PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

1. Fidas 200® Method 11
2. Fidas 200® S Method 11
3. Fidas 200® E Method 11

Manufactured by:

PALAS GmbH
Greschbachstrasse 3b,
76229 Kahlsruhe,
Germany

has been assessed by CSA Group
and for the conditions stated on this certificate complies with:

MCERTS Performance Standards for Continuous Ambient Air Quality Monitoring Systems, Version 10 dated June 2016

MCERTS for UK Particulate Matter as set out in the Annex to the MCERTS Performance Standards for Ambient Air Quality Monitoring Systems: Requirements of the UK Competent Authority for the Equivalence Testing and Certification of Automated Continuous and Manual Discontinuous Methods that Monitor Particulate Matter in Ambient Air, Version 1.1, dated 31 July 2012

Certification range:

PM_{10}	0 to 10,000 µg/m^3
$PM_{2.5}$	0 to 10,000 µg/m^3

Project No.:	80073263
Certificate No:	CSA MC160290/04
Initial Certification:	04 April 2016
This Certificate issued:	25 July 2024
Renewal Date:	03 April 2026

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Form 1335
Issue 10

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Approved Site Application

Any potential user should ensure, in consultation with the manufacturer, that the monitoring system is suitable for the intended application. For general guidance on monitoring techniques refer to the Environment Agency Monitoring Technical Guidance Notes available at www.mcerts.net

The field test sites covered urban background, suburban, rural and traffic locations.

On the basis of these tests this certificate is valid when the instrument is used for urban background (including suburban) rural and traffic locations.

The requirements according to the Guide to the Demonstration of Equivalence of Ambient Air Monitoring Methods (GDE 2010) are fulfilled for PM_{10} and for $PM_{2.5}$.

Basis of Certification

This certification is based on the following test report(s) and on CSA Group's assessment and ongoing surveillance of the product and the manufacturing process:

MCERTS certification committee report	Certification Report and Checklist on the Evaluation of the Ambient Air Particulate Matter Monitor Test Reports for the PALAS Fidas 200 and 200s Monitors Submitted for Approval and Certification within the MCERTS Scheme for UK Particulate Matter: Requirements of the UK Competent Authority for the Equivalence Testing of Methods that Monitor Particulate Matter in Ambient Air, MCERTSPMT6PALASPM10&PM2.5260416/10.4 dated April 2016
Bureau Veritas	UK Report on the Equivalence of the PALAS Fidas 200 Method 11 for PM_{10} and $PM_{2.5}$, Report ref AGGX8316719/BV/DH/2972 dated March 2016
TÜV Rheinland	Report on supplementary testing of the Fidas® 200 S respectively Fidas® 200 measuring systems manufactured by PALAS GmbH for the components suspended particulate matter PM_{10} and $PM_{2.5}$. TÜV Report 936/21227195/A, dated 9th March 2015 Report published on www.qal1.de/en/hersteller/palas.htm

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Product Certified

The **Palas Fidas® 200 Method 11** consists of the following parts:

- Fidas 100;
- Sigma-2 Inlet;
- IADS sampling tube;
- met station;

The **Palas Fidas® 200 S Method 11** consists of the **Palas Fidas® 200 Method 11** operated in an IP65 Enclosure.

The instrument stores high frequency data covering many different size fractions. PM_{10} and $PM_{2.5}$ concentrations are calculated by applying a density distribution to the detailed size fraction data.

A number of algorithms have been developed by the manufacturer, and specific to this certificate:

- data have been processed *via* an algorithm known as PM_ENVIRO_0011, which is more commonly referred to as Method 11;
- data have been processed as 15-minute averages which are then averaged to form 24 hour averages.

The certificate only covers data processed using the Method 11 algorithm and does not cover data processed using any other algorithm. The operation of instruments in permutations other than the above are not covered by this certificate, and are not recommended for approval without further consideration by the MCERTS certification committee for the implications of any variations.

For PM_{10} the CM fulfils the relevant Data Quality Objective of EU Directive 2008/50/EC without the need for slope and/or intercept correction. For $PM_{2.5}$ the CM does not fulfil the relevant Data Quality Objective of EU Directive 2008/50/EC when used without correction. Slope correction of dividing by 1.06 is required in order to make the $PM_{2.5}$ Palas Fidas® 200 Method 11 equivalent.

The certificate also covers (from 10th August 2021) Palas Fidas® 200 version with restricted licence for single channel functionality for $PM_{2.5}$. This version is identical to a standard Palas Fidas® 200 and permits accessibility to $PM_{2.5}$ data through an appropriate set-up in the instrument licence file.

This certification covers all instruments with serial numbers SN 0111 onwards and operated with firmware versions 100327.0007.0001.0001.0011 onwards. The most recent approved firmware version is 100380.0014.0001.0001.0011. It is recommended that every effort should be made by the operators of the instruments to install the latest approved version of the instrument firmware.

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Certified Performance

Ambient temperature range:

Palas Fidas® 200 Method 11 (Indoor Version)	**+5 to +40 ºC**
Palas Fidas® 200 S Method 11 (Outdoor Version)	**-20 to +50 ºC**

In the field tests and initial laboratory tests, the instrument was operated with the IP65 case which is heated and ventilated, but not air conditioned. In this configuration, the instrument is known by the manufacturer as the Fidas® 200 S Method 11. A laboratory test was subsequently conducted on the Fidas® 200 Method 11 (i.e. the instrument without the bespoke case), and the results were considered by the MCERTS certification committee. The operation of the Fidas® 200 Method 11 and Fidas® 200 S Method 11 were both shown to be unaffected by the temperature of their surroundings, and the certification therefore covers the Palas Fidas® 200 Method 11, and that the instrument can either be installed in the IP65 case, or any other enclosure suitable for the application. The approved temperature operating ranges of the Palas Fidas® 200 Method 11 and Palas Fidas® 200 S Method 11 differ as they were tested over different temperature ranges.

The summary of the test results for the Palas Fidas® 200 Method 11 is as follows. **No correction is required for PM_{10}, but slope correction by dividing by 1.06 is compulsory for $PM_{2.5}$.**

Test	Results	MCERTS Specification
Constancy of the sample volumetric flow	2.3%	To remain constant within ± 3% of the rated value
Tightness of the sampling system	0.8%	Leakage not to exceed 1% of the sampled volume
Maintenance Interval	4 weeks	≥Two weeks
Data Availability	99.2%	≥90%
Number of UK Tests	2	≥2
Number of Reference Methods	2	≥2

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Test	Results	MCERTS Specification
Between sampler/instrument uncertainty for the standard method **PM_{10}**		
Full data set	0.57 µg/m^3	≤2 µg/m^3
<30 µg/m^3	0.56 µg/m^3	Not specified
≥30 µg/m^3	0.60 µg/m^3	Not specified
Between sampler/instrument uncertainty for the candidate method **PM_{10}**		
Full data set	0.67 µg/m^3	≤2.5 µg/m^3
<30 µg/m^3	0.57 µg/m^3	≤2.5 µg/m^3
≥30 µg/m^3	1.17 µg/m^3	≤2.5 µg/m^3
Between sampler/instrument uncertainty for the candidate method **PM_{10}**		
Full data set	0.53 µg/m^3	≤2 µg/m^3
<18 µg/m^3	0.51 µg/m^3	Not specified
≥18 µg/m^3	0.60 µg/m^3	Not specified
Between sampler/instrument uncertainty for the candidate method **$PM_{2.5}$ without slope correction**		
Full data set	0.48 µg/m^3	≤2.5 µg/m^3
<18 µg/m^3	0.32 µg/m^3	≤2.5 µg/m^3
≥18 µg/m^3	0.85 µg/m^3	≤2.5 µg/m^3
Test	**Uncorrected**	**MCERTS Specification**
Expanded uncertainty calculated at 50 µg/m^3 for **Instrument SN 0111**		
Full data set	9.0%	≤25%
<30 µg/m^3	9.4%	Not specified
≥30 µg/m^3	11.9%	≤25%
Individual sites		
Cologne Summer	7.0%	≤25%
Cologne Winter	9.2%	≤25%
Bonn Winter	12.0%	≤25%
Bornheim Summer	19.1%	≤25%
Teddington Winter	9.2%	≤25%
Teddington Summer	12.3%	≤25%
Expanded uncertainty calculated at 50 µg/m^3 for **Instrument SN 0112**		
Full data set	7.5%	≤25%
<30 µg/m^3	6.5%	Not specified
≥30 µg/m^3	11.4%	≤25%
Individual sites		
Cologne Summer	6.6%	≤25%
Cologne Winter	5.7%	≤25%
Bonn Winter	9.3%	≤25%
Bornheim Summer	10.6%	≤25%
Teddington Winter	13.9%	≤25%
Teddington Summer	14.3%	≤25%

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Test	Uncorrected	Slope Corrected	MCERTS Specification
Expanded uncertainty calculated at 30 µg/m^3 for **Instrument SN 0111**			
Full data set	16.7%	9.5%	≤25%
<30 µg/m^3	25.8%	13.8%	Not specified
≥30 µg/m^3	18.5%	12.7%	≤25%
Individual sites			
Cologne Summer	20.1%	10.4%	≤25%
Cologne Winter	17.1%	8.5%	≤25%
Bonn Winter	21.2%	12.3%	≤25%
Bornheim Summer	35.0%	22.4%	≤25%
Teddington Winter	7.7%	9.5%	≤25%
Teddington Summer	5.9%	11.5%	≤25%
Expanded uncertainty calculated at 30 µg/m^3 for **Instrument SN 0112**			
Full data set	12.8%	10.2%	≤25%
<30 µg/m^3	20.3%	10.0%	Not specified
≥30 µg/m^3	15.5%	13.4%	≤25%
Individual sites			
Cologne Summer	20.1%	10.8%	≤25%
Cologne Winter	11.4%	9.4%	≤25%
Bonn Winter	16.6%	12.3%	≤25%
Bornheim Summer	29.1%	17.5%	≤25%
Teddington Winter	6.7%	10.0%	≤25%
Teddington Summer	5.7%	13.4%	≤25%

Note 1: The PM_{10} and $PM_{2.5}$ datasets were tested for equivalence using the methodology set out in the Guide to Demonstration of Equivalence 2010 and Technical Specification CEN/TS16450:2013. Calculations were made for each of the following: without correction; slope correction; intercept correction; and both slope and intercept correction. The results are summarised in the below table. **For PM_{10} the CM fulfils the relevant Data Quality Objective of EU Directive 2008/50/EC without the need for slope and/or intercept correction. For $PM_{2.5}$ the CM does not fulfil the relevant Data Quality Objective of EU Directive 2008/50/EC when used without correction. Slope correction of dividing by 1.06 is required in order to make the $PM_{2.5}$ Palas Fidas® 200 Method 11 equivalent.**

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The summary of the slope, intercept and expanded uncertainties with and without slope and/or intercept correction for the Palas Fidas® 200 Method 11 is as follows:

PM_{10} Palas Fidas® 200	**Calculated slope of all paired data**	**Calculated intercept of all paired data (µg/m³)**	**Expanded uncertainty of all paired data**	**Range of individual expanded uncertainties**
Uncorrected data	1.035	-1.360	7.5%	5.7% to 19.1 %
Data corrected for slope by dividing by 1.035	1.000	-1.305	9.0%	5.9% to 20.3 %
Data corrected for intercept by adding 1.360	1.035	0.000	10.2%	6.5% to 24.2 %
Data corrected for intercept by adding 1.360 and then dividing by 1.035	1.000	0.009	7.4%	6.1% to 17.0 %
$PM_{2.5}$ Palas Fidas® 200	**Calculated slope of all paired data**	**Calculated intercept of all paired data (µg/m³)**	**Expanded uncertainty of all paired data**	**Range of individual expanded uncertainties**
Uncorrected data	1.060	-0.210	14.4%	5.7% to 35.0%
Data corrected for slope by dividing by 1.060	0.999	-0.190	9.3%	8.5% to 22.4%
Data corrected for intercept by adding 0.210	1.060	0.000	15.5%	5.7% to 36.4%
Data corrected for intercept by adding 0.210 and then dividing by 1.060	0.999	0.008	9.3%	8.6% to 23.6%

Note 2: During the laboratory and field testing, full unprocessed data files have been downloaded by the manufacturer or TÜV Rheinland and subsequently processed as 15 minute averages *via* an algorithm known as PM_ENVIRO_0011, or more commonly known as Method 11. The 15 minute data have then been averaged to form 24 hour averages. **The certificate only covers data processed using the Method 11 algorithm and does not cover data processed using any other algorithm.** This certificate covers the post processing of full data sets using Method 11. It is also possible to program the instrument to process the data using the PM_ENVIRO_0011 algorithm in real time, then to poll the processed data from the instrument using hardware or software employing Bayern Hessen protocols. This certificate also covers the polling of processed data directly from the instrument, though it is essential that care is taken that data are taken in such a way as to avoid double averaging or missing data. Further it is essential that the coverage of data used to form 24 hour averages covers the exact period of 00:00:00 Day X to 00:00:00 Day X + 1.

Note 3: For the purposes of quality control of these monitors in the field, as with all PM instruments that are not the reference method, the Palas Fidas® 200 Method 11 should be calibrated on a test site at intervals against the gravimetric

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reference method EN12341: 2014 and as given in the recommendations of CEN/TS16450:2013 and GDE 2010. Further, it is essential that thorough and frequent on-going QA/QC procedures are employed as prescribed in CEN/TS16450:2013.

Note 4: A comprehensive set of laboratory tests were undertaken by TÜV Rheinland and are discussed in the TÜV Rheinland report. It is not necessary to review the results of these tests under the MCERTS for UK Particulate Matter certification scheme.

Note 5: A study of pollution climate relevant to sites in the UK and Germany has demonstrated that in all cases the particulate geometric mean criteria are met. At least one site meets the lower threshold and higher threshold criterion for wind speed, ambient temperature, ambient dew point and semi volatile nitrate content. The pollution climate criteria are therefore satisfied for all the equivalence tests.

Note 6: For the Cologne Winter PM_{10} dataset, TÜV Rheinland chose not to delete the single outlier as this would result in too few data points where PM_{10} was greater than 28 µg/ m^3. This outlier has been deleted for MCERTS purposes, and as such, the PM_{10} equivalence calculations on the herein certificate are different to those in the Palas Fidas® 200 S Method 11 TÜV Rheinland Report.

Note 7: The maintenance interval is 4 weeks and this is defined by the need to calibrate with MonoDust 1500 or CalDust 1100. The calibration peak should be within ± 1.5 of the value assigned to the calibration dust by the manufacturer. Should the peak lie outside of the specified range, then the user should recalibrate the instrument to the specified peak value.

Note 8: When operating a Palas Fidas® 200 Method 11 in an air conditioned enclosure, it is recommended that the user makes sure that the air conditioning unit does not point directly at the instrument, and also insulates the 1.5 cm section between the IADS and the measurement volume. During the winter it may be required to add extra heating to a measurement site, though this will be dependent on the specific site.

Note 9: Palas Fidas® 200 E Method 11 was included within the scope of certification following an assessment of equivalence by the MCERTS Certification Committee.

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Description

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

The particle sample passes through the Sigma-2 sampling head (a TSP head without an impaction surface or cyclone) 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 temperature of 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 moisture compensation is carried out by a dynamic adjustment of the IADS temperature up to a maximum heating output of 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. The particles move separately through an optically differentiated measurement volume that is homogeneously illuminated with white light. By using a polychromatic light source (LED) in combination with 90° scattered light detection, a precise calibration curve without any ambiguities within Mie-range can be achieved. This enables working with a high resolution.

Each particle generates a scattered light impulse, detected at an angle of 85° to 90° degrees. The number concentration is deducted from the number of scattered light impulses. The intensity of the scattered light is a measure for the particle size-diameter. The signal length is measured as well.
By means of the T-aperture, particles which only fly through the T's arm (shorter signal length) can be distinguished from particles which also pass the middle part of the T (longer signal length). The latter ones are illuminated completely in the upper part.

Measuring the signal length also enables the detection of coincidence (more than one particle in the optical detection volume), because the signal length is greater in this case. By means of a correction, this coincidence can then be adjusted online.

The Fidas® 200 measuring system is characterised by the following features:

The described features

- precise calibration curve (white light and 90° scattered light detection)
- no border zone error (patented T-aperture technology)
- identification and correction of coincidence (digital analysis of individual particles)

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 Fidas® 200 measurement system 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 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 Palas Fidas 200® also has a version which offers single channel functionality through a restricted licence, whereby $PM_{2.5}$ data can be accessed.

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General Notes

1. This certificate is based upon the equipment tested. The Manufacturer is responsible for ensuring that on-going production complies with the standard(s) and performance criteria defined in this certificate. 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 system shall be subject to regular surveillance according to 'Regulations Applicable to the Holders of CSA Group Testing UK Ltd Certificates'.

2. The design of the product certified is held and maintained by TUV Rheinland for certificate No. Sira MC160290/04.

3. If a certified product is found not to comply, CSA Group should be notified immediately at the address shown on this certificate.

4. The certification marks that can be applied to the product or used in publicity material are defined in 'Regulations Applicable to the Holders of CSA Group Testing UK Ltd Certificates'.

5. This document remains the property of CSA Group and shall be returned when requested by CSA Group.

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