

# CERTIFICATE

## of Product Conformity (QAL1)

Certificate No.: 0000026912\_04

**AMS designation:** BAM-1020 with PM<sub>2.5</sub> pre-separator  
for suspended particulate matter PM<sub>2.5</sub>

**Manufacturer:** Met One Instruments, Inc.  
1600 Washington Blvd.  
Grants Pass, Oregon 97526  
USA

**Test Laboratory:** TÜV Rheinland Energy GmbH

**This is to certify that the AMS has been tested  
and found to comply with:**

**VDI 4202-1 (2002), VDI 4203-3 (2004), EN 14907 (2005), EN 16450 (2017),  
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 11 pages).

The present certificate replaces certificate 0000026912\_03 of 28 July 2015



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

www.tuv.com  
ID 0000026912

Publication in the German Federal Gazette  
(BAnz) of 26 March 2019

German Federal Environment Agency  
Dessau, 12 June 2019

This certificate will expire on:  
25 March 2024

TÜV Rheinland Energy GmbH  
Cologne, 11 June 2019



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 17025:2005 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.

<b>Test Report:</b>	936/21209919/A dated 26 March 2010 issued by TÜV Rheinland Immissionsschutz und Energie Systeme GmbH and Addendum No. 936/21243375/A dated 21 September 2018 issued by TÜV Rheinland Energy GmbH
<b>Initial certification:</b>	2 August 2010
<b>Expiry date:</b>	25 March 2024
<b>Publication:</b>	BAnz. 28 July 2010, no. 111, p. 2597, chapter II number 1.1

### 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.

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 936/21209919/A dated 26 March 2010 issued by TÜV Rheinland Immissionsschutz und Energie Systeme GmbH and Addendum No. 936/21243375/A dated 21 September 2018 issued by 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. 28 July 2010, No. 111, p. 2597,  
chapter II number 1.1, UBA announcement dated 12 July 2010:

**AMS designation:**

BAM-1020 with PM<sub>2.5</sub> pre-separator

**Manufacturer:**

Met One Instruments Inc., Grants Pass, USA

**Field of application:**

For continuous monitoring of suspended particulate matter, PM<sub>2.5</sub> fraction, in ambient air from stationary sources

**Measuring range during performance testing:**

Component	Certification range	supplementary range	Unit
PM <sub>2.5</sub>	0–1 000	-	µg/m <sup>3</sup>

**Software version:**

Version 3236-07 5.0.10

**Restriction:**

None

**Notes:**

1. The measuring system complies with the requirements of the guide to "Demonstration of Equivalence of Ambient Air Monitoring Methods" for the component PM<sub>2.5</sub>.
2. For monitoring PM<sub>2.5</sub>, the instrument must at least be equipped with the following:  
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 measuring system must be calibrated on site at regular intervals by using the gravimetric PM<sub>2.5</sub> reference method according to EN 14907.
7. Horiba Europe GmbH, 61440 Oberursel, offer an identical AMS under the brand name APDA-371 with PM<sub>2.5</sub> pre-separator.

**Test Report:**

TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne  
Report no.: 936/21209919/A dated 26 March 2010

Publication in the German Federal Gazette: BAnz. 26 January 2011, No. 14, p. 294, Chapter IV, notification 18, UBA announcement dated 10 January 2011:

**18 Notification as regards Federal Environment Agency notice of 12 July 2010 (BAnz. p. 2597, Chapter II, Number 1.1)**

After a re-assessment, the BAM-1020 measuring system with PM<sub>2.5</sub> pre-separator manufactured by Met One Instruments meets the requirements for the leak tightness of the sampling system.

The measuring system also complies with the requirements of guideline "Demonstration of Equivalence of Ambient Air Monitoring Methods", version dated January 2010.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 25 September 2010

Publication in the German Federal Gazette: BAnz. 29 July 2011, No. 113, p. 2725, Chapter III, Notification 11, UBA announcement dated 15 July 2011:

**11 Notification as regards Federal Environment Agency (UBA) notices of 12 July 2010 (BAnz. p. 2597, Chapter II, Number 1.1 and of 10 January 2011 (BAnz. p. 294, Chapter IV, 18<sup>th</sup> notification)**

The BAM-1020 measuring system with PM<sub>2.5</sub> pre-separator manufactured by Met One Instruments, Inc. measuring suspended particulate matter PM<sub>2.5</sub> may also be operated with a BX-125 pump.

The measuring system may optionally be equipped with a touch screen display (BX-970 option). The current software version is:

3236-77 V5.1.0

The software version of the measuring system without the BX-970 touch screen option remains unchanged: 3236-07 5.0.10.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 24 March 2011

Publication in the German Federal Gazette: BAnz AT 20.07.2012 B11,  
chapter IV notification 5, UBA announcement dated 6 July 2012:

**5 Notification as regards Federal Environment Agency (UBA) notices  
of 12 July 2010 (BAnz. p. 2597, Chapter II, Number 1.1 and  
of 15 July 2011 (BAnz. p. 2725, Chapter III, 11<sup>th</sup> notification)**

The BAM-1020 measuring system with PM<sub>2.5</sub> pre-separator manufactured by Met One Instruments, Inc. measuring suspended particulate matter PM<sub>2.5</sub> was equipped with a re-designed back plate, which makes room for additional interfaces such as the optional BX-965 reporting process.

The current software version of the measuring system is:

3236-07 5.0.15

The current software version of the measuring system  
with the touch screen display (option BX-970) is:

3236-77 V5.1.2

Statement issued by TÜV Rheinland Energie und Umwelt GmbH  
dated 21 March 2012

Publication in the German Federal Gazette: BAnz AT 23.07.2013 B4,  
chapter V notification 4, UBA announcement dated 3 July 2013:

**4 Notification as regards Federal Environment Agency (UBA) notices  
of 12 July 2010 (BAnz. p. 2597, Chapter II, Number 1.1 and  
of 6 July 2012 (BAnz AT 20.07.2012 B11, chapter IV 5<sup>th</sup> notification)**

The current software version of the BAM-1020 measuring system with PM<sub>2.5</sub> pre-separator manufactured by Met One Instruments, Inc. monitoring suspended particulate matter PM<sub>2.5</sub> is:

3236-07 5.1.1

The current software version of the measuring system  
with the touch screen display (option BX-970) is:

3236-77 V5.2.0

Statement issued by TÜV Rheinland Energie und Umwelt GmbH  
dated 18 March 2013

Publication in the German Federal Gazette: BAnz AT 02.04.2015 B5,  
chapter IV notification 12, UBA announcement dated 25 February 2015:

**12 Notification as regards Federal Environment Agency (UBA) notices  
of 12 July 2010 (BAnz. p. 2597, Chapter II, Number 1.1 and  
of 3 July 2013 (BAnz AT 23.07.2013 B4, chapter V 4<sup>th</sup> notification)**

The 970595 (MICROSWITCH #185 C15AT) pressure sensor integrated in the  
BAM 1020 measuring system with PM<sub>2.5</sub> pre-separator manufactured by Met One  
Instruments, Inc. has been discontinued and replaced by a 970595 (HONEYWELL  
SSCDANN015PAAA5) pressure sensor.

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

Publication in the German Federal Gazette: BAnz AT 26.03.2018 B8,  
chapter V notification 9, UBA announcement dated 21 February 2018:

**9 Notification as regards Federal Environment Agency (UBA) notices  
of 12 July 2010 (BAnz. p. 2597, Chapter II, Number 1.1 and  
of 25 February 2015 (BAnz AT 02.04.2015 B5, chapter IV, 12<sup>th</sup> notification)**

The current software version of the BAM-1020 measuring system with PM<sub>2.5</sub> pre-  
separator manufactured by Met One Instruments, Inc. is:

3236-07 5.5.0

The current software version of the measuring system with the touch screen dis-  
play (option BX-970) is:

3236-77 V5.2.0

Statement issued by TÜV Rheinland Energy GmbH dated 18 August 2017

Publication in the German Federal Gazette: BAnz AT 26.03.2019 B7, chapter IV notifica-  
tion 43, UBA announcement dated 27 February 2019

**43 Notification as regards Federal Environment Agency (UBA) notices  
of 12 July 2010 (BAnz. p. 2597, Chapter II, number 1.1  
of 21 February 2018 (BAnz AT 26.03.2018 B8, chapter V 9<sup>th</sup> notification)**

In its version without a touch screen display (option BX-970), the BAM-1020  
measuring system with PM<sub>2.5</sub> pre-separator manufactured by Met One Instru-  
ments, Inc. meets the requirements of standard EN 16450 (July 2017). An adden-  
dum to test report No. 936/21243375/A is available online at [www.qal1.de](http://www.qal1.de).

The current software version is: 3236-05 3.14.2

The current software version of the measuring system with the touch screen dis-  
play (option BX-970) is: 3236-77 V5.2.0.

Statement issued by TÜV Rheinland Energy GmbH dated 10 January 2019.

**Certified product**

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

The ambient air quality measuring system BAM-1020 uses beta-attenuation as its measurement principle.

The BAM-1020 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) instrument vacuum pump, the BAM-1020 measuring instrument as such (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 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 BAM-1020 analyser via the sampling tube.

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

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).

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>. 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<sub>2</sub> with an inserted reference foil. The same spot of the filter tape is subjected to yet another I<sub>1x</sub>, eight minutes before the end of the collection time in order to monitor stability of the zero point with the help of I<sub>1</sub> and I<sub>1x</sub>.
4. Once sampling has been completed, the filter band is reversed back four sampling spots and the sampled filter spot is measured radiometrically (I<sub>3</sub>). The calculation of the concentration completes the measurement cycle.
5. The next cycle will start again with step 1.

The BAM 1020 with PM<sub>2.5</sub> pre-separator has already been performance tested and publically announced as such. The instrument version certified here is equipped with a PM<sub>2.5</sub> pre-separator.

### 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 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. 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 [gal1.de](http://gal1.de).

### Document history

Certification of the BAM-1020 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. 0000026912: 2 August 2010  
Expiry date of the certificate: 1 August 2015

Test report: 936/21209919/A dated 26 March 2010  
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne  
Publication: BAnz. 28 July 2010, no. 111, p. 2597, chapter II number 1.1  
UBA announcement dated 12 July 2010

#### Notifications in accordance with EN 15267:

Certificate no. 0000026912\_01: 19 August 2011  
Expiry date of the certificate: 1 August 2015  
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 25 September 2010  
Publication: BAnz. 26 January 2011, no. 14, p. 294, chapter IV, notification 18  
UBA announcement dated 10 January 2011  
(re-assessment of requirements)

Certificate no.: 0000026912\_02 16 March 2012  
Expiry date of the certificate: 1 August 2015  
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 24 March 2011  
Publication: BAnz. 29 July 2011, no. 113, p. 2725, chapter III, notification 11  
UBA announcement dated 15 July 2011  
(optional touch screen display)



Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 21 March 2012  
Publication: BAnz AT 20.07.2012 B11, chapter IV notification 5  
UBA announcement dated 6 July 2012  
(new software version, new back plate)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 18 March 2013  
Publication: BAnz AT 23.07.2013 B4, chapter V notification 4  
UBA announcement dated 3 July 2013  
(new software version)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 20 September 2014  
Publication: BAnz AT 02.04.2015 B5, chapter IV notification 12  
UBA announcement dated 25 February 2015  
(new pressure sensor)

**Renewal of the certificate:**

Certificate no. 0000026912\_03: 28 July 2015  
Expiry date of the certificate: 1 August 2020

**Notifications in accordance with EN 15267:**

Statement issued by TÜV Rheinland Energy GmbH dated 18 August 2017  
Publication in the German Federal Gazette: BAnz AT 26.03.2018 B8,  
chapter V notification 9, UBA announcement dated 21 February 2018  
(new software version)

Certificate No. 0000026912\_04: 12 June 2019  
Expiry date of the certificate: 25 March 2024  
Statement issued by TÜV Rheinland Energy GmbH dated 10 January 2019  
Test report Addendum No. 936/21243375/A dated 21 September 2018  
Publication: BAnz AT 26.03.2019 B7, chapter IV notification 43  
UBA announcement dated 27 February 2019  
(Satisfaction of requirements according to EN 16450)

Comparison candidate with reference according to Standard EN 16450:2017				
Candidate	BAM-1020	SN	SN 17010 & SN 17011	
Status of measured values	Offset corrected	Limit value	30	$\mu\text{g}/\text{m}^3$
		Allowed uncertainty	25	%
<b>All comparisons</b>				
Uncertainty between Reference	0,33			$\mu\text{g}/\text{m}^3$
Uncertainty between Candidates	1,38			$\mu\text{g}/\text{m}^3$
<b>SN 17010 &amp; SN 17011</b>				
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			%
<b>All comparisons, <math>\geq 18 \mu\text{g}/\text{m}^3</math></b>				
Uncertainty between Reference	0,30			$\mu\text{g}/\text{m}^3$
Uncertainty between Candidates	1,57			$\mu\text{g}/\text{m}^3$
<b>SN 17010 &amp; SN 17011</b>				
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			%
<b>All comparisons, <math>&lt; 18 \mu\text{g}/\text{m}^3</math></b>				
Uncertainty between Reference	0,34			$\mu\text{g}/\text{m}^3$
Uncertainty between Candidates	1,05			$\mu\text{g}/\text{m}^3$
<b>SN 17010 &amp; SN 17011</b>				
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			%

Comparison candidate with reference according to Standard EN 16450:2017				
Candidate	BAM-1020	SN	SN 17010 & SN 17011	
Status of measured values	Offset corrected	Limit value	30	µg/m <sup>3</sup>
		Allowed uncertainty	25	%
<b>Teddington, Summer</b>				
Uncertainty between Reference	0,33	µg/m <sup>3</sup>		
Uncertainty between Candidates	1,13	µg/m <sup>3</sup>		
	<b>SN 17010</b>		<b>SN 17011</b>	
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 <sub>CM</sub>	14,54	%	11,95	%
<b>Cologne, Winter</b>				
Uncertainty between Reference	0,39	µg/m <sup>3</sup>		
Uncertainty between Candidates	1,76	µg/m <sup>3</sup>		
	<b>SN 17010</b>		<b>SN 17011</b>	
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 <sub>CM</sub>	13,08	%	14,12	%
<b>Bornheim, Summer</b>				
Uncertainty between Reference	0,30	µg/m <sup>3</sup>		
Uncertainty between Candidates	1,13	µg/m <sup>3</sup>		
	<b>SN 17010</b>		<b>SN 17011</b>	
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 <sub>CM</sub>	11,17	%	20,77	%
<b>Teddington, Winter</b>				
Uncertainty between Reference	0,27	µg/m <sup>3</sup>		
Uncertainty between Candidates	1,01	µg/m <sup>3</sup>		
	<b>SN 17010</b>		<b>SN 17011</b>	
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 <sub>CM</sub>	14,46	%	7,70	%
<b>All comparisons, ≥18 µg/m<sup>3</sup></b>				
Uncertainty between Reference	0,30	µg/m <sup>3</sup>		
Uncertainty between Candidates	1,57	µg/m <sup>3</sup>		
	<b>SN 17010</b>		<b>SN 17011</b>	
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 <sub>CM</sub>	16,73	%	16,73	%
<b>All comparisons, &lt;18 µg/m<sup>3</sup></b>				
Uncertainty between Reference	0,34	µg/m <sup>3</sup>		
Uncertainty between Candidates	1,05	µg/m <sup>3</sup>		
	<b>SN 17010</b>		<b>SN 17011</b>	
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 <sub>CM</sub>	13,31	%	11,22	%
<b>All comparisons</b>				
Uncertainty between Reference	0,33	µg/m <sup>3</sup>		
Uncertainty between Candidates	1,38	µg/m <sup>3</sup>		
	<b>SN 17010</b>		<b>SN 17011</b>	
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 <sub>CM</sub>	13,87	%	13,61	%