Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000040212

Certified AMS:	Fidas® 200 S for particulate matter PM_{10} and $PM_{2.5}$
Manufacturer:	PALAS GmbH Greschbachstraße 3b 76229 Karlsruhe Germany
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: 2010, VDI 4203-3: 2010, EN 12341: 1998, EN 14907: 2005, 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 (see also the following pages).

TÜVRheinland® CERTIFIED

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

www.tuv.com
ID 0000040212

Publication in the German Federal Gazette (BAnz.) of 01 April 2014

This certificate will expire on:
31 March 2019

German Federal Environment Agency
Dessau, 29 April 2014

i. A. Dr. Marcel Langner

TÜV Rheinland Energie und Umwelt GmbH
Cologne, 28 April 2014

ppa. Dr. Peter Wilbring

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

Certificate:
0000040212 / 29 April 2014

Test report:	936/21218896/A of 20 September 2013
Initial certification:	01 April 2014
Date of expiry:	31 March 2019
Publication:	BAnz AT 01 April 2014 B12, chapter IV, No. 5.1

Approved application
The certified AMS is suitable for permanent monitoring of suspended particulate matter PM_{10} and $PM_{2,5}$ in ambient air (stationary operation).

The suitability of the AMS 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 a temperature range of -20 °C to +50 °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 936/21218896/A of 20 September 2013 of TÜV Rheinland Energie und Umwelt 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
- publication in the German Federal Gazette (BAnz AT 01 April 2014 B12, chapter IV, No. 5.1) Announcement by UBA from 27 February 2014

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

Manufacturer:
PALAS GmbH, Karlsruhe

Field of application:
For permanent monitoring of suspended particulate matter PM_{10} and $PM_{2.5}$ in ambient air (stationary operation).

Measuring ranges during the performance test:

Components	Certification ranges	Units
PM_{10}	0 – 10,000	µg/m³
$PM_{2.5}$	0 – 10,000	µg/m³

Software version:

Measurement system:	100327
Implemented evaluation algorithm:	PM_ENVIRO_0011
Evaluation software PDAnalyze:	1.010

Restrictions:
None

Notes:
1. The requirements as stipulated in the guide “Demonstration of Equivalence of Ambient Air Monitoring Methods” are fulfilled for the measured components PM_{10} und $PM_{2.5}$.
2. The requirements as related to the variation coefficient R^2 in accordance with EN 12341 were not met by one of the two candidates at the location Cologne, summer.
3. The sensitivity of the particle sensor shall be checked once a month with CalDust 1100.
4. The measuring system shall be calibrated regularly on site by means of the gravimetric reference method for PM_{10} as stipulated in EN 12341.
5. The measuring system shall be calibrated regularly on site by means of the gravimetric reference method for $PM_{2.5}$ as stipulated in EN 14907.
6. The report on the performance test is available online at www.qal1.de.

Test institute:
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Report No.: 936/21218896/A of 20 September 2013

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

The Fidas® 200 S is an optical aerosol spectrometer which determines particle size by means of scattered light analysis according to Lorenz-Mie.

The measuring system tested consists of the Sigma-2 sampling head, a sampling tube with the IADS moisture compensation module, the Fidas® control unit with integrated aerosol sensor, the compact WS600-UMB weather station, a UMTS-antenna, weatherproof housing (IP 65), corresponding connection lines and cables, a bottle of CalDust 1000 as well as manuals in German.

The particle sample passes through the Sigma-2 sampling head (described in VDI 2119 Sheet 4 - August 1997) at a flow rate of 4.8 l/min (based on 25 °C and 1013 hPa) and is led into the sampling line which connects the sampling head to the Fidas control unit. The IADS (Intelligent Aerosol Drying System) moisture compensation module is used in order to avoid the possible effects of condensation, especially when ambient air humidity is high. The IADS is regulated with regard to relative humidity and ambient temperature (measured with weather station WS600-UMB). The minimum temperature is 23 °C, the maximum temperature is 24 °C above ambient temperature at an heat output of max. 90 watts. The IADS module is controlled via the Fidas Firmware. After passing through the IADS module, the particle sample is led to the aerosol sensor where the actual measuring is performed. From the aerosol sensor the sample is then led through an absolute filter which can be used, for instance, to further analyse the collected aerosol. The measuring system Fidas® 200 S is complete with an integrated weather station (WS600-UMB) to capture the measured quantities wind velocity, wind direction, amount of precipitation, type of precipitation, temperature, humidity, and pressure. The Fidas® 200 S control unit contains the necessary electronics for operating the measuring system as well as the 2 parallel-connected sample pumps. Should one pump fail, proper operation is secured by the remaining pump.

The Fidas® 200 S measuring system saves data in the RAW format. In order to determine the mass concentration values, the stored raw data have to be converted by means of an evaluation algorithm. A size-dependent and weighted algorithm is used to convert particle size and number to mass concentrations. During performance testing, conversion was performed using the evaluation algorithm PM_ENVIRO_0011.

The measuring system can be operated using either the touch screen at the front side of the instrument or remotely via radio modem using the corresponding software (e.g. TeamViewer). The user can access measurement data and device information, change parameters, and perform tests to monitor the functionality of the measuring system.

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 Fidas® 200 S for particulate matter PM_{10} and $PM_{2.5}$ 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. 0000040212: 29 April 2014

Validity of the certificate: 31 March 2019

Test report: 936/21218896/A of 20 September 2013
TÜV Rheinland Energie und Umwelt GmbH, Cologne

Publication: BAnz AT 01 April 2014 B12, chapter IV, No. 5.1
Announcement by UBA from 27 February 2014

Results of the equivalence test for systems SN 0111 & SN 0112, for the measured component $PM_{2.5}$ after correction of slope /intercept

Comparison candidate with reference according to Guide "Demonstration of Equivalence Of Ambient Air Monitoring Methods", January 2010					
Candidate	FIDAS 200 S		SN	SN 0111 & SN 0112	
			Limit value	30	µg/m³
Status of measured values	Slope & offset corrected		Allowed uncertainty	25	%
All comparisons					
Uncertainty between Reference	**0.58**	**µg/m³**			
Uncertainty between Candidates	**0.44**	**µg/m³**			
SN 0111 & SN 0112					
Number of data pairs	**225**				
Slope b	**0.999**	**not significant**			
Uncertainty of b	**0.010**				
Ordinate intercept a	**0.012**	**not significant**			
Uncertainty of a	**0.178**				
Expanded meas. uncertainty W_{CM}	**10.17**	**%**			
All comparisons, ≥18 µg/m³					
Uncertainty between Reference	**0.63**	**µg/m³**			
Uncertainty between Candidates	**0.78**	**µg/m³**			
SN 0111 & SN 0112					
Number of data pairs	**54**				
Slope b	**0.971**				
Uncertainty of b	**0.023**				
Ordinate intercept a	**0.771**				
Uncertainty of a	**0.715**				
Expanded meas. uncertainty W_{CM}	**12.87**	**%**			
All comparisons, <18 µg/m³					
Uncertainty between Reference	**0.57**	**µg/m³**			
Uncertainty between Candidates	**0.31**	**µg/m³**			
SN 0111 & SN 0112					
Number of data pairs	**171**				
Slope b	**1.108**				
Uncertainty of b	**0.030**				
Ordinate intercept a	**-1.010**				
Uncertainty of a	**0.304**				
Expanded meas. uncertainty W_{CM}	**17.50**	**%**			

Comparison candidate with reference according to Guide "Demonstration of Equivalence Of Ambient Air Monitoring Methods", January 2010					
Candidate	FIDAS 200 S		SN	SN 0111 & SN 0112	
			Limit value	30	µg/m³
Status of measured values	Slope & offset 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	**1.036**		**1.034**		
Uncertainty of b	**0.031**		**0.033**		
Ordinate intercept a	**-0.518**		**-0.478**		
Uncertainty of a	**0.337**		**0.351**		
Expanded meas. uncertainty W_{CM}	**10.06**	**%**	**10.40**	**%**	
Cologne, Winter					
Uncertainty between Reference	**0.54**	**µg/m³**			
Uncertainty between Candidates	**0.51**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**51**		**50**		
Slope b	**0.976**		**0.942**		
Uncertainty of b	**0.013**		**0.013**		
Ordinate intercept a	**0.962**		**0.951**		
Uncertainty of a	**0.291**		**0.303**		
Expanded meas. uncertainty W_{CM}	**8.36**	**%**	**9.90**	**%**	
Bonn					
Uncertainty between Reference	**0.62**	**µg/m³**			
Uncertainty between Candidates	**0.65**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**50**		**50**		
Slope b	**1.034**		**0.993**		
Uncertainty of b	**0.023**		**0.025**		
Ordinate intercept a	**-0.394**		**-0.144**		
Uncertainty of a	**0.531**		**0.575**		
Expanded meas. uncertainty W_{CM}	**11.94**	**%**	**12.42**	**%**	
Bornheim					
Uncertainty between Reference	**0.42**	**µg/m³**			
Uncertainty between Candidates	**0.46**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**45**		**45**		
Slope b	**1.124**		**1.098**		
Uncertainty of b	**0.050**		**0.050**		
Ordinate intercept a	**-1.027**		**-1.137**		
Uncertainty of a	**0.598**		**0.598**		
Expanded meas. uncertainty W_{CM}	**21.34**	**%**	**16.63**	**%**	
All comparisons, ≥18 µg/m³					
Uncertainty between Reference	**0.63**	**µg/m³**			
Uncertainty between Candidates	**0.78**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**54**		**54**		
Slope b	**0.994**		**0.948**		
Uncertainty of b	**0.023**		**0.024**		
Ordinate intercept a	**0.515**		**1.011**		
Uncertainty of a	**0.701**		**0.74**		
Expanded meas. uncertainty W_{CM}	**12.77**	**%**	**13.86**	**%**	
All comparisons, <18 µg/m³					
Uncertainty between Reference	**0.57**	**µg/m³**			
Uncertainty between Candidates	**0.31**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**173**		**173**		
Slope b	**1.130**		**1.090**		
Uncertainty of b	**0.030**		**0.030**		
Ordinate intercept a	**-1.095**		**-0.929**		
Uncertainty of a	**0.304**		**0.308**		
Expanded meas. uncertainty W_{CM}	**20.87**	**%**	**15.14**	**%**	
All comparisons					
Uncertainty between Reference	**0.58**	**µg/m³**			
Uncertainty between Candidates	**0.44**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**227**		**227**		
Slope b	**1.017**	**not significant**	**0.981**	**not significant**	
Uncertainty of b	**0.010**		**0.010**		
Ordinate intercept a	**-0.053**	**not significant**	**0.111**	**not significant**	
Uncertainty of a	**0.176**		**0.182**		
Expanded meas. uncertainty W_{CM}	**10.57**	**%**	**10.89**	**%**	

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Certificate:
0000040212 / 29 April 2014

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Results of the equivalence test for systems SN 0111 & SN 0112, for the measured component PM_{10} after correction of slope /intercept

Comparison candidate with reference according to Guide "Demonstration of Equivalence Of Ambient Air Monitoring Methods", January 2010					
Candidate	FIDAS 200 S		SN	SN 0111 & SN 0112	
			Limit value	50	µg/m³
Status of measured values	Slope and offset corrected		Allowed uncertainty	25	%
All comparisons					
Uncertainty between Reference	**0.62**	**µg/m³**			
Uncertainty between Candidates	**0.64**	**µg/m³**			
SN 0111 & SN 0112					
Number of data pairs	**227**				
Slope b	**0.999**	**not significant**			
Uncertainty of b	**0.011**				
Ordinate intercept a	**0.015**	**not significant**			
Uncertainty of a	**0.249**				
Expanded measured uncertainty WCM	**7.22**	**%**			
All comparisons, ≥30 µg/m³					
Uncertainty between Reference	**0.67**	**µg/m³**			
Uncertainty between Candidates	**1.10**	**µg/m³**			
SN 0111 & SN 0112					
Number of data pairs	**35**				
Slope b	**0.949**				
Uncertainty of b	**0.036**				
Ordinate intercept a	**2.181**				
Uncertainty of a	**1.530**				
Expanded measured uncertainty WCM	**10.17**	**%**			
All comparisons, <30 µg/m³					
Uncertainty between Reference	**0.61**	**µg/m³**			
Uncertainty between Candidates	**0.55**	**µg/m³**			
SN 0111 & SN 0112					
Number of data pairs	**192**				
Slope b	**1.023**				
Uncertainty of b	**0.021**				
Ordinate intercept a	**-0.408**				
Uncertainty of a	**0.364**				
Expanded measured uncertainty WCM	**7.23**	**%**			

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Comparison candidate with reference according to Guide "Demonstration of Equivalence Of Ambient Air Monitoring Methods", January 2010					
Candidate	FIDAS 200 S		SN	SN 0111 & SN 0112	
			Limit value	50	µg/m³
Status of measured values	Slope and 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	**0.986**		**0.970**		
Uncertainty of b	**0.026**		**0.026**		
Ordinate intercept a	**-0.098**		**0.009**		
Uncertainty of a	**0.463**		**0.462**		
Expanded measured uncertainty W_{CM}	**7.28**	**%**	**8.86**	**%**	
Cologne, Winter					
Uncertainty between Reference	**0.53**	**µg/m³**			
Uncertainty between Candidates	**0.63**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**51**		**50**		
Slope b	**1.006**		**0.971**		
Uncertainty of b	**0.014**		**0.014**		
Ordinate intercept a	**0.238**		**0.216**		
Uncertainty of a	**0.378**		**0.377**		
Expanded measured uncertainty W_{CM}	**6.23**	**%**	**7.62**	**%**	
Bonn					
Uncertainty between Reference	**0.38**	**µg/m³**			
Uncertainty between Candidates	**0.85**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**50**		**50**		
Slope b	**0.985**		**0.948**		
Uncertainty of b	**0.026**		**0.027**		
Ordinate intercept a	**1.372**		**1.510**		
Uncertainty of a	**0.776**		**0.817**		
Expanded measured uncertainty W_{CM}	**8.95**	**%**	**10.01**	**%**	
Bornheim					
Uncertainty between Reference	**0.54**	**µg/m³**			
Uncertainty between Candidates	**0.82**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**47**		**47**		
Slope b	**1.064**		**1.022**		
Uncertainty of b	**0.037**		**0.037**		
Ordinate intercept a	**-0.425**		**-0.597**		
Uncertainty of a	**0.693**		**0.681**		
Expanded measured uncertainty W_{CM}	**13.33**	**%**	**7.44**	**%**	
All comparisons, ≥30 µg/m³					
Uncertainty between Reference	**0.67**	**µg/m³**			
Uncertainty between Candidates	**1.10**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**35**		**35**		
Slope b	**0.979**		**0.919**		
Uncertainty of b	**0.036**		**0.037**		
Ordinate intercept a	**1.526**		**2.795**		
Uncertainty of a	**1.539**		**1.56**		
Expanded measured uncertainty W_{CM}	**10.30**	**%**	**11.37**	**%**	
All comparisons, <30 µg/m³					
Uncertainty between Reference	**0.61**	**µg/m³**			
Uncertainty between Candidates	**0.55**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**194**		**194**		
Slope b	**1.046**		**1.002**		
Uncertainty of b	**0.021**		**0.020**		
Ordinate intercept a	**-0.510**		**-0.305**		
Uncertainty of a	**0.372**		**0.358**		
Expanded measured uncertainty W_{CM}	**9.79**	**%**	**6.52**	**%**	
All comparisons					
Uncertainty between Reference	**0.62**	**µg/m³**			
Uncertainty between Candidates	**0.64**	**µg/m³**			
	SN 0111		**SN 0112**		
Number of data pairs	**229**		**229**		
Slope b	**1.017**	**not significant**	**0.981**	**not significant**	
Uncertainty of b	**0.011**		**0.011**		
Ordinate intercept a	**-0.037**	**not significant**	**0.081**	**not significant**	
Uncertainty of a	**0.252**		**0.249**		
Expanded measured uncertainty W_{CM}	**8.05**	**%**	**8.01**	**%**	