Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000043107_01

Certified AMS:	APDA-372 for particulate matter PM_{10} and $PM_{2.5}$
Manufacturer:	HORIBA Europe GmbH Hans-Mess-Str. 6 61440 Oberursel /Ts. Germany
Test Institute:	TÜV Rheinland Energy GmbH

This is to certify that the AMS has been tested and certified according to the standards

VDI 4202-1 (2010), VDI 4203-3 (2010), EN 12341 (1998), 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 (this certificate contains 10 pages).
The present certificate replaces certificate 0000043107 of 30 April 2015

TÜVRheinland® CERTIFIED

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

www.tuv.com
ID 0000043107

Publication in the German Federal Gazette (BAnz.) of 2 April 2015

This certificate will expire on:
1 April 2020

German Federal Environment Agency
Dessau, 25 April 2016

Dr. Marcel Langner
Head of Section II 4.1

TÜV Rheinland Energy GmbH
Cologne, 24 April 2016

ppa. Dr. Peter Wilbring

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TÜV Rheinland Energy GmbH
Am Grauen Stein
51105 Cologne

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

Certificate:
0000043107_01 / 25 April 2016

Test report:	936/21226418/B of 15 October 2015
Initial certification:	02 April 2015
Date of expiry:	1 April 2020
Publication:	BAnz AT 14.03.2016 B7, chapter V notification 5

Approved application
The tested AMS is suitable for the continuous parallel monitoring of PM_{10} and $PM_{2.5}$ fractions 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 +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 936/21226418/B of 15 October 2015 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 02.04.2015 B5, chapter III number 3.1, Announcement by UBA from 25. February 2015:

AMS designation:
APDA-372 for particulate matter PM_{10} and $PM_{2.5}$

Manufacturer:
HORIBA Europe GmbH, Oberursel

Field of application:
For the continuous parallel monitoring of PM_{10} and $PM_{2.5}$ fractions in ambient air (stationary operation)

Measuring ranges during the performance test:

Components	Certification range	Unit
PM_{10}	0 – 10,000	µg/m³
$PM_{2.5}$	0 – 10,000	µg/m³

Software versions:
Measuring system: 100380.0014.0001.0001.0011
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} and $PM_{2.5}$.
2. The requirements as related to the variation coefficient R^2 in accordance with Standard EN 12341 were not met by one of the two candidates at the location Cologne, summer.
3. The measuring system was designed as an indoor-version for installation a temperature-controlled locations.
4. The sensitivity of the particle sensor shall be checked once a month with CalDust 1100.
5. The measuring system shall be calibrated regularly on site by means of the gravimetric reference method for PM_{10} as stipulated in EN 12341.
6. 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.
7. The report on the performance test is available online at www.qal1.de.

Test report:
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Report no.: 936/21226418/A of 29 September 2014

Publication in the German Federal Gazette: BAnz AT 14.03.2016 B7, chapter V notification 5, Announcement by UBA from 18 February 2016:

5 Notification as regards Federal Environment Agency (UBA) notices of 25 February 2015 (BAnz AT 02.04.2015 B5, chapter III number 3.1)

A mistake regarding the description of the of the IADS-control functions was detected in the manual for the APDA-372 measuring system for PM10 and PM2,5 manufactured by HORIBA Europe 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 HE0140815. Test report 936/21226418/A dated 29 September 2014 issued by TÜV Rheinland Energie und Umwelt GmbH was corrected accordingly and replaced by test report 936/21226418/B dated 15 October 2015.

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

Furthermore, the APDA-372E version of the measuring system may be used with an external sensor.

The current software version is: 100396.0014.0001.0001.0011.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 6 November 2015

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

Apart from a re-designed front panel and software adjustments (the terms “Palas” and “Fidas® 200” have been replaced by “Horiba” and “APDA-372”), the APDA-372 measuring system is identical in construction to the Fidas® 200 measuring system and was also developed and manufactured entirely by PALAS GmbH.

The APDA-372 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, a control unit with integrated aerosol sensor, a compact WS600-UMB weather station, a UMTS-antenna, corresponding connection lines and cables, a bottle of CalDust 1100 as well as manuals in German.

The particle sample passes through the Sigma-2 sampling head (described in VDI 2119 Sheet 4) at a flow rate of 4.8 l/m (based on 25 °C and 1013 hPa) and is led into the sampling line which connects the sampling head to the APDA-372 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 a heat output of max. 90 watts. The IADS module is controlled via the 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 APDA-372 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 APDA-372 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 APDA-372 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 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 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 Energy GmbH. With revocation of the publication the certificate loses its validity. After the expiration of the certificate and on requests of the TÜV Rheinland Energy 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 APDA-372 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. 0000043107: 30 April 2015
Expiration date of the certificate: 1 April 2020

Test report: 936/21226418/A of 29 September 2014
TÜV Rheinland Energie und Umwelt GmbH, Cologne,

Publication: BAnz AT 02.04.2015 B5, chapter III No. 3.1
Announcement by UBA from 25 February 2015

Notification:

Certificate No. 0000043107_01: 25 April 2016
Expiration date of the certificate: 1 April 2020
Statement of TÜV Rheinland Energie und Umwelt GmbH of 6 November 2015
and test report 936/21226418/B of 15 October 2015
Publication: BAnz AT 14.03.2016 B7, chapter V notification 5
UBA announcement of 18 February 2016
(Correction of manual, alternative weather station and new software version)

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

* The equivalence testing has been performed in the basis test with the identical measuring devices FIDAS 200 S of the company Palas GmbH

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	%

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

* The equivalence testing has been performed in the basis test with the identical measuring devices FIDAS 200 S of the company Palas GmbH

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**	**%**		

Umwelt Bundesamt

Certificate:
0000043107_01 / 25 April 2016

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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**	**%**	