Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000040212_05

AMS designation:	Fidas® 200 S, Fidas® 200 and Fidas® 200 E for suspended particulate matter PM_{10} and $PM_{2.5}$
Manufacturer:	PALAS GmbH Greschbachstraße 3b 76229 Karlsruhe Germany
Test Laboratory:	TÜV Rheinland Energy GmbH

This is to certify that the AMS has been tested and found to comply with:
VDI 4202-1 (2010), VDI 4203-3 (2010), EN 12341 (1999), 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 14 pages).
The present certificate replaces certificate 0000040212_04 of 13 April 2018.

TÜVRheinland® CERTIFIED

Performance tested
Equivalent to
2008/50/EC
EN 15267
Regular Surveillance

www.tuv.com
ID 0000040212

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

This certificate will expire on:
25 March 2024

German Federal Environment Agency
Dessau, 12 June 2019

TÜV Rheinland Energy GmbH
Cologne, 11 June 2019

Dr. Marcel Langner
Head of Section II 4.1

ppa. Dr. Peter Wilbring

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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.

Test Report:	936/21227195/C dated 12 October 2016 and Addendum 936/21239834/B dated 7 September 2018
Initial certification:	1 April 2014
Expiry date:	25 March 2024
Publication:	BAnz AT 26.03.2019 B7, chapter IV number 44

Approved application
The certified AMS is suitable for continuous and simultaneous ambient air monitoring of suspended particulate matter, PM_{10} and $PM_{2.5}$ (stationary operation).

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a sixteen-months field test.

The Fidas® 200 S version of the instrument is approved for an ambient temperature range of -20 °C to +50 °C. The Fidas® 200 and Fidas® 200 E versions of the instrument are 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 limit values 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. 936/21227195/C dated 12 October 2016 and Addendum 936/21239834/B dated 7 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 AT 26.08.2015 B4, chapter III number 2.1
UBA announcement dated 22 July 2015:

AMS designation:
Fidas® 200 S, Fidas® 200 and Fidas® 200 E
for suspended particulate matter PM_{10} and $PM_{2.5}$

Manufacturer:
PALAS GmbH, Karlsruhe

Field of application:
For continuous and simultaneous ambient air monitoring suspended particulate matter, PM_{10} and $PM_{2.5}$ fractions (stationary sources)

Measuring ranges during performance testing:

Component	Certification range	Unit
PM_{10}	0–10 000	µg/m³
$PM_{2,5}$	0–10 000	µg/m³

Software version: 100449.0014.0001.0001.0011

Restrictions: None

Notes:

1. The Fidas® 200 S measuring system is also available as an indoor-version for installation at temperature-controlled locations. It is then called Fidas® 200.
2. Both, the four comparison campaigns (initial testing) and the six comparison campaigns (supplementary testing) meet the requirements for PM_{10} and $PM_{2,5}$ stipulated by the Guide to “Demonstration of Equivalence of Ambient Air Monitoring Methods”.
3. One of the tested instrument tested at the site in Cologne in the summer failed to meet the requirements for the variation coefficient R^2 in accordance with standard EN 12341 (1998 version).
4. The particle sensor’s sensitivity has to be checked on a monthly basis using CalDust 1100 or MonoDust 1500.
5. The measuring system must be calibrated on site at regular intervals by using the gravimetric $PM_{2.5}$ and PM_{10} reference method according to EN 12341 (2014 version).
6. The test report on performance testing is available on the internet at www.qal1.de.
7. Supplementary testing (extended equivalence testing, presentation of design changes, inclusion of the MonoDust1500 test standard) as regards Federal Environment Agency notices of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV number 5.1) and of 25 February 2015 (BAnz AT 02.04.2015 B5 chapter IV 14th notification)

Test Report:
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Report no. 936/21227195/A dated 9 March 2015

Publication in the German Federal Gazette: BAnz AT 14.03.2016 B7, chapter V notification 6, UBA announcement dated 18 February 2016:

6 Notification as regards Federal Environment Agency (UBA) notice of 22 July 2015 (BAnz AT 26.08.2015 B4, chapter III number 2.1)

A mistake regarding the description of the of the IADS-control functions was detected in the manual for the Fidas® 200 S or the Fidas® 200 measuring system for PM_{10} and $PM_{2.5}$ manufactured by PALAS GmbH. The description should correctly read as follows:

"*The temperature of the IADS is controlled as a function of the ambient temperature and humidity (as measured by the weather station).* The minimum temperature is 23 °C. Moisture compensation is ensured via a dynamic adjustment of the IADS temperature up to a maximum heat capacity of 90 Watt.

The manufacturer corrected this mistake as of manual version V0140815. 936/21227195/A dated 9 March 2015 issued by TÜV Rheinland Energie und Umwelt GmbH was corrected accordingly and replaced by test report 936/21227195/B dated 5 October 2015.

The measuring system can alternatively be operated with a WS300-UMB weather station. An extended IADS adaptable for lengths between 1.20m and 2.10m is available for the measuring system.

Furthermore, the Fidas® 200 E version of the measuring system may be used with an external sensor.

The current software version is: 100396.0014.0001.0001.0011

Statement issued by TÜV Rheinland Energie und Umwelt GmbH
dated 6 November 2015

Publication in the German Federal Gazette: BAnz AT 01.08.2016 B11,
chapter V notification 35, UBA announcement dated 14 July 2016:

35 Notification as regards Federal Environment Agency (UBA) notices of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV number 5.1) and of 18 February 2016 (BAnz AT 14.03.2016 B7, chapter V 6th notification)

The sensitivity test of the particle sensor for the Fidas® 200, Fidas® 200 S or Fidas® 200 E for PM_{10} and $PM_{2.5}$ particle monitor with MonoDust 1500 manufactured by PALAS GmbH can be performed at an IADS temperature between 35 °C and 50 °C.
The measuring system may provide two additional contacts for the control of an external pump/flow regulator (not relevant for the performance-tested instrument version).
The current software version of the measuring system is:
100408.0014.0001.0001.0011

Statement issued by TÜV Rheinland Energie und Umwelt GmbH
dated 24 February 2016

Publication in the German Federal Gazette: BAnz AT 15.03.2017 B6,
chapter V notification 10, UBA announcement dated 22 February 2017:

10 Notification as regards Federal Environment Agency (UBA) notices of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV number 5.1) and of 14 July 2016 (BAnz AT 01.08.2016 B11, chapter V 35th notification)

The particle sensor's sensitivity of the Fidas® 200, Fidas® 200 S and Fidas® 200 E for PM_{10} and $PM_{2.5}$ manufactured by PALAS GmbH has to be checked using CalDust 1100 or MonoDust 1500 every three months.
These measuring systems may alternatively be used with the Siargo FS4008-10-O6-CV-A flow sensor instead of the Honeywell AWM5102VN model used so far.
The new temperature compensation factors for each instrument are as follows: 0.15 (Fidas® 200 S), 0.19 (Fidas® 200 E) and 0.17 (Fidas® 200).
To ensure effective heating for the outdoor enclosure of the Fidas® 200 S AMS variant the fan heater has been repositioned. The air flow produced by the fan heater now flows from the bottom to the top of the enclosure.
A mistake in the test report no. 936/21227195/B dated 5 October 2015 prepared by TÜV Rheinland Energie und Umwelt GmbH has been corrected. Instead of a 30-minute moving average as stated in two instances in the report, the Fidas® 200 S, Fidas® 200 E and Fidas® 200 ambient air quality monitors operate with a moving average over 900s (15 minutes). Test report 936/21227195/C dated 12 October 2016 issued by TÜV Rheinland Energy GmbH replaces the aforementioned report.
The current software version of the measuring system is:
100417.0014.0001.0001.0011.

Statement issued by TÜV Rheinland Energy GmbH dated 12 October 2016

Publication in the German Federal Gazette: BAnz AT 31.07.2017 B12,
chapter II notification 30, UBA announcement dated 13 July 2017:

30 Notification as regards Federal Environment Agency (UBA) notices of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV number 5.1) and of 22 February 2017 (BAnz AT 15.03.2017 B6, chapter V 10th notification)

The current software version for the Fidas® 200, Fidas® 200 S and Fidas® 200 E monitoring PM_{10} and $PM_{2,5}$ manufactured by PALAS GmbH is:
100427.0014.0001.0001.0011

Statement issued by TÜV Rheinland Energy GmbH dated 7 March 2017

Publication in the German Federal Gazette: BAnz AT 26.03.2018 B8,
chapter V notification 10, UBA announcement dated 21 February 2018:

10 Notification as regards Federal Environment Agency (UBA) notices of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV number 5.1) and of 13 July 2017 (BAnz AT 31.07.2017 B12, chapter II 30th notification)

The Fidas® 200, Fidas® 200 S and Fidas® 200 E measuring systems for PM_{10} and $PM_{2.5}$ manufactured by PALAS GmbH meet the requirements of standard EN 16450 (July 2017 version). An addendum no. 936/21239834/A as integral part of test report is available online at www.qal1.de.

The current software versions are:

100430.0014.0001.0001.0011
100431.0014.0001.0001.0011
100434.0014.0001.0001.0011

Statement issued by TÜV Rheinland Energy GmbH dated 8 September 2017

Publication in the German Federal Gazette: BAnz AT 17.07.2018 B9, chapter III notification 30,
UBA announcement dated 3 July 2018:

30 Notification as regards Federal Environment Agency (UBA) notices of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV number 5.1) and of 21 February 2018 (BAnz AT 26.03.2018 B8, chapter V 10th notification)

In order to improve practicability of the leak test for the Fidas® 200, Fidas® 200 S and Fidas® 200 E particle monitors for PM_{10} and $PM_{2.5}$ manufactured by PALAS GmbH, the criterion for passing the leak test with the instrument inlet blocked was changed to 0 ± 0.5 l/min (entire system without the Sigma-2 sampling head) and 0 ± 0.08 l/min (APDA-372 control unit on its own).

In the future, the measuring system will be equipped with an LED protective shield. It is possible to retrofit systems.

Statement issued by TÜV Rheinland Energy GmbH dated 2 May 2018

Publication in the German Federal Gazette: BAnz AT 26.03.2019 B7, chapter V number 44,
Announcement by UBA dated 27 February 2019:

44 Notification as regards Federal Environment Agency (UBA) notices of 27 February 2014 (BAnz AT 01.04.2014 B9, chapter IV number 5.1) and of 3 July 2018 (BAnz AT 17.07.2018 B9, chapter III 30th notification)

The addendum no. 936/21239834/A dated 1 September 2017 to the report on testing the Fidas® 200 S, Fidas® 200 E and Fidas® 200 measuring systems for PM_{10} and $PM_{2,5}$ manufactured by PALAS GmbH contains a mistake regarding the uncertainty determination of the reference method. This error was corrected by way of an additional addendum to test report no. 936/21239834/B dated 7 September 2018. The addendum no. 936/21239834/A dated 1 September 2017 was withdrawn.
The instrument's software version has been revised. The current software version is:

100449.0014.0001.0001.0011.

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

100435.0014.0001.0001.0011, 100437.0014.0001.0001.0011
100439.0014.0001.0001.0011, 100440.0014.0001.0001.0011
100441.0014.0001.0001.0011, 100443.0014.0001.0001.0011
100444.0014.0001.0001.0011, 100445.0014.0001.0001.0011
100447.0014.0001.0001.0011, 100448.0014.0001.0001.0011

An o-ring at the sampling rod of the IADS was optimised. A resistance on the temperature measurement board was replaced by a new resistance with optimised temperature behaviour.

Statement issued by TÜV Rheinland Energy GmbH dated 8 October 2018

Certified product

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

The Fidas® 200 S, Fidas® 200 and Fidas® 200 E are optical aerosol sensors which determine the particle size and number using scattered light on single particles in accordance with Lorenz-Mie. For the determination of mass concentrations, particle size and count distributions are converted using a size-dependent and weighted evaluation algorithm.

The measuring system is available as instrument versions Fidas® 200 S (for use outdoors, incl. protective enclosure), Fidas® 200 (for installation at temperature controlled sites such as air-conditioned measurement stations) and as Fidas® 200 E (as Fidas® 200, but with external sensor unit).

The tested measuring system consists of a Sigma-2 sampling head, the sampling tube c/w IADS humidity compensation module (standard or long version), the Fidas® control unit with integrated aerosol sensor (Fidas® 200 S or Fidas® 200) or with external sensor unit

At a flow rate of 4.8 l/min (at 25 °C and 1013 hPa), the particle sample passes through the Sigma2 sampling head and reaches the sampling tube which connects the sampling head to the Fidas control unit. In order to avoid water condensation effects especially at high ambient humidity, the IADS humidity compensation module is used. The IADS was controlled in relation to ambient temperature and moisture (as measured using a compact weather station). The minimum temperature is 23 °C. Moisture compensation is ensured via a dynamic adjustment of the IADS temperature up to a maximum heat capacity of 90 Watt. The IADS module is controlled via the Fidas firmware. After passing through the IADS module, the particle sample finally reaches the aerosol sensor which is were the actual measurement takes place. Downstream of the aerosol sensor, the sample passes through an absolute filter which may be used for further analyses of the collected aerosol. The Fidas® 200 S, Fidas® 200 and Fidas® 200 E measuring systems also come with an integrated weather station (type Lufft WS300-UMB for recording parameters such as wind speed, wind direction, precipitation rates, type of precipitation, temperature, humidity and pressure; the alternative is the Lufft WS600-UMB for recording temperature, humidity and pressure). The measuring system's control unit does not only provide the necessary electronics for operating the system, but also 2 sampling pumps, which are connected in parallel. If one pump fails, the other one takes over to ensure smooth operation.

The Fidas® 200 S, Fidas® 200 and Fidas® 200 E measuring systems store data in the raw-format. To determine mass concentration values, the stored raw data will have to be converted with the help of evaluation algorithm. To this effect, a size-dependent and weighted algorithm converts particle size and counts into mass concentrations. Algorithm PM_ENVIRO_0011 was used for conversion in the context of performance testing.

The measuring system may be operated either directly via the touch screen at the front of the instrument or remotely via an internet connection using a wireless modem using appropriate software (e.g. Teamviewer). The user is able to check measurement data and instrument information, change parameters and check correct functionality of the AMS.

The current software versions are: 100449.0014.0001.0001.0011.

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

100435.0014.0001.0001.0011, 100437.0014.0001.0001.0011,
100439.0014.0001.0001.0011, 100440.0014.0001.0001.0011,
100441.0014.0001.0001.0011, 100443.0014.0001.0001.0011,
100444.0014.0001.0001.0011, 100445.0014.0001.0001.0011,
100447.0014.0001.0001.0011, 100448.0014.0001.0001.0011

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 Fidas® 200 S, Fidas® 200 and Fidas® 200 E 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. 0000040212: 29 April 2014
Expiry date of the certificate: 31 March 2019
Test report: 936/21218896/A dated 20 September 2013
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Publication: BAnz AT 01.04.2014 B12, chapter IV no. 5.1
UBA announcement dated 27 February 2014

Notification in accordance with EN 15267

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 27 September 2014
Publication: BAnz AT 02.04.2015 B5, chapter IV notification 14
UBA announcement dated 25 February 2015
(new LED, indoor version, new format for software versions)

Supplementary testing according to EN 15267

Certificate no. 0000040212_01: 30 September 2015
Expiry date of the certificate: 31 March 2019
Test report: 936/21227195/A dated 9 March 2015
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Publication: BAnz AT 26.08.2015 B4, chapter III number 2.1
UBA announcement dated 22 July 2015

Notifications in accordance with EN 15267

Certificate no. 0000040212_02: 25 April 2016
Expiry date of the certificate: 31 March 2019
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 6 November 2015
and test report 936/21227195/B dated 5 October 2015
Publication: BAnz AT 14.03.2016 B7, chapter V notification 6
UBA announcement dated 18 February 2016
(correction of the manual, alternative weather station and new software version)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH
Publication: BAnz AT 01.08.2016 B11, chapter V notification 35
UBA announcement dated 14 July 2016
(change in the test procedure, hardware amendment, new software version)

Correction of the certificate

Certificate no. 0000040212_03: 09 November 2016
Expiry date of the certificate: 31 March 2019
(Correction of the quote taken from the standard referred to)

Notifications in accordance with EN 15267

Statement issued by TÜV Rheinland Energy GmbH dated 8 September 2017
Publication: BAnz AT 15.03.2017 B6, chapter V notification 10
UBA announcement dated 22 February 2017
(temperature compensation factors, flow sensor, mistake in the test report)

Statement issued by TÜV Rheinland Energy GmbH dated 7 March 2017
Publication: BAnz AT 31.07.2017 B12, chapter II notification
UBA announcement dated 13 July 2017
(New software version)

Certificate no. 0000040212_04: 13. April 2018
Expiry date of the certificate: 31 March 2019
Statement issued by TÜV Rheinland Energy GmbH dated 8. September 2017
Test report: 936/21239834/A dated 1. September 2017
Publication: BAnz AT 26.03.2018 B8, chapter V notification 10
UBA announcement dated 21 February 2018
(Compliance with the requirements of EN 16450 (2017), new software version)

Statement issued by TÜV Rheinland Energy GmbH dated 2 May 2018
Publication: BAnz AT 17.07.2018 B9, chapter III notification 30,
UBA announcement dated 3 July 2018
(modification functional check, hardware changes)

Certificate no. 0000040212_05: 12 June 2019
Expiry date of the certificate: 25 March 2024
Statement issued by TÜV Rheinland Energy GmbH dated 8 October 2018
and test report: 936/21239834/B dated 7 September 2018
Publication: BAnz AT 26.03.2019 B7, chapter IV number 44
UBA announcement dated 27 February 2019
(correction of uncertainty calculation, new software version)

Summary of the results for equivalence testing, SN 0111 & SN 0112
Measured component $PM_{2.5}$ after correction of the slope,
evaluation algorithm PM_ENVIRO_0011

Comparison candidate with reference according to Standard EN 16450: 2017					
Candidate	FIDAS 200 S		SN	SN 0111 & SN 0112	
			Limit value	30	µg/m³
Status of measured values	Slope corrected		Allowed uncertainty	25	%
All comparisons					
Uncertainty between Reference	**0.53**	**µg/m³**			
Uncertainty between Candidates	**0.45**	**µg/m³**			
SN 0111 & SN 0112					
Number of data pairs	**313**				
Slope b	**0.999**	**not significant**			
Uncertainty of b	**0.008**				
Ordinate intercept a	**-0.190**	**not significant**			
Uncertainty of a	**0.136**				
Expanded meas. uncertainty W_{CM}	**9.67**	**%**			
All comparisons, ≥18 µg/m³					
Uncertainty between Reference	**0.60**	**µg/m³**			
Uncertainty between Candidates	**0.80**	**µg/m³**			
SN 0111 & SN 0112					
Number of data pairs	**67**				
Slope b	**0.981**				
Uncertainty of b	**0.020**				
Ordinate intercept a	**0.306**				
Uncertainty of a	**0.630**				
Expanded meas. uncertainty W_{CM}	**12.83**	**%**			
All comparisons, <18 µg/m³					
Uncertainty between Reference	**0.51**	**µg/m³**			
Uncertainty between Candidates	**0.31**	**µg/m³**			
SN 0111 & SN 0112					
Number of data pairs	**246**				
Slope b	**1.065**				
Uncertainty of b	**0.023**				
Ordinate intercept a	**-0.782**				
Uncertainty of a	**0.224**				
Expanded meas. uncertainty W_{CM}	**11.59**	**%**			

Umwelt Bundesamt

Certificate:
0000040212_05 / 12 June 2019

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Comparison candidate with reference according to Standard EN 16450: 2017					
Candidate	FIDAS 200 S		SN	SN 0111 & SN 0112	
			Limit value	30	µg/m³
Status of measured values	Slope corrected		Allowed uncertainty	25	%
Cologne, Summer					
Uncertainty between Reference	0.66	µg/m³			
Uncertainty between Candidates	0.11	µg/m³			
	SN 0111		SN 0112		
Number of data pairs	81		82		
Slope b	1.053		1.050		
Uncertainty of b	0.032		0.033		
Ordinate intercept a	-0.850		-0.810		
Uncertainty of a	0.342		0.357		
Expanded meas. uncertainty W_{CM}	10.92	%	11.21	%	
Cologne, Winter					
Uncertainty between Reference	0.54	µg/m³			
Uncertainty between Candidates	0.52	µg/m³			
	SN 0111		SN 0112		
Number of data pairs	51		50		
Slope b	0.991		0.956		
Uncertainty of b	0.013		0.013		
Ordinate intercept a	0.656		0.645		
Uncertainty of a	0.296		0.307		
Expanded meas. uncertainty W_{CM}	8.87	%	9.77	%	
Bonn					
Uncertainty between Reference	0.62	µg/m³			
Uncertainty between Candidates	0.66	µg/m³			
	SN 0111		SN 0112		
Number of data pairs	50		50		
Slope b	1.050		1.008		
Uncertainty of b	0.024		0.026		
Ordinate intercept a	-0.723		-0.471		
Uncertainty of a	0.539		0.584		
Expanded meas. uncertainty W_{CM}	12.67	%	12.67	%	
Bornheim					
Uncertainty between Reference	0.42	µg/m³			
Uncertainty between Candidates	0.47	µg/m³			
	SN 0111		SN 0112		
Number of data pairs	45		45		
Slope b	1.142		1.115		
Uncertainty of b	0.051		0.050		
Ordinate intercept a	-1.370		-1.482		
Uncertainty of a	0.607		0.607		
Expanded meas. uncertainty W_{CM}	22.49	%	17.60	%	
Teddington, Winter					
Uncertainty between Reference	0.42	µg/m³			
Uncertainty between Candidates	0.52	µg/m³			
	SN 0111		SN 0112		
Number of data pairs	44		44		
Slope b	0.964		0.963		
Uncertainty of b	0.012		0.011		
Ordinate intercept a	-0.004		-0.143		
Uncertainty of a	0.223		0.208		
Expanded meas. uncertainty W_{CM}	9.67	%	10.21	%	
Teddington, Summer					
Uncertainty between Reference	0.25	µg/m³			
Uncertainty between Candidates	0.35	µg/m³			
	SN 0111		SN 0112		
Number of data pairs	44		44		
Slope b	0.934		0.926		
Uncertainty of b	0.020		0.020		
Ordinate intercept a	0.461		0.399		
Uncertainty of a	0.232		0.229		
Expanded meas. uncertainty W_{CM}	11.56	%	13.45	%	
All comparisons, ≥18 µg/m³					
Uncertainty between Reference	0.60	µg/m³			
Uncertainty between Candidates	0.80	µg/m³			
	SN 0111		SN 0112		
Number of data pairs	67		67		
Slope b	0.999		0.965		
Uncertainty of b	0.020		0.021		
Ordinate intercept a	0.134		0.443		
Uncertainty of a	0.642		0.65		
Expanded meas. uncertainty W_{CM}	12.99	%	13.69	%	
All comparisons, <18 µg/m³					
Uncertainty between Reference	0.51	µg/m³			
Uncertainty between Candidates	0.31	µg/m³			
	SN 0111		SN 0112		
Number of data pairs	248		248		
Slope b	1.083		1.052		
Uncertainty of b	0.023		0.023		
Ordinate intercept a	-0.841		-0.744		
Uncertainty of a	0.227		0.226		
Expanded meas. uncertainty W_{CM}	14.04	%	10.25	%	
All comparisons					
Uncertainty between Reference	0.53	µg/m³			
Uncertainty between Candidates	0.45	µg/m³			
	SN 0111		SN 0112		
Number of data pairs	315		315		
Slope b	1.014	not significant	0.985	not significant	
Uncertainty of b	0.008		0.008		
Ordinate intercept a	-0.225	not significant	-0.137	not significant	
Uncertainty of a	0.137		0.137		
Expanded meas. uncertainty W_{CM}	9.82	%	10.47	%	

Compilation of results of the equivalence testing, SN 0111 & SN 0112, measured component PM_{10} after slope and offset correction, evaluation algorithm PM_ENVIRO_0011

Comparison candidate with reference according to Standard EN 16450: 2017					
Candidate	FIDAS 200 S		SN	SN 0111 & SN 0112	
			Limit value	50	µg/m³
Status of measured values	Slope & offset corrected		Allowed uncertainty	25	%
All comparisons					
Uncertainty between Reference	**0.58**	**µg/m³**			
Uncertainty between Candidates	**0.65**	**µg/m³**			
SN 0111 & SN 0112					
Number of data pairs	**316**				
Slope b	**1.000**	**not significant**			
Uncertainty of b	**0.009**				
Ordinate intercept a	**0.010**	**not significant**			
Uncertainty of a	**0.208**				
Expanded measured uncertainty WCM	**7.51**	**%**			
All comparisons, ≥30 µg/m³					
Uncertainty between Reference	**0.68**	**µg/m³**			
Uncertainty between Candidates	**1.15**	**µg/m³**			
SN 0111 & SN 0112					
Number of data pairs	**44**				
Slope b	**0.955**				
Uncertainty of b	**0.034**				
Ordinate intercept a	**2.060**				
Uncertainty of a	**1.490**				
Expanded measured uncertainty WCM	**10.86**	**%**			
All comparisons, <30 µg/m³					
Uncertainty between Reference	**0.56**	**µg/m³**			
Uncertainty between Candidates	**0.55**	**µg/m³**			
SN 0111 & SN 0112					
Number of data pairs	**272**				
Slope b	**1.006**				
Uncertainty of b	**0.018**				
Ordinate intercept a	**-0.122**				
Uncertainty of a	**0.300**				
Expanded measured uncertainty WCM	**6.82**	**%**			

Comparison candidate with reference according to Standard EN 16450: 2017					
Candidate	FIDAS 200 S		SN	SN 0111 & SN 0112	
			Limit value	50	µg/m³
Status of measured values	Slope & offset corrected		Allowed uncertainty	25	%
Cologne, Summer					
Uncertainty between Reference	**0.80**	**µg/m³**			
Uncertainty between Candidates	**0.26**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**81**		**82**		
Slope b	**1.007**		**0.990**		
Uncertainty of b	**0.027**		**0.027**		
Ordinate intercept a	**-0.221**		**-0.112**		
Uncertainty of a	**0.473**		**0.471**		
Expanded measured uncertainty W_{CM}	**6.97**	**%**	**7.35**	**%**	
Cologne, Winter					
Uncertainty between Reference	**0.53**	**µg/m³**			
Uncertainty between Candidates	**0.64**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**51**		**50**		
Slope b	**1.026**		**0.990**		
Uncertainty of b	**0.014**		**0.014**		
Ordinate intercept a	**0.130**		**0.107**		
Uncertainty of a	**0.385**		**0.384**		
Expanded measured uncertainty W_{CM}	**8.33**	**%**	**6.08**	**%**	
Bonn					
Uncertainty between Reference	**0.38**	**µg/m³**			
Uncertainty between Candidates	**0.87**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**50**		**50**		
Slope b	**1.005**		**0.968**		
Uncertainty of b	**0.026**		**0.028**		
Ordinate intercept a	**1.279**		**1.419**		
Uncertainty of a	**0.792**		**0.834**		
Expanded measured uncertainty W_{CM}	**10.65**	**%**	**9.22**	**%**	
Bornheim					
Uncertainty between Reference	**0.54**	**µg/m³**			
Uncertainty between Candidates	**0.84**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**47**		**47**		
Slope b	**1.086**		**1.043**		
Uncertainty of b	**0.038**		**0.038**		
Ordinate intercept a	**-0.555**		**-0.731**		
Uncertainty of a	**0.707**		**0.694**		
Expanded measured uncertainty W_{CM}	**16.81**	**%**	**9.28**	**%**	
Teddington, Winter					
Uncertainty between Reference	**0.48**	**µg/m³**			
Uncertainty between Candidates	**0.73**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**44**		**44**		
Slope b	**0.963**		**0.934**		
Uncertainty of b	**0.017**		**0.016**		
Ordinate intercept a	**-0.195**		**-0.179**		
Uncertainty of a	**0.426**		**0.405**		
Expanded measured uncertainty W_{CM}	**10.49**	**%**	**15.24**	**%**	
Teddington, Summer					
Uncertainty between Reference	**0.46**	**µg/m³**			
Uncertainty between Candidates	**0.54**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**45**		**45**		
Slope b	**0.912**		**0.910**		
Uncertainty of b	**0.028**		**0.029**		
Ordinate intercept a	**1.264**		**0.868**		
Uncertainty of a	**0.457**		**0.489**		
Expanded measured uncertainty W_{CM}	**13.74**	**%**	**15.68**	**%**	
All comparisons, ≥30 µg/m³					
All comparisons, ≥30 µg/m³	**0.68**	**µg/m³**			
Uncertainty between Candidates	**1.15**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**44**		**44**		
Slope b	**0.983**		**0.928**		
Uncertainty of b	**0.035**		**0.034**		
Ordinate intercept a	**1.474**		**2.590**		
Uncertainty of a	**1.518**		**1.50**		
Expanded measured uncertainty W_{CM}	**11.33**	**%**	**11.63**	**%**	
All comparisons, <30 µg/m³					
Uncertainty between Reference	**0.56**	**µg/m³**			
Uncertainty between Candidates	**0.55**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**274**		**274**		
Slope b	**1.025**		**0.990**		
Uncertainty of b	**0.018**		**0.017**		
Ordinate intercept a	**-0.172**		**-0.102**		
Uncertainty of a	**0.308**		**0.297**		
Expanded measured uncertainty W_{CM}	**8.20**	**%**	**7.17**	**%**	
All comparisons					
Uncertainty between Reference	**0.58**	**µg/m³**			
Uncertainty between Candidates	**0.65**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**318**		**318**		
Slope b	**1.016**	**not significant**	**0.983**	**not significant**	
Uncertainty of b	**0.009**		**0.009**		
Ordinate intercept a	**-0.019**	**not significant**	**0.043**	**not significant**	
Uncertainty of a	**0.212**		**0.209**		
Expanded measured uncertainty W_{CM}	**8.32**	**%**	**8.18**	**%**	