

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000040337_01

AMS designation: F-701-20 with PM_{2,5} pre-separator
for suspended particulate matter PM_{2,5}

Manufacturer: DURAG GmbH
Kollastraße 105
22453 Hamburg
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 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 9 pages).

The present certificate replaces certificate 0000040337 of 9 September 2014.



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

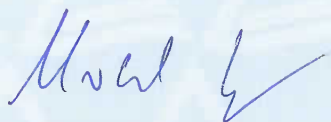
www.tuv.com
ID 0000040337

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

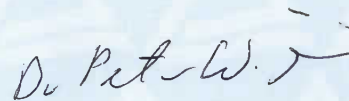
German Federal Environment Agency
Dessau, 12 June 2019

This certificate will expire on:
25 March 2024

TÜV Rheinland Energy GmbH
Cologne, 11 June 2019



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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:	936/21220478/A dated 17 March 2014 and addendum 936/21243589/A dated 14 September 2018
Initial certification:	5 August 2014
Expiry date:	25 March 2024
Publication:	BAnz AT 26.03.2019 B7, chapter IV No. 44

Approved application

The tested AMS is suitable for continuous ambient air monitoring of suspended particulate matter, PM_{2.5} fraction (stationary operation).

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a field test performed at four different sites and/or different periods.

The AMS is approved for an ambient temperature range of +5 °C to +40 °C.

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 936/21220478/A dated 17 March 2014 and addendum 936/21243589/A dated 14 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: BAnz AT 08.05.2014 B11, chapter III number 3.1
UBA announcement dated 17 July 2014:

AMS designation:

F-701-20 with PM_{2,5} pre-separator for suspended particulate matter PM_{2,5}

Manufacturer:

DURAG GmbH, Hamburg

Field of application:

For continuous monitoring of suspended particulate matter, PM_{2,5} fraction, in ambient air from stationary sources

Measuring range during performance testing:

Component	Certification range	Unit
PM _{2,5}	0–1 000	µg/m ³

Software version:

3.10

Restrictions:

None

Notes:

1. The measuring system complies with the requirements of the guide to “Demonstration of Equivalence of Ambient Air Monitoring Methods” for the component PM_{2,5}.
2. During the performance test, the cycle time was 1 h, every filter spot was sampled 24 times; i.e. an automatic filter change was performed every hour, with each filter spot being sampled up to a maximum of 24 times.
3. The measuring system must be operated with an actively ventilated sampling system without auxiliary pipe heating.
4. The measuring system must be operated inside a lockable measurement container.
5. The instrument must be calibrated on-site regularly using a gravimetric PM_{2,5} reference method in accordance with EN 14907.
6. This 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 dated 17 March 2014

Publication in the German Federal Gazette: BAnz AT 15.03.2017 B6,
chapter V notification 3, UBA announcement dated 22 February 2017:

**3 Notification as regards Federal Environment Agency (UBA) notice
of 17 July 2014 (BAnz AT 05.08.2014 B11, chapter III number 3.1)**

The current software version of the F-701-20 measuring system with PM_{2,5} pre-
separator for suspended particulate matter PM_{2,5}
manufactured by DURAG GmbH is: 03.11R0005.

Version V03.10R0001 is equally approved.

The measuring system may now also be used with SD chips of a newer make
(spec. V4.10, 22 January 2013).

Statement issued by TÜV Rheinland Energy GmbH dated 13 October 2016

Publication in the German Federal Gazette: BAnz AT 26.03.2018 B8,
chapter V notification 4, UBA announcement dated 21 February 2018:

**4 Notification as regards Federal Environment Agency (UBA) notices
of 17 July 2014 (BAnz AT 05.08.2014 B11, chapter III number 3.1 and
of 22 February 2017 (BAnz AT 15.03.2017 B6, chapter V 3rd notification)**

The current software version of the F-701-20 measuring system with PM_{2,5} pre-
separator for suspended particulate matter PM_{2,5}
manufactured by DURAG GmbH is: 03.11R0008.

The measuring system may also be equipped with the Buschjost
8288200.9638.02400 control valve instead of the Buschjost 8288200.9624.02400
control valve.

Statement issued by TÜV Rheinland Energy GmbH dated 29 September 2017

Publication in the German Federal Gazette: BAnz AT 17.07.2018 B9,
chapter III notification 27, UBA announcement dated 3 July 2018:

**27 Notification as regards Federal Environment Agency (UBA) notices
of 17 July 2014 (BAnz AT 05.08.2014 B11, chapter III number 3.1 and
of 21 February 2018 (BAnz AT 26.03.2018 B8, chapter V 4th notification)**

The current software version of the F-701-20 measuring system with PM_{2,5} pre-
separator for suspended particulate matter PM_{2,5}
manufactured by DURAG GmbH is:

04.11R0009

The instrument housing was adapted to be fitted into a 19" rack.

The measuring system is also available as instrument version with external pump.
This version is clearly marked by the letter "F" in the model code system F-701-20
PM xx2-xxxxxF and thus identifiable.

Statement issued by TÜV Rheinland Energy GmbH dated 2 May 2018

Publication in the German Federal Gazette: BAnz AT 26.03.2019 B7,
chapter IV notification 13, Announcement by UBA dated 27 February 2019:

13 Notification as regards Federal Environment Agency (UBA) notices of 17 July 2014 (BAnz AT 05.08.2014 B11, chapter III number 3.1 and of 3 July 2018 (BAnz AT 17.07.2018 B9, chapter III 27th notification)

The F-701-20 measuring system with PM_{2,5} pre-separator for suspended particulate matter PM_{2,5} manufactured by DURAG GmbH complies with the requirements of standard EN 16450 (July 2017 version). An addendum to test report No. 936/21243589/A is available online at www.qal1.de.

The current software version is: 4.11R0010

Instead of the VT-A Drivecontrol manufactured by Ebmpapst used to control the clamping motor so far, the measuring system may also be equipped with the DSA-B60 drive control manufactured by miControl GmbH.

The measuring system can be equipped with the option "dust content analysis", consisting of a filter belt printer with corresponding control electronics as well as a roll with cover foil. The letter "E" in the model code system F-701-20 PM xx2-xxxxxE clearly marks and identifies this option.

Statement issued by TÜV Rheinland Energy GmbH dated 14 September 2018

Certified product

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

The F-701-20 ambient air quality measuring system consists of the PM_{2,5} sampling head, the meteorology sensor, the intake tube with active ventilation, the F-701-20 analyser itself incl. glass fibre filter tape, the required connecting tubes and cables as well as adapters, the roof flange as well as the manual in German.

The F-701-20 ambient air quality measuring system uses beta-attenuation as its measurement principle.

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 analyser through the intake pipe.

During performance testing, the AMS was tested with an actively ventilated intake tube and without an auxiliary pipe heating. When using the actively ventilated intake tube, ambient air is steadily transported through the outer cladding tube with a ventilation unit in order to keep the sampling tube proper situated on the inside upstream of the measurement section at ambient temperature.

The instrument itself is of a compact design. Except for the sampling probe (intake tube, sampling head), the meteorological sensor to measure air pressure and ambient temperature and the installation for the active ventilation of the intake tube, all components are built in one unit.

The AMS is controlled with the help of a micro controller board.

A step motor transports the filter belt from the supply roll to the take-up roll. The Geiger-Müller tube determines the mass increase on the filter belt on the basis of the attenuation of radiance emitted by the C-14 source. A pump sucks in air. A flow meter measures the flow and a by-pass valve keeps it at a constant flow rate of 1000 l/h. Electronics save the data and control the measurement procedure, which enables a user-optimised handling via a touchscreen.

In a regular test sequence, an unloaded filter spot is inserted in between the C-14 source and the counter tube at the beginning of the sequence. Radiance intensity is measured over a period of 300s. This implies that impulses generated by the counter tube are used as a measure of beta attenuation.

Subsequently, the filter adapter is opened and the filter belt is transported until the assessed filter spot reaches the extraction position. The filter adapter is then closed and the extraction process starts. Once sampling is completed, the filter adapter is opened again and the filter paper is brought into its original position under the counter tube. The filter adapter is closed and the radiance intensity is measured for 300 s again.

Dust load is then determined from the count rates before and after the extraction and dust concentration is calculated from setting it of from extracted air.

The measured values determined are shown in the display and are available both as 4–20 mA analogue signals and via a serial RS232 interface (e.g. using the Bayern-Hessen protocol, Gesytec).

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 certification mark may be applied to the product or used in advertising materials for the certified product.

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 F-701-20 with PM_{2,5} pre-separator 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.0000040337: 9 September 2014
Expiry date of the certificate: 4 August 2019

Test report: 936/21220478/A dated 17 March 2014
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Publication: BAnz AT 05.08. 2014 B11, chapter III no. 3.1
UBA announcement dated 17 July 2014

Notifications in accordance with EN 15267

Statement issued by TÜV Rheinland Energy GmbH dated 13 October 2016
Publication in the German Federal Gazette: BAnz AT 15.03.2017 B6, chapter V notification 3
UBA announcement dated 22 February 2017
(new software version, SD chips)

Statement issued by TÜV Rheinland Energy GmbH dated 29 September 2017
Publication in the German Federal Gazette: BAnz AT 26.03.2018 B8, chapter V notification 4
UBA announcement dated 21 February 2018
(alternative control valve, new software version)

Statement issued by TÜV Rheinland Energy GmbH dated 2 May 2018
Publication in the German Federal Gazette: BAnz AT 17.07.2018 B9,
chapter III notification 27, UBA announcement dated 3 July 2018
(new software version, adaption to 19" rack)

Certificate no. 0000040337_01: 12 June 2019
Expiry date of the certificate: 25 March 2024

Addendum 936/21243589/A dated 14 September 2018, TÜV Rheinland Energy GmbH
Publication: BAnz AT 26.03.2019 B7, chapter IV notification 13,
Announcement by UBA dated 27 February 2019,
(Satisfaction of requirements according to EN 16450)

Comparison candidate with reference according to Standard EN 16450:2017			
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}	8.89	%	
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}	11.59	%	
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}	8.73	%	

Comparison candidate with reference according to Standard EN 16450:2017				
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}	10.22	%	10.86	%
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}	17.24	%	21.02	%
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}	8.13	%	14.30	%
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}	13.75	%	12.12	%
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}	10.35	%	14.18	%
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}	8.53	%	10.55	%
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}	8.77	%	10.01	%