Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000072195

AMS designation:	HORIBA PG-350 P-AMS for CO, NO_X, CO_2 and O_2
Manufacturer:	HORIBA Europe GmbH Hans-Mess-Str. 6 61440 Oberursel Germany
Test Laboratory:	TÜV Rheinland Energy GmbH

This is to certify that the P-AMS has been tested and found to comply with the standards EN 15267-1 (2009), EN 15267-2 (2009), EN 15267-4 (2017), EN 14793 (2017) and EN 14181 (2014).

Certification is awarded in respect of the conditions stated in this certificate (this certificate contains 9 pages).

TÜVRheinland® CERTIFIED

Suitability Tested
EN 15267
QAL1 Certified
Regular Surveillance

www.tuv.com
ID 0000072195

Publication in the German Federal Gazette (BAnz) of 31 July 2020

This certificate will expire on: 30 July 2025

German Federal Environment Agency
Dessau, 07 September 2020

Dr. Marcel Langner
Head of Section II 4.1

TÜV Rheinland Energy GmbH
Cologne, 06 September 2020

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.

10/221 2.08

Test Report:	936/21245114/A dated 13 February 2020
Initial certification:	31 July 2020
Expiry date:	30 July 2025
Publication:	BAnz AT 31.07.2020 B10, chapter I number 4.1

Approved application

The tested P-AMS is suitable for periodic measurements of stationary-source industrial emissions and as a standard reference method for calibrating and validating stationary AMS in the context of QAL2 and AST in accordance with standard EN 14181 at 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 P-AMS for this application was assessed on the basis of a laboratory test and five field tests at different industrial plants. The plants were two municipal waste incinerators, a lignite-fired power plant, a sewage incinerator and a biomass heating plant.

The AMS is approved for an ambient temperature range of +5 °C to +40 °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 and oxygen concentrations 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. 936/21245114/A dated 13 February 2020 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 in the German Federal Gazette: BAnz AT 31.07.2020 B10, chapter I number 4.1, UBA announcement of 27 May 2020:

AMS designation:
HORIBA PG-350 P-AMS for CO, NO_X, CO_2 and O_2

Manufacturer:
HORIBA Europe GmbH**,** Oberursel

Field of application:
Portable AMS for periodic measurements of measurements of emissions from stationary sources and as a standard reference method for calibrating and validating stationary AMS in the context of QAL2 and AST in accordance with standard EN 14181 at plants requiring official approval and plants within the scope of the 27th and 44th BImSchV.

Measuring ranges during performance testing:

Component	Certification range	supplementary range	Unit
CO	0–75	0–6250	mg/m³
NO_x	0–102,5[1)]	0–2050[2)]	mg/m³
CO_2	0–20	-	Vol.-%
O_2	0–25	0–10	Vol.-%

[1)] as NO_2, this corresponds to apx. 0–67 mg/m³ NO
[2)] as NO_2, this corresponds to apx. 0–1340 mg/m³ NO

Software version:
P20007880001F / 1.19

Restrictions:
None

Note:
In the event of temperature changes of more than 6 °C, it must be checked on-site whether the measurement uncertainty is still within the permissible limits.

Test Report:
TÜV Rheinland Energy GmbH, Cologne
Report no.: 936/21245114/A dated 13 February 2020

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

The HORIBA PG-350 P-AMS under test comprises the following components: the PG-350EU analyser, a test gas cooler, a heated sample gas line and a heated sampling probe equipped with a filter.
The analyser measures multiple components and uses component-specific measuring principles. NO_x is measured using chemiluminescence (CLD), CO and CO_2 are determined with the help of infrared absorption (NDIR) and O_2 is measured with the help of paramagnetism.
The gas to be measured is led to the analyser via a heated probe. A heated sample gas line transports the sample gas to the cooling unit and then via an unheated PFTE line to the analyser.
The PSS-5H cooler is used for gas conditioning and is installed in a plastic case, which also contains the sample gas pump. The sample gas line can be heated electrically to a maximum of 200 °C. The PSP4000-H sampling probe is portable and is equipped with an external ceramic filter element. The probe can be set to a maximum temperature of 180 °C.

The HORIBA PG-350 P-AMS under test consists of the following components:

- PG-350EU multigas analyser,
- Gas conditioning cooler type PSS-5H,
- Sample gas pump,
- Heated sample gas line, max 200 °C, made of PFTE, max. length used during performance testing: 5m, and
- PSP4000-H sampling probe, portable and heated to max. 180 °C, ceramic filter, length during performance testing: 1m.

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 HORIBA PG-350 P-AMS measuring system 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.0000072195: 07 September 2020
Expiry date of the certificate: 30 July 2025
Test report 936/21245114/A dated 13 February 2020
TÜV Rheinland Energy GmbH, Cologne
Publication: BAnz AT 31.07.2020 B10, chapter I number 4.1
UBA announcement of 27 May 2020

The following pages present the uncertainty calculations for the individual components. Since separate uncertainty calculations are required for each field test, this certificate indicates the highest uncertainty result determined for each field test. All other uncertainty calculations are summarised in the mentioned performance test.

Calculation of overall uncertainty according to EN 14181 and EN 15267-4 for both systems during field test 3

Measuring system

Manufacturer	HORIBA Europe GmbH
AMS designation	HORIBA PG-350 P-AMS
Serial number of units under test	7DB92A3P / VWG18APN
Measuring principle	Infrared absorption

Test report	936/21245114/A
Test laboratory	TÜV Rheinland
Date of report	13.02.2020

Measured component	CO
Certification range	0 - 75 mg/m³

Evaluation of the cross-sensitivity (CS)
(system with largest CS)
The cross-sensitivities were calculated site-specifically as a function of the exhaust gas matrix at the respective field test facility, taking into account the cross-sensitivity influences determined in the laboratory.

Maximum sum of cross-sensitivities		0.29	mg/m³
Uncertainty of cross-sensitivity	u_i	0.170	mg/m³

Calculation of the combined standard uncertainty

Test parameter				u^2	
Standard deviation laboratory test	u_r	0.160	mg/m³	0.026	(mg/m³)²
Lack of fit	u_{lof}	0.082	mg/m³	0.007	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.260	mg/m³	0.068	(mg/m³)²
Span drift from field test	$u_{d.s}$	-0.823	mg/m³	0.677	(mg/m³)²
Influence of ambient temperature from field	u_t	0.600	mg/m³	0.360	(mg/m³)²
Influence of supply voltage field test specific	u_v	0,000	mg/m³	0.000	(mg/m³)²
Cross-sensitivity field test specific	u_i	0.170	mg/m³	0.029	(mg/m³)²
Influence of sample gas flow field test specific	u_p	0,000	mg/m³	0.000	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.606	mg/m³	0.368	(mg/m³)²

Combined standard uncertainty (u_c)	$u_c = \sqrt{\sum (u_{max,\,j})^2}$	1.24	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1{,}96$	2.43	mg/m³

Relative total expanded uncertainty	**U in % of the range 50 mg/m³**	**4.9**
Requirement of 2010/75/EU	**U in % of the range 50 mg/m³**	**10.0**
Requirement of EN 15267-3	U in % of the range 50 mg/m³	7.5
Requirement for standard reference methods	U in % of the range 50 mg/m³	6.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-4 for both systems during field test 1

Measuring system			
Manufacturer			HORIBA Europe GmbH
AMS designation			HORIBA PG-350 P-AMS
Serial number of units under test			7DB92A3P / VWG18APN
Measuring principle			Infrared absorption
Test report			936/21245114/A
Test laboratory			TÜV Rheinland
Date of report			13.02.2020
Measured component			CO_2
Certification range			0 - 20 Vol.-%

Evaluation of the cross-sensitivity (CS)
(system with largest CS)

The cross-sensitivities were calculated site-specifically as a function of the exhaust gas matrix at the respective field test facility, taking into account the cross-sensitivity influences determined in the laboratory.

Maximum sum of cross-sensitivities		0.05	Vol.-%		
Uncertainty of cross-sensitivity	u_i	0.031	Vol.-%		

Calculation of the combined standard uncertainty

Test parameter				u^2	
Standard deviation laboratory test	u_r	0.020	Vol.-%	0.000	(Vol.-%)²
Lack of fit	u_{lof}	0.081	Vol.-%	0.007	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	0.035	Vol.-%	0.001	(Vol.-%)²
Span drift from field test	$u_{d,s}$	0.173	Vol.-%	0.030	(Vol.-%)²
Influence of ambient temperature from field	u_t	0.346	Vol.-%	0.120	(Vol.-%)²
Influence of supply voltage field test specific	u_v	0,000	Vol.-%	0.000	(Vol.-%)²
Cross-sensitivity field test specific	u_i	0.031	Vol.-%	0.001	(Vol.-%)²
Influence of sample gas flow field test specific	u_p	0,000	Vol.-%	0.000	(Vol.-%)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.162	Vol.-%	0.026	(Vol.-%)²

Combined standard uncertainty (u_c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.43	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1,96$	0.84	Vol.-%

Relative total expanded uncertainty	**U in % of the range 20 Vol.-%**	**4.2**
Requirement of 2010/75/EU	**U in % of the range 20 Vol.-%**	**10.0 ****
Requirement of EN 15267-3	U in % of the range 20 Vol.-%	7.5
Requirement for standard reference methods	U in % of the range 20 Vol.-%	6.0

** The EU-directive 2010/75/EC on industrial emissions does not requirements for this component. A value of 10.0 % was used instead.

Calculation of overall uncertainty according to EN 14181 and EN 15267-4 for both systems during field test 3

Measuring system			
Manufacturer			HORIBA Europe GmbH
AMS designation			HORIBA PG-350 P-AMS
Serial number of units under test			7DB92A3P / VWG18APN
Measuring principle			Chemiluminescence
Test report			936/21245114/A
Test laboratory			TÜV Rheinland
Date of report			13.02.2020
Measured component			NO
Certification range			0 - 67 mg/m³

Evaluation of the cross-sensitivity (CS)
(system with largest CS)
The cross-sensitivities were calculated site-specifically as a function of the exhaust gas matrix at the respective field test facility, taking into account the cross-sensitivity influences determined in the laboratory.

Maximum sum of cross-sensitivities		0.31	mg/m³
Uncertainty of cross-sensitivity	u_i	0.179	mg/m³

Calculation of the combined standard uncertainty

Test parameter				u^2	
Standard deviation laboratory test	u_r	0.100	mg/m³	0.010	(mg/m³)²
Lack of fit	u_{lof}	-0.348	mg/m³	0.121	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.039	mg/m³	0.002	(mg/m³)²
Span drift from field test	$u_{d,s}$	-1.006	mg/m³	1.012	(mg/m³)²
Influence of ambient temperature from field	u_t	0.663	mg/m³	0.440	(mg/m³)²
Influence of supply voltage field test specific	u_v	0,000	mg/m³	0.000	(mg/m³)²
Cross-sensitivity field test specific	u_i	0.179	mg/m³	0.032	(mg/m³)²
Influence of sample gas flow field test specific	u_p	0,000	mg/m³	0.000	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.542	mg/m³	0.293	(mg/m³)²
Converter effciency for AMS measuring NOx	u_{ce}	1.277	mg/m³	1.630	(mg/m³)²

Combined standard uncertainty (u_c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.88	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1{,}96$	3.69	mg/m³

Relative total expanded uncertainty	**U in % of the range 45 mg/m³**	**8.2**
Requirement of 2010/75/EU	**U in % of the range 45 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the range 45 mg/m³	15.0
Requirement for standard reference methods	U in % of the range 45 mg/m³	10.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-4 for both systems during field test 1

Measuring system	
Manufacturer	HORIBA Europe GmbH
AMS designation	HORIBA PG-350 P-AMS
Serial number of units under test	7DB92A3P / VWG18APN
Measuring principle	Paramagnetic
Test report	936/21245114/A
Test laboratory	TÜV Rheinland
Date of report	13.02.2020
Measured component	O_2
Certification range	0 - 25 Vol.-%

Evaluation of the cross-sensitivity (CS)
(system with largest CS)
The cross-sensitivities were calculated site-specifically as a function of the exhaust gas matrix at the respective field test facility, taking into account the cross-sensitivity influences determined in the laboratory.

Maximum sum of cross-sensitivities		0.00	Vol.-%
Uncertainty of cross-sensitivity	u_i	0.000	Vol.-%

Calculation of the combined standard uncertainty

Test parameter				u^2	
Standard deviation laboratory test	u_r	0.010	Vol.-%	0.000	(Vol.-%)²
Lack of fit	u_{lof}	0.016	Vol.-%	0.000	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	-0.017	Vol.-%	0.000	(Vol.-%)²
Span drift from field test	$u_{d,s}$	-0.046	Vol.-%	0.002	(Vol.-%)²
Influence of ambient temperature from field	u_t	0.346	Vol.-%	0.120	(Vol.-%)²
Influence of supply voltage field test specific	u_v	0,000	Vol.-%	0.000	(Vol.-%)²
Cross-sensitivity field test specific	u_i	0.000	Vol.-%	0.000	(Vol.-%)²
Influence of sample gas flow field test specific	u_p	0,000	Vol.-%	0.000	(Vol.-%)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.202	Vol.-%	0.041	(Vol.-%)²

Combined standard uncertainty (u_c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.40	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1{,}96$	0.79	Vol.-%

Relative total expanded uncertainty	**U in % of the range 25 Vol.-%**	**3.2**
Requirement of 2010/75/EU	**U in % of the range 25 Vol.-%**	**10.0 ****
Requirement of EN 15267-3	U in % of the range 25 Vol.-%	7.5
Requirement for standard reference methods	U in % of the range 25 Vol.-%	6.0

** The EU-directive 2010/75/EC on industrial emissions does not requirements for this component. A value of 10.0 % was used instead.