Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No. : 0000028749_01

Certified AMS:	D-R 290 for dust
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 certified according to the standards

EN 15267-1 (2009), EN 15267-2 (2009), EN 15267-3 (2008) and EN 14181 (2004)

Certification is awarded in respect of the conditions stated in this certificate
(This certificate contains 8 pages).

TÜVRheinland®
CERTIFIED

Suitability Tested
EN 15267
QAL1 Certified
Regular
Surveillance

www.tuv.com
ID 0000028749

Publication in the German Federal Gazette (BAnz.) of 26 January 2011

This certificate will expire on:
25 January 2021

German Federal Environment Agency
Dessau, 21 January 2016

i. A. Dr. Marcel Langner

TÜV Rheinland Energie und Umwelt GmbH
Cologne, 20 January 2016

ppa. Dr. Peter Wilbring

www.umwelt-tuv.de / **www.eco-tuv.com** teu@umwelt-tuv.de Tel. +49 221 806-5200	TÜV Rheinland Energie und Umwelt 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.

10/221 2.08

Test report:	936/21212470/B of 1 October 2010
Initial certification:	26 January 2011
Certificate:	renewal (previous certificate 0000028749 of 09 February 2011 valid until 25 January 2016)
Expiry date:	25 January 2021
Publication:	BAnz. 26 January 2011, No. 14, p.294, Chapter I No. 1.2

Approved application
The tested AMS is suitable for use at combustion plants according to Directive 2010/75/EU, chapter III (13. BImSchV), at waste incineration plants according to Directive 2010/75/EU, chapter IV (17. BImSchV) and other plants requiring official approval. The measured ranges have been selected considering the wide application range of the AMS.

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a three-month field test at municipal waste incineration plant.

The AMS is approved for the following ambient temperature range:
measuring head D-R 290 M -20 °C to +50 °C
measuring head D-R 290 M EC2 -40 °C to +60 °C

The notification of suitability of the AMS, performance testing, and the uncertainty calculation have been effected on the basis of the regulations valid at the time of performance testing. As changes in legal regulations are possible, any potential user should ensure that this AMS is suitable for monitoring the limit value relevant to the application.

Any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for the installation at which it will be installed.

Basis of the certification
This certification is based on:

- test report 936/21212470/B of 1 October 2010 of TÜV Rheinland Energie und Umwelt GmbH
- test report 936/21226948/A of 26 March 2015 of TÜV Rheinland Energie und Umwelt 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 in the German Federal Gazette: BAnz 26 January 2011, No. 14, p.294, Chapter I No. 1.2
UBA announcement from 10 January 2011:

AMS name:
D-R 290 for dust

Manufacturer:
DURAG GmbH, Hamburg

Approval:
For measurements at plants requiring official approval and plants according to 27th BImSchV.

Measuring ranges during the suitability test:

Component	Certification range	Supplementary ranges			
dust (optical transmission)	0 – 15 mg/m³	0 – 0.2 Ext.	0 – 0.5 Ext.	0 – 1.6 Ext.	0 – 100 Opacity

0 – 0.1 Ext. equals 0 – 16 mg/m³ with an optical length of 5 m

Software versions:
3.21 (measuring head),
4.37 (evaluation unit)

Restriction:
The measuring system can only be used if an undercut of the dewpoint can be excluded.

Remarks:
1. The dust concentration is measured in wet gas under operating conditions.
2. The maintenance interval is four weeks.
3. With the measuring path length of 5 m and the measuring range of 16 mg/m³ determined during the calibration a product of 80 mg m/m³ results for the field test plant.
4. Supplementary test on the announcement of the Federal Environmental Agency of 22 April 2003 (BAnz. p. 10742, chapter I No. 1.1) concerning the transfer into EN 15267.
5. The requirements of the determination coefficient of the calibration function R^2 according to EN 15267 have not been fulfilled.

Test report:
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Report-No.: 936/21212470/B of 1 October 2010

Publication in the German Federal Gazette: BAnz AT 02 April 2015 B5, chapter IV number 28, Announcement by UBA from 25 February 2015:

28 Notification as regards Federal Environment Agency (UBA) notice of 10 January 2011 (Federal Gazette (BAnz.) p. 294, chapter I number 1.2)

As an alternative to the previous light source L3-W30, the D-R 290 measuring system, manufactured by DURAG GmbH, can be equipped with the light source L3-W32.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 30 September 2014

Publication in the German Federal Gazette: BAnz AT 26 August 2015 B4, chapter V number 28, Announcement by UBA from 22 July 2015:

28 Notification as regards Federal Environment Agency (UBA) notices of 10 January 2011 (BAnz. p. 294, chapter I number 1.2) and of 25 February 2015 (BAnz 02.04.2015 B5, chapter IV 28th notification)

The D-R 290 measuring system for dust of DURAG GmbH has been equipped with a redesigned measuring head, which now carries the designation D-R 290 M EC2. With the new measuring head it is no longer necessary to use the D-R 290 AW evaluation unit to operate the AMS.

The following points apply when using AMS with the D-R 290 M EC2 measuring head:

- The AMS can be operated either with the D-ISC 100 evaluation unit or with the D-TB 100 supply unit.
- The D-ISC 100 universal control unit is equipped with digital Modbus RTU and Modbus TCP interfaces in accordance with VDI 4201 Sheets 1 and 3 (EIA-485, serial, TCP/IP, Ethernet).
- The D-R 290 measuring system is fitted with a Modbus RTU digital interface in accordance with VDI 4201 Sheets 1 and 3 (EIA-485, serial).
- When combining the D-R 290 measuring system with the D-ISC 100 universal control unit, the Modbus interface on the D-R 290 measuring system cannot be used. Instead, the digital Modbus interface on the D-ISC universal control unit is used.
- When using the AMS without the D-ISC 100 evaluation unit, operation is carried out on a customary PC / notebook / tablet by means of the D-ESI 100 software.
- The permissible ambient temperature range for the AMS is -40 °C – 60 °C.

Regardless of the changes, the use of the D-R 290 R reflector and a suitable purge air supply with the AMS is still mandatory.

The current software versions for the D-R 290 measuring system, manufactured by DURAG GmbH, are:

D-R 290:	05.00R0000
D-ISC 100:	01.03R0000
D-ESI 100:	1.1.015

Statement and test report no. 936/21226948/A of
TÜV Rheinland Energie und Umwelt GmbH of 26 March 2015

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

The measuring system D-R 290 uses the two-beam alternate light method, based on the autocollimation principle. The measuring light crosses the measuring path twice. The attenuation of the measuring light beam due to the dust concentration is measured. An optical recorder receives the measuring and comparison light beams alternately. The changeover between measuring light and comparison light is performed using a step motor every 2 min for 2 s. There is a common amplifier for signal processing of measuring and comparison light, temperature influences and longterm drift effects of the amplifier are compensated. The measuring light beam is generated by a Super Wide Band Diode (SWBD) without any influence of d.c. light (daylight). With the Wide Band performance of the SWBD the measuring result is independent against temperature and other influences and provides a very stable measuring.

The measurement system D-R 290 has two analogue outputs. Each of these outputs has two freely selectable extinction and opacity measuring ranges, which are external changeable. The ranges are freely adjustable from 0.1 to 1.6 Extinction and from 20 to 100 % Opacity.

To check proper functioning of the D-R 290, a control cycle is performed in adjustable periodic intervals. In this cycle, the contamination of the optical interfaces, the span and the zero point are automatically measured and displayed. The results of the following measurements are corrected by the magnitude of the measured difference (contamination). If the contamination exceeds 6 % a status signal is given. By heating the optical discs, condensation and contamination are reduced as far as possible.

The measurement system D-R 290 with measuring head D-R 290 M (see type plate) consisted of:

- measuring head D-R 290 M
- reflector D-R 290 R
- evaluation unit D-R 290 AW
- welding flanges and
- purge air unit
- software version: measuring head: 3.21
  evaluation unit: 4.37

The measurement system D-R 290 with measuring head D-R 290 M EC2 (see type plate) consisted of:

- measuring head D-R 290 M EC2
- reflector D-R 290 R
- purge air unit
- evaluation unit D-ISC 100 with digital interface Modbus RTU and Modbus TCP according to VDI 4201 page 1 and 3 (EIA-485, seriell and TCP/IP, Ethernet)

  or
- supply unit D-TB 100 with digital interface Modbus RTU according to VDI 4201 page 1 and 3 (EIA-485, seriell)
- software version: D-R 290: 05.00R0000
  D-ISC 100: 01.03R0000
  D-ESI 100: 1.1.015

When combining the D-R 290 measuring system with the D-ISC 100 universal control unit, the Modbus interface on the D-R 290 measuring system cannot be used. Instead, the digital Modbus interface on the D-ISC universal control unit is used. When using the AMS without the D-ISC 100 evaluation unit, operation is carried out on a customary PC / notebook / tablet by means of the D-ESI 100 software.

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.

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 its expiration is also accessible on the internet: **qal1.de**.

Certification of D-R 290 for dust is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

First suitability test:

Test report 936/801017/A of 31 January 2003
TÜV Immissionsschutz und Energiesysteme GmbH, Cologne
Publication: BAnz. 15 May 2003, No. 90, p. 10742, Chapter I No 1.1
Announcement by UBA from 22 April 2003.

Notification:

Statement of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH of 2006-06-30,
Publication: BAnz. 14 October 2006, No. 194, p. 6715, Chapter V notification 1
Announcement by UBA from 12 September 2006. (Extension for crematorium)

Statement of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH of 2009-10-22,
Publication: BAnz. 12 February 2010, No. 24, p. 552, Chapter IV notification 12
Announcement by UBA from 25 January 2010. (Software changing)

Statement of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH of 2009-10-09,
Publication: BAnz. 12 February 2010, No. 24, p. 552, Chapter IV notification 13
Announcement by UBA from 25 January 2010. (Distribution also by Horiba)

Initial certification according to EN 15267:

Certificate No. 0000028749: 09 February 2011
Validity of the certificate until: 25 January 2016
Test report: 936/21212470/B of 01 October 2010,
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne
Publication: BAnz. 26 January 2011, No. 14, p. 294
Announcement by UBA from 10 January 2011.

Notifications according to EN 15267:

Statement of TÜV Rheinland Energie und Umwelt GmbH, Cologne of 30 September 2014,
Publication: BAnz AT 02.04.2015 B5, chapter IV notification 28,
Announcement by UBA on 25 February 2015(alternative light source)

Statement and test report 936/21226948/A of TÜV Rheinland Energie und Umwelt GmbH, Cologne of 26 March 2015,
Publication: BAnz AT 26.08.2015 B4, chapter V notification 28,
Announcement by UBA on 22 July 2015 (redesigned measuring head)

Renewal of the certificate:

Certificate No : 0000028749_01: 21 January 2016
Validity of the certificate: 25 January 2021

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system					
Manufacturer			DURAG GmbH		
Name of measuring system			D-R 290		
Serial number of the candidates			406752 (142) / 406753 (158) / 1214444 / 1214434		
Measuring principle			optical Transmission		
Test report			936 / 21212470/B		
Test laboratory			TÜV Rheinland		
Date of report			2010-10-01		
Measured component			Dust		
Certification range			0 - 15	mg/m³	

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Standard deviation from paired measurements under field conditions *	u_D	0.143	mg/m³	0.020	(mg/m³)²
Lack of fit	u_{lof}	0.058	mg/m³	0.003	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.012	mg/m³	0.000	(mg/m³)²
Span drift from field test	$u_{d,s}$	0.017	mg/m³	0.000	(mg/m³)²
Influence of ambient temperature at span	u_t	0.052	mg/m³	0.003	(mg/m³)²
Influence of supply voltage	u_v	0.040	mg/m³	0.002	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.121	mg/m³	0.015	(mg/m³)²
Excursion of measurement beam	u_{mb}	0.167	mg/m³	0.028	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.27	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.52	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 10 mg/m³**	**5.2**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 10 mg/m³**	**30,0**
Requirement of EN 15267-3	U in % of the ELV 10 mg/m³	22,5