

# CERTIFICATE

## of Product Conformity (QAL1)

Certificate No.: 0000040207\_02

**AMS designation:** Spirant BAM 1100 with PM<sub>2,5</sub> pre-separator for suspended particulate matter

**Manufacturer:** Ecotech Pty Ltd.  
1492 Ferntree Gully Road  
Knoxfield, VIC, 3180  
Australia

**Test Laboratory:** TÜV Rheinland Energy GmbH

This is to certify that the AMS has been tested and found to comply with the standards:  
VDI 4202-1 (2002), VDI 4202-3 (2004), EN 14907 (2005),  
Guide to the Demonstration of Equivalence of Ambient Air Monitoring Methods (2010),  
EN 15267-1 (2009) and EN 15267-2 (2009).

Certification is awarded in respect of the conditions stated in this certificate  
(this certificate contains 7 pages).  
The present certificate replaces certificate 0000040207\_01 of 01 April 2019.



Suitability Tested  
Equivalent to  
2008/50/EC  
EN 15267  
Regular Surveillance  
[www.tuv.com](http://www.tuv.com)  
ID 0000040207

Publication in the German Federal Gazette  
(BAnz) of 01 April 2014

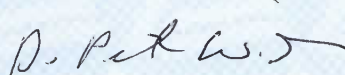
This certificate will expire on:  
30 June 2025

German Federal Environment Agency  
Dessau, 01 July 2020

TÜV Rheinland Energy GmbH  
Cologne, 30 June 2020



Dr. Marcel Langner  
Head of Section II 4.1



ppa. Dr. Peter Wilbring

[www.umwelt-tuv.eu](http://www.umwelt-tuv.eu)  
[tre@umwelt-tuv.eu](mailto:tre@umwelt-tuv.eu)  
Phone: + 49 221 806-5200

TÜV Rheinland Energy GmbH  
Am Grauen Stein  
51105 Köln

Test institute accredited to EN ISO/IEC 17025 by DAkkS (German Accreditation Body).  
This accreditation is limited to the accreditation scope defined in the enclosure to certificate D-PL-11120-02-00.

<b>Test Report:</b>	936/21222754/A dated 01 October 2013
<b>Initial certification:</b>	01 April 2014
<b>Expiry date:</b>	30 June 2025
<b>Certificate:</b>	Renewal (of previous certificate 0000040207_01 dated 01 April 2019 valid until 30 June 2020)
<b>Publication:</b>	BAnz AT 01.04.2014 B12, chapter IV number 6.1

### **Approved application**

The tested AMS is suitable for continuous ambient air monitoring of suspended particulate matter, PM<sub>2.5</sub> fraction (stationary operation).

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a field test performed at four different sites and/or different periods.

The AMS is approved for an ambient temperature range of +5 °C to +40 °C.

The notification of suitability of the AMS, performance testing and the uncertainty calculation have been effected on the basis of the regulations applicable at the time of testing. As changes in legal provisions are possible, any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for monitoring the AMS readings relevant to the application.

Any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for the intended purpose.

### **Basis of the certification**

This certification is based on:

- Test report no. 936/21222754/A dated 01 October 2013 issued by TÜV Rheinland Energie und Umwelt GmbH
- Suitability announced by the German Federal Environment Agency (UBA) as the relevant body
- The ongoing surveillance of the product and the manufacturing process

Publication in the German Federal Gazette: BAnz AT 01.04.2014 B12, chapter IV number 6.1, UBA announcement dated 27 February 2014:

**AMS designation:**

Spirant BAM 1100 with PM<sub>2,5</sub> pre-separator

**Manufacturer:**

Ecotech Pty Ltd., Knoxfield, Australia

**Field of application:**

For continuous ambient air monitoring of suspended particulate matter, PM<sub>2,5</sub> (stationary operation)

**Measuring range during performance testing:**

Component	Certification range	Unit
PM <sub>2,5</sub>	0–1 000	µg/m <sup>3</sup>

**Software version:**

Version 81237-05 V1.0.0

**Restrictions:**

None

**Notes:**

1. The measuring system complies with the requirements of the guide to “Demonstration of Equivalence of Ambient Air Monitoring Methods” (January 2010 version) for the component PM<sub>2,5</sub>.
2. For monitoring PM<sub>2,5</sub>, the instrument must be fitted with the following options: Sample heater (BX-830), PM<sub>10</sub> sampling head (BX-802), PM<sub>2,5</sub> Sharp Cut Cyclone SCC (BX-807), combined temperature and pressure sensor (BX-596) or an ambient temperature sensor (BX-592).
3. During the performance test, the cycle time was 1 h, i.e. the filter was automatically changed once an hour. Every filter spot was sampled only once.
4. Sampling time in the cycle time is 42s.
5. The measuring system must be operated inside a lockable measurement container.
6. The instrument must be calibrated on-site regularly using a gravimetric PM<sub>2,5</sub> reference method in accordance with EN 14907.
7. The measuring system may also be operated with the BX-125 pump (optional).
8. The test report on performance testing is available on the internet at [www.qal1.de](http://www.qal1.de).

**Test Laboratory:**

TÜV Rheinland Energie und Umwelt GmbH, Cologne  
Report no.: 936/21222754/A dated 01 October 2013

Publication in the German Federal Gazette: BAnz AT 02.04.2015 B5, chapter IV notification 3, UBA announcement dated 25 February 2015:

**3 Notification as regards Federal Environment Agency (UBA) notice of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV number 6.1)**

The 970603 pressure sensor (MICROSWITCH #185PC15AT) of the Spirant BAM 1100 with PM<sub>2.5</sub> pre-separator measuring system with PM<sub>10</sub> pre-separator manufactured by Ecotech Pty Ltd., is no longer produced and has been replaced by the 970595 pressure sensor (HONEYWELL SSCDANN015PAAA5).

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 20 September 2014

**Certified product**

This certification applies to automated measurement systems conforming to the following description:

With the exception of a modified front design and minor software adaptations, the Spirant BAM 1100 measuring system with PM<sub>2.5</sub> pre-separator exactly corresponds to the BAM-1020 developed and entirely manufactured by Met One Instruments, Inc.

The Spirant BAM 1100 measuring system with PM<sub>2.5</sub> pre-separator consists of the PM<sub>10</sub> sampling inlet BX-802, PM<sub>2.5</sub> Sharp Cut Cyclone SCC BX-807, the sampling tube, the sample heater BX-830, the ambient temperature sensor BX-596 or, alternatively, the BX-592 ambient temperature sensor, the BX-127 (or optional BX-125) vacuum pump, the Spirant BAM 1100 measuring instrument (incl. glass-fibre filter tape), the respective connecting tubes and lines as well as adapters, the roof flange as well as the manual in German.

The measuring system uses beta-attenuation as a measurement principle.

The particle sample passes the PM<sub>10</sub>-sampling inlet and the PM<sub>2.5</sub> Sharp Cut Cyclone SCC at a flow rate of 1 m<sup>3</sup>/h and reaches the Spirant BAM 1100 analyser via the sampling tube.

During performance testing, the measuring system was operated with the BX-830 sample heater.

Particles arrive at the measuring instrument and will be separated by the glass fibre filter tape.

A measurement cycle (incl. automatic checking of radiometric measurement) proceeds as follows (setting for PM<sub>2.5</sub>: radiometric measuring time: 8min):

1. At the beginning of each cycle, initial and blank measurements are performed with a clean filter tape I<sub>0</sub> (initial beta count). This takes 8 min.
2. The filter tape is transported forward over a distance of 4 dust spots and pushed under the sampling point. The sample is taken from the filter spot where I<sub>0</sub> was previously determined. For a sampling duration of 42 min. particulate-loaded air is then sucked through that filter spot.
3. At the same time, the spot 4 positions upstream on the filter band is submitted to radiometric measurement I<sub>1</sub> for a duration of 8 minutes. This measurement is performed to check for potential drift effects caused by changes in external parameters such as

temperature or relative moisture. The same spot is subjected to a third radiometric measurement  $I_2$  with an inserted reference foil. The same spot of the filter tape is subjected to yet another  $I_{1x}$ , eight minutes before the end of the collection time in order to monitor stability of the zero point with the help of  $I_1$  and  $I_{1x}$ .

4. Once sampling has been completed, the filter band is reversed back four sampling spots and the sampled filter spot is measured radiometrically ( $I_3$ ). The calculation of the concentration completes the measurement cycle.
5. The next cycle will start again with step 1.

The radiometric determination of mass is calibrated in the factory and is checked hourly during operation as part of internal quality assurance at the zero point (clean filter spot) and at the span point (built-in reference foil). Measured values at zero and span points are easily derived from the data generated. These can then be compared to stability criteria (drift) or target values for span (factory settings).

#### General remarks

This certificate is based upon the equipment tested. The manufacturer is responsible for ensuring that on-going production complies with the requirements of the EN 15267. The manufacturer is required to maintain an approved quality management system controlling the manufacturing process for the certified product. Both the product and the quality management systems shall be subject to regular surveillance.

If a product of the current production does not conform to the certified product, TÜV Rheinland Energy GmbH must be notified at the address given on page 1.

A certification mark with an ID-Number that is specific to the certified product is presented on page 1 of this certificate.

This document as well as the certification mark remains property of TÜV Rheinland Energy GmbH. Upon revocation of the publication the certificate loses its validity. After the expiration of the certificate and on request of TÜV Rheinland Energy GmbH this document shall be returned and the certificate mark must no longer be used.

The relevant version of this certificate and its expiration date are also accessible on the internet at [qal1.de](http://qal1.de).

### **Document history**

Certification of the Spirant BAM 1100 with PM<sub>2,5</sub> pre-separator is based on the documents listed below and the regular, continuous surveillance of the manufacturer's quality management system:

### **Initial certification according to EN 15267**

Certificate no. 0000040207: 29 April 2014  
Expiry date of the certificate: 31 March 2019  
Test report no.: 936/21222754/A dated 1 October 2013  
TÜV Rheinland Energie und Umwelt GmbH, Cologne  
Publication: BAnz AT 01.04.2014 B12, chapter IV number 6.1  
UBA announcement dated 27 February 2014

### **Notifications in accordance with EN 15267**

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 20 September 2014  
Publication: BAnz AT 02.04.2015 B5, chapter IV notification 3  
UBA announcement dated 25 February 2015  
(Design changes)

### **Renewal of the certificate**

Certificate no. 0000040207\_01: 01 April 2019  
Expiry date of the certificate: 30 June 2020

### **Renewal of the certificate**

Certificate no. 0000040207\_02: 01 July 2020  
Expiry date of the certificate: 30 June 2025

**Calculation of total uncertainty**

PM <sub>2.5</sub> Spirant BAM 1100*	33.1% > 17 µg m <sup>-3</sup>	Orthogonal Regression				Betw een Instrument Uncertainties	
	W <sub>CM</sub> / %	n <sub>c-s</sub>	r <sup>2</sup>	Slope (b) +/- u <sub>b</sub>	Intercept (a) +/- u <sub>a</sub>	Reference	Candidate
All Data	12.6	248	0.967	1.000 +/- 0.012	0.764 +/- 0.204	0.33	1.38
< 18 µg m <sup>-3</sup>	9.8	174	0.889	0.971 +/- 0.025	1.066 +/- 0.267	0.34	1.05
> 18 µg m <sup>-3</sup>	15.9	74	0.926	1.031 +/- 0.033	-0.068 +/- 0.919	0.30	1.57

SN 17010	Dataset	Orthogonal Regression				Limit Value of 30 µg m <sup>3</sup>	
		n <sub>c-s</sub>	r <sup>2</sup>	Slope (b) +/- u <sub>b</sub>	Intercept (a) +/- u <sub>a</sub>	W <sub>CM</sub> / %	% > 17 µg m <sup>3</sup>
Individual Datasets	Teddington Summer	78	0.931	0.994 +/- 0.030	1.822 +/- 0.372	17.11	19.2
	Cologne Winter	75	0.957	0.980 +/- 0.024	0.960 +/- 0.512	12.79	56.0
	Bornheim Summer	53	0.941	1.052 +/- 0.036	-0.962 +/- 0.527	11.61	20.8
	Teddington Winter	45	0.991	0.970 +/- 0.014	-0.182 +/- 0.300	10.28	35.6
Combined Datasets	< 18 µg m <sup>3</sup>	175	0.849	0.955 +/- 0.028	1.137 +/- 0.306	11.46	4.6
	> 18 µg m <sup>3</sup>	76	0.907	0.984 +/- 0.035	0.584 +/- 0.975	16.02	100.0
	All Data	251	0.957	0.969 +/- 0.013	0.989 +/- 0.226	12.90	33.5

SN 17011	Dataset	Orthogonal Regression				Limit Value of 30 µg m <sup>3</sup>	
		n <sub>c-s</sub>	r <sup>2</sup>	Slope (b) +/- u <sub>b</sub>	Intercept (a) +/- u <sub>a</sub>	W <sub>CM</sub> / %	% > 17 µg m <sup>3</sup>
Individual Datasets	Teddington Summer	78	0.955	1.016 +/- 0.025	1.018 +/- 0.308	14.66	19.2
	Cologne Winter	75	0.977	1.061 +/- 0.019	0.430 +/- 0.405	17.91	56.0
	Bornheim Summer	57	0.901	1.134 +/- 0.048	-1.498 +/- 0.727	23.91	21.1
	Teddington Winter	43	0.992	0.991 +/- 0.014	0.630 +/- 0.293	7.41	32.6
Combined Datasets	< 18 µg m <sup>3</sup>	178	0.881	1.021 +/- 0.026	0.634 +/- 0.286	13.44	4.5
	> 18 µg m <sup>3</sup>	75	0.929	1.092 +/- 0.034	-1.108 +/- 0.952	19.03	100.0
	All Data	253	0.966	1.041 +/- 0.012	0.377 +/- 0.214	16.28	32.8

\* Equivalence tests was performed as part of the original test using the identical BAM-1020 measuring systems manufactured by Met One Instruments, Inc.

\*\* The test of the measuring system was performed on the basis of the July 2009 version of the EU guide. The guide has been revised in the meantime and its latest version was published in January 2010. The changes are of editorial nature and did not result in changes to the equivalence tests as such. Thus, equivalence tests performed in accordance with the January 2010 version of the guide will generate the same results as tests performed on the basis of the July 2009 version.