




# AQMesh

Hyperlocal small sensor air quality monitoring system


 **Ecotech**  
ACOEM Group

TOGETHER WE CREATE SOLUTIONS THAT SHAPE THE FUTURE




**“ New ‘hyperlocal’ [AQMesh] sensor network will monitor London’s air quality.**

Intelligent Transport 2018, 22 Jun



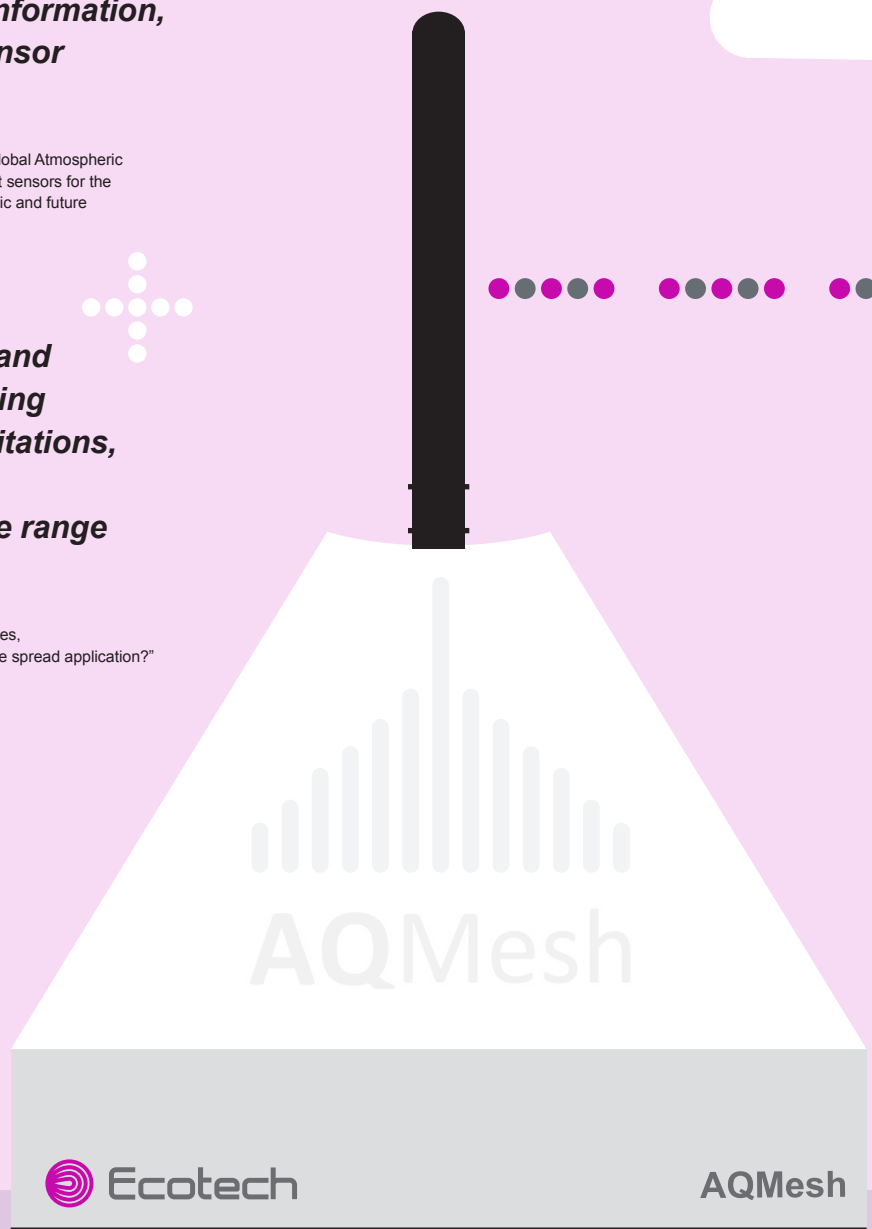
**“ [Small] sensors are not currently a direct substitute for reference instruments, especially for mandatory purposes; they are however a complementary source of information, provided an appropriate sensor is used.**

World Meteorological Organization (WMO), International Global Atmospheric Chemistry (IGAC) & UN Environment, 2018 May, “Low-cost sensors for the measurement of atmospheric composition: Overview of topic and future applications”



**“ When tested appropriately and used with a full understanding of their capabilities and limitations, [small] sensors can be an unprecedented aid in a wide range of air quality applications.**

Jayaratne et al. 2018, Atmospheric Measurement Techniques, “Low-cost PM<sub>2.5</sub> sensors: Is the technology matured for wide spread application?”

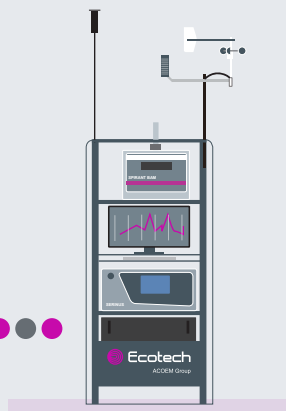




# AQMesh + ECOTECH

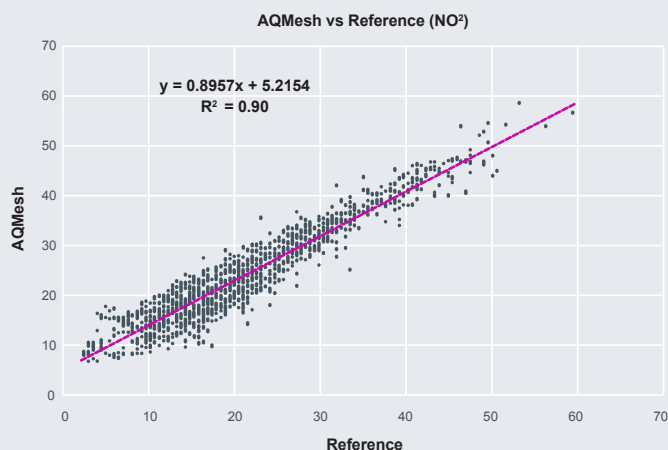
The world's finest reference quality gas analysers have teamed up with the best of breed small sensor Air Quality monitoring system.

Combining AQMesh with ECOTECH's superior range of gas analysers will transform the way smart cities and progressive thinking organisations use the power of collective environmental monitoring to measure, report and adhere to air quality standards and regulations.



**“ Co-location comparison trials against certified reference equipment continue to prove AQMesh performance and reliability for localised air quality monitoring.**

Environmental Technology 2018, "Latest AQMesh co-location studies show capability of small sensor systems", 14 Nov.



## AQMesh

The tried and tested name in small sensor technology for commercial use:

- 98 published scientific and research papers\*
- Thousands of hours of real-world trials and commercial placements in more than 30 countries
- No other commercially available small sensor system demonstrates better accuracy.\*\*

## ECOTECH

Tier one trusted global supplier of reference quality Air Quality Monitoring Systems (AQMS):

- Superior design, manufacture, installation and maintenance
- Air quality monitoring pioneer with 40 years' experience
- Serinus<sup>®</sup> gas analysers for reference quality monitoring of O<sub>3</sub>, CO, NO, NO<sub>2</sub>, NO<sub>x</sub>, NH<sub>3</sub>, SO<sub>2</sub>, H<sub>2</sub>S, TS and TRS
- Hundreds of AQMS sites around the world consisting of thousands of individual pieces of reference quality monitoring equipment.

## AQMesh + ECOTECH GAS ANALYSERS

Designed to work alone, together with Serinus<sup>®</sup> gas analysers or in harmony with new or existing reference quality AQMS:

- Practical, cost-effective, commercial indoor and outdoor use
- Greatly increase the spatial resolution of air quality monitoring networks
- Provides hyperlocal measurement and trend analysis over time of human exposure to air pollution.

ECOTECH is the exclusive distributor of AQMesh in Australia and India.



\* Google Scholar as of 19 Feb 2019

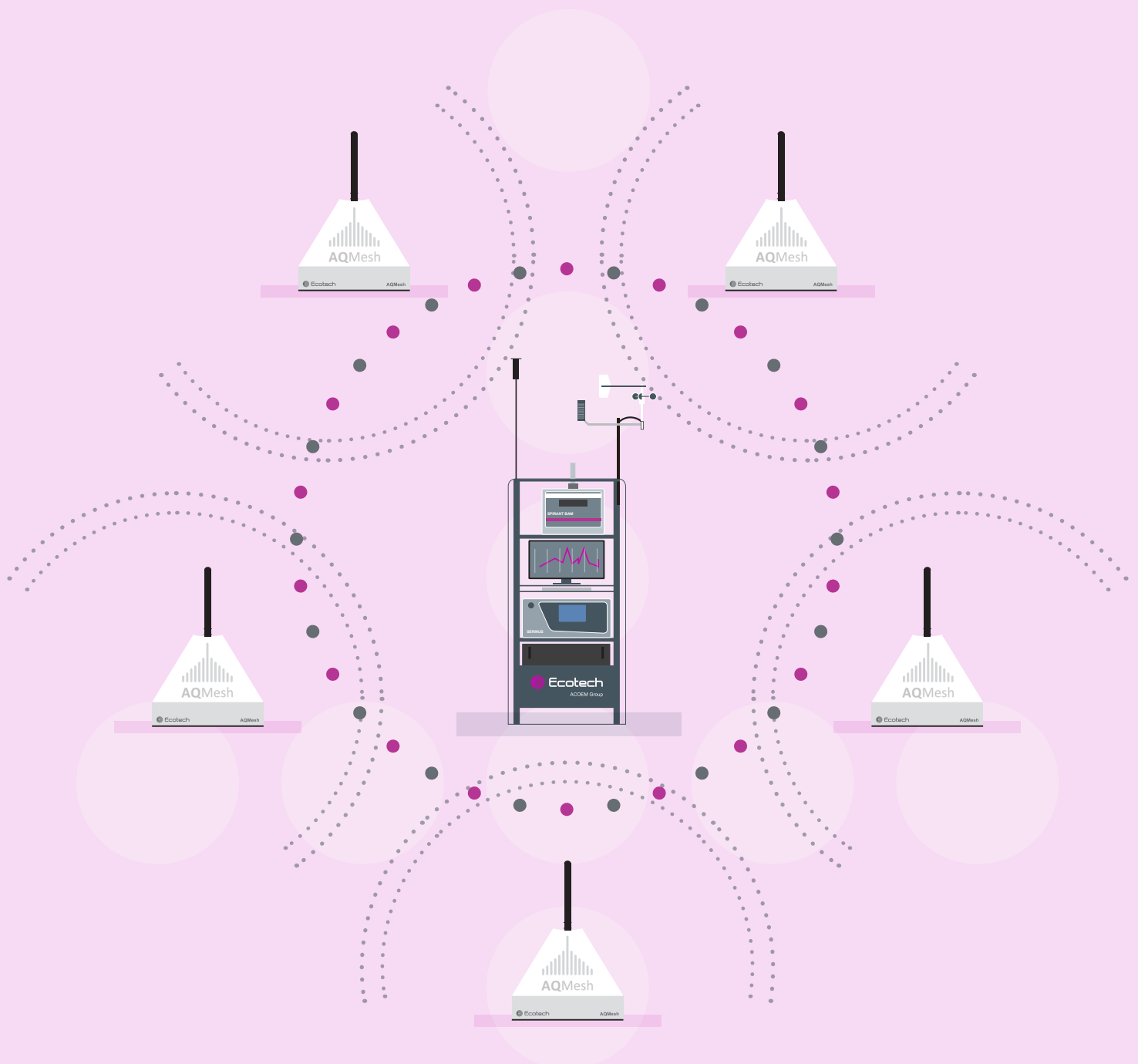
\*\* Environmental Instruments Ltd 2016, "Looking for a 'low cost' air quality monitoring solution?" "10 reasons why you should choose AQMesh", 25 Jul



# Scalability

**When multiple AQMesh pods are added together they deliver localised real-time air quality data that supports initiatives to reduce air pollution and its risk to human health.**

It's this ability to easily add, subtract, or relocate individual AQMesh pods where and when required that provides environmental professionals with a level of monitoring flexibility and scalability not possible with fixed-site reference quality AQMS alone.





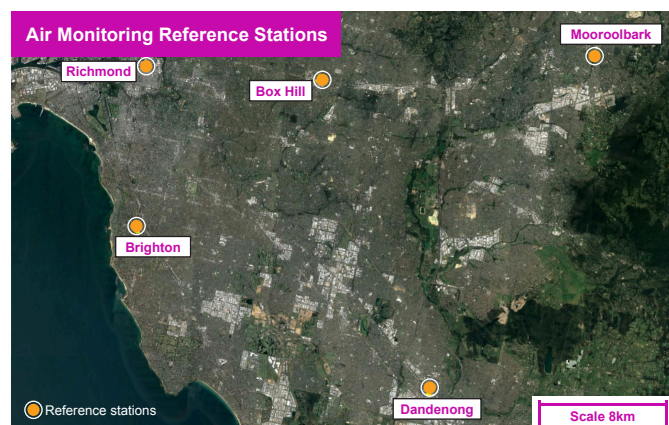
# One to Many

**Strategically placing a high number of AQMesh pods around and between a low number of reference quality AQMS stations delivers hyperlocal monitoring results.**

However, small sensor technology is not a direct substitute for reference quality instruments, especially for mandatory or regulatory purposes.

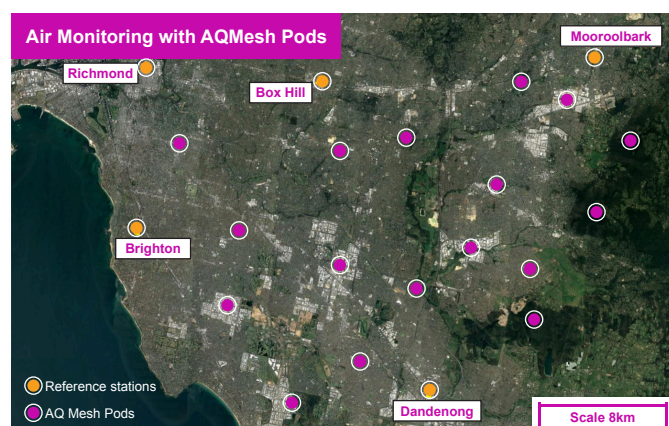
That is why when AQMesh is used as a complementary source of information to augment and enhance existing reference quality AQMS networks, environmental professionals are rewarded with increased spatial resolution of air quality data.

Increased spatial resolution of air quality data dramatically multiplies the opportunity for better understanding, insight and action.



## MELBOURNE SOUTH EASTERN SUBURBS

- A city of 5 million
- 5 ECOTECH reference quality AQMS stations
- 10-20 km apart
- Mixed land use over changing topography: Suburban, residential, commercial, industrial, roads, parks



## WHAT AN AUGMENTED AIR MONITORING NETWORK COULD LOOK LIKE

- Add 25 AQMesh pods
- Each pod 3-7 km apart
- 5 AQMS + 25 AQMesh = Significantly increase understanding of air quality at the neighbourhood level
- Target identified pollution hotspots







# AQMesh

## The proven small sensor air quality monitoring system

AQMesh is manufactured in the UK by Environmental Instruments Ltd and distributed exclusively in Australia and India by ECOTECH.

AQMesh has been designed to offer a robust and easy-to-use air quality monitoring system that can deliver localised real-time readings, improving the accuracy and scope of gathering air quality data to support initiatives to reduce air pollution and its risk to human health.



### Power

Sensor type	Expected life span*	Notes
External DC	> 5 years	9 – 24V DC
Lithium metal battery pack <sup>#9</sup>	> 24 months	Dependent on measurement strategy & pod spec
External high capacity battery pack <sup>#9</sup>	> 60 months	Dependent on measurement strategy & pod spec
NiMH rechargeable battery pack <sup>#9</sup>	> 4 months	Dependent on measurement strategy & pod spec
Solar power pack	> 5 years	Change internal lead-acid battery every 24 months

### Sensor life

Sensor type	Expected life span
Electrochemical	2 years <sup>#7</sup>
NDIR	5 years
Solid state	5 years
Omnidirectional microphone	5 years
Optical particle counter	1 year (minimum) <sup>#7 #8</sup>

### Physical

ENCLOSURE  
**ABS, protection IP65**  
 ENVIRONMENTAL  
**Temperature range: - 20 to + 40 °C\*\***  
**Humidity range: 15 to 95 % RH**  
 MOUNTING  
**Pod supplied with mounting bracket for walls / posts**  
 APPROX. SIZE & WEIGHT  
**Length: 170 mm**  
**Width: 220 mm**  
**Height (excl antenna): 250 mm**  
**Height (incl antenna): 430 mm**  
**Weight: 2 – 2.7 kg**

### Data & Communications

COMMUNICATIONS  
**Data sent to remote server via 2G or 3G SIM (data access contract is required)**  
 MEASUREMENT PERIOD  
**Variable, from 1 min to 1 hr**  
 TRANSMISSION FREQUENCY  
**Variable, from 5 mins to 12 hr intervals**  
 SERVER SOFTWARE  
**Web browser based, processing of sensor output to give reading, database storage on secure server**  
 DATA ACCESS  
**Tables, graphs, data download, multi-user access, password controlled, optional API data access**

\* For gas only AQMesh pods. Actual life span may vary depending on application, settings and monitoring conditions.

\*\* Tested to 40 °C for CE marking.



## AQMESH SPECIFICATIONS†

### Measurement

Sensor	Sensor Type	Units	Range #2
NO	Electrochemical	ppb or µg/m³	0 to 4,000 ppb
NO <sub>2</sub>	Electrochemical	ppb or µg/m³	0 to 4,000 ppb
NO <sub>x</sub>	Electrochemical	ppb or µg/m³	0 to 8,000 ppb
O <sub>3</sub>	Electrochemical	ppb or µg/m³	0 to 1,800 ppb
CO	Electrochemical	ppb or µg/m³	0 to 6,000 ppb
SO <sub>2</sub>	Electrochemical	ppb or µg/m³	0 to 10,000 ppb
H <sub>2</sub> S	Electrochemical	ppb or µg/m³	0 to 100,000 ppb
CO <sub>2</sub>	NDIR	ppm or mg/m³	0 to 5,000 ppm
Pod temperature	Solid state	°C or °F	-20 °C to 100 °C
Pressure	Solid state	mb	500 to 1500 mb
Humidity	Solid state	%	0 to 100 %
Noise	Omnidirectional mic	dB	35 to 100 dB SPL
Particle count	Optical particle counter	Particles/cm³	0.30 to 30 µm
PM <sub>1</sub> #1	Optical particle counter	µg/m³	0 to 200 µg/m³
PM <sub>2.5</sub> #1	Optical particle counter	µg/m³	0 to 500 µg/m³
PM <sub>10</sub> #1	Optical particle counter	µg/m³	0 to 1,000 µg/m³
Lat, long, alt	GPS	decimal	N/A

### Performance

Sensor	Limit of confidence #3	Typical precision to ref #4	Typical mean prescaled accuracy #5
NO	< 5 ppb	> 0.9 R <sup>2</sup>	± 5 ppb
NO <sub>2</sub>	< 10 ppb	> 0.85 R <sup>2</sup>	± 10 ppb
NO <sub>x</sub>	< 10 ppb	> 0.9 R <sup>2</sup>	± 10 ppb
O <sub>3</sub>	< 5 ppb	> 0.9 R <sup>2</sup>	± 10 ppb
CO	< 50 ppb	> 0.8 R <sup>2</sup>	± 0.05 ppm
SO <sub>2</sub>	< 10 ppb	> 0.7 R <sup>2</sup>	± 5 ppb
H <sub>2</sub> S	< 5 ppb	> 0.7 R <sup>2</sup>	± 5 ppb
CO <sub>2</sub>	< 1 ppm	> 0.9 R <sup>2</sup>	± 30 ppm
Sensor	Limit of detection	Typical precision to ref #4	Typical mean prescaled accuracy #5
Pod temperature	0.1 °C	> 0.9 R <sup>2</sup>	± 2 °C
Pressure	1 mb	> 0.9 R <sup>2</sup>	± 5 mb
Humidity	1 % RH	> 0.9 R <sup>2</sup>	± 5 % RH
Average noise #6	20 Hz to 20 kHz	> 0.8 R <sup>2</sup>	± 1 dB
Peak noise #6	20 Hz to 20 kHz	N/A	± 3 dB
Particle count	0 particles	> 0.9 R <sup>2</sup> variable	N/A
PM <sub>1</sub> (v3.0)	0 µg/m³	> 0.85 R <sup>2</sup> variable	± 15 µg/m³ variable
PM <sub>2.5</sub> (v3.0)	0 µg/m³	> 0.85 R <sup>2</sup> variable	± 20 µg/m³ variable
PM <sub>10</sub> (v3.0)	0 µg/m³	> 0.75 R <sup>2</sup>	± 30 µg/m³ variable
PM <sub>1</sub> (v3.0h)	0 µg/m³	> 0.9 R <sup>2</sup> variable	± 5 µg/m³ variable
PM <sub>2.5</sub> (v3.0h)	0 µg/m³	> 0.9 R <sup>2</sup> variable	± 5 µg/m³ variable
PM <sub>10</sub> (v3.0h)	0 µg/m³	> 0.85 R <sup>2</sup> variable	± 5 µg/m³ variable
GPS	< 0.5 m	N/A	± 3 m radius

**Product designs and specifications are subject to change without prior notice.**

The user is responsible for determining the suitability of the product.

#1 Mass estimation based on standardisation of particle shape and density.

#2 From sensor manufacturer's specification. This data was derived from independent lab tests. Standard test conditions are 20 °C and 80 % RH and in the absence of interfering gases. Tested range is -30 °C to +30 °C.

#3 Readings provided below this level, however, due to interferences the level of uncertainty is greater than at higher levels of the target pollutant.

#4 Results based on field testing around the world versus certified reference or equivalence methods at hourly intervals, in extreme and varied conditions.

#5 Average variance to reference equivalence methods at hourly intervals from field testing around the world, in extreme and varied conditions.

#6 Peak noise is the highest recorded value over the gas reporting interval while average noise is calculated using all noise samples over the same period.

#7 Electrochemical sensors and particle sensors carry a 12-month warranty.

#8 Maintenance dependent on application & setting. Detail of maintenance required is listed in the standard operating procedure.

#9 Subject to carrier restrictions on dangerous goods.

† Gas algorithm v5.0  
PM algorithm v3.0 (and v3.0h)





### **ABOUT ECOTECH: Together we create solutions that shape the future**

For over 40 years ECOTECH has pioneered innovative solutions in environmental monitoring for air, water, gas, noise, vibration, blast, fine particulate and dust. Headquartered in Australia, and certified to internationally recognised quality standards, ECOTECH operates in more than 80 countries, managing and maintaining over 500 real-time environmental monitoring sites consisting of thousands of individual pieces of precision equipment. ECOTECH is part of the ACOEM Group.

### **ABOUT ACOEM: Reduce your environmental impact**

The ACOEM Group is a global leader in providing sustainable solutions for the development of smart cities of the future. It is committed to helping companies and public authorities meet challenges by offering products and services that:

- Prevent and control air, noise and vibration pollution
- Increase the productivity and reliability of industrial machinery
- Contribute to the development of effective, robust & noiseless solutions
- Protect soldiers, sites and vehicles in military theatres of operation.

Across the world, ACOEM's 700+ employees innovate in the measurement, analysis and control of environmental parameters through its 01dB, ECOTECH, ONEPROD, FIXTURLASER, MEAX, VIBRALIGN and METRAVIB brands.

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