effects of sunlight.

1.8 Storage

When not in use the monitor should be kept in a clean, dry and warm environment, such as an office. It should be stored upright on its base which helps prolong the life of the sensors.

1.9 Memory

Data will be automatically transferred to AQMesh.net for secure storage and processing. Data is stored locally when it cannot be transmitted to the server. The internal memory should not be used as a permanent storage medium and any important data should be transferred to AQMesh.net as soon as possible. The monitor should not be stored for prolonged periods with valuable data in its memory.

1.10 Calibration


The sensors fitted into the AQMesh are fully calibrated during manufacture and do not exhibit drift normally associated with other types of sensors. However, to prove accuracy prior to deployment pods can be co-located with industry standard reference equipment. User/field calibration can be performed using specialist equipment and applying the required offset via AQMesh.

1.11 Cross-gas effects and data processing

The sensors fitted into the AQMesh pod suffer cross-gas effects. Measured gases are compensated automatically during post-processing on AQMesh.net. Unmeasured gases can be the cause of erroneous measurements.

The O₃ reading is achieved using digital signal processing which requires a certain number of data points to give results that are comparable to the industry standard reference equipment. This will result in a straight line


projected forward for the last section of processed O3 data. This data is retrospectively corrected as new data is delivered.

 Note: For further information please contact support@aqmesh.com or contact your distributor.

1.12 Service

The AQMesh pod will last for many years but should be regularly serviced to ensure correct operation and accurate readings. The manufacturer recommends replacement of all sensors and the battery **every 2 years**.

1.12.1 User serviceable parts

 Note: Please do not attempt any repair as this may invalidate any warranty supplied with your pod. Only parts supplied by AQMesh or its authorised distributors can be fitted into this equipment.


The following parts are user-replaceable and can be purchased from your local distributor. Please contact them for further information.

AQM-NO-SENSOR	Spare-NO sensor for AQMesh including data on AQMesh.net
AQM-NO2-SENSOR	Spare-NO2 sensor for AQMesh including data on AQMesh.net
AQM-O3-SENSOR	Spare-O3 sensor for AQMesh including data on AQMesh.net
AQM-SO2-SENSOR	Spare-SO2 sensor for AQMesh including data on AQMesh.net
AQM-CO-SENSOR	Spare-CO sensor for AQMesh including data on AQMesh.net
AQM-3GAS	Spare-3 gas sensor suite for AQMesh (NO, NO2, O3)
AQM-5GAS	Spare-5 gas sensor suite for AQMesh (NO, NO2, O3, SO2, CO)
AQM-BATTERY	Spare-Battery pack for AQMesh
AQM-ANTENNA	Spare-Antenna for AQMesh
AQM-MOUNTBRKT	Spare-Standard mounting bracket for AQMesh
AQM-COMSCABLE	Spare-Communications cable for AQMesh
AQM-TAMPTOOLBIT	Spare-Tamperproof screwdriver bit for use with AQMesh (pack of 10)
AQM-TAMPPIN	Spare-Tamperproof pin (pack of 10) for AQMesh
AQM-FIXINGCHANNEL	Spare-Fixing channel set for AQMesh - includes 2 channel pcs and 4 fixing screws
AQM-LAMPPOSTCLIP-76MM	Spare-Standard post fixing set for 76mm diameter post (pack of 2)

AQM-LAMPPOSTCLIP-89MM	Spare-Standard post fixing set for 89mm diameter post (pack of 2)
AQM-LAMPPOSTCLIP-114MM	Spare-Standard post fixing set for 114mm diameter post (pack of 2)
AQM-BANDING	Spare Banding, steel reel 30.5m x 12.5mm for AQMesh
AQM-FIXTOOL	Spare-Steel banding tool for use with AQMesh standing fixings
AQM-POSTCLIPS	Spare-Universal banding clips for AQMesh (pack of 2)
AQM-BANDBUCKLE	Spare-Universal banding buckles for AQMesh (pack of 2)
AQM-SUN SHIELD	Spare-Sun shield for AQMesh
AQM-ANTENNA/SOCKET	Spare-Cable, assembly for AQM-ANTENNA
AQM-SCREW (3MM HEX)	Spare-Screw, (3mm hex) for AQMesh (pack of 100)
AQM-BACK PLATE ASSY	Spare-Back plate assembly fitted with gaskets
AQM-2MM HEX KEY	Spare, Hexagon key 2mm, L-shape for AQMesh

1.13 Cleaning

The AQMesh can be wiped clean using a damp non-fibrous cloth.

 **Note:** Do not use solvents or any other chemical cleaners as they may damage the finish and adversely affect the gas readings.

Installation

1.14 Tools required

- Handle for hex security bit

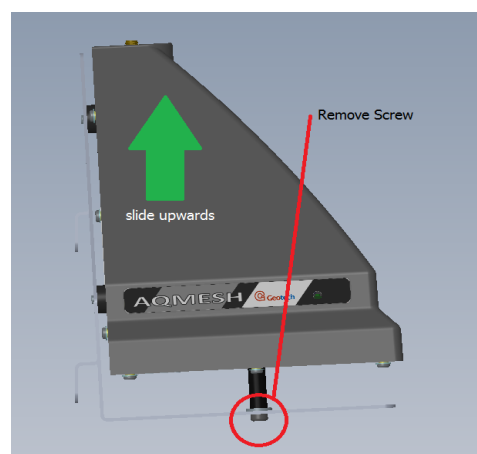
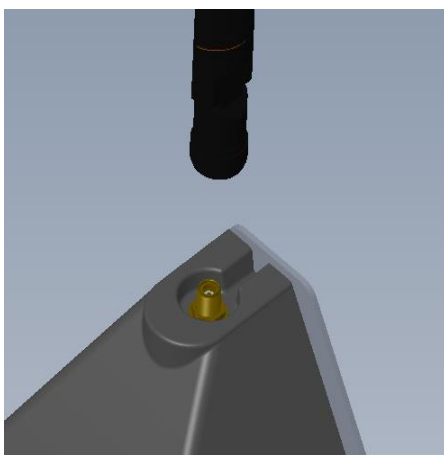
Please note: Each installation is different depending on the site and method of mounting. Therefore the tooling requirements for placement and fixing of the mounting bracket is not covered by this document.


1.15 Preparation

Carefully unpack your AQMesh pod. You should have the following items:-

- AQMesh pod serial number AQXXXX
- An aerial
- A mounting bracket with security screw
- Hex security bit
- 2mm Allen key
- Sun shield

1. Install the aerial to the threaded fitting on the top of the AQMesh pod



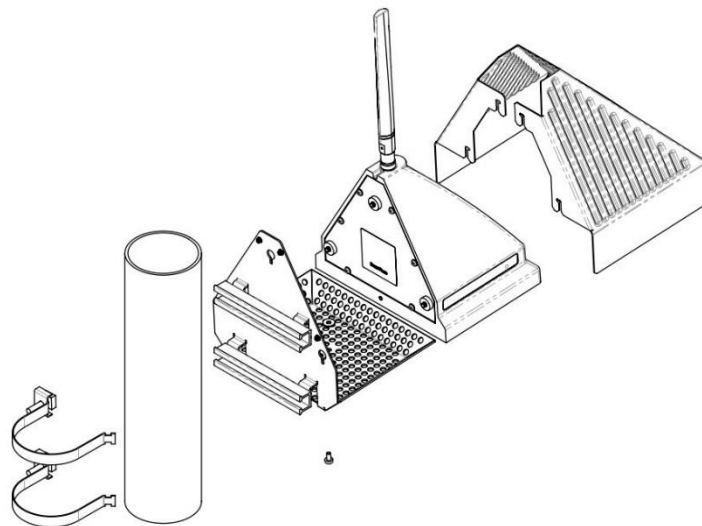
 Important: DO NOT POWER UP THE AQMESH POD WITHOUT THE AERIAL IN-PLACE AS IT CAN DAMAGE THE ELECTRONICS

2. Remove the AQMesh pod from the mounting bracket. Remove the central security screw from the base of the product and slide the pod upwards to release from the mounting bracket.

1.16 Installation method

<p>⚠ Warning</p>	<p>Always ensure that you refer to and comply with the relevant National Working at Heights regulations prior to any installation work.</p>
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Install the pod's mounting bracket securely in position where you would like to install your pod. Example below:-



Please consider the following requirements for all potential installation sites:-

- Weight of AQMesh assembly (approx.1.5kg)
- GPRS coverage
- Safety of the public
- Security (the pod is not designed to be vandal proof)
- Permission for access and installation of battery powered equipment
- Environmental conditions:-
 - Temperature (-20 to +40 °C)
 - Humidity (15-85%)

Please consider the following requirements when positioning your AQMesh:-

- Free access to ambient air
- Away from potential sources of contamination
- GPRS signal strength with its aerial in the upright position

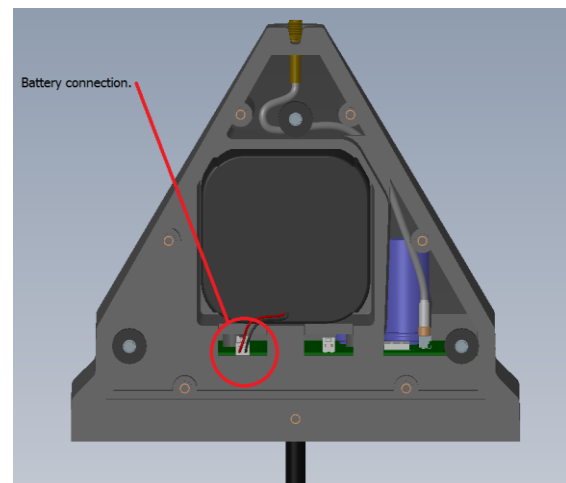
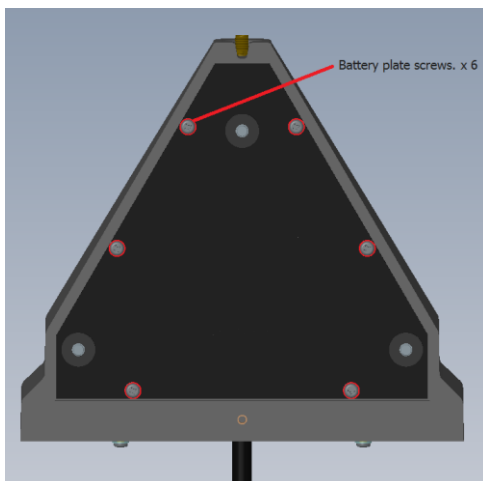
1.17 Activation method

Your pod is shipped with the battery in-place but disconnected and rotated for safety during shipping.

1. Remove the sun shield from the pod
2. Remove the six screws holding the triangular battery plate in position and remove the plate.

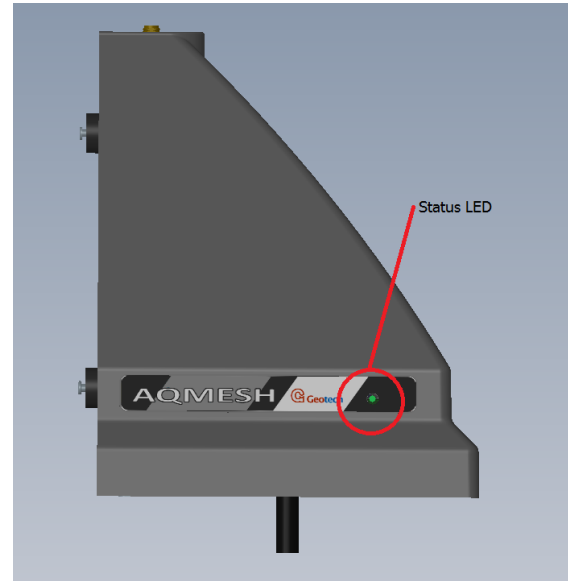


Care point: Ensure the battery is held in place as the plate is removed



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3. Rotate the battery and connect the 2-pin battery lead to either connector on the PCB.
4. Ensure the status LED located behind the window in the AQMesh label lights. The LED blinks alternatively green and red at power-up.
5. Observe the LED sequence to determine the server connection is achieved (see below):-




- | | |
|---|--|
| 1 | Alternate green/red blink, power-up |
| ↓ | |
| 2 | Slow green blink, super-cap is charging |
| ↓ | |
| 3 | Fast green blink, connecting to the server |
| ↓ | |
| Green on for 5 seconds then permanently off, connection succeeded | |

✍ Please note: When the pod has successfully connected, **ALL** LEDs will be off. If the pod cannot make a connection immediately it will re-try. In this case, the LEDs will go off when it makes a connection. The best way of confirming that a connection has been made is by looking at pod connections within AQMesh.net.

6. Replace the triangular battery plate and secure its six screws
7. Replace the sun shield

8. Check the web server is receiving data from the AQMesh pod (see separate instructions)
9. Enter the GPS coordinates for the pods installation position into the relevant field on the web server 'pod detail' page. Please note: This can be done at any time before, during or after installation.
10. Install the AQMesh pod on to the mounting bracket. Locate the keyhole pillars and slide the pod downwards to lock onto the mounting bracket
11. Secure the AQMesh on to the mounting bracket using the security screw provided
12. The sensors in your AQMesh pod may take 5 days to stabilise within its environment, followed by 2 to 4 days for base line adjustment. It is very important that this is performed in the environment that the pod will be used and not in your office or a local test site. You can use AQMesh.net options to Re-start the stabilisation period at any time.

 Warning	<p>If the equipment is likely to be used with equipment conforming to IEC60950 and there is a hazard due to moisture or liquids (eg using a PC during installation outside) please take the precautions necessary as stated by the equipment manufacturer's instructions. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.</p>
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1.18 Installation FAQs

1.18.1 **LED fault codes during the start-up sequence**

Pattern 4: Slow red blink occurs where the connection failed due to a local issue. Possible causes can include the following:-

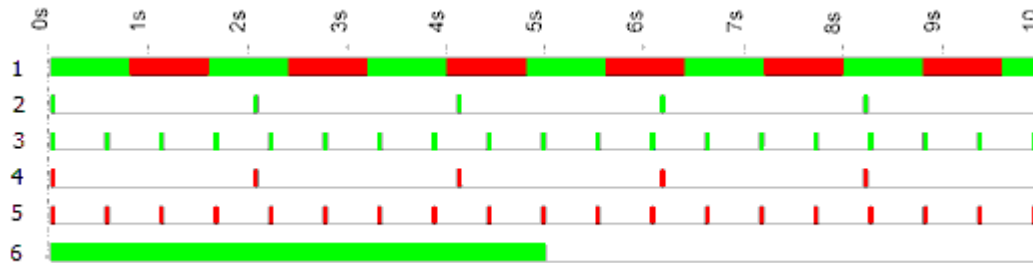
- The SIM card is locked with a PIN code - the AQMesh pod cannot accept SIM cards which have been configured to include a PIN code. Talk to your service provider if the SIM fitted is not AQMesh standard issue
- The AQMesh pod can't attach to the network - try to change the aerial orientation or the pod location because of bad GPRS coverage
- The AQMesh pod can't connect to the APN - talk to your service provider. The engineer may need to manually enter the correct APN settings via the serial link
- Unexpected error - please contact AQMesh technical support

Pattern 5: Fast red blink occurs when there is an error with the server:

- Can't connect to the server - the server may be offline or the IP and port are not set correctly in the AQMesh pod. The engineer may need to manually enter the correct settings via the serial link
- Response timeout - the server did not reply in time to a command. In the first instance contact AQMesh technical support as it may be possible to adjust settings remotely
- Response error - the AQMesh pod received data from the server, but the format of the response is not correct. Contact AQMesh technical support
- The pod has not been enabled in AQMesh (tick box)

LED Summary table:

- 1 Alternate green/red blink, start-up
- 2 Slow green blink, super-cap is charging
- 3 Fast green blink, connecting to the server
- 4 Slow red blink, connection failed due to a local issue
- 5 Fast red blink, connection failed due to a server issue
- 6 Green on for 5 seconds then off, connection succeeded



1.18.2 Changing a sensor

<p>⚠ Warning</p>	<p>Always ensure that you refer and comply with the relevant National Working at Heights regulations prior to any installation work.</p>
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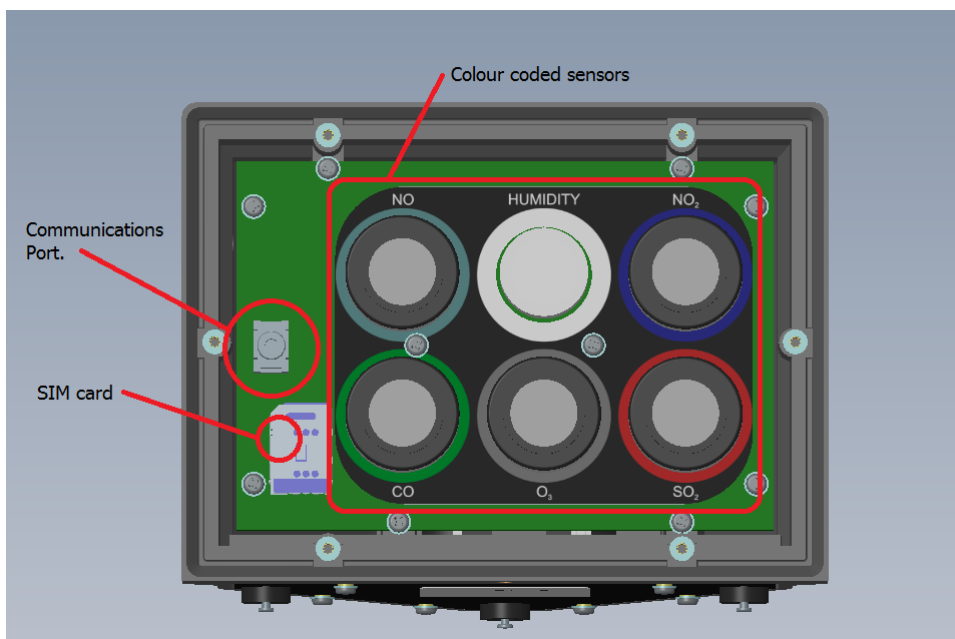
To change a sensor it must be updated in two phases. In addition to replacing the physical sensor the web-server needs updating to associate the relevant calibration data (stored on the server) with the new sensor. Please follow the steps listed:-

<p>📌 Note: Important - DO NOT INSERT OR REMOVE THE GAS SENSORS WHILE THE POWER IS ON AS IT CAN DAMAGE THE SENSORS.</p>

1. Login to the web application using you user ID and password
2. Select the correct AQMesh pod.
3. Select the “Manage Pod Sensors” and select the sensor type using the drop down list box and click “view”

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4. Enter or scan the new sensor's barcode in to the barcode field. Scroll down to the end of the page and press the "Update" button
5. Confirm the new barcode is accepted then proceed. Note: The server update can be done at any time before, during or after the physical sensor installation.
6. Remove the six screws holding the triangular battery plate in position and remove the plate. Care point – ensure the battery is held in-place as the plate is removed
7. Disconnect the 2-pin battery lead, taking care to lift the locking tab and not to pull the wires from the housing
8. Remove the six screws holding the sensor plate in position and remove the plate.
9. Locate and carefully remove the required sensor from its socket. It pulls straight out but may require a gentle wiggle.



10. Carefully insert the new sensor in position taking care not to damage the sensitive gas interface membrane on its surface
11. Replace the sensor plate and secure in position with its six screws
12. Reconnect the 2-pin battery lead to either connector on the PCB
13. Ensure the status LED located behind the window in the AQMesh label lights

14. Observe the LED sequence to determine the server connection is achieved
15. Replace the triangular battery plate and secure its six screws
16. Check the web server is receiving data from the AQMesh pod (see separate instructions)
17. The sensors in your AQMesh pod may take 5 days to stabilise within its environment, followed by 2 to 4 days for base line adjustment
18. Refer to WEEE directive for disposal of sensors or return to your distributor for a warranty return.


1.18.3 Changing a SIM card

To change a SIM card on the same network requires two changes:


1. Replace the physical SIM card fitted to the AQMesh
2. Updating the pod on AQMesh.net with the new SIM card details

 Note: Important - DO NOT INSERT OR REMOVE THE SIM CARD WHILE THE POWER IS ON AS IT CAN DAMAGE THE ELECTRONICS.

1. Login to the web application using you user ID and password
2. Select the correct AQMesh pod and select “Pod details”
3. Select the “DETAILS” tab
4. Enter or scan the new SIM’s barcode in to the “SIM Card IMEA No.” field. Scroll down to the end of the page and press the “submit” button.
5. Confirm the new barcode is accepted then proceed.

 Note: The server update can be done at any time before, during or after the physical SIM installation.

6. Remove the six screws holding the triangular battery plate in position and remove the plate

 Care point – ensure the battery is held in-place as the plate is removed.

7. Disconnect the 2-pin battery lead taking care to lift the locking tab and not to pull the wires from the housing
8. Remove the six screws holding the sensor plate in position and remove the plate
9. Locate and carefully remove the SIM from its carrier. Slide the metal cover towards the back of the box to unlock. It will then be free and is hinged at the back of the carrier
10. Carefully insert the new SIM in the carrier and lock into position, taking care not to damage the contacts
11. Replace the sensor plate and secure in position with its six screws
12. Reconnect the 2-pin battery lead to either connector on the PCB
13. Ensure the status LED located behind the window in the AQMesh label lights
14. Observe the LED sequence to determine the server connection is achieved
15. Replace the triangular battery plate and secure its six screws
16. Check the web server is receiving data from the AQMesh pod (see separate instructions)
17. The sensors in your AQMesh pod may take 24 hours to stabilise. Please allow up to 48 hours before using the data produced.

1.19 Getting online

Each AQMesh pod is automatically registered on the AQMesh server when it is manufactured. The pods are then assigned to a distributor who will in turn assign them to the user and open an AQMesh.net account for the user.

You should have received your username and password from your local distributor with this shipment. If you have not received it please contact your local distributor.

Once your pod is activated log in to www.aqmesh.net using your username (usually your email address) and your password (must be more than 8 characters and contain at least one upper case letter and a number)

Once online you will be able to access your pods, each of which can be assigned to a project and their location can be entered.

Each pod can be selected and the setup and details can be viewed or changed dependent on your access privileges. Data can also be viewed in tabular or graphical formats.

You may amend your account details and change your password at any time.

You may also access additional technical assistance, download AQMesh resources or renew or upgrade your account at any time at via the link on <http://www.aqmesh.com/>.

Important notices to all customers

1.20 Technical specification

Gases monitored	Up to five gases – NO, NO2, Ozone [#] , CO, SO2
Other measured parameters	Temperature, pressure, humidity
Power	Primary Lithium metal batteries Up to 2 years operation (depending on measurement strategy)
Communications	GPRS, Multi-band worldwide operation
Physical	Enclosure - Polyurethane moulded Size - Approx 170x180x140 Weight - <2Kg Protection - IP65

[#]The O3 reading is achieved using digital signal processing which requires a certain number of data points to give results that are comparable to the industry standard reference equipment. This will result in a straight line projected forward for the last section of processed O3 data. This data is retrospectively corrected as new data is delivered.

1.21 Warranty policy

This analyser is guaranteed, to the original end user purchaser, against defect in materials and workmanship for a period of 24 months from the date of the shipment to the user. During this period AQMesh will repair or replace defective parts on an exchange basis. The decision to repair or replace will be determined by AQMesh.

To maintain this warranty, the purchaser must perform the installation and maintenance as prescribed in the operating manual. Only parts supplied by AQMesh or its authorised distributors should be fitted. Normal wear and tear, and parts damaged by abuse, misuse, negligence or accidents are specifically excluded from the warranty.

Electrochemical sensors carry a 12 month warranty. Exposure to relative humidity in excess of 85% on five or more days as validated by the on-board relative humidity sensors will void the warranty.

1.22 WEEE compliance



The wheelie bin symbol now displayed on equipment supplied by Geotech signifies that the apparatus must not be disposed of through the normal municipal waste stream but through a registered recycling scheme.



The Waste Electrical and Electronic Equipment directive (WEEE) makes producers responsible from July 1st 2007 in meeting their obligations, with the fundamental aim of reducing the environmental impact of electrical and electronic equipment at the end of its life.

Geotech, original manufacturer of AQMesh, is registered with the Environmental Agency as a producer and has joined a recycling scheme provider who will manage and report on our electrical waste on our behalf.

Our producer registration number is WEE/GB0052TQ

So when your equipment (pod or sensor) is at the end of its life, please email support@aqmesh.com for advice on the next step.

1.23 Battery disposal considerations

Batteries do not contain hazardous materials according to EC directives 91/157/EEC, 93/86/EEC, and 2011/65/EU (RoHS directive)

EC battery directive 2006/66/EC has been implemented by most EC member states.

According to the EU Battery Directive, batteries are marked with the symbol of the crossed out wheeled bin (see figure above). The symbol reminds the end user that batteries are not permitted to be disposed of with household waste, but must be collected separately.

Waste batteries must effectively be protected against short circuit during storage and transportation.

☒ Note: Please contact support@aqmesh.com for further information

1.24 Declaration of conformity

AQMesh was manufactured and sold by Geotechnical Instruments (UK) Ltd. until 31st July 2015.



Declaration of Conformity

In accordance with BS EN ISO/IEC 17050-1:2010

We - Geotechnical Instruments (UK) Ltd.

Of - Sovereign House
 Queensway
 Leamington Spa
 Warwickshire
 CV31 3JR

Declares that under our own responsibility the following products:

Name	AQMesh
Description	A range of wireless outdoor air quality monitors measuring various atmospheric gases and other parameters.
Models	AQMG00-00 - NO, NO2 and O3 AQMG10-00 - NO, NO2, O3 and CO AQMG01-00 – NO, NO2, O3 and SO2 AQMG11-00 – NO, NO2, O3, CO and SO2

In accordance with the following directives:

R&TTE Directive 1999/5/EC	The Radio and Telecommunications Terminal Equipment (R&TTE) Directive.
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Has been designed and manufactured to the following harmonized standards and specifications:

EN 301-489-1 V1.9.2	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
EN301-489-7 V1.3.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 7: Specific conditions for mobile and portable

EN301 511 V9.0.2	radio and ancillary equipment of digital cellular radio telecommunications systems (GSM and DCS) Global System for Mobile communications (GSM); Harmonized EN for mobile stations in the GSM 900 and GSM 1800 bands covering essential requirements under article 3.2 of the R&TTE directive (1999/5/EC)
EN61010-1-2010	Safety requirements for electrical equipment for measurement, control, and laboratory use -- Part 1: General requirements

Signed by:



Name : Mr Dean Kavanagh

Position : Programme Director

Done at: Geotechnical Instruments on: 01/04/2013

Last two digits of the year that CE marking was first affixed: 13

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