

CERTIFICATE

on Product Conformity (QAL1)

Certificate No.: 0000032301

Certified AMS: PG-350E for NO_x, SO₂, CO, CO₂ and O₂

Manufacturer: HORIBA Europe GmbH
Julius-Kronenberg-Str. 9
42799 Leichlingen
Germany

Test Institute: TÜV Rheinland Energie und Umwelt GmbH

**This is to certify that the AMS has been tested
and found to comply with:**

**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
(see also the following pages).



- EN 15267-3 tested
- QAL1 certified
- TUV approved
- Annual inspection

Publication in the German Federal Gazette
(BAnz.) of 05 March 2013

This certificate will expire on:
04 March 2018

German Federal Environment Agency
Dessau, 22 March 2013

TÜV Rheinland Energie und Umwelt GmbH
Cologne, 21 March 2013

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Am Grauen Stein
51105 Cologne

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

Test report:	936/21217617/A of 05 October 2012
Initial certification:	05 March 2013
Expiry date:	04 March 2018
Publication:	BAnz AT 05 March 2013 B10, chapter I, No. 5.2

Approved application

The tested AMS is suitable for use at combustion plants according to EC Directive 2001/80/EC, at waste incineration plants according to EC directive 2000/76/EC 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 sevenmonth field test at a waste incineration plant.

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 installation at which it will be installed.

Basis of the certification

This certification is based on:

- test report 936/21217617/A of 05 October 2012 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 AT 05 March 2013 B10, chapter I, No. 5.2

AMS designation:

PG-350E for NO_x, SO₂, CO, CO₂ and O₂

Manufacturer:

Horiba Europe GmbH, Leichlingen

Field of application:

Measurement at plants requiring official approval as well as plants within the scope of 2000/76/EC (waste incineration directive) and 2001/80/EC (large combustion plants directive)

Measuring ranges during the suitability test:

Components	Certification ranges	Supplementary ranges	Unit
NO _x	0 - 205 ¹⁾	0 - 2050 ²⁾	mg/m ³
SO ₂	0 - 143	0 - 1430	mg/m ³
CO	0 - 75	0 - 1250	mg/m ³
CO ₂	0 - 20	-	Vol.-%
O ₂	0 - 25	0 - 10	Vol.-%

¹⁾ as NO₂, this corresponds to apx 0 - 134 mg/m³ NO

²⁾ as NO₂, this corresponds to apx. 0 - 1340 mg/m³ NO

Software version:

P2000788001D / 1.11

Restrictions:

None

Notes:

1. The maintenance interval is four weeks.
2. The certification range for the component SO₂ is not suited to monitor the daily mean value at plants pursuant to 2000/76/EC.
3. The internal dryer should be by-passed for the test gas flow inside the PG-350E.
4. For measuring SO₂ the PD-100 permeation dryer manufactured by Horiba should be used.

Test report:

TÜV Rheinland Energie und Umwelt GmbH, Köln
Report No.: 936/21217617/A dated 05 October 2012

Certified product

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

The PG-350E measuring system is a multi-channel gas analyser which uses different measuring principles according to the specific measured component. The following table lists the different measuring principles:

Measured component	Measuring principle
NO _x	Chemiluminescence
CO, SO ₂ , CO ₂	Non-dispersive Infrared absorption (NDIR)
O ₂	Paramagnetism

The HORIBA PG-350E measuring system is comprised of the main parts described below:

Sampling

Sampling probe: M&C Type PSP 4000-H/C

Heated sample gas filter Type SP-2K ceramic material, pore size 2µm

Sampling hose: M&C Type PSP-W 4M 4/6 (length for performance testing apx. 5 m)
(max. 120 °C)

Analyser

Horiba: PG-350E

Sample gas dryer

Horiba permeation dryer, type PD-100 with 100 permeation tubes

or

M&C Analysentechnik condensing dryer, type PSS-5

The measuring system may be operated with the PD-100 permeation dryer manufactured by Horiba or with the PSS-5 condensing dryer manufactured by M&C Analysentechnik.

Sample gas is led to the measuring system via a heated probe. The probe is equipped with an internal filter made of ceramic material with a pore size of 2µm. The sample gas is transported via a heated PTFE-line to a sample dryer before continuing via an unheated PTFE-line to the analyser. The pump is situated behind the measuring cell.

Integrating several measuring cells, the AMS performs simultaneous measurement of multiple components. The sample gas continuously flows through the respective measuring cell of the AMS.

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 PG-350E for NO_x, SO₂, CO, CO₂ and O₂ 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. 0000032301: 22 March 2013

Expiry date of the certificate: 04 March 2018

Test report: 936/21217617/A dated 05 October 2012
TÜV Rheinland Energie und Umwelt GmbH, Cologne

Publication: BAnz AT 05 March 2013 B10, chapter I, No. 5.2
Announcement by UBA from 12 February 2013

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

Measuring system

Manufacturer	Horiba Europe GmbH
Name of measuring system	PG-350E
Serial number of the candidates	VC4DFKB9 / XL7LTUL1
Measuring principle	Chemiluminescence

Test report

Test laboratory	TÜV Rheinland
Date of report	2012-10-08

Measured component

Certification range	NO _x as NO 0 - 134 mg/m ³
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0,84 mg/m ³
Sum of negative CS at zero point	0,00 mg/m ³
Sum of positive CS at reference point	0,00 mg/m ³
Sum of negative CS at reference point	-0,70 mg/m ³
Maximum sum of cross sensitivities	0,84 mg/m ³
Uncertainty of cross sensitivity	0,487 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

			u ²
Standard deviation from paired measurements under field conditions *	u _D	mg/m ³	0,797 (mg/m ³) ²
Lack of fit	u _{lof}	mg/m ³	0,336 (mg/m ³) ²
Zero drift from field test	u _{d.z}	mg/m ³	0,082 (mg/m ³) ²
Span drift from field test	u _{d.s}	2,035 mg/m ³	4,141 (mg/m ³) ²
Influence of ambient temperature at span	u _t	1,332 mg/m ³	1,774 (mg/m ³) ²
Influence of supply voltage	u _v	0,306 mg/m ³	0,094 (mg/m ³) ²
Cross sensitivity (interference)	u _i	mg/m ³	0,238 (mg/m ³) ²
Influence of sample gas flow	u _n	mg/m ³	0,013 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm}	mg/m ³	1,173 (mg/m ³) ²
Converter efficiency for AMS measuring NO _x	u _{ce}	mg/m ³	10,563 (mg/m ³) 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)

$$u_c = \sqrt{\sum (u_{\max, j})^2} \quad 4,38 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 8,59 \text{ mg/m}^3$$

Relative total expanded uncertainty

U in % of the ELV 131 mg/m³ 6.6

Requirement of 2000/76/EC and 2001/80/EC

U in % of the ELV 131 mg/m³ 20.0

Requirement of EN 15267-3

U in % of the ELV 131 mg/m³ 15.0

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

Measuring system

Manufacturer	Horiba Europe GmbH
Name of measuring system	PG-350E
Serial number of the candidates	VC4DFKB9 / XL7LTUL1
Measuring principle	NDIR

Test report

Test laboratory	21217617/A TÜV Rheinland
Date of report	2012-10-08

Measured component

Certification range	SO ₂ 0 - 143 mg/m ³
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.54 mg/m ³
Sum of negative CS at zero point	-0.69 mg/m ³
Sum of positive CS at reference point	0.70 mg/m ³
Sum of negative CS at reference point	-2.60 mg/m ³
Maximum sum of cross sensitivities	-2.60 mg/m ³
Uncertainty of cross sensitivity	-1.503 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

			u ²	
Standard deviation from paired measurements under field conditions *	u _D	mg/m ³	1.672	(mg/m ³) ²
Lack of fit	u _{lof}	mg/m ³	0.334	(mg/m ³) ²
Zero drift from field test	u _{d,z}	mg/m ³	3.861	(mg/m ³) ²
Span drift from field test	u _{d,s}	-2.171 mg/m ³	4.713	(mg/m ³) ²
Influence of ambient temperature at span	u _t	1.752 mg/m ³	3.070	(mg/m ³) ²
Influence of supply voltage	u _v	0.790 mg/m ³	0.624	(mg/m ³) ²
Cross sensitivity (interference)	u _i	mg/m ³	2.258	(mg/m ³) ²
Influence of sample gas flow	u _p	mg/m ³	0.067	(mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm}	mg/m ³	1.336	(mg/m ³) 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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	4.23 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	8.30 mg/m ³

Relative total expanded uncertainty

Requirement of 2000/76/EC and 2001/80/EC

Requirement of EN 15267-3

U in % of the ELV 60 mg/m³	13.8
U in % of the ELV 60 mg/m³	20.0
U in % of the ELV 60 mg/m ³	15.0

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

Measuring system

Manufacturer	Horiba Europe GmbH
Name of measuring system	PG-350E
Serial number of the candidates	VC4DFKB9 / XL7LTUL1
Measuring principle	NDIR

Test report

Test laboratory	21217617/A TÜV Rheinland
Date of report	2012-10-08

Measured component

Certification range	CO 0 - 75 mg/m ³
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at reference point	0.50 mg/m ³
Sum of negative CS at reference point	-0.65 mg/m ³
Maximum sum of cross sensitivities	-0.65 mg/m ³
Uncertainty of cross sensitivity	-0.377 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

			u ²	
Standard deviation from paired measurements under field conditions *	u _D	mg/m ³	0.356	(mg/m ³) ²
Lack of fit	u _{lof}	mg/m ³	0.070	(mg/m ³) ²
Zero drift from field test	u _{d,z}	mg/m ³	0.706	(mg/m ³) ²
Span drift from field test	u _{d,s}	-0.675 mg/m ³	0.456	(mg/m ³) ²
Influence of ambient temperature at span	u _t	0.866 mg/m ³	0.750	(mg/m ³) ²
Influence of supply voltage	u _v	0.286 mg/m ³	0.082	(mg/m ³) ²
Cross sensitivity (interference)	u _i	mg/m ³	0.142	(mg/m ³) ²
Influence of sample gas flow	u _p	mg/m ³	0.001	(mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm}	mg/m ³	0.368	(mg/m ³) 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)

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 1.71 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 3.35 \text{ mg/m}^3$$

Relative total expanded uncertainty

U in % of the ELV 50 mg/m³ 6.7

Requirement of 2000/76/EC and 2001/80/EC

U in % of the ELV 50 mg/m³ 10.0

Requirement of EN 15267-3

U in % of the ELV 50 mg/m³ 7.5

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

Measuring system

Manufacturer	Horiba Europe GmbH
Name of measuring system	PG-350E
Serial number of the candidates	VC4DFKB9 / XL7LTUL1
Measuring principle	NDIR

Test report

Test laboratory	TÜV Rheinland
Date of report	2012-10-08

Measured component

Certification range	CO ₂	0 - 20 Vol.-%
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 Vol.-%
Sum of negative CS at zero point	0.00 Vol.-%
Sum of positive CS at reference point	0.00 Vol.-%
Sum of negative CS at reference point	-0.11 Vol.-%
Maximum sum of cross sensitivities	-0.11 Vol.-%
Uncertainty of cross sensitivity	-0.064 Vol.-%

Calculation of the combined standard uncertainty

Tested parameter

			u ²	
Standard deviation from paired measurements under field conditions *	u _D	Vol.-%	0.000	(Vol.-%) ²
Lack of fit	u _{lof}	Vol.-%	0.013	(Vol.-%) ²
Zero drift from field test	u _{d,z}	Vol.-%	0.071	(Vol.-%) ²
Span drift from field test	u _{d,s}	0.238 Vol.-%	0.057	(Vol.-%) ²
Influence of ambient temperature at span	u _t	0.115 Vol.-%	0.013	(Vol.-%) ²
Influence of supply voltage	u _v	0.051 Vol.-%	0.003	(Vol.-%) ²
Cross sensitivity (interference)	u _i	Vol.-%	0.004	(Vol.-%) ²
Influence of sample gas flow	u _p	Vol.-%	0.000	(Vol.-%) ²
Uncertainty of reference material at 70% of certification range	u _{rm}	Vol.-%	0.026	(Vol.-%) 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)	$u_c = \sqrt{\sum (u_{max, j})^2}$	0.43 Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.85 Vol.-%

Relative total expanded uncertainty

Requirement of 2000/76/EC and 2001/80/EC

Requirement of EN 15267-3

U in % of the range 20 Vol.-%	4.2
U in % of the range 20 Vol.-%	10.0**
U in % of the range 20 Vol.-%	7.5

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
The chosen value is recommended by the certification body.

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

Measuring system

Manufacturer	Horiba Europe GmbH
Name of measuring system	PG-350E
Serial number of the candidates	VC4DFKB9 / XL7LTUL1
Measuring principle	Paramagnetism

Test report

Test laboratory	21217617/A TÜV Rheinland
Date of report	2012-10-08

Measured component

Certification range	O ₂ 0 - 25 Vol.-%
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 Vol.-%
Sum of negative CS at zero point	0.00 Vol.-%
Sum of positive CS at reference point	0.00 Vol.-%
Sum of negative CS at reference point	0.00 Vol.-%
Maximum sum of cross sensitivities	0.00 Vol.-%
Uncertainty of cross sensitivity	0.000 Vol.-%

Calculation of the combined standard uncertainty

Tested parameter

			u ²	
Standard deviation from paired measurements under field conditions *	u _D	Vol.-%	0.004	(Vol.-%) ²
Lack of fit	u _{lof}	Vol.-%	0.000	(Vol.-%) ²
Zero drift from field test	u _{d,z}	Vol.-%	0.006	(Vol.-%) ²
Span drift from field test	u _{d,s}	0.092 Vol.-%	0.008	(Vol.-%) ²
Influence of ambient temperature at span	u _t	0.084 Vol.-%	0.007	(Vol.-%) ²
Influence of supply voltage	u _v	0.018 Vol.-%	0.000	(Vol.-%) ²
Cross sensitivity (interference)	u _i	Vol.-%	0.000	(Vol.-%) ²
Influence of sample gas flow	u _p	Vol.-%	0.000	(Vol.-%) ²
Uncertainty of reference material at 70% of certification range	u _{rm}	Vol.-%	0.041	(Vol.-%) 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)	$u_c = \sqrt{\sum (u_{max, j})^2}$	0.26 Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.51 Vol.-%

Relative total expanded uncertainty

Requirement of 2000/76/EC and 2001/80/EC

Requirement of EN 15267-3

U in % of the range 25 Vol.-%	2.0
U in % of the range 25 Vol.-%	10.0**
U in % of the range 25 Vol.-%	7.5

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
The chosen value is recommended by the certification body.