

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000026912_03

Certified AMS: BAM 1020 with PM_{2.5}-pre-separator

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

Test Institute: TÜV Rheinland Energie und Umwelt 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,
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
(see also the following pages).
The present certificate replaces the Certificate 0000026912_02 of 16 March 2012.



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

www.tuv.com
ID 0000026912

Publication in the German Federal Gazette
(BAnz.) of 28 July 2010

This certificate will expire on:
01 August 2020

German Federal Environment Agency
Dessau, 28 July 2015

TÜV Rheinland Energie und Umwelt GmbH
Cologne, 27 July 2015



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Accreditation according to EN ISO/IEC 17025 and certified according to ISO 9001:2008.

Certificate:
0000026912_03 / 28 July 2015

Test report: 936/21209919/A of 26 March 2010
Initial certification: 02 August 2010
Certificate: renewal (previous certificate 0000026912_02
of 16 March 2012 valid until 01 August 2015)
Date of expiry: 01 August 2020
Publication: BAnz. 28 July 2010, No. 111, p. 2597, chapter II, number 1.1

Approved application

The AMS is approved for permanent monitoring of suspended particulate matter PM_{2.5} in ambient air (stationary operation)

The suitability of the product for this application was assessed on the basis of a laboratory test and a field test at four different test sites respectively time periods.

The AMS is approved for the temperature range from +5 °C to +40 °C.

Any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for ambient air applications at which it will be installed.

Basis of the certification

This certification is based on:

- test report 936/21209919/A dated 26 March 2010 of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH
- suitability announced by the German Federal Environment Agency (UBA) as the relevant body
- the on-going surveillance of the product and the manufacturing process
- the publication in the German Federal Gazette (BAnz. 28 July 2010, No. 111, p. 2597, chapter II no 1.1, UBA publication from 12 July 2010)
- publication in the German Federal Gazette (BAnz. 26 January 2011, No. 14, p. 294, chapter IV, notification 18, UBA publication from 10 January 2011)
- publication in the German Federal Gazette (BAnz. 29 July 2011, No. 113, p. 2725, chapter III, notification 11, UBA publication from 15 July 2011)
- publication in the German Federal Gazette (BAnz AT 20 July 2012 B11, chapter IV notification 5, UBA publication from 06 July 2012)
- publication in the German Federal Gazette (BAnz AT 23 July 2013 B4, chapter V notification 4, UBA publication from 03 July 2013)
- publication in the German Federal Gazette (BAnz AT 02 April 2015 B5, chapter IV notification 12, UBA publication from 25 February 2015)

AMS name:

BAM-1020 with PM_{2.5}-pre-separator

Manufacturer:

Met One Instruments, Inc., Grants Pass, USA

Approval:

For permanent monitoring of suspended particulate matter PM_{2.5} in ambient air (stationary operation).

Measuring range during the suitability test:

Component	Certification range	Supplementary range	Unit
PM _{2.5}	0 – 1,000	-	µg/m ³

Software version:

Version 3236-07 5.0.10

Restriction:

None

Remarks:

1. The requirements according to guide "Demonstration of Equivalence of Ambient Air Monitoring Methods" are fulfilled for the measured component PM_{2.5}.
2. For the recordation of PM_{2.5}, the system has to be equipped with the following options: Sample heater (BX-830), PM₁₀-sampling inlet (BX-802), PM_{2.5} Sharp Cut Cyclone SCC (BX-807), combined pressure and temperature sensor (BX-596) respectively as an alternative ambient temperature sensor (BX-592).
3. The cycle time during the suitability test was 1 h, i.e. an automatic filter change has been performed every hour. Each filter spot has been used one time.
4. The sampling time within the cycle time is 42 min.
5. The measuring system has to be operated in a lockable measuring cabinet.
6. The measuring system is to be calibrated on site in regular intervals by application of the gravimetric PM_{2.5} reference method according to EN 14907.
7. The identical measuring system is also distributed by the company Horiba Europe GmbH, 61440 Oberursel, Germany under the name APDA-371 with PM_{2.5} pre-separator.

Test report:

TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Köln
Report-No.: 936/21209919/A of 26 March 2010

18 Notification on announcements of the Federal Environment Agency of 12 July 2010 (BAnz. p. 2597, chapter II, No. 1.1)

The requirements on the tightness of the sampling system for the measurement system BAM 1020 with PM_{2.5}-pre-separator of Met One Instruments are fulfilled after the re-evaluation.

The requirements according to guideline „Demonstration of Equivalence of Ambient Air Monitoring Method“ Version January 2010 are fulfilled.

Statement of TÜV Rheinland Energie und Umwelt GmbH 25 September 2010

11 Notification on announcements of the Federal Environment Agency of 12 July 2010 (BAnz. p. 2597, chapter II, No. 1.1) and of 10 January 2011 (BAnz. p. 294, chapter IV, 18th notification)

As an option the measuring system BAM-1020 with PM_{2.5}-pre-separator of the company Met One Instruments, Inc. for the measured component PM_{2.5} can be operated with the pump BX-125.

As an option the measuring system can be equipped with a Touch Screen Display (Option BX-970). The current firmware version is:

3236-77 V5.1.0

The firmware version of the measuring system without the option BX-970 Touch Screen Display remains 3236-07 5.0.10.

Statement of TÜV Rheinland Energie und Umwelt GmbH 24 of March 2011

5 Notification as regards Federal Environmental Agency notices of 12 July 2010 (Federal Journal (BAnz.) p. 2597, chapter II, No. 1.1) and of 15 July 2011 (Federal Journal (BAnz.) p. 2725, chapter III, 11th Notification)

The BAM-1020 measuring system with PM_{2.5}-pre-separator for the component suspended particulate matter PM_{2.5}-fraction manufactured Met One Instruments, Inc. is equipped with a re-designed back plate in order to make room for extended interfaces (i.e. the optional BX-965 reporting unit).

The current software version of the AMS is:

3236-07 5.0.15

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

3236-77 V5.1.2

Statement of TÜV Rheinland Energie und Umwelt GmbH dated 21 March 2012

4 Notification as regards Federal Environmental Agency notices of 12 July 2010 Federal Gazette (BAnz. p. 2597, chapter II no. 1.1) and of 6 July 2012 Federal Gazette (BAnz AT 20 July 2012 B11, chapter IV, 5th notice)

The BAM-1020 measuring system with PM_{2.5}-pre-separator manufactured by der Met One Instruments, Inc. for suspended particulate matter PM_{2.5} currently operates software version:

3236-07 5.1.1

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

3236-77 V5.2.0

Statement of TÜV Rheinland Energie und Umwelt GmbH of 18 March 2013

12 Notification as regards Federal Environment Agency (UBA) notices of 12 July 2010 (Federal Gazette (BAnz.) p. 2597, chapter II number 1.1) and of 03 July 2013 (Federal Gazette (BAnz) AT 23 July 2013 B4, chapter V 4th notification)

The 970603 pressure sensor (MICROSWITCH #185PC15AT) of the BAM-1020 measuring system with PM_{2.5}-pre-separator, manufactured by Met One Instruments, Inc., has been discontinued and was replaced by the 970595 pressure sensor (HONEYWELL SSCDANN015PAAA5).

Statement of TÜV Rheinland Energie und Umwelt GmbH of 20 September 2014

Certified product

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

The ambient air measuring system BAM-1020 is based on the measuring principle of beta-attenuation. The measuring system BAM-1020 with PM_{2.5}-pre-separator consists of the PM₁₀-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 and the optional BX-125, the measuring instrument BAM-1020 (incl. glass fiber filter tape), the respective connecting tubes and lines as well as adapters, the roof flange and the manual in English / German.

The particle sample passes the PM₁₀-sampling inlet and the PM_{2.5} Sharp Cut Cyclone with a flow rate of 1 m³/h and arrives via the sampling tube at the measuring instrument BAM-1020.

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

The radiometric determination of mass is calibrated in the factory and is checked within the scope of internal quality assurance hourly at the zero point (clean filter spot) and at the reference point (built-in reference foil) during operation. With the help of the generated data, measured values at zero and reference point can be easily affiliated. They can be compared with any stability requirements (drift effects) respectively with the nominal value for the reference foil (factory setting).

One measurement cycle (incl. automatic check of the radiometric measurement) consists of the following steps (setting: measuring time for radiometry 8 min):

1. The initial count of the clean filter tape I_0 is performed at the beginning of the cycle for a period of eight minutes.
2. The filter tape is advanced four windows and the sampling (vacuum pumping) begins on the spot in which I_0 was just measured. Air is drawn through this spot on the filter tape for approximately 42 minutes.
3. At the same time the second count I_1 occurs (at a point on the tape 4 windows back) for a period of eight minutes. The purpose of the measurement is to perform the verification for instrument drift caused by varying external parameters such as temperature and relative humidity. A third count I_2 occurs with the reference membrane extended over the same place on the tape. Eight minutes before the end of sampling time, another count I_{1x} occurs on the same point of the tape. With the help of I_1 and I_{1x} , the stability at the zero point can be monitored.
4. After sampling, the filter tape is moved back four windows to measure the beta ray absorption through the section that has collected dust (I_3). Finally the concentration calculation is performed to complete the cycle.
5. The next cycle begins with step 1.

The measuring system BAM-1020 with PM₁₀ pre-separator is already suitability-tested and published. The measuring system, which is certified with this certificate, is equipped with a PM_{2.5}-pre-separator.

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 Energie und Umwelt 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 can be applied to the product or used in publicity material for the certified product is presented on page 1 of this certificate.

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

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

Certification of BAM-1020 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. 0000026912: 02 August 2010
Validity of the certificate: 01 August 2015
Test report: 936/21209919/A of 26 March 2010,
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Köln,
Publication: BAnz. 28 July 2010, No. 111, p. 2597, chapter II, no 1.1,
publication by UBA from 12 July 2011

Notifications according to EN 15267:

Certificate No. 0000026912_01: 19 August 2011
Validity of the certificate: 01 August 2015
Certificate No. 0000026912_02: 16 March 2012
Validity of the certificate: 01 August 2015

1st notification on changes to the certificate according to EN 15267:

Statement of TÜV Rheinland Energie und Umwelt GmbH, Köln of 25 September 2010

Publication: BAnz. 26 January 2011, No. 14, p. 294, chapter IV, notification 18
(re-evaluation of requirements)
publication by UBA from 10 January 2011

2nd notification on changes to the certificate according to EN 15267:

Statement of TÜV Rheinland Energie und Umwelt GmbH, Köln of 24 March 2011

Publication: BAnz. 29 July 2011, No. 113, p. 2725, chapter III, notification 11
(option touch screen display)
publication by UBA from 15 July 2011

3rd notification on changes to the certificate according to EN 15267:

Statement of TÜV Rheinland Energie und Umwelt GmbH, Köln of 21 March 2012

Publication: BAnz AT 20 July 2012 B11, chapter IV notification 5
(new software version, new back plate)
publication by UBA from 06 July 2012

4th notification on changes to the certificate according to EN 15267:

Statement of TÜV Rheinland Energie und Umwelt GmbH, Köln of 18 March 2013

Publication: BAnz AT 23 July 2013 B4, chapter V notification 4 (new software version)
publication by UBA from 03 July 2013

5th notification on changes to the certificate according to EN 15267:

Statement of TÜV Rheinland Energie und Umwelt GmbH, Köln of 20 September 2014

Publication: BAnz AT 02 April 2015 B5, chapter IV notification 12 (new pressure sensor)
publication by UBA from 25 February 2015

Renewal of the certificate:

Certificate No. 0000026912_03: 28 July 2015

Validity of the certificate: 01 August 2020

Results of the equivalence testing for the demonstration of equivalence according to the EC-Guide of July 2009*

PM _{2.5} Smart Heated BAM	33.1% > 17 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 Data	12.6	248	0.967	1.000 +/- 0.012	0.764 +/- 0.204	0.33	1.38
< 18 µg m ⁻³	9.8	174	0.889	0.971 +/- 0.025	1.066 +/- 0.267	0.34	1.05
> 18 µg m ⁻³	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 ⁻³	
		n _{c-s}	r ²	Slope (b) +/- u _b	Intercept (a) +/- u _a	W _{CM} / %	% > 17 µg m ⁻³
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 ⁻³	175	0.849	0.955 +/- 0.028	1.137 +/- 0.306	11.46	4.6
	> 18 µg m ⁻³	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 ⁻³	
		n _{c-s}	r ²	Slope (b) +/- u _b	Intercept (a) +/- u _a	W _{CM} / %	% > 17 µg m ⁻³
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 ⁻³	178	0.881	1.021 +/- 0.026	0.634 +/- 0.286	13.44	4.5
	> 18 µg m ⁻³	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

* The investigations for the measuring system Met One BAM-1020 with PM_{2.5}-pre-separator have been performed on basis of the version of July 2009 of the EC-Guide. In the meanwhile there have been again some modifications on the Guide and a new version has been published in January 2010. The made modifications are purely of cosmetic kind and do not lead to any changes in the equivalence test itself. Hence an equivalence test according to the Guide in version of January 2010 leads to exactly identical results as an equivalence test according to the Guide in version of July 2009.