Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000028749_02

AMS designation:	D-R 290 for dust
Manufacturer:	DURAG GmbH Kollaustraße 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 the standards EN 15267-1 (2009), EN 15267-2 (2009), EN 15267-3 (2007) and EN 14181 (2004).

Certification is awarded in respect of the conditions stated in this certificate (this certificate contains 11 pages).
The present certificate replaces certificate 0000028749_01 of 21 January 2016

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 2026

German Federal Environment Agency
Dessau, 25 January 2021

Dr. Marcel Langner
Head of Section II 4.1

TÜV Rheinland Energy GmbH
Cologne, 24 January 2021

ppa. Dr. Peter Wilbring

www.umwelt-tuv.eu tre@umwelt-tuv.eu Phone: + 49 221 806-5200	TÜV Rheinland Energy GmbH Am Grauen Stein 51105 Köln

Test institute accredited to EN ISO/IEC 17025 by DAkkS (German Accreditation Body).
This accreditation is limited to the accreditation scope defined in the enclosure to certificate D-PL-11120-02-00.

Test Report:	936/21212470/B dated 1 October 2010
Initial certification:	26 January 2011
Expiry date:	25 January 2026
Certificate:	Renewal (of previous certificate 0000028749_01 dated 21 January 2016 valid until 25 January 2021)
Publication:	BAnz. 26 January 2011, No. 14, p. 294, chapter I number 1.2

Approved application
The tested AMS is suitable for use at combustion plants according to Directive 2010/75/EU, chapter III (13th BImSchV), chapter IV (17th BImSchV), 30th BImSchV, 44th BImSchV, plants in compliance with TA Luft and plants according to the 27th BImSchV. The measured ranges have been selected so as to ensure as broad a field of application as possible.

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

The AMS is approved for the following ambient temperature range:

Measurement head D-R 290 M	-20 °C to +50 °C
Measurement 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 applicable at the time of testing. As changes in legal provisions are possible, any potential user should ensure that this AMS is suitable for monitoring the limit values relevant to the application.

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 no. 936/21212470/B dated 1 October 2010 issued by TÜV Rheinland Energie und Umwelt GmbH
- Test report no. 936/21226948/A dated 26 March 2015 issued by 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 number 1.2, UBA announcement dated 10 January 2011:

AMS designation:
D-R 290 for dust

Manufacturer:
DURAG GmbH, Hamburg

Field of application:
For plants requiring official approval and for plants according to the 27th BImSchV

Measuring ranges during performance testing:

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% Opac.

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

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

Restriction:
The measuring system may only be employed if the temperature does not fall below dew point.

Notes:
1. The dust concentration is determined in wet flue gas under operational conditions.
2. The maintenance interval is four weeks.
3. The measuring path length of 5 m and the measuring range of 16 mg/m³ determined during the calibration results in a product of 80 mg m/m³ for the field test plant.
4. Supplementary test as regards Federal Agency Notice of 22 April 2003 (BAnz. p. 10742, chapter I number 1.1) related to the applicability of standard EN 15267.
5. The requirement for the determination coefficient R^2 of the calibration function in accordance with EN 15267-3 was not satisfied.

Test Report:
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Report no.: 936/21212470/B dated 1 October 2010

Publication in the German Federal Gazette: BAnz AT 02.04.2015 B5, chapter IV notification 28, UBA announcement dated 25 February 2015:

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

The D-R 290 measuring system manufactured by DURAG GmbH may also be equipped with the L3-W32 light source instead of the L3-W30 light source.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 30 September 2014

Publication in the German Federal Gazette: BAnz AT 26.08.2015 B4, chapter V notification 28, UBA announcement dated 22 July 2015:

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

The D-R 290 measuring system for dust manufactured by DURAG GmbH has been equipped with a re-designed 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 used with the D-ISC 100 evaluation unit or the D-TB 100 supply unit.
- The D-ISC 100 universal control unit has a digital Modbus RTU interface and a Modbus TCP in accordance with VDI 4201 parts 1 and 3 (EIA-485, serial and TCP/IP, Ethernet).
- The D-R 290 measuring system has a digital Modbus RTU interface in accordance with VDI 4201 parts 1 and 3.
- When using the D-R 290 measuring system with the D-ISC 100 universal control unit, the Modbus interface of the D-R 290 measuring system cannot be used. Instead, the Modbus digital interface of the D-ISC 100 universal control unit is used.
- When using the AMS without the D-ISC 100 evaluation unit, the AMS shall be operated by means of the D-ESI 100 software on a customary PC/notebook/tablet.
- 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 latest software versions of the D-R 290 measuring system for dust 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 dated 26 March 2015 issued by TÜV Rheinland Energie und Umwelt GmbH

Publication in the German Federal Gazette: BAnz AT 26.03.2018 B8, chapter V notification 23
UBA announcement dated 21 February 2018:

23 Notification as regards Federal Environment Agency notices of 10 February 2011 (BAnz. p. 294, chapter I number 1.2) and of 22 July 2015 (BAnz AT 26.08.2015 B4, chapter V 28th notification)

The latest software versions of D-R 290 measuring system for dust manufactured by DURAG GmbH are:

D-R 290:	05.01.R004
D-ISC 100:	01.04R0007
D-ESI 100:	01.10R0007

The following intermediary versions have also been approved:

D-ISC 100:	01.04R0001;	01.04R0004;	01.04R0006
D-ESI 100:	1.1.016;	1.1.017;	1.2.003

In the D-ISC 100, the Phoenix Contact QUINT4-PS/1AC/24DC/10 power supply unit may be used instead of the XPPower DNR240PS24-I power supply unit used up to now.

Statement issued by TÜV Rheinland Energy GmbH dated 8 December 2017

Publication in the German Federal Gazette: BAnz AT 26.03.2019 B7, chapter IV notification 3, UBA announcement dated 27 February 2019:

3 Notification as regards Federal Environment Agency (UBA) notices of 10 January 2011 (BAnz. p. 294, chapter I number 1.2) and of 21 February 2018 (BAnz AT 26.03.2018 B8, chapter V 23rd notification)

The latest software versions of D-R 290 measuring system for dust manufactured by DURAG GmbH are:
D-R 290: 05.10.R004
D-ISC 100: 02.02R0066
D-ESI 100: 01.10R0007

Thus, the following software versions have also been approved:
D-ISC 100: 02.00R0048, 02.02R0020

The measuring system (D-R 290 measuring head MEC2) may be equipped with a revised version of the D-ISC 100 control unit. It is available in the following model versions:
– D-ISC 100 M (standard)
– D-ISC 100 C (compact housing)
– D-ISC 100 P (c/w purge air blower)
– D-ISC 100 R (housing for 19“ rack mounting)

The D-ISC 100 control unit also provides a digital Modbus interface which complies with VDI standard 4201, parts 1 and 3.
Report no. 936/21242380/A dated 14 September 2018 prepared by TÜV Rheinland Energy GmbH presents the test results for the revised D-ISC 100 control unit.
The technical specifications of the components remain unchanged. The technical specifications of the components remain unchanged.
An alternative manufacturer qualified for the PK243-03A-C22 step engine, art. no. 1107147. The SECM243-S0.3A engine manufactured by EC Motors may also be used in the future.

Statement issued by TÜV Rheinland Energy GmbH dated 14 January 2019

Publication in the German Federal Gazette: BAnz AT 24.03.2020 B7, chapter IV notification 13,
UBA announcement dated 24 February 2020:

13 Notification as regards Federal Environment Agency (UBA) notices of 10 January 2011 (BAnz. p. 294, chapter I number 1.2) and of 27 February 2019 (BAnz AT 26.03.2019 B7, chapter IV 3rd notification)

The latest software versions of D-R 290 measuring system for dust manufactured by DURAG GmbH are:

D-R 290:	05.10.R004
D-ISC 100:	02.02R0066
D-ESI 100:	01.11R0018

D-ESI 100 software version 01.11R0017 may also be used.

Statement issued by TÜV Rheinland Energy GmbH dated 1 October 2019

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

The D-R 290 measuring system 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 caused by 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 long-term 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 at 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 produced. By heating the optical discs, condensation and contamination are reduced as far as possible.

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

- D-R 290 M measuring head
- the D-R 290 R reflector
- D-R 290 AW evaluation unit
- Welding flanges and
- Blower purge
- Software versions: measuring head: 3.21
  evaluation unit: 4.37

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

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

or

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

When combining the D-R 290 measuring system (equipped with the D-R 290 M EC2 measuring head) with the D-ISC 100 universal control unit, the digital Modbus interface on the D-ISC universal control unit must be used. When using the AMS without the D-ISC evaluation unit, the AMS shall be operated by means of the D-ESI 100 software on a customary PC/notebook/tablet.

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 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 D-R 290 measuring system is based on the documents listed below and the regular, continuous surveillance of the manufacturer's quality management system:

First suitability test

Basic test report No. 936/801017/A dated 31 January 2003,
TÜV Immissionsschutz und Energiesysteme GmbH, Cologne
Publication: BAnz. 15 May 2003, no. 90, p. 10742, chapter I number 1.1
UBA announcement dated 22 April 2003

Notifications

Statement issued by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH dated 30 June 2006
Publication: BAnz. 14 October 2006, No. 194, p. 6715, chapter V notification 1,
UBA announcement dated 12 September 2006
(Extension of the scope to include the 27th BImSchV)

Statement issued by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH dated 22 October 2009
Publication: BAnz. 12 February 2010 No. 24, p. 552, chapter IV notification 12
UBA announcement dated 25 January 2010:
(New software version)

Statement issued by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH dated 9 October 2009
Publication: BAnz. 12 February 2010 No. 24, p. 552, chapter IV notification 13
UBA announcement dated 25 January 2010:
(Distribution by Horiba)

Initial certification according to EN 15267

Certificate no. 0000028749: 9 February 2011
Expiry date of the certificate: 25 January 2016
Test report no. 936/21212470/B dated 01 October 2010
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Publication: BAnz. 26 January 2011, No. 14, p. 294, chapter I number 1.2
UBA announcement dated 10 January 2011:

Notifications in accordance with EN 15267

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

Statement and report no. 936/21226948/A issued by TÜV Rheinland Energie und Umwelt GmbH of 26 March 2015
Publication: BAnz AT 26.08.2015 B4, chapter V notification 28
UBA announcement dated 22 July 2015
(revised measuring head)

Renewal of the certificate

Certificate no. 0000028749_01: 21 January 2016
Expiry date of the certificate: 25 January 2021

Notifications in accordance with EN 15267

Statement issued by TÜV Rheinland Energy GmbH dated 8 December 2017
Publication: BAnz AT 26.03.2018 B8, chapter V notification 23
UBA announcement dated 21 February 2018
(New software version)

Statement issued by TÜV Rheinland Energy GmbH dated 14 January 2019
Publication: BAnz AT 26.03.2019 B7, chapter IV notification 3
UBA announcement dated 27 February 2019
(New software version and control unit)

Statement issued by TÜV Rheinland Energy GmbH dated 1 October 2019
Publication: BAnz AT 24.03.2020 B7, chapter IV notification 13
UBA announcement dated 24 February 2020
(New software version)

Renewal of the certificate

Certificate no. 0000028749_02: 25 January 2021
Expiry date of the certificate: 25 January 2026

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			optische 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