Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000040207_03

Certified AMS:	Spirant BAM 1100 with $PM_{2.5}$ pre separator for suspended particulate matter, $PM_{2.5}$ fraction
Manufacturer:	Ecotech Pty. Ltd. 1492 Ferntree Gully Road Knoxfield VIC, 3180 Australia
Test Institute:	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 16450 (2017), EN 14907 (2005), Guide to 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 9 pages).
The present certificate replaces certificate 0000040207_02 dated 01 July 2020.

TÜVRheinland®
CERTIFIED

Suitability Tested
Complying with
2008/50/EC
EN 15267
Regular
Surveillance

www.tuv.com
ID 0000040207

Publication in the German Federal Gazette (BAnz.) of 03 May 2021

German Federal Environment Agency
Dessau, 02 June 2021

Dr. Marcel Langner
Head of Section II 4.1

This certificate will expire on:
30 June 2025

TÜV Rheinland Energy GmbH
Cologne, 01 June 2021

ppa. Dr. Peter Wilbring

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TÜV Rheinland Energy GmbH
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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 the certificate D-PL-11120-02-00.

Test report:	936/21222754/A of 01 October 2013 and Addendum no. 936/21250428/A of 01 September 2020
Initial certification:	01 April 2014
Expiry date:	30 June 2025
Publication:	BAnz AT 03.05.2021 B9, chapter III notification 8

Approved application
The tested AMS is suitable for continuous ambient air monitoring of suspended particulate matter, $PM_{2.5}$ 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 936/21222754/A of 01 October 2013 of TÜV Rheinland Energie und Umwelt GmbH and Addendum 936/21250428/A from 01 September 2020 of TÜV Rheinland Energy 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, Announcement by UBA dated 27 February 2014:

AMS designation:

Spirant BAM 1100 with $PM_{2.5}$ pre-separator

Manufacturer:

Ecotech Pty. Ltd., Knoxfield, Australia

Field of application:

For continuous ambient air monitoring of suspended particulate matter, $PM_{2.5}$ (stationary operation)

Measuring range during performance testing:

Component	Certification range	Unit
$PM_{2.5}$	0–1,000	µg/m³

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 $PM_{2.5}$.
2. For monitoring $PM_{2.5}$, the instrument must be fitted with the following options: Sample heater (BX-830), PM_{10} sampling head (BX-802), $PM_{2.5}$ 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 42 min.
5. The measuring system must be operated inside a lockable measurement container.
6. The instrument must be calibrated on-site regularly using a gravimetric $PM_{2.5}$ 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.

Test report:

TÜV Rheinland Energy GmbH, Cologne
Report No.: 936/21222754/A of 1 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 measuring system with $PM_{2.5}$ pre-separator manufactured by Eco-tech 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

Publication in the German Federal Gazette: BAnz AT 03.05.2021 B9, chapter III notification 8, UBA announcement dated 31 March 2021:

8 Notification as regards Federal Environment Agency (UBA) notice of 27. February 2014 (BAnz AT 01.04.2014 B12, chapter IV No. 6.1) and of 25. February 2015 (BAnz AT 02.04.2015 B5, chapter IV notification 3)

The actual software version of the Spirant BAM 1100 measuring system with $PM_{2.5}$ pre-separator manufactured by Ecotech Pty Ltd. is: 81237-05 V1.1.0.

In addition to this version number, the following intermediate versions are also valid:

81237-05 V1.0.1; 81237-05 V1.0.2; 81237-05 V1.0.3

From software version 81237-05 V1.1.0, the measuring system fulfills the requirements of DIN EN 16450 (July 2017 edition). An addendum to the test report with report number 936/21250428/A is available on the Internet at www.qal1.de.

Statement issued by TÜV Rheinland Energy GmbH dated 1. September 2020

Certified product

This certificate 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 $PM_{2.5}$ pre-separator corresponds exactly to the BAM-1020 developed and entirely manufactured by Met One Instruments, Inc.

The Spirant BAM 1100 measuring system with $PM_{2.5}$-pre-separator consists of the PM_{10} sampling inlet BX-802, the $PM_{2.5}$ Sharp Cut Cyclone SCC (BX-807), the sampling tube, the sample heater BX-830, the combined pressure and temperature sensor (BX-596) or alternatively the ambient temperature sensor (BX-592), the vacuum pump BX-127 or optionally the BX-125, the measuring instrument Spirant BAM 1100 (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_{10} sampling inlet and the $PM_{2.5}$ Sharp Cut Cyclone SCC at a flow rate of 1 m^3/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.

During the performance test, the cycle time was set to 60 min, radiometric measurement taking 8 min.

Thus, the cycle time consists of 2 x 8 min for the radiometric measurement (I_0 & I_3) as well as approximately 1–2 min for filter tape movements. Consequently, the effective sampling time is around 42 min.

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 notes

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 manufacture of 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 certification mark may be applied to the product or used in advertising materials for the certified product.

This document as well as the certification mark remains property of TÜV Rheinland Energy GmbH. With revocation of the publication the certificate loses its validity. After the expiration of the certificate and on requests of the TÜV Rheinland Energy GmbH this document shall be returned and the certificate mark must not be employed anymore.

The relevant version of this certificate and its expiration is also accessible on the internet: **qal1.de**.

History of documents

Certification of Spirant BAM 1100 with $PM_{2.5}$ pre separator is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

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

Certificate based on a notification according to EN 15267

Certificate No. 0000040207_03: 02 June 2021
Expiry date of the certificate: 30 June 2025
Statement by TÜV Rheinland Energy GmbH dated 01 September 2020
Addendum 936/21250425/A of 01 September 2020
TÜV Rheinland Energy GmbH, Cologne
Publication: BAnz AT 03.05.2021 B9, chapter III notification 8
UBA announcement dated 31 March 2021

Calculation of the total uncertainty

Comparison candidate with reference according to Standard EN 16450:2017				
Candidate	Spirant BAM 1100	SN	SN 17010 & SN 17011	
		Limit value	30	µg/m³
Status of measured values	Offset corrected	Allowed uncertainty	25	%
All comparisons				
Uncertainty between Reference	**0.33**	**µg/m³**		
Uncertainty between Candidates	**1.38**	**µg/m³**		
SN 17010 & SN 17011				
Number of data pairs	**248**			
Slope b	**1.000**	**not significant**		
Uncertainty of b	**0.012**			
Ordinate intercept a	**0.000**	**not significant**		
Uncertainty of a	**0.204**			
Expanded meas. uncertainty W_{CM}	**11.67**	**%**		
All comparisons, ≥18 µg/m³				
Uncertainty between Reference	**0.30**	**µg/m³**		
Uncertainty between Candidates	**1.57**	**µg/m³**		
SN 17010 & SN 17011				
Number of data pairs	**74**			
Slope b	**1.031**			
Uncertainty of b	**0.033**			
Ordinate intercept a	**-0.832**			
Uncertainty of a	**0.919**			
Expanded meas. uncertainty W_{CM}	**15.00**	**%**		
All comparisons, <18 µg/m³				
Uncertainty between Reference	**0.34**	**µg/m³**		
Uncertainty between Candidates	**1.05**	**µg/m³**		
SN 17010 & SN 17011				
Number of data pairs	**174**			
Slope b	**0.971**			
Uncertainty of b	**0.025**			
Ordinate intercept a	**0.302**			
Uncertainty of a	**0.267**			
Expanded meas. uncertainty W_{CM}	**10.64**	**%**		

Calculation of the total uncertainty

Comparison candidate with reference according to Standard EN 16450:2017					
Candidate	Spirant BAM 1100		SN	SN 17010 & SN 17011	
			Limit value	30	µg/m³
Status of measured values	Offset corrected		Allowed uncertainty	25	%
Teddington, Summer					
Uncertainty between Reference	**0.33**	**µg/m³**			
Uncertainty between Candidates	**1.13**	**µg/m³**			
	SN 17010			**SN 17011**	
Number of data pairs	**78**			**78**	
Slope b	**0.994**			**1.016**	
Uncertainty of b	**0.030**			**0.025**	
Ordinate intercept a	**1.058**			**0.254**	
Uncertainty of a	**0.372**			**0.308**	
Expanded meas. uncertainty W_{CM}	**14.54**	**%**		**11.95**	**%**
Cologne, Winter					
Uncertainty between Reference	**0.39**	**µg/m³**			
Uncertainty between Candidates	**1.76**	**µg/m³**			
	SN 17010			**SN 17011**	
Number of data pairs	**75**			**75**	
Slope b	**0.980**			**1.061**	
Uncertainty of b	**0.024**			**0.019**	
Ordinate intercept a	**0.196**			**-0.334**	
Uncertainty of a	**0.512**			**0.405**	
Expanded meas. uncertainty W_{CM}	**13.08**	**%**		**14.12**	**%**
Bornheim, Summer					
Uncertainty between Reference	**0.30**	**µg/m³**			
Uncertainty between Candidates	**1.13**	**µg/m³**			
	SN 17010			**SN 17011**	
Number of data pairs	**53**			**57**	
Slope b	**1.052**			**1.134**	
Uncertainty of b	**0.036**			**0.048**	
Ordinate intercept a	**-1.726**			**-2.262**	
Uncertainty of a	**0.527**			**0.727**	
Expanded meas. uncertainty W_{CM}	**11.17**	**%**		**20.77**	**%**
Teddington, Winter					
Uncertainty between Reference	**0.27**	**µg/m³**			
Uncertainty between Candidates	**1.01**	**µg/m³**			
	SN 17010			**SN 17011**	
Number of data pairs	**45**			**43**	
Slope b	**0.970**			**0.991**	
Uncertainty of b	**0.014**			**0.014**	
Ordinate intercept a	**-0.946**			**-0.134**	
Uncertainty of a	**0.300**			**0.293**	
Expanded meas. uncertainty W_{CM}	**14.46**	**%**		**7.70**	**%**
All comparisons, ≥18 µg/m³					
Uncertainty between Reference	**0.30**	**µg/m³**			
Uncertainty between Candidates	**1.57**	**µg/m³**			
	SN 17010			**SN 17011**	
Number of data pairs	**76**			**75**	
Slope b	**0.984**			**1.092**	
Uncertainty of b	**0.035**			**0.034**	
Ordinate intercept a	**-0.180**			**-1.872**	
Uncertainty of a	**0.975**			**0.95**	
Expanded meas. uncertainty W_{CM}	**16.73**	**%**		**16.73**	**%**
All comparisons, <18 µg/m³					
Uncertainty between Reference	**0.34**	**µg/m³**			
Uncertainty between Candidates	**1.05**	**µg/m³**			
	SN 17010			**SN 17011**	
Number of data pairs	**175**			**178**	
Slope b	**0.955**			**1.021**	
Uncertainty of b	**0.028**			**0.026**	
Ordinate intercept a	**0.373**			**-0.130**	
Uncertainty of a	**0.306**			**0.286**	
Expanded meas. uncertainty W_{CM}	**13.31**	**%**		**11.22**	**%**
All comparisons					
Uncertainty between Reference	**0.33**	**µg/m³**			
Uncertainty between Candidates	**1.38**	**µg/m³**			
	SN 17010			**SN 17011**	
Number of data pairs	**251**			**253**	
Slope b	**0.969**	**significant**		**1.041**	**significant**
Uncertainty of b	**0.013**			**0.012**	
Ordinate intercept a	**0.225**	**not significant**		**-0.387**	**not significant**
Uncertainty of a	**0.226**			**0.214**	
Expanded meas. uncertainty W_{CM}	**13.87**	**%**		**13.61**	**%**