

# CERTIFICATE

about Product Conformity (QAL1)

Number of Certificate: 0000028756\_01

**Certified AMS:** APOA 370 for O<sub>3</sub>

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

**Test Institute:** TÜV Rheinland Energie und Umwelt GmbH

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

**VDI 4202-1: 2002, VDI 4203-3: 2004, EN 14625: 2005,  
EN 15267-1: 2009, 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 No. 0000028756 of 09 February 2011.



- Complying with 2008/50/EC
- TUV approved
- Annual Inspection

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

The certificate is valid until:  
25 January 2016

Umweltbundesamt  
Dessau, 16 March 2012

TÜV Rheinland Energie und Umwelt GmbH  
Köln, 15 March 2012

i. A. Dr. Hans-Joachim Hummel

ppa. Dr. Peter Wilbring

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Am Grauen Stein  
51105 Köln

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

<b>Test report:</b>	936/21204643/A of 05 January 2006
<b>First certification:</b>	26 January 2011
<b>Run of validity until:</b>	25 January 2016
<b>Publication</b>	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 the ambient air application on 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 addendum to the test report 936/21204643/A1 of 27 July 2011
- 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)



**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:**

O<sub>3</sub> 0 – 360 µg/m<sup>3</sup>  
0 – 500 µg/m<sup>3</sup>

**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 with regard to the UBA announcement 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 with regard to the UBA announcement of 21 February 2006 (BAnz. p. 2653, chapter IV, No. 3.1) and of 3 August 2009 (BAnz. p. 2929, chapter III, 3<sup>rd</sup> notification)

The APOA 370 measuring system by Horiba Ltd., Japan and Horiba Europe GmbH for component O<sub>3</sub> fulfils the requirements of EN 14625. Moreover, the production and quality management of the APOA 370 measuring system for component O<sub>3</sub> complies with the requirements of EN 15267.

The report of the suitability test is available on the internet at [www.qal1.de](http://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. 2.1) and of 10 January 2011 (BAnz. p. 294, chapter IV, 8<sup>th</sup> 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 O<sub>3</sub>. 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](http://www.qal1.de).

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

**Certified product**

This certificate applies to automated measurement systems confirming 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.

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 validity 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 Address: **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: Addendum to test report 936/21204643/A1 from 27 July 2011

**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

Expanded Uncertainty of the result of the laboratory test for system 1 (in the test report a combined evaluation of both systems is stated in one table)

Measuring system:		Horiba APOA 370		Serial number		SN 10041	
Component		O3		Level of the hourly alert threshold value		120	
No	Standard uncertainty due to	Performance criterion	Result	Value of partial uncertainty	Value of partial uncertainty squared	nmol/mol	
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.250	$u_{rz}$	0.03	0.0010	
2	Repeatability standard deviation at concentration $c_1$ (at a level of the hourly threshold)	≤ 3.0 nmol/mol	0.140	$u_{lv}$	0.05	0.0027	
3	Lack of fit at the hourly alert threshold	≤ 4.0% of the measured value	0.400	$u_{lv}$	0.28	0.0768	
4	Variation in sample gas pressure at the hourly alert threshold	≤ 2.0 nmol/mol/kPa	0.023	$u_{gp}$	0.27	0.0755	
5	Variation in sample gas temperature at the hourly alert threshold	≤ 1.0 nmol/mol/K	0.090	$u_{gt}$	1.15	1.3333	
6	Variation in surrounding temperature at the hourly alert threshold	≤ 1.0 nmol/mol/K	0.360	$u_{st}$	1.56	2.4300	
7	Variation in electrical voltage at the hourly alert threshold	≤ 0.30 nmol/mol/V	0.000	$u_v$	0.00	0.0000	
8a	Presence of water vapour with concentration 21 nmol/mol	≤ 10 nmol/mol	0.165	$u_{H_2O}$	0.11	0.0124	
8b	Presence of toluene with concentration 0.5 µmol/mol	≤ 5.0 nmol/mol	0.519	$u_{tol, pos}$	0.64	0.4146	
8c	Presence of xylene with concentration mit 0.5 µmol/mol	≤ 5.0 nmol/mol	0.596	oder $u_{tol, neg}$			
9	Averaging error	≤ 7.0% of the measured value	1.400	$u_{av}$	0.97	0.9408	
18	Difference sample / calibration port	≤ 1.0%	0.000	$u_{bsc}$	0.00	0.0000	
23	Uncertainty calibration gas	≤ 3.0%	2.000	ucg	1.20	1.4400	
				Combined standard uncertainty		$u_c$	
				Expanded uncertainty		$U_c$	
				Relative expanded uncertainty		$U_{c,rel}$	
				Maximum expanded uncertainty		$U_{rel,rel}$	
						nmol/mol	
						nmol/mol	
						%	
						%	

Expanded Uncertainty of the result of the laboratory test for system 2 (in the test report a combined evaluation of both systems is stated in one table)

Measuring system:		Horiba APOA 370		Serial number		SN 10042	
Component		O3		Level of the hourly alert threshold value		120	
No	Standard uncertainty due to	Performance criterion	Result	Value of partial uncertainty	Value of partial uncertainty squared	nmol/mol	
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.170	$u_{i,z}$	0.02	0.0005	
2	Repeatability standard deviation at concentration $c_i$ (at a level of the hourly threshold)	≤ 3.0 nmol/mol	0.135	$u_{i,v}$	0.05	0.0025	
3	Lack of fit at the hourly alert threshold	≤ 4.0% of the measured value	0.400	$u_{i,v}$	0.28	0.0768	
4	Variation in sample gas pressure at the hourly alert threshold	≤ 2.0 nmol/mol/kPa	0.013	$u_{gp}$	0.16	0.0253	
5	Variation in sample gas temperature at the hourly alert threshold	≤ 1.0 nmol/mol/K	0.100	$u_{gt}$	1.30	1.6875	
6	Variation in surrounding temperature at the hourly alert threshold	≤ 1.0 nmol/mol/K	0.390	$u_{st}$	1.69	2.8519	
7	Variation in electrical voltage at the hourly alert threshold	≤ 0.30 nmol/mol/V	0.000	$u_v$	0.00	0.0000	
8a	Presence of water vapour with concentration 21 nmol/mol	≤ 10 nmol/mol	-0.180	$u_{w20}$	0.12	0.0148	
8b	Presence of toluene with concentration 0.5 µmol/mol	≤ 5.0 nmol/mol	0.234	$u_{tol,pos}$	0.58	0.3388	
8c	Presence of xylene with concentration mit 0.5 µmol/mol	≤ 7.0% of the measured value	0.774	oder $u_{xt,neg}$			
9	Averaging error	≤ value	-0.300	$u_{av}$	-0.21	0.0432	
18	Difference sample / calibration port	≤ 1.0%	0.000	$u_{bac}$	0.00	0.0000	
23	Uncertainty calibration gas	≤ 3.0%	2.000	0	1.20	1.4400	
Combined standard uncertainty				$u_c$		2.5458 nmol/mol	
Expanded uncertainty				$U_c$		5.0917 nmol/mol	
Relative expanded uncertainty				$U_{c,rel}$		4.24 %	
Maximum expanded uncertainty				$U_{rel,rel}$		15 %	



Expanded Uncertainty of the result of the laboratory and field test for system 1 (in the test report a combined evaluation of both systems is stated in one table)

Measuring system:		Horiba APOA 370		Serial number		SN 10041	
Component		O3		Level of the hourly alert threshold value		120	
No	Standard uncertainty due to	Performance criterion	Result	Value of partial uncertainty	Value of partial uncertainty squared	nmol/mol	
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.250	u <sub>r,z</sub>	0.03	0.0010	
2	Repeatability standard deviation at concentration c <sub>i</sub> (at a level of the hourly threshold)	≤ 3.0 nmol/mol	0.140	u <sub>r,iv</sub>	not considered, because u <sub>r,iv</sub> = 0.05 < u <sub>r,f</sub>	-	
3	Lack of fit (at the hourly alert threshold)	≤ 4.0% of the measured value	0.400	u <sub>lv</sub>	0.28	0.0768	
4	Variation in sample gas pressure at the hourly alert threshold	≤ 2.0 nmol/mol/kPa	0.023	u <sub>gp</sub>	0.27	0.0755	
5	Variation in sample gas temperature at the hourly alert threshold	≤ 1.0 nmol/mol/K	0.090	u <sub>gt</sub>	1.15	1.3333	
6	Variation in surrounding temperature at the hourly alert threshold	≤ 1.0 nmol/mol/K	0.360	u <sub>st</sub>	1.56	2.4300	
7	Variation in electrical voltage	≤ 0.30 nmol/mol/V	0.000	u <sub>v</sub>	0.00	0.0000	
8a	Presence of water vapour with concentration 21 nmol/mol	≤ 10 nmol/mol	0.165	u <sub>wz</sub>	0.11	0.0124	
8b	Presence of toluene with concentration 0.5 µmol/mol	≤ 5.0 nmol/mol	0.519	u <sub>lipos</sub>	0.64	0.4146	
8c	Presence of xylene with concentration mit 0.5 µmol/mol	≤ 5.0 nmol/mol	0.596	oder u <sub>nit,neg</sub>			
9	Averaging error	≤ 7.0% of the measured value	1.400	u <sub>av</sub>	0.97	0.9408	
10	Reproducibility under field conditions	≤ 5.0% of the average of a three month period	2.180	u <sub>rf</sub>	2.62	6.8435	
11	Long term drift at zero	≤ 5.0 nmol/mol	-0.900	u <sub>d,z</sub>	-0.52	0.2700	
12	Long term drift at the hourly alert threshold	≤ 5.0% of Max. of cert. range	-3.890	u <sub>d,iv</sub>	-2.70	7.2634	
18	Difference sample / calibration port	≤ 1.0%	0.000	u <sub>bsc</sub>	0.00	0.0000	
23	Uncertainty calibration gas	≤ 3.0%	2.000	ucg	1.20	1.4400	
Combined standard uncertainty				u <sub>c</sub>		4.5936	
Expanded uncertainty				U <sub>c</sub>		9.1872	
Relative expanded uncertainty				U <sub>c,rel</sub>		7.66	
Maximum expanded uncertainty				U <sub>req,rel</sub>		15	

Expanded Uncertainty of the result of the laboratory and field test for system 2 (in the test report a combined evaluation of both systems is stated in one table)

Measuring system:		Serial number		Level of the hourly alert threshold value		SN 10042	
Component		Horiba APOA 370		O3		120	
No	Standard uncertainty due to	Performance criterion	Result	Value of partial uncertainty	Value of partial uncertainty squared	nmol/mol	
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.170	$u_{r,z}$	0.0005		
2	Repeatability standard deviation at concentration $c_i$ (at a level of the hourly threshold)	≤ 3.0 nmol/mol	0.135	$u_{r,iv}$	not considered because $u_{r,iv} = 0.05 < u_{r,f}$		
3	Lack of fit (at the hourly alert threshold)	≤ 4.0% of the measured value	0.400	$u_{l,iv}$	0.28	0.0768	
4	Variation in sample gas pressure at the hourly alert threshold	≤ 2.0 nmol/mol/kPa	0.013	$u_{gp}$	0.16	0.0253	
5	Variation in sample gas temperature at the hourly alert threshold	≤ 1.0 nmol/mol/K	0.100	$u_{gt}$	1.30	1.6875	
6	Variation in surrounding temperature at the hourly alert threshold	≤ 1.0 nmol/mol/K	0.390	$u_{st}$	1.69	2.8519	
7	Variation in electrical voltage	≤ 0.30 nmol/mol/V	0.000	$u_v$	0.00	0.0000	
8a	Presence of water vapour with concentration 21 mmol/mol	≤ 10 nmol/mol	-0.180	$u_{H_2O}$	0.12	0.0148	
8b	Presence of toluene with concentration 0.5 µmol/mol	≤ 5.0 nmol/mol	0.234	$u_{tol, pos}$	0.58	0.3388	
8c	Presence of xylene with concentration mit 0.5 µmol/mol	≤ 5.0 nmol/mol	0.774	oder $u_{xyr, neg}$			
9	Averaging error	≤ 7.0% of the measured value	-0.300	$u_{av}$	-0.21	0.0432	
10	Reproducibility under field conditions	≤ 5.0% of the average of a three month period	2.180	$u_{r,f}$	2.62	6.8435	
11	Long term drift at zero	≤ 5.0 nmol/mol	-1.100	$u_{d,z}$	-0.64	0.4033	
12	Long term drift at the hourly alert threshold	≤ 5.0% of Max. of cert. range	-3.670	$u_{d,iv}$	-2.54	6.4651	
18	Difference sample / calibration port	≤ 1.0%	0.000	$u_{bse}$	0.00	0.0000	
23	Uncertainty calibration gas	≤ 3.0%	2.000	0	1.20	1.4400	
Combined standard uncertainty						$u_c$	4.4934
Expanded uncertainty						$U_c$	8.9868
Relative expanded uncertainty						$U_{c,rel}$	7.49
Maximum expanded uncertainty						$U_{req,rel}$	15