

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000028756_02

Certified AMS: APOA 370 for O₃

Manufacturer: HORIBA, Ltd.
2 Miyanohigashi
Kisshoin Minami-ku
Kyoto 610-8510
Japan

Test Institute: TÜV Rheinland Energie und Umwelt GmbH

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

**VDI 4202-1: 2002, VDI 4203-3: 2004, EN 14625: 2012,
EN 15267-1: 2009 and EN 15267-2: 2009**

Certification is awarded in respect of the conditions stated in this certificate
(see also the following pages).

The present Certificate replaces Certificate 0000028756_01 dated 16 March 2012



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

www.tuv.com
ID 0000028756

Publication in the German Federal Gazette
(BAnz.) of 08 April 2006

German Federal Environment Agency
Dessau, 29 April 2014

i. A. Dr. Marcel Langner

This certificate will expire on:
25 January 2016

TÜV Rheinland Energie und Umwelt GmbH
Cologne, 28 April 2014

ppa. Dr. Peter Wilbring

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Am Grauen Stein
51105 Cologne

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

Certificate:
0000028756_02 / 29 April 2014

Test report: 936/21204643/A of 05 January 2006
Initial certification: 26 January 2011
Date of expiry: 25 January 2016
Publication: BAnz. 08 April 2006, No. 70, p. 2653, chapter IV, No. 3.1

Approved application

The certified AMS is approved for continuous monitoring of Ozone in ambient air (stationary operation). The suitability of the product for this application was assessed on the basis of a laboratory test and a 3 month field test. The AMS is approved for the temperature range from 0 °C to +40 °C.

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

Basis of the certification

This certification is based on:

- test report 936/21204643/A of 05 January 2006 of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH and on the addenda to the test report 936/21204643/A1 of 27 July 2011 and 936/21222689/A of 05 October 2013
- suitability announced by the German Environmental Agency (UBA) as the relevant body
- the ongoing surveillance of the product and the manufacturing process
- publication in the German Federal Gazette (BAnz. 08 April 2006, No. 70, p. 2653, chapter IV, No. 3.1, UBA publication from 21 February 2006)
- publication in the German Federal Gazette (BAnz. 25 August 2009, No. 125, p. 2929, chapter III, notification 3, UBA announcement from 03 August 2009)
- publication in the German Federal Gazette (BAnz. 26 January 2011, No. 14, p. 294, chapter IV, notification 8, UBA announcement from 10 January 2011)
- publication in the German Federal Gazette (BAnz. 02 March 2012, No. 36, p. 920, chapter V, notification 15, UBA announcement from 23 February 2012)
- publication in the German Federal Gazette (BAnz AT 05 March 2013 B10, chapter V, notification 9, UBA announcement from 12 February 2013)
- publication in the German Federal Gazette (BAnz AT 01 April 2014 B12, chapter VI, notification 28, UBA announcement from 27 February 2014)

AMS name:

APOA 370

Manufacturer:

HORIBA, Ltd., Kyoto 610-8510, Japan

Distributor:

HORIBA Europe GmbH, 42799 Leichlingen

Approval:

For continuous monitoring of Ozone in ambient air (stationary operation).

Measuring ranges during the suitability test:

O₃ 0 – 360 µg/m³
0 – 500 µg/m³

Software:

Version P1000878001C

Test institute:

TÜV Immissionsschutz und Energiesysteme GmbH, Köln
TÜV Rheinland Group

Test report:

No. 936/21204643/A of 5 January 2006

3 Notification on the announcement of the Federal Environment Agency of 21 February 2006 (BAnz. p. 2655)

The current software version of the ambient air measuring system APOA 370 of the company Horiba Europe GmbH is:

P1000878001J

As an option, the pump of the type GD-6 EH of the company Horiba can be used alongside the so far used measured gas pump type N 86 KNE of the company KNF.

Statement of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH of 31 March 2009

8 Notification on the announcement of the Federal Environment Agency of 21 February 2006 (BAnz. p. 2653, chapter IV, No. 3.1) and of 3 August 2009 (BAnz. p. 2929, chapter III, 3rd notification)

The APOA 370 measuring system by Horiba Ltd., Japan and Horiba Europe GmbH for component O₃ fulfils the requirements of EN 14625. Moreover, the production and quality management of the APOA 370 measuring system for component O₃ complies with the requirements of EN 15267.

The report of the suitability test is available on the internet at www.qal1.de.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 6 October 2010

15 Notification on the announcement of the Federal Environment Agency of 21 February 2006 (BAnz. p. 2653, chapter IV, No. 3.1) and of 10 January 2011 (BAnz. p. 294, chapter IV 8th notification)

There is an addendum to the test report 936/21204643/A for the APOA 370 measuring system by Horiba Ltd., Japan and Horiba Europe GmbH for the component O₃. The addendum has the report number 936/21204643/A1 and is an integral part of the test report 936/21204643/A after its publication and is also published on www.qal1.de.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 3 November 2011

9 Notification on the announcement of the Federal Environment Agency of 21 February 2006 (Federal Gazette (BAnz.) p. 2653, chapter IV, No. 3.1) and of 23 February 2012 (Federal Gazette (BAnz.) p. 920, chapter V 15th notification)

The APOA 370 measuring system for O₃ manufactured by Horiba Ltd., Japan and Horiba Europe GmbH can be optionally equipped with an additional calibration gas inlet. Calibration gas can be fed either before or after the sample gas filter by means of an additional three-way valve.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 11 October 2012

28 Notification on the announcement of the Federal Environment Agency of 21 February 2006 (BAnz. p. 2653, chapter IV No 3.1) and of 12 February 2013 (BAnz AT 05 March 2013 B10, chapter V 9th notification)

The measuring system APOA 370 for O₃ by Horiba Ltd., Japan and Horiba Europe GmbH fulfils the requirements of Standard DIN EN 14625 (dated December 2012). An addendum that is an integral part of the test report 936/21222689/A can be viewed on the internet at www.qal1.de. In addition to use with the type D06T-24 PH housing ventilation by Nidec as used so far, the measuring system can also be fitted with a type 3412 NGV regulated ventilator by Papst.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 8 October 2013

Certified product

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

The ambient air measuring system APOA 370 is based on the measuring principle of UV- absorption.

Sampled Air is drawn continuously through an optical absorption cell, where it is irradiated by monochromatic radiation, centered on 253.7 nm, from a stabilized low-pressure mercury (Hg) discharge lamp. The UV-radiation, which passes through the absorption cell, is measured by a sensitive photodiode and converted to a measurable electrical signal. Absorption of this radiation by the sampled air within the absorption cell is a measure of the Ozone concentration in the air. A catalytic converter clears the sample air selective from Ozone. The measuring principle complies with the reference measuring principle stated in the Standard EN 14625 in section 5.2.

First the sample air passes a filter, where coarse dirt particles are filtered out. Afterwards it is separated in two gas flows (measuring and reference gas). The analyzer contains a single cuvette. Via a 3 way magnetic valve measuring and reference gas are conducted to the cuvette. The reference gas is cleared of the ozone by a catalytic converter. The cuvette irradiated by monochromatic radiation, centered on 253.7 nm, from a stabilized low-pressure mercury (Hg) discharge lamp. The UV-radiation, which passes through the absorption cell, is measured by a sensitive photodiode and converted to a measurable electrical signal. The difference of the UV-Absorption of measuring and reference gas is a rate of the ozone concentration in the ambient air

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 is presented on page 1 of this certificate.

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 the validity is also accessible on the internet: **qal1.de**.

Certification of APOA 370 Ozone Analyzer 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: 936/21204643/A of 5 January 2006
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Köln
Publication: BAnz. 08 April 2006, No. 70, p. 2653, chapter IV, No. 3.1
Announcement by UBA from 21 February 2006

Notifications:

Publication: BAnz. 25 August 2009, No. 125, p. 2929, chapter III, notification 3
Announcement by UBA from 3 August 2009

Publication: BAnz. 26 January 2011, No. 14, p. 294, chapter IV, notification 8
Announcement by UBA from 10 January 2011

Publication: BAnz. 02 March 2012, No. 36, p. 920, chapter V, notification 15
Announcement by UBA from 23 February 2012

Publication: BAnz AT 05 March 2013 B10, chapter V, notification 9,
announcement by UBA from 12 February 2013

Publication: BAnz AT 01 April 2014 B12, chapter VI, notification 28
Announcement by UBA from 27 February 2014

Initial certification according to EN 15267:

Certificate No. 0000028756: 09 February 2011

Validity of the certificate until: 25 January 2016

Test report: 936/21204643/A of 05 January 2006
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Köln

Publication: BAnz. 26 January 2011, No. 14, p. 294, chapter IV, notification 8
Announcement by UBA from 10 January 2011

Notification according to EN 15267:

Certificate No. 0000028756_01: 16 March 2012

Validity of the certificate until: 25 January 2016

Certificate No. 0000028756_02: 29 April 2014

Validity of the certificate until: 25 January 2016

1st notification on changes to the certificate according to EN 15267

Addendum to test report 936/21204643/A1 from 27 July 2011

TÜV Rheinland Energie und Umwelt GmbH, Köln

Publication: BAnz. 02 March 2012, No. 36, p. 920, chapter V, notification 15
UBA announcement from 23 February 2012

2nd notification on changes to the certificate according to EN 15267

Addendum to test report 936/21222689/A from 05 October 2013

TÜV Rheinland Energie und Umwelt GmbH, Köln

Publication: BAnz AT 01 April 2014 B12, chapter VI, notification 28
Announcement by UBA from 27 February 2014

Expanded uncertainty based on the results of the laboratory testing of System 1

Measuring device:		Serial-No.:		1h-alert threshold:		nmol/mol	
Horiba APOA 370		SN 10041		120			
Measured component:		Performance criterion		Result		Square of partial uncertainty	
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty		
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.250	$u_{r,z}$	0.06	0.0042	
2	Repeatability standard deviation at 1h-alert threshold	≤ 3.0 nmol/mol	0.140	$u_{r,h}$	0.10	0.0107	
3	"lack of fit" at 1h-alert threshold	≤ 4.0% of measured value	-1.100	$u_{l,h}$	-0.76	0.5808	
4	Sensitivity coefficient of sample gas pressure at 1h-alert threshold	≤ 2.0 nmol/mol/kPa	0.023	u_{sp}	0.27	0.0755	
5	Sensitivity coefficient of sample gas temperature at 1h-alert threshold	≤ 1.0 nmol/mol/K	0.090	u_{Tt}	1.15	1.3333	
6	Sensitivity coefficient of surrounding temperature at 1h-alert threshold	≤ 1.0 nmol/mol/K	0.360	u_{st}	1.56	2.4300	
7	Sensitivity coefficient of electrical voltage at 1h-alert threshold	≤ 0.30 nmol/mol/V	0.000	u_v	0.00	0.0000	
8a	Interferent H ₂ O with 21 mmol/mol	≤ 10 nmol/mol (Zero) ≤ 10 nmol/mol (Span)	-0.100 0.270	u_{H_2O}	0.11	0.0120	
8b	Interferent Toluene with 0,5 µmol/mol	≤ 5.0 nmol/mol (Zero) ≤ 5.0 nmol/mol (Span)	0.070 0.740	$u_{int,pos}$ or	0.64	0.4146	
8c	Interferent Xylene with 0,5 µmol/mol	≤ 5.0 nmol/mol (Zero) ≤ 5.0 nmol/mol (Span)	0.100 0.840	$u_{int,neg}$			
9	Averaging effect	≤ 7.0% of measured value	1.400	u_{av}	0.97	0.9408	
18	Difference sample/calibration port	≤ 1.0%	0.000	u_{sc}	0.00	0.0000	
21	Uncertainty of test gas	≤ 3.0%	2.000	u_{tg}	1.20	1.4400	
Combined standard uncertainty				u_c		2.6911	nmol/mol
Expanded uncertainty				U		5.3821	nmol/mol
Relative expanded uncertainty				W		4.49	%
Maximum allowed expanded uncertainty				W_{req}		15	%

Expanded uncertainty based on the results of the laboratory testing of System 2

Measuring device:		Serial-No.:		SN 10042	
Measured component:		1h-alert threshold:		120	
Horiba APOA 370		O3		nmol/mol	
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.170	u _{r,z} 0.04	0.0020
2	Repeatability standard deviation at 1h-alert threshold	≤ 3.0 nmol/mol	0.135	u _{r,lv} 0.10	0.0103
3	"lack of fit" at 1h-alert threshold	≤ 4.0% of measured value	-0.700	u _{lv} -0.48	0.2352
4	Sensitivity coefficient of sample gas pressure at 1h-alert threshold	≤ 2.0 nmol/mol/kPa	0.013	u _{gp} 0.16	0.0253
5	Sensitivity coefficient of sample gas temperature at 1h-alert threshold	≤ 1.0 nmol/mol/K	0.100	u _{gt} 1.30	1.6875
6	Sensitivity coefficient of surrounding temperature at 1h-alert threshold	≤ 1.0 nmol/mol/K	0.390	u _{st} 1.69	2.8519
7	Sensitivity coefficient of electrical voltage at 1h-alert threshold	≤ 0.30 nmol/mol/V	0.000	u _v 0.00	0.0000
8a	Interferent H ₂ O with 21 mmol/mol	≤ 10 nmol/mol (Zero) ≤ 10 nmol/mol (Span)	-0.770 0.140	u _{H2O} -0.12	0.0149
8b	Interferent Toluene with 0.5 µmol/mol	≤ 5.0 nmol/mol (Zero) ≤ 5.0 nmol/mol (Span)	0.100 0.300	u _{int,pos} or	0.3388
8c	Interferent Xylene with 0.5 µmol/mol	≤ 5.0 nmol/mol (Zero) ≤ 5.0 nmol/mol (Span)	0.100 1.100	u _{int,neg}	
9	Averaging effect	≤ 7.0% of measured value	-0.300	u _{av} -0.21	0.0432
18	Difference sample/calibration port	≤ 1.0%	0.000	u _{psc} 0.00	0.0000
21	Uncertainty of test gas	≤ 3.0%	2.000	u _{cg} 1.20	1.4400
				u _c	2.5786
				U	5.1571
				W	4.30
				W _{req}	15
				Expanded uncertainty	nmol/mol
				Relative expanded uncertainty	nmol/mol
				Maximum allowed expanded uncertainty	%

Expanded uncertainty based on the results of the laboratory and field testing of System 1

Measuring device:		Serial-No.:		SN 10041		nmol/mol	
Measured component:		1h-alert threshold:		120			
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty		
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.250	$U_{r,z}$	0.06	0.0042	
2	Repeatability standard deviation at 1h-alert threshold	≤ 3.0 nmol/mol	0.140	$U_{r,h}$	not considered, as $u_{r,h} = 0.1 < u_{r,f}$	-	
3	"lack of fit" at 1h-alert threshold	≤ 4.0% of measured value	-1.100	$U_{l,h}$	-0.76	0.5808	
4	Sensitivity coefficient of sample gas pressure at 1h-alert threshold	≤ 2.0 nmol/mol/kPa	0.023	U_{sp}	0.27	0.0755	
5	Sensitivity coefficient of sample gas temperature at 1h-alert threshold	≤ 1.0 nmol/mol/K	0.090	U_{gt}	1.15	1.3333	
6	Sensitivity coefficient of surrounding temperature at 1h-alert threshold	≤ 1.0 nmol/mol/K	0.360	U_{st}	1.56	2.4300	
7	Sensitivity coefficient of electrical voltage at 1h-alert threshold	≤ 0.30 nmol/mol/V	0.000	U_v	0.00	0.0000	
8a	Interferent H ₂ O with 21 nmol/mol	≤ 10 nmol/mol (Zero)	-0.100	$U_{h,20}$	0.11	0.0120	
		≤ 10 nmol/mol (Span)	0.270				
8b	Interferent Toluene with 0.5 µmol/mol	≤ 5.0 nmol/mol (Zero)	0.070	$U_{int,pos}$			
		≤ 5.0 nmol/mol (Span)	0.740	or	0.64	0.4146	
8c	Interferent Xylene with 0.5 µmol/mol	≤ 5.0 nmol/mol (Zero)	0.100	$U_{int,neg}$			
		≤ 5.0 nmol/mol (Span)	0.840				
9	Averaging effect	≤ 7.0% of measured value	1.400	U_{av}	0.97	0.9408	
10	Reproducibility standard deviation under field conditions	≤ 5.0% of average over 3 months	2.180	$U_{r,f}$	2.62	6.8435	
11	Long term drift at zero level	≤ 5.0 nmol/mol	-0.900	$U_{d,l,z}$	-0.52	0.2700	
12	Long term drift at span level	≤ 5.0% of max. of certification range	-3.890	$U_{d,l,h}$	-2.70	7.2634	
18	Difference sample/calibration port	≤ 1.0%	0.000	U_{sac}	0.00	0.0000	
21	Uncertainty of test gas	≤ 3.0%	2.000	U_{sg}	1.20	1.4400	
Combined standard uncertainty						u_c	4.6484
Expanded uncertainty						U	9.2969
Relative expanded uncertainty						W	7.75
Maximum allowed expanded uncertainty						W_{req}	15

Expanded uncertainty based on the results of the laboratory and field testing of System 2

Measuring device:		Serial-No.:		SN 10042		nmol/mol	
Measured component:		1h-alert threshold:		120			
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty		
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.170	u _{r,z}	0.04	0.0020	
2	Repeatability standard deviation at 1h-alert threshold	≤ 3.0 nmol/mol	0.135	u _{r,h}	not considered, as u _{r,h} = 0.1 < u _{r,f}	-	
3	"lack of fit" at 1h-alert threshold	≤ 4.0% of measured value	-0.700	u _{l,h}	-0.48	0.2352	
4	Sensitivity coefficient of sample gas pressure at 1h-alert threshold	≤ 2.0 nmol/mol/kPa	0.013	u _{gp}	0.16	0.0253	
5	Sensitivity coefficient of sample gas temperature at 1h-alert threshold	≤ 1.0 nmol/mol/K	0.100	u _{gt}	1.30	1.6875	
6	Sensitivity coefficient of surrounding temperature at 1h-alert threshold	≤ 1.0 nmol/mol/K	0.390	u _{st}	1.69	2.8519	
7	Sensitivity coefficient of electrical voltage at 1h-alert threshold	≤ 0.30 nmol/mol/V	0.000	u _v	0.00	0.0000	
8a	Interferent H ₂ O with 21 mmol/mol	≤ 10 nmol/mol (Zero)	-0.770	u _{H₂O}	-0.12	0.0149	
		≤ 10 nmol/mol (Span)	0.140				
8b	Interferent Toluene with 0.5 µmol/mol	≤ 5.0 nmol/mol (Zero)	0.100	u _{tol,pos}			
		≤ 5.0 nmol/mol (Span)	0.300	or			
8c	Interferent Xylene with 0.5 µmol/mol	≤ 5.0 nmol/mol (Zero)	0.100	u _{xt,neg}	0.58	0.3388	
		≤ 5.0 nmol/mol (Span)	1.100				
9	Averaging effect	≤ 7.0% of measured value	-0.300	u _{av}	-0.21	0.0432	
10	Reproducibility standard deviation under field conditions	≤ 5.0% of average over 3 months	2.180	u _{r,f}	2.62	6.8435	
11	Long term drift at zero level	≤ 5.0 nmol/mol	-1.100	u _{l,z}	-0.64	0.4033	
12	Long term drift at span level	≤ 5.0% of max. of certification range	-3.670	u _{l,h}	-2.54	6.4651	
18	Difference sample/calibration port	≤ 1.0%	0.000	u _{ssc}	0.00	0.0000	
21	Uncertainty of test gas	≤ 3.0%	2.000	u _{cg}	1.20	1.4400	
Combined standard uncertainty						u _c	4.5112
Expanded uncertainty						U	9.0223
Relative expanded uncertainty						W	7.52
Maximum allowed expanded uncertainty						W _{req}	15