Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000040206_02

AMS designation:	Spirant BAM 1000 with PM_{10} 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 4203-3 (2004), EN 12341 (1998), 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 10 pages).
The present certificate replaces certificate 0000040206_02 of 01 April 2019.

TÜVRheinland® CERTIFIED

Suitability Tested
Equivalent to
2008/50/EC
EN 15267
Regular Surveillance

www.tuv.com
ID 0000040206

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

Dr. Marcel Langner
Head of Section II 4.1

TÜV Rheinland Energy GmbH
Cologne, 30 June 2020

ppa. Dr. Peter Wilbring

www.umwelt-tuv.eu
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.

Test Report:	936/21222754/B dated 01 October 2013
Initial certification:	01 April 2014
Expiry date:	30 June 2025
Certificate:	Renewal (of previous certificate 0000040206_02 dated 01 April 2019 valid until 30 June 2020)
Publication:	BAnz AT 01.04.2014 B12, chapter IV number 7.1

Approved application
The certified AMS is suitable for continuous ambient air monitoring of suspended particulate matter, PM_{10} (stationary operation).

The suitability of the AMS for this application was assessed on the basis of a laboratory test and field tests (initial testing) at three different locations and/or periods as well as equivalence assessments taking into account seven different locations/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/B 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 7.1, UBA announcement dated 27 February 2014:

AMS designation:
Spirant BAM 1000 with PM_{10} pre-separator

Manufacturer:
Ecotech Pty Ltd., Knoxfield, Australia

Field of application:
For continuous ambient air monitoring of suspended particulate matter, PM_{10} (stationary operation)

Measuring range during performance testing:

Component	Certification range	Unit
PM_{10}	0–1 000	µg/m³

Software version:
Version 81236-02 V1.0.0

Restrictions: None

Notes:

1. For monitoring PM_{10}, the instrument must be fitted with the following options at least: Sample heater (BX-830), sampling head (BX-802) and ambient temperature sensor (BX-592).
2. The heater may only be used in the manner it was used during performance testing.
3. Flow control must be related to operational flow considering ambient conditions (operating mode: ACTUAL).
4. 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.
5. The measuring system must be operated inside a lockable measurement container.
6. The measuring system must be calibrated on site at regular intervals by using the gravimetric PM_{10} reference method according to EN 12341.
7. The measuring system may also be operated with the BX-125 pump (optional).
8. The measuring system complies with the requirements of standard EN 12341 and the guide to the “Demonstration of Equivalence of Ambient Air Monitoring Methods” in its January 2010 version.
9. The test report on performance testing is available on the internet at www.qal1.de.

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

Publication in the German Federal Gazette: BAnz AT 02.04.2015 B5, chapter IV notification 2, UBA announcement dated 25 February 2015:

2 Notification as regards Federal Environment Agency (UBA) notice of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV number 7.1)

The 970603 pressure sensor (MICROSWITCH #185PC15AT) of the Spirant BAM 1000 with PM_{10} pre-separator measuring system with PM_{10} 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 1000 measuring system with PM_{10} pre-separator exactly corresponds to the BAM-1020 developed and entirely manufactured by Met One Instruments, Inc.

The Spirant BAM 1000 measuring system with PM_{10}-pre-separator consists of the PM_{10} sampling inlet BX-802, the sampling tube, the sample heater BX-830, the ambient temperature sensor BX-592 (incl. radiation protection shield), the vacuum pump BX-127 or optionally the BX-125, the measuring instrument Spirant BAM 1000 (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 at a flow rate of 1 m^3/h and reaches the Spirant BAM 1000 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 4 min.

Thus, the cycle time consists of 2 x 4 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 50 min.

Furthermore, the measuring system allows an extension of the measuring time to 6 or 8 min in order to increase the precision of the radiometric measurement. Effective sampling time in that case decreases to 46 or 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 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**.

Document history

Certification of the Spirant BAM 1000 with PM_{10} pre-separator measuring system 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. 0000040206: 29 April 2014
Expiry date of the certificate: 31 March 2019
Test report no.: 936/21222754/B dated 1 October 2013
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Publication: BAnz AT 01.04.2014 B12, chapter IV number 7.1
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 2
UBA announcement dated 25 February 2015
(Design changes)

Renewal of the certificate

Certificate no. 0000040206_01: 01 April 2019
Expiry date of the certificate: 30 June 2020

Renewal of the certificate

Certificate no. 0000040206_02: 01 July 2020
Expiry date of the certificate: 30 June 2025

Calculation of total uncertainty

PM_{10} Spirant BAM 1000*	35.3% > 28 µg m-3	Orthogonal Regression				Between Instrument Uncertainties	
	W_{CM} / %	n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	Reference	Candidate
All Paired Data	16.0	320	0.982	1.034 +/- 0.008	0.843 +/- 0.290	0.67	1.22
< 30 µg m-3	24.7	215	0.826	1.119 +/- 0.032	-0.446 +/- 0.557	0.53	1.09
> 30 µg m-3	17.7	105	0.971	1.042 +/- 0.017	0.141 +/- 1.031	0.91	1.49

4294	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Individual Datasets	Cologne, Parking Lot	29	0.960	0.948 +/- 0.036	2.202 +/- 0.950	10.13	34.5
	Titz - Rödingen	37	0.962	1.058 +/- 0.035	0.376 +/- 0.782	14.75	18.9
	Cologne, Frankfurter Str.	28	0.963	1.025 +/- 0.039	-1.293 +/- 1.083	8.07	42.9
Combined Datasets	< 30 µg m^{-3}	68	0.814	1.040 +/- 0.055	0.162 +/- 0.981	12.58	4.4
	> 30 µg m^{-3}	26	0.897	0.964 +/- 0.063	1.810 +/- 2.438	9.75	100.0
	All Data	94	0.953	0.987 +/- 0.022	1.048 +/- 0.563	9.16	35.3

4295	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Individual Datasets	Cologne, Parking Lot	29	0.970	0.990 +/- 0.033	2.681 +/- 0.862	12.53	34.5
	Titz - Rödingen	37	0.961	1.056 +/- 0.035	1.260 +/- 0.785	17.52	18.9
	Cologne, Frankfurter Str.	28	0.969	1.021 +/- 0.035	-0.154 +/- 0.994	8.10	42.9
Combined Datasets	< 30 µg m^{-3}	68	0.830	1.056 +/- 0.053	0.935 +/- 0.952	17.24	4.4
	> 30 µg m^{-3}	26	0.929	1.025 +/- 0.056	0.713 +/- 2.151	11.49	100.0
	All Data	94	0.960	1.004 +/- 0.021	1.735 +/- 0.528	11.41	30.9

Austria1	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Individual Datasets	Graz	45	0.969	1.025 +/- 0.027	-0.202 +/- 1.848	20.89	82.2
	Steyregg	45	0.824	1.049 +/- 0.067	-1.750 +/- 1.392	9.31	8.9
Combined Datasets	< 30 µg m^{-3}	50	0.644	1.339 +/- 0.109	-6.789 +/- 2.135	42.75	2.0
	> 30 µg m^{-3}	40	0.960	1.057 +/- 0.034	-2.826 +/- 2.431	19.58	100.0
	All Data	90	0.983	1.039 +/- 0.015	-1.294 +/- 0.729	15.95	45.6

Austria2	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Individual Datasets	Graz	45	0.966	1.033 +/- 0.029	1.948 +/- 1.962	26.05	82.2
	Steyregg	45	0.793	1.035 +/- 0.072	-1.668 +/- 1.489	9.56	8.9
Combined Datasets	< 30 µg m^{-3}	50	0.557	1.492 +/- 0.130	-9.462 +/- 2.545	62.86	2.0
	> 30 µg m^{-3}	40	0.956	1.084 +/- 0.037	-2.296 +/- 2.635	22.65	100.0
	All Data	90	0.980	1.079 +/- 0.016	-1.702 +/- 0.818	19.84	45.6

J7860	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Combined Datasets	< 30 µg m^{-3}	59	0.906	1.172 +/- 0.047	1.204 +/- 0.839	40.46	6.8
	> 30 µg m^{-3}	38	0.974	1.002 +/- 0.027	3.154 +/- 1.548	17.67	100.0
	All Data (Tusimice)	97	0.984	0.999 +/- 0.013	3.739 +/- 0.492	18.45	43.3

J7863	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Combined Datasets	< 30 µg m^{-3}	58	0.913	1.158 +/- 0.045	0.159 +/- 0.812	33.73	6.9
	> 30 µg m^{-3}	38	0.978	1.032 +/- 0.025	1.948 +/- 1.450	17.98	100.0
	All Data (Tusimice)	96	0.987	1.035 +/- 0.012	2.035 +/- 0.461	18.18	43.8

17011	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Combined Datasets	< 30 µg m^{-3}	39	0.960	1.039 +/- 0.034	0.632 +/- 0.458	11.13	0.0
	> 30 µg m^{-3}	1		+/-	+/-		100.0
	All Data (Teddington)	40	0.949	1.162 +/- 0.042	-0.766 +/- 0.602	29.99	2.5

17022	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Combined Datasets	< 30 µg m^{-3}	39	0.958	1.051 +/- 0.035	0.603 +/- 0.477	13.45	0.0
	> 30 µg m^{-3}	1		+/-	+/-		100.0
	All Data (Teddington)	40	0.963	1.110 +/- 0.034	-0.050 +/- 0.488	22.28	2.5

* The equivalence testing has been performed in the basis test with the identical measuring devices BAM-1020 of the company Met One Instruments, Inc.

Calculation of total uncertainty

PM_{10} Spirant BAM 1000* Intercept Corrected	35.3% > 28 µg m-3	Orthogonal Regression				Between Instrument Uncertainties	
	W_{CM} / %	n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	Reference	Candidate
All Paired Data	14.2	320	0.982	1.034 +/- 0.008	0.000 +/- 0.290	0.67	1.22
< 30 µg m-3	21.7	215	0.826	1.119 +/- 0.032	-1.288 +/- 0.557	0.53	1.09
> 30 µg m-3	16.3	105	0.971	1.042 +/- 0.017	-0.701 +/- 1.031	0.91	1.49

4294	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Individual Datasets	Cologne, Parking Lot	29	0.960	0.948 +/- 0.036	1.359 +/- 0.950	11.22	34.5
	Titz - Rödingen	37	0.962	1.058 +/- 0.035	-0.466 +/- 0.782	11.91	18.9
	Cologne, Frankfurter Str.	28	0.963	1.025 +/- 0.039	-2.136 +/- 1.083	8.92	42.9
Combined Datasets	< 30 µg m^{-3}	68	0.814	1.040 +/- 0.055	-0.680 +/- 0.981	10.58	4.4
	> 30 µg m^{-3}	26	0.897	0.964 +/- 0.063	0.967 +/- 2.438	10.38	100.0
	All Data	94	0.953	0.987 +/- 0.022	0.206 +/- 0.563	9.30	35.3

4295	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Individual Datasets	Cologne, Parking Lot	29	0.970	0.990 +/- 0.033	1.839 +/- 0.862	10.54	34.5
	Titz - Rödingen	37	0.961	1.056 +/- 0.035	0.417 +/- 0.785	14.52	18.9
	Cologne, Frankfurter Str.	28	0.969	1.021 +/- 0.035	-0.996 +/- 0.994	7.32	42.9
Combined Datasets	< 30 µg m^{-3}	68	0.830	1.056 +/- 0.053	0.092 +/- 0.952	14.49	4.4
	> 30 µg m^{-3}	26	0.929	1.025 +/- 0.056	-0.129 +/- 2.151	9.57	100.0
	All Data	94	0.960	1.004 +/- 0.021	0.892 +/- 0.528	9.53	30.9

Austria1	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Individual Datasets	Graz	45	0.969	1.025 +/- 0.027	-1.045 +/- 1.848	20.50	82.2
	Steyregg	45	0.824	1.049 +/- 0.067	-2.593 +/- 1.392	8.95	8.9
Combined Datasets	< 30 µg m^{-3}	50	0.644	1.339 +/- 0.109	-7.631 +/- 2.135	39.58	2.0
	> 30 µg m^{-3}	40	0.960	1.057 +/- 0.034	-3.668 +/- 2.431	19.88	100.0
	All Data	90	0.983	1.039 +/- 0.015	-2.137 +/- 0.729	15.78	45.6

Austria2	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Individual Datasets	Graz	45	0.966	1.033 +/- 0.029	1.106 +/- 1.962	24.39	82.2
	Steyregg	45	0.793	1.035 +/- 0.072	-2.511 +/- 1.489	10.09	8.9
Combined Datasets	< 30 µg m^{-3}	50	0.557	1.492 +/- 0.130	-10.304 +/- 2.545	59.63	2.0
	> 30 µg m^{-3}	40	0.956	1.084 +/- 0.037	-3.138 +/- 2.635	21.77	100.0
	All Data	90	0.980	1.079 +/- 0.016	-2.544 +/- 0.818	18.61	45.6

J7860	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Combined Datasets	< 30 µg m^{-3}	59	0.906	1.172 +/- 0.047	0.361 +/- 0.839	37.23	6.8
	> 30 µg m^{-3}	38	0.974	1.002 +/- 0.027	2.311 +/- 1.548	15.38	100.0
	All Data (Tusimice)	97	0.984	0.999 +/- 0.013	2.896 +/- 0.492	15.92	43.3

J7863	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Combined Datasets	< 30 µg m^{-3}	58	0.913	1.158 +/- 0.045	-0.684 +/- 0.812	30.54	6.9
	> 30 µg m^{-3}	38	0.978	1.032 +/- 0.025	1.105 +/- 1.450	15.50	100.0
	All Data (Tusimice)	96	0.987	1.035 +/- 0.012	1.193 +/- 0.461	15.54	43.8

17011	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Combined Datasets	< 30 µg m^{-3}	39	0.960	1.039 +/- 0.034	-0.210 +/- 0.458	8.21	0.0
	> 30 µg m^{-3}	1		+/-	+/-		100.0
	All Data (Teddington)	40	0.949	1.162 +/- 0.042	-1.608 +/- 0.602	26.73	2.5

17022	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Combined Datasets	< 30 µg m^{-3}	39	0.958	1.051 +/- 0.035	-0.240 +/- 0.477	10.40	0.0
	> 30 µg m^{-3}	1		+/-	+/-		100.0
	All Data (Teddington)	40	0.963	1.110 +/- 0.034	-0.893 +/- 0.488	19.05	2.5

* The equivalence testing has been performed in the basis test with the identical measuring devices BAM-1020 of the company Met One Instruments, Inc.

Calculation of total uncertainty

PM_{10} Spirant BAM 1000* Slope Corrected	35.3% > 28 µg m-3	Orthogonal Regression				Between Instrument Uncertainties	
	W_{CM} / %	n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	Reference	Candidate
All Paired Data	12.5	320	0.982	1.000 +/- 0.008	0.824 +/- 0.280	0.67	1.18
< 30 µg m-3	17.9	215	0.826	1.079 +/- 0.031	-0.372 +/- 0.538	0.53	1.06
> 30 µg m-3	14.9	105	0.971	1.007 +/- 0.017	0.164 +/- 0.997	0.91	1.44

4294	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Individual Datasets	Cologne, Parking Lot	29	0.960	0.917 +/- 0.035	2.144 +/- 0.919	12.72	34.5
	Titz - Rödingen	37	0.962	1.023 +/- 0.034	0.378 +/- 0.756	9.03	18.9
	Cologne, Frankfurter Str.	28	0.963	0.990 +/- 0.037	-1.235 +/- 1.048	10.44	42.9
Combined Datasets	< 30 µg m^{-3}	68	0.814	1.003 +/- 0.053	0.219 +/- 0.949	8.97	4.4
	> 30 µg m^{-3}	26	0.897	0.931 +/- 0.061	1.815 +/- 2.358	11.57	100.0
	All Data	94	0.953	0.954 +/- 0.022	1.032 +/- 0.545	10.23	35.3

4295	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Individual Datasets	Cologne, Parking Lot	29	0.970	0.957 +/- 0.032	2.605 +/- 0.834	9.04	34.5
	Titz - Rödingen	37	0.961	1.021 +/- 0.034	1.233 +/- 0.760	11.24	18.9
	Cologne, Frankfurter Str.	28	0.969	0.988 +/- 0.034	-0.135 +/- 0.962	7.70	42.9
Combined Datasets	< 30 µg m^{-3}	68	0.830	1.018 +/- 0.052	0.961 +/- 0.921	11.33	4.4
	> 30 µg m^{-3}	26	0.929	0.990 +/- 0.054	0.737 +/- 2.080	8.24	100.0
	All Data	94	0.960	0.971 +/- 0.020	1.693 +/- 0.510	8.28	30.9

Austria1	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Individual Datasets	Graz	45	0.969	0.991 +/- 0.027	-0.164 +/- 1.787	19.96	82.2
	Steyregg	45	0.824	1.012 +/- 0.065	-1.624 +/- 1.347	9.63	8.9
Combined Datasets	< 30 µg m^{-3}	50	0.644	1.285 +/- 0.105	-6.378 +/- 2.065	34.09	2.0
	> 30 µg m^{-3}	40	0.960	1.022 +/- 0.033	-2.687 +/- 2.351	20.01	100.0
	All Data	90	0.983	1.005 +/- 0.014	-1.240 +/- 0.705	15.78	45.6

Austria2	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Individual Datasets	Graz	45	0.966	0.998 +/- 0.028	1.920 +/- 1.898	22.33	82.2
	Steyregg	45	0.793	0.997 +/- 0.069	-1.531 +/- 1.441	11.48	8.9
Combined Datasets	< 30 µg m^{-3}	50	0.557	1.429 +/- 0.126	-8.879 +/- 2.462	52.84	2.0
	> 30 µg m^{-3}	40	0.956	1.048 +/- 0.036	-2.167 +/- 2.549	20.66	100.0
	All Data	90	0.980	1.043 +/- 0.016	-1.631 +/- 0.791	17.32	45.6

J7860	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Combined Datasets	< 30 µg m^{-3}	59	0.906	1.131 +/- 0.046	1.195 +/- 0.812	32.66	6.8
	> 30 µg m^{-3}	38	0.974	0.969 +/- 0.026	3.074 +/- 1.498	13.09	100.0
	All Data (Tusimice)	97	0.984	0.966 +/- 0.012	3.625 +/- 0.476	13.28	43.3

J7863	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Combined Datasets	< 30 µg m^{-3}	58	0.913	1.119 +/- 0.044	0.182 +/- 0.786	26.26	6.9
	> 30 µg m^{-3}	38	0.978	0.998 +/- 0.025	1.904 +/- 1.403	12.97	100.0
	All Data (Tusimice)	96	0.987	1.001 +/- 0.012	1.975 +/- 0.446	12.77	43.8

17011	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Combined Datasets	< 30 µg m^{-3}	39	0.960	1.004 +/- 0.033	0.620 +/- 0.443	5.53	0.0
	> 30 µg m^{-3}	1		+/-	+/-		100.0
	All Data (Teddington)	40	0.949	1.123 +/- 0.041	-0.728 +/- 0.583	22.58	2.5

17022	Dataset	Orthogonal Regression				Limit Value of 50 µg m^{-3}	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^{-3}
Combined Datasets	< 30 µg m^{-3}	39	0.958	1.016 +/- 0.034	0.592 +/- 0.461	7.27	0.0
	> 30 µg m^{-3}	1		+/-	+/-		100.0
	All Data (Teddington)	40	0.963	1.073 +/- 0.033	-0.040 +/- 0.473	15.26	2.5

* The equivalence testing has been performed in the basis test with the identical measuring devices BAM-1020 of the company Met One Instruments, Inc.

Calculation of total uncertainty

PM_{10} Spirant BAM 1000* Slope and Intercept Corrected	35.3% > 28 µg m-3	Orthogonal Regression				Between Instrument Uncertainties	
	W_{CM} / %	n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	Reference	Candidate
All Paired Data	12.1	320	0.982	1.000 +/- 0.008	0.009 +/- 0.280	0.67	1.18
< 30 µg m-3	15.5	215	0.826	1.079 +/- 0.031	-1.187 +/- 0.538	0.53	1.06
> 30 µg m-3	14.9	105	0.971	1.007 +/- 0.017	-0.651 +/- 0.997	0.91	1.44

4294	Dataset	Orthogonal Regression				Limit Value of 50 µg m^3	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^3
Individual Datasets	Cologne, Parking Lot	29	0.960	0.917 +/- 0.035	1.329 +/- 0.919	15.05	34.5
	Titz - Rödingen	37	0.962	1.023 +/- 0.034	-0.437 +/- 0.756	7.33	18.9
	Cologne, Frankfurter Str.	28	0.963	0.990 +/- 0.037	-2.050 +/- 1.048	12.87	42.9
Combined Datasets	< 30 µg m^3	68	0.814	1.003 +/- 0.053	-0.596 +/- 0.949	9.11	4.4
	> 30 µg m^3	26	0.897	0.931 +/- 0.061	1.000 +/- 2.358	13.74	100.0
	All Data	94	0.953	0.954 +/- 0.022	0.217 +/- 0.545	12.26	35.3

4295	Dataset	Orthogonal Regression				Limit Value of 50 µg m^3	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^3
Individual Datasets	Cologne, Parking Lot	29	0.970	0.957 +/- 0.032	1.790 +/- 0.834	9.04	34.5
	Titz - Rödingen	37	0.961	1.021 +/- 0.034	0.418 +/- 0.760	8.91	18.9
	Cologne, Frankfurter Str.	28	0.969	0.988 +/- 0.034	-0.950 +/- 0.962	9.54	42.9
Combined Datasets	< 30 µg m^3	68	0.830	1.018 +/- 0.052	0.146 +/- 0.921	9.59	4.4
	> 30 µg m^3	26	0.929	0.990 +/- 0.054	-0.078 +/- 2.080	8.55	100.0
	All Data	94	0.960	0.971 +/- 0.020	0.878 +/- 0.510	8.65	30.9

Austria1	Dataset	Orthogonal Regression				Limit Value of 50 µg m^3	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^3
Individual Datasets	Graz	45	0.969	0.991 +/- 0.027	-0.979 +/- 1.787	20.64	82.2
	Steyregg	45	0.824	1.012 +/- 0.065	-2.439 +/- 1.347	11.48	8.9
Combined Datasets	< 30 µg m^3	50	0.644	1.285 +/- 0.105	-7.193 +/- 2.065	31.13	2.0
	> 30 µg m^3	40	0.960	1.022 +/- 0.033	-3.502 +/- 2.351	21.30	100.0
	All Data	90	0.983	1.005 +/- 0.014	-2.055 +/- 0.705	16.94	45.6

Austria2	Dataset	Orthogonal Regression				Limit Value of 50 µg m^3	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^3
Individual Datasets	Graz	45	0.966	0.998 +/- 0.028	1.105 +/- 1.898	21.51	82.2
	Steyregg	45	0.793	0.997 +/- 0.069	-2.346 +/- 1.441	13.69	8.9
Combined Datasets	< 30 µg m^3	50	0.557	1.429 +/- 0.126	-9.694 +/- 2.462	49.76	2.0
	> 30 µg m^3	40	0.956	1.048 +/- 0.036	-2.982 +/- 2.549	20.80	100.0
	All Data	90	0.980	1.043 +/- 0.016	-2.446 +/- 0.791	17.28	45.6

J7860	Dataset	Orthogonal Regression				Limit Value of 50 µg m^3	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^3
Combined Datasets	< 30 µg m^3	59	0.906	1.131 +/- 0.046	0.380 +/- 0.812	29.59	6.8
	> 30 µg m^3	38	0.974	0.969 +/- 0.026	2.259 +/- 1.498	11.97	100.0
	All Data (Tusimice)	97	0.984	0.966 +/- 0.012	2.810 +/- 0.476	11.73	43.3

J7863	Dataset	Orthogonal Regression				Limit Value of 50 µg m^3	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^3
Combined Datasets	< 30 µg m^3	58	0.913	1.119 +/- 0.044	-0.633 +/- 0.786	23.28	6.9
	> 30 µg m^3	38	0.978	0.998 +/- 0.025	1.089 +/- 1.403	11.54	100.0
	All Data (Tusimice)	96	0.987	1.001 +/- 0.012	1.160 +/- 0.446	11.08	43.8

17011	Dataset	Orthogonal Regression				Limit Value of 50 µg m^3	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^3
Combined Datasets	< 30 µg m^3	39	0.960	1.004 +/- 0.033	-0.195 +/- 0.443	4.58	0.0
	> 30 µg m^3	1		+/-	+/-		100.0
	All Data (Teddington)	40	0.949	1.123 +/- 0.041	-1.543 +/- 0.583	19.51	2.5

17022	Dataset	Orthogonal Regression				Limit Value of 50 µg m^3	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% > 28 µg m^3
Combined Datasets	< 30 µg m^3	39	0.958	1.016 +/- 0.034	-0.223 +/- 0.461	5.30	0.0
	> 30 µg m^3	1		+/-	+/-		100.0
	All Data (Teddington)	40	0.963	1.073 +/- 0.033	-0.855 +/- 0.473	12.29	2.5

* The equivalence testing has been performed in the basis test with the identical measuring devices BAM-1020 of the company Met One Instruments, Inc.