CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000028756_05

Certified AMS:	APOA 370 for O_3
Manufacturer:	Horiba Ltd. 2 Miyanohigashi Kisshoin Minami-ku / Kyoto 610-8510 Japan
Test Institute:	TÜV Rheinland Energy & Environment GmbH

This is to certify that the AMS has been tested and found to comply with the standards VDI 4202-1 (2010), VDI 4203-3 (2010), EN 14625 (2012), as well as EN 15267-1 (2009) and EN 15267-2 (2023).

Certification is awarded in respect of the conditions stated in this certificate (this certificate contains 14 pages).
The present certificate replaces certificate 0000028756_04 dated 25 January 2021.

TÜVRheinland® CERTIFIED
Suitability Tested
Complying with 2008/50/EC
EN 15267
Regular Surveillance
www.tuv.com
ID 0000028756

Publication in the German Federal Gazette (BAnz) of 8 April 2006

German Environment Agency

Dessau, 22 January 2026

This certificate will expire on:
25 January 2031

TÜV Rheinland
Energy & Environment GmbH
Cologne, 21 January 2026

Dr. Marcel Langner
Head of Section II 4

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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 the certificate D-PL-11120-02-00.

Test report:	936/21204643/A dated 5 January 2006
Initial certification:	26 January 2011
Expiry date:	25 January 2031
Certificate:	Renewal (of previous certificate 0000028756_04 of 25 January 2021 valid until 25 January 2026)
Publication:	BAnz. 08 April 2006, No. 70, p. 2653, chapter IV No. 3.1

Approved application

The tested AMS is suitable for continuous immission measurement of O_3 in stationary use.

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a three-month field test.

The AMS is approved for an ambient temperature range of 0 °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 measured values relevant to the application.

Any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for the intended use.

Basis of the certification

This certification is based on:

- Test report 936/21204643/A dated 5 January 2006 of TÜV Immissionsschutz und Energiesysteme GmbH
- Addenda 936/21204643/A1 dated 27 July 2011 and 936/21222689/A dated 5 October 2013
- 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. 08 April 2006, No. 70, p. 2653, chapter IV No. 3.1, Announcement by UBA dated 21 February 2006:

AMS designation:
APOA 370

Manufacturer:
HORIBA, Ltd., Kyoto 610-8510, Japan
Distribution: HORIBA Europe GmbH, 42799 Leichlingen

Field of application:
For continuous monitoring of O_3 in ambient air (stationary operation)

Measuring ranges during the performance test:
Measuring ranges during performance testing

O_3	0 – 360	µg/m³
	0 – 500	µg/m³

Software version:
Version P1000878001C

Test institute:
TÜV Immissionsschutz und Energiesysteme GmbH, Cologne
TÜV Rheinland Group
Report No.:
936/21204643/A dated 5 January 2006

Publication in the German Federal Gazette: BAnz. 25. August 2009, Nr. 125, S. 2929, Chap. III notification 3, Announcement by UBA dated 3 August 2009:

3 Notification as regards Federal Environment Agency notice of 21 February 2006 (BAnz. p. 2655)

The latest software version of the APOA 370 ambient air measuring system manufactured by Horiba Europe GmbH is:
P1000878001J
The type GS-6-EH sample gas pump manufactured by Horiba may be used instead of the N 86 KNE sample gas pump manufactured by KNF.

Statement issued by TÜV Immissionsschutz und Energiesysteme GmbH dated 31 March 2009

Publication in the German Federal Gazette: BAnz. 26. Januar 2011, Nr. 14, S. 294, Chap. IV notification 8, Announcement by UBA dated 10 January 2011:

8 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (BAnz. p. 2653, chapter IV number 3.1) and of 3 August 2009 (BAnz. p. 2929, chapter III notification 3)

The APOA 370 measuring system for O_3 manufactured by Horiba Ltd, Japan, and Horiba Europe GmbH meets the requirements defined in standard EN 14625. Furthermore, the manufacturing process and the quality management for the Model APOA 370 for O_3 measuring system meet the requirements of EN 15267.
The test report on performance testing is available on the internet at www.qal1.de.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 6-10-2010

Publication in the German Federal Gazette: BAnz. 02. März 2012, Nr. 36, S. 920, Chap. V notification 15, Announcement by UBA dated 23 February 2012:

15 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (p. 2653, chapter IV number 3.1) and of 10 January 2011 (BAnz. p. 294, chapter IV notification 8)

There is an addendum to test report No. 936/21204643/A for thee APOA 370 measuring system for O_3 manufactured by Horiba, Ltd., Japan and Horiba Europe GmbH.
The addendum is assigned report No. 936/21204643/A1 and after its publication is an integral part of the test report No. 936/21204643/A and is also available online at www.qal1.de.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 3-11-2011

Publication in the German Federal Gazette: BAnz AT 05.03.2013 B10, Chap. V notification 9, Announcement by UBA dated 12 February 2013:

9 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (p. 2653, chapter IV number 3.1) and of 23 February 2012 (BAnz. p. 920, chapter V notification 15)

The APOA 370 measuring system for O_3 manufactured by Horiba Ltd, Japan, and Horiba Europe GmbH may optionally be equipped with an additional calibration port. Calibration gas may be fed upstream or downstream of the sample gas filter using a three-way valve.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 11-10-2012

Publication in the German Federal Gazette: BAnz AT 01.04.2014 B12, Chap. VI notification 28, Announcement by UBA dated 27 February 2014:

28 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (p. 2653, chapter IV number 3.1) and of 12 February 2013 (BAnz AT 05.03.2013 B10, chapter V notification 9)

The APOA 370 measuring system for O_3 manufactured by Horiba Ltd, Japan, and Horiba Europe GmbH meets the requirements defined in standard EN 14625 (December 2012 version). An addendum as integral part of test report No. 936/21222689/A is available online at www.qal1.de.
In addition to the Nidec case fan type D06T-24 PH previously used, the measuring system may also be equipped with a controlled fan type 3412 NGV manufactured by Papst.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 8-10-2013

Publication in the German Federal Gazette: BAnz AT 01.08.2016 B11, Chap. V notification 32, Announcement by UBA dated 14 July 2016:

32 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (p. 2653, chapter IV number 3.1) and of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter VI notification 27)

The APOA-370 measuring system for O_3 manufactured by HORIBA Ltd. is equipped with a new display which, in design and functionality, largely corresponds to its predecessor. In addition, the power supply ZWS-BAF may also be used.

The current software version of the measuring system APOA-370 for O_3 is:

P1000878001K

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 29-2-2016.

Publication in the German Federal Gazette: BAnz AT 22.07.2019 B8, Chap. V notification 11, Announcement by UBA dated 28 June 2019:

11 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (BAnz. p. 2653, chapter IV number 3.1) and of 14 July 2016 (BAnz AT 01.08.2016 B11, chapter V notification 32)

The latest software version of the APOA-370 for O_3 manufactured by HORIBA Ltd. is:

P1000878001L

The rear of the housing was modified to cater for additional cable connections. In future, it will be possible to use a type QT-4A measuring cell.

Statement issued by TÜV Rheinland Energy GmbH dated 5 March 2019

Publication in the German Federal Gazette: BAnz AT 24.03.2020 B7, Chap. IV notification 55, Announcement by UBA dated 24 February 2020:

55 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (p. 2653, chapter IV number 3.1) and of 28 June 2019 (BAnz AT 22.07.2019 B8, chapter V notification 11)

The latest software version of the APOA-370 for O_3 manufactured by HORIBA Ltd. is:

P1000878001M

Statement issued by TÜV Rheinland Energy GmbH dated 20 September 2019

Publication in the German Federal Gazette: BAnz AT 03.05.2021 B9, Chap. III notification 37, Announcement by UBA dated 31 March 2021:

37 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (BAnz. p. 2653, chapter IV number 3.1) and of 24 February 2020 (BAnz AT 24.03.2020 B7, chapter IV notification 55)

The latest software version of the APOA-370 measuring system for O_3 manufactured by HORIBA Ltd. is:

P1000878001N.

Statement issued by TÜV Rheinland Energy GmbH dated 08 September 2020

Publication in the German Federal Gazette: BAnz AT 11.04.2022 B10, Chap. VI notification 14, Announcement by UBA dated 9 March 2022:

14 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (BAnz. p. 2653, chapter IV number 3.1) and of 31 March 2021 (BAnz AT 03.05.2021 B9, chapter III notification 37)

The immission measuring device APOA-370 for O_3 of the company HORIBA Ltd. can be equipped with a new heater for the light source block in the future. The new heater has the part number 3200837467.

Statement issued by TÜV Rheinland Energy GmbH dated 12 September 2021

Publication in the German Federal Gazette: BAnz AT 20.03.2023 B6, Chap. IV notification 73, Announcement by UBA dated 21 February 2023:

73 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (BAnz. p. 2653, chapter IV number 3.1) and of 9 March 2022 (BAnz AT 11.04.2022 B10, chapter VI notification 14)

The current software version of the APOA-370 measuring system for O_3 from the company HORIBA Ltd. is:

P1000878001P

The measuring system can also be equipped with an LCD display type TL-0267L2 from the manufacturer AUO.

Statement issued by TÜV Rheinland Energy GmbH dated 13 September 2022

Publication in the German Federal Gazette: BAnz AT 19.05.2025 B3, Chap. IV notification 79, Announcement by UBA dated 2 April 2025:

79 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (BAnz. p. 2653, chapter IV number 3.1) and of 21 February 2023 (BAnz AT 20.03.2023 B6, chapter IV notification 73)

The current software version of the APOA-370 measuring system for O_3 from HORIBA Ltd. is

P1000878001Q

Statement issued by TÜV Rheinland Energy & Environment GmbH dated 26 September 2024

Certified product

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

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

The measuring principle complies with the reference measuring method described in section 5.2 of Standard EN 14625 (2012).

The sample air first passes a filter in the APOA 370, where coarse dirt particles are filtered out. It is then divided in two gas flows (measuring and reference gas) The analyser is equipped with a single measurement cuvette. A 3-way magnetic valve directs measuring and reference gas to the cuvette. A catalytic converter removes ozone from the reference gas. The cuvette irradiated by monochromatic radiation, centred 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 measure 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 Energy & Environment 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 certification mark may be applied to the product or used in advertising materials for the certified product.

This document as well as the certification mark remains property of TÜV Rheinland Energy & Environment GmbH. With revocation of the publication the certificate loses its validity. After the expiration of the certificate and on requests of the TÜV Rheinland Energy & Environment 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**.

History of documents
Certification of APOA 370 is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

Basic test
Test report: 936/21204643/A dated 5 January 2006
TÜV Immissionsschutz und Energiesysteme GmbH
Publication: BAnz. 08 April 2006, No. 70, p. 2653, chapter IV number 3.1
UBA announcement dated 21 February 2006

Notifications
Statement issued by TÜV Immissionsschutz und Energiesysteme GmbH
dated 31 March 2009
Publication: BAnz. 25 August 2009, No. 125, p. 2929, chapter III notification 3
UBA announcement dated 3 August 2009
(Soft- and hardware changes)

Initial certification according to EN 15267
Certificate No. 0000028756_00: 9 February 2011
Expiry date of the certificate: 25 January 2016
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 6 October 2010
Test report: 936/21204643/A dated 5 January 2006
Publication: BAnz. 26 January 2011, No. 14, p. 294, chapter IV number 8
UBA announcement dated 10 January 2011

Certificate based on a notification
Certificate No. 0000028756_01: 16 March 2012
Expiry date of the certificate: 25 January 2016
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 3 November 2011
Test report: 936/21204643/A1 dated 27 July 2011
Publication: BAnz. 02 March 2012, No. 36, p. 920, chapter V number 15
UBA announcement dated 23 February 2012

Notifications
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 11 October 2012
Publication: BAnz AT 05.03.2013 B10, chapter V notification 9
UBA announcement dated 12 February 2013
(Hardware change)

Certificate based on a notification
Certificate No. 0000028756_02: 29 April 2014
Expiry date of the certificate: 25 January 2016
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 8 October 2013
Test report: 936/21222689/A dated 5 October 2013
Publication: BAnz AT 01.04.2014 B12, chapter VI number 28
UBA announcement dated 27 February 2014

Renewal of certificates
Certificate No. 0000028756_03: 21 January 2016
Expiry date of the certificate: 25 January 2021

Notifications
Statement issued by TÜV Rheinland Energy GmbH dated 29 February 2016
Publication: BAnz AT 01.08.2016 B11, chapter V notification 32
UBA announcement dated 14 July 2016
(Soft- and hardware changes and new system name)

Statement issued by TÜV Rheinland Energy GmbH dated 5 March 2019
Publication: BAnz AT 22.07.2019 B8, chapter V notification 11
UBA announcement dated 28 June 2019
(Soft- and hardware changes)

Statement issued by TÜV Rheinland Energy GmbH dated 20 September 2019
Publication: BAnz AT 24.03.2020 B7, chapter IV notification 55
UBA announcement dated 24 February 2020
(Software changes)

Renewal of certificates
Certificate No. 0000028756_04: 25 January 2021
Expiry date of the certificate: 25 January 2026

Notifications
Statement issued by TÜV Rheinland Energy GmbH dated 8 September 2020
Publication: BAnz AT 03.05.2021 B9, chapter III notification 37
UBA announcement dated 31 March 2021
(Software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 12 September 2021
Publication: BAnz AT 11.04.2022 B10, chapter VI notification 14
UBA announcement dated 9 March 2022
(Hardware changes)

Statement issued by TÜV Rheinland Energy GmbH dated 13 September 2022
Publication: BAnz AT 20.03.2023 B6, chapter IV notification 73
UBA announcement dated 21 February 2023
(Soft- and hardware changes)

Statement issued by TÜV Rheinland Energy & Environment GmbH dated 26 September 2024
Publication: BAnz AT 19.05.2025 B3, chapter IV notification 79
UBA announcement dated 2 April 2025
(Software changes)

Renewal of certificates
Certificate No. 0000028756_05: 26 January 2026
Expiry date of the certificate: 25 January 2031

Expanded uncertainty laboratory, system 1

Measuring device:	Horiba APOA 370	Serial-No.:	SN 10041		
Measured component:	O3	1h-alert threshold:	120	nmol/mol	

No.	Performance characteristic		Performance criterion	Result	Partial uncertainty		Square of partial uncertainty
1	Repeatability standard deviation at zero	≤	1.0 nmol/mol	0.250	$u_{i,z}$	0.06	0.0042
2	Repeatability standard deviation at 1h-alert threshold	≤	3.0 nmol/mol	0.140	$u_{i,lh}$	0.10	0.0107
3	"lack of fit" at 1h-alert threshold	≤	4.0% of measured value	-1.100	$u_{j,lh}$	-0.76	0.5808
4	Sensitivity coefficient of sample gas pressure at 1h-alert threshold	≤	2.0 nmol/mol/kPa	0.023	u_{gp}	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_2O with 21 mmol/mol	≤	10 nmol/mol (Zero)	-0.100	u_{H2O}	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	$u_{int,pos}$ or $u_{int,neg}$	0.64	0.4146
		≤	5.0 nmol/mol (Span)	0.740			
8c	Interferent Xylene with 0,5 µmol/mol	≤	5.0 nmol/mol (Zero)	0.100			
		≤	5.0 nmol/mol (Span)	0.840			
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	$u_{\Delta sc}$	0.00	0.0000
21	Uncertainty of test gas	≤	3.0%	2.000	u_{cg}	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 laboratory, system 2

Measuring device:	Horiba APOA 370	Serial-No.:	SN 10042		
Measured component:	O3	1h-alert threshold:	120	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	$u_{r,Iv}$	0.10		0.0103	
3	"lack of fit" at 1h-alert threshold	≤	4.0% of measured value	-0.700	$u_{l,Iv}$	-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_2O 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	$u_{Int,pos}$	or	0.58	0.3388	
		≤	5.0 nmol/mol (Span)	0.300					
8c	Interferent Xylene with 0,5 µmol/mol	≤	5.0 nmol/mol (Zero)	0.100	$u_{Int,neg}$				
		≤	5.0 nmol/mol (Span)	1.100					
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_{Dsc}	0.00		0.0000	
21	Uncertainty of test gas	≤	3.0%	2.000	ucg	1.20		1.4400	

Combined standard uncertainty	u_c	2.5786	nmol/mol
Expanded uncertainty	U	5.1571	nmol/mol
Relative expanded uncertainty	W	4.30	%
Maximum allowed expanded uncertainty	W_{req}	15	%

Combined uncertainty, laboratory and field, system 1

Measuring device: Horiba APOA 370 | Serial-No.: SN 10041

Measured component: O3 | 1h-alert threshold: 120 nmol/mol

No.	Performance characteristic		Performance criterion	Result	Partial uncertainty		Square of partial uncertainty
1	Repeatability standard deviation at zero	≤	1.0 nmol/mol	0.250	$u_{r,z}$	0.06	0.0042
2	Repeatability standard deviation at 1h-alert threshold	≤	3.0 nmol/mol	0.140	$u_{r,lh}$	not considered, as ur,lh = 0.1 < ur,f	-
3	"lack of fit" at 1h-alert threshold	≤	4.0% of measured value	-1.100	$u_{l,lh}$	-0.76	0.5808
4	Sensitivity coefficient of sample gas pressure at 1h-alert threshold	≤	2.0 nmol/mol/kPa	0.023	u_{gp}	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_2O with 21 mmol/mol	≤	10 nmol/mol (Zero)	-0.100	u_{H2O}	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	$u_{int,pos}$ or $u_{int,\ neg}$	0.64	0.4146
		≤	5.0 nmol/mol (Span)	0.740			
8c	Interferent Xylene with 0,5 µmol/mol	≤	5.0 nmol/mol (Zero)	0.100			
		≤	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	$u_{d,l,lh}$	-2.70	7.2634
18	Difference sample/calibration port	≤	1.0%	0.000	$u_{\Delta sc}$	0.00	0.0000
21	Uncertainty of test gas	≤	3.0%	2.000	u_{cg}	1.20	1.4400

Combined standard uncertainty	u_c	4.6484	nmol/mol
Expanded uncertainty	U	9.2969	nmol/mol
Relative expanded uncertainty	W	7.75	%
Maximum allowed expanded uncertainty	W_{req}	15	%

Combined uncertainty, laboratory and field, system 2

Measuring device:	Horiba APOA 370			Serial-No.:	SN 10042	
Measured component:	O3			1h-alert threshold:	120	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	$u_{r,lh}$	not considered, as ur,lh = 0.1 < ur,f	-
3	"lack of fit" at 1h-alert threshold	≤	4.0% of measured value	-0.700	$u_{l,lh}$	-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_20 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	$u_{Int,pos}$ or $u_{Int,neg}$	0.58	0.3388
		≤	5.0 nmol/mol (Span)	0.300			
8c	Interferent Xylene with 0,5 µmol/mol	≤	5.0 nmol/mol (Zero)	0.100			
		≤	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	$u_{d,l,z}$	-0.64	0.4033
12	Long term drift at span level	≤	5.0% of max. of certification range	-3.670	$u_{d,l,lh}$	-2.54	6.4651
18	Difference sample/calibration port	≤	1.0%	0.000	$u_{\Delta sc}$	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	nmol/mol
Expanded uncertainty	U	9.0223	nmol/mol
Relative expanded uncertainty	W	7.52	%
Maximum allowed expanded uncertainty	W_{req}	15	%