

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000040337

Certified AMS: F-701-20 with PM_{2.5}-pre-separator for particulate matter PM_{2.5}

Manufacturer: DURAG GmbH
Kollaustraße 105
22453 Hamburg
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 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).



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

www.tuv.com
ID 0000040337

Publication in the German Federal Gazette
(BAnz.) of 5 August 2014

German Federal Environment Agency
Dessau, 9 September 2014



i. A. Dr. Marcel Langner

This certificate will expire on:
4 August 2019

TÜV Rheinland Energie und Umwelt GmbH
Cologne, 8 September 2014



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

Certificate:
0000040337 / 9 September 2014

Test report: 936/21220478/A of 17 March 2014
Initial certification: 5 August 2014
Date of expiry: 4 August 2019
Publication: BAnz AT 5 August 2014 B11, chapter III, no. 3.1

Approved application

The tested AMS is suitable for the continuous monitoring of the PM_{2.5} fraction in suspended particular 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 locations or rather 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 936/21220478/A of 17 March 2014 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 5 August 2014 B11, chapter III, no. 3.1
UBA announcement of 17 July 2014

AMS designation:

F-701-20 with PM_{2.5}-pre-separator for particulate matter PM_{2.5}

Manufacturer:

DURAG GmbH, Hamburg

Field of application:

For the continuous monitoring of the PM_{2.5} fraction in suspended particular in ambient air (stationary operation).

Measuring range during the performance test:

Component	Certification range	Unit
PM _{2.5}	0 – 1000	µg/m ³

Software version:

3.10

Restrictions:

None

Notes:

1. The requirements as stipulated in the guidance document "Demonstration of Equivalence of Ambient Air Monitoring Methods" are fulfilled for the measured component PM_{2.5}.
2. During performance testing, the cycle time was 1 h and the sample count rate was 24, meaning that an automatic change of filters was carried out every hour with every filter spot being sampled 24 times at maximum.
3. The measuring system shall run with an actively ventilated sampling system without a pipe auxiliary heating.
4. The measuring system shall be installed in a lockable measuring container.
5. The measuring system shall be calibrated regularly on site with the gravimetric PM_{2.5} reference method as per EN 14907.
6. The report on the performance test is available online at www.qal1.de.

Test report:

TÜV Rheinland Energie und Umwelt GmbH, Cologne
Report no.: 936/21220478/A of 17 March 2014

Certified product

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

The ambient air monitor consists of a PM_{2.5} sampling head, a meteorological sensor, a sample inlet tube with active ventilation, the actual measuring system F-701-20 incl. glass fibre filter tape and the respective connecting tubes and cables as well as adapters, a roof duct incl. flange and a user manual in German.

The F-701-20 ambient air monitor is based on the principle of Beta attenuation.

The particulate sample passes the PM_{2.5} sampling head at a flow rate of 1 m³/h (= 16.67 l/min) and reaches the F-701-20 measuring system via the sample inlet tube.

For the performance test the AMS was been used with an actively ventilated sample inlet tube and without an auxiliary tube heating. When using the actively ventilated sample inlet pipe, ambient air is constantly transported through the outer cladding tube by means of a ventilation unit in order to keep the temperature of the actual inner sampling pipe up to the measurement section within the instrument at ambient temperature.

The AMS itself has a compact design. All components but the sampling probe (sample inlet tube, sampling head), the meteorological sensor used for measuring atmospheric pressure and ambient temperature as well as the installation for active ventilation of the sample inlet tube are placed in the enclosure.

The AMS is controlled by means of a micro controller board.

The filter tape is transported from supply roll to take-up roll by a stepper motor. On the basis of the decrease of intensity of the radiation emitted from the C-14 radiance source, the Geiger-Müller counter determines the mass increase on the filter tape. The air is sucked off by a pump and the volume flow is measured by the volume flow meter and kept constant at 1000 l/h by a bypass valve. Electronics control the measurement processes, allow for user-friendly handling via touchscreen and store measured values.

During a regular test sequence, in the beginning a clean filter spot is transported in between the C-14 source and the counter. The beta attenuation is measured for 300 s, meaning that the impulses generated by the counter are taken as a measure for the detected beta radiation.

Subsequently the filter holder is opened and the filter tape is transported until the evaluated filter area reaches the position where the particles are sampled. The filter holder is then closed again and the sampling process starts. After the sampling has finished the filter holder is opened and the filter paper is brought back into its original position below the counter. The filter holder closes and the beta attenuation is measured again for 300 s.

The dust mass is determined from the measured counting rates before and after sampling and the dust concentration is calculated by relating the dust mass to the sampled volume.

The measured values are shown in the display and are made available as a 4-20 analogue-signal as well as through a serial RS232-interface (e.g. using Bayern-Hessen-Protokoll, Gesytec).

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 F-701-20 with PM_{2.5}-pre-separator for particulate matter 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. 0000040337: 9 September 2014

Expiration date of the certificate: 4 August 2019

Test report: 936/21220478/A of 17 March 2014
TÜV Rheinland Energie und Umwelt GmbH, Cologne

Publication: BAnz AT 5 August 2014 B11, chapter III, no. 3.1
Announcement by UBA from 17 July 2014

Results of the equivalence test for systems SN 1512361 & SN 1512401 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	F-701-20	SN	SN 1512361 / SN 1512401
Status of measured values	Slope and offset corrected	Limit value	30 $\mu\text{g}/\text{m}^3$
		Allowed uncertainty	25 %
All comparisons			
Uncertainty between Reference	0.58	$\mu\text{g}/\text{m}^3$	
Uncertainty between Candidates	0.67	$\mu\text{g}/\text{m}^3$	
SN 1512361 / SN 1512401			
Number of data pairs	213		
Slope b	1.001	not significant	
Uncertainty of b	0.010		
Ordinate intercept a	-0.013	not significant	
Uncertainty of a	0.167		
Expanded meas. uncertainty W_{CM}	8.46	%	
All comparisons, $\geq 18 \mu\text{g}/\text{m}^3$			
Uncertainty between Reference	0.70	$\mu\text{g}/\text{m}^3$	
Uncertainty between Candidates	0.92	$\mu\text{g}/\text{m}^3$	
SN 1512361 / SN 1512401			
Number of data pairs	53		
Slope b	1.007		
Uncertainty of b	0.027		
Ordinate intercept a	-0.283		
Uncertainty of a	0.763		
Expanded meas. uncertainty W_{CM}	11.12	%	
All comparisons, $< 18 \mu\text{g}/\text{m}^3$			
Uncertainty between Reference	0.53	$\mu\text{g}/\text{m}^3$	
Uncertainty between Candidates	0.54	$\mu\text{g}/\text{m}^3$	
SN 1512361 / SN 1512401			
Number of data pairs	160		
Slope b	1.025		
Uncertainty of b	0.024		
Ordinate intercept a	-0.209		
Uncertainty of a	0.244		
Expanded meas. uncertainty W_{CM}	8.36	%	

Comparison candidate with reference according to Guide "Demonstration of Equivalence Of Ambient Air Monitoring Methods", January 2010				
Candidate	F-701-20		SN	SN 1512361 / SN 1512401
Status of measured values	Slope and offset corrected		Limit value	30 $\mu\text{g}/\text{m}^3$
			Allowed uncertainty	25 %
Bonn				
Uncertainty between Reference	0.62	$\mu\text{g}/\text{m}^3$		
Uncertainty between Candidates	0.67	$\mu\text{g}/\text{m}^3$		
	SN 1512361		SN 1512401	
Number of data pairs	51		51	
Slope b	1.010		0.986	
Uncertainty of b	0.019		0.022	
Ordinate intercept a	0.306		0.544	
Uncertainty of a	0.436		0.499	
Expanded meas. uncertainty W_{CM}	9.79	%	10.46	%
Bornheim				
Uncertainty between Reference	0.52	$\mu\text{g}/\text{m}^3$		
Uncertainty between Candidates	0.49	$\mu\text{g}/\text{m}^3$		
	SN 1512361		SN 1512401	
Number of data pairs	54		54	
Slope b	1.114		1.142	
Uncertainty of b	0.033		0.032	
Ordinate intercept a	-1.134		-1.330	
Uncertainty of a	0.411		0.398	
Expanded meas. uncertainty W_{CM}	17.07	%	20.87	%
Cologne, Autumn				
Uncertainty between Reference	0.65	$\mu\text{g}/\text{m}^3$		
Uncertainty between Candidates	0.89	$\mu\text{g}/\text{m}^3$		
	SN 1512361		SN 1512401	
Number of data pairs	62		62	
Slope b	1.007		1.051	
Uncertainty of b	0.022		0.032	
Ordinate intercept a	-0.345		-0.327	
Uncertainty of a	0.295		0.421	
Expanded meas. uncertainty W_{CM}	7.54	%	13.97	%
Cologne, Winter				
Uncertainty between Reference	0.49	$\mu\text{g}/\text{m}^3$		
Uncertainty between Candidates	0.36	$\mu\text{g}/\text{m}^3$		
	SN 1512361		SN 1512401	
Number of data pairs	46		46	
Slope b	0.929		0.934	
Uncertainty of b	0.011		0.010	
Ordinate intercept a	0.201		0.311	
Uncertainty of a	0.180		0.169	
Expanded meas. uncertainty W_{CM}	13.56	%	11.90	%
All comparisons, $\geq 18 \mu\text{g}/\text{m}^3$				
Uncertainty between Reference	0.70	$\mu\text{g}/\text{m}^3$		
Uncertainty between Candidates	0.92	$\mu\text{g}/\text{m}^3$		
	SN 1512361		SN 1512401	
Number of data pairs	53		53	
Slope b	1.014		1.006	
Uncertainty of b	0.025		0.033	
Ordinate intercept a	-0.464		-0.246	
Uncertainty of a	0.686		0.92	
Expanded meas. uncertainty W_{CM}	9.81	%	13.79	%
All comparisons, $< 18 \mu\text{g}/\text{m}^3$				
Uncertainty between Reference	0.53	$\mu\text{g}/\text{m}^3$		
Uncertainty between Candidates	0.54	$\mu\text{g}/\text{m}^3$		
	SN 1512361		SN 1512401	
Number of data pairs	160		160	
Slope b	1.018		1.040	
Uncertainty of b	0.025		0.025	
Ordinate intercept a	-0.250		-0.251	
Uncertainty of a	0.254		0.257	
Expanded meas. uncertainty W_{CM}	8.15	%	10.24	%
All comparisons				
Uncertainty between Reference	0.58	$\mu\text{g}/\text{m}^3$		
Uncertainty between Candidates	0.67	$\mu\text{g}/\text{m}^3$		
	SN 1512361		SN 1512401	
Number of data pairs	213		213	
Slope b	1.005	not significant	0.999	not significant
Uncertainty of b	0.010		0.011	
Ordinate intercept a	-0.155	not significant	0.095	not significant
Uncertainty of a	0.165		0.187	
Expanded meas. uncertainty W_{CM}	8.33	%	9.64	%