CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000028757_05

Certified AMS:	APSA 370 for SO_2
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 14212 (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 0000028757_04 dated 25 January 2021.

TÜVRheinland® CERTIFIED
Suitability Tested
Complying with 2008/50/EC
EN 15267
Regular Surveillance
www.tuv.com
ID 0000028757

Publication in the German Federal Gazette (BAnz) of 14 October 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
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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 the certificate D-PL-11120-02-00.

Test report:	936/21204643/D dated 7 July 2006
Initial certification:	26 January 2011
Expiry date:	25 January 2031
Certificate:	Renewal (of previous certificate 0000028757_04 of 25 January 2021 valid until 25 January 2026)
Publication:	BAnz. 14 October 2006, No. 194, p. 6715, chapter IV No. 2.1

Approved application

The tested AMS is suitable for continuous immission measurement of SO_2 in stationary use.

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a four 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/D dated 7 July 2006 of TÜV Immissionsschutz und Energiesysteme GmbH
- Addenda 936/21204643/D1 dated 27 July 2011 and 936/21222689/D 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. 14 October 2006, No. 194, p. 6715, chapter IV No. 2.1, Announcement by UBA dated 12 September 2006:

AMS designation:
APSA 370

Manufacturer:
HORIBA, Ltd., Kyoto, Japan
Distribution: HORIBA Europe GmbH, Leichlingen

Field of application:
For continuous ambient air monitoring of sulphur dioxide (stationary operation)

Measuring ranges during the performance test:

Component	Measurement ranges	Unit
SO_2	0 - 700	µg/m³
	0 - 1,000	µg/m³

Software version:
P1000878001C

Test institute:
TÜV Immissionsschutz und Energiesysteme GmbH, Cologne
TÜV Rheinland Group

Report No.:
936/21204643/D dated 7 July 2006

Publication in the German Federal Gazette: BAnz. 25. August 2009, Nr. 125, S. 2929, Chap. III notification 4, Announcement by UBA dated 3 August 2009:

4 Notification as regards Federal Environment Agency notice of 12 September 2006 (BAnz. p. 6717)

The latest software version of the APSA 370 ambient air measuring system manufac-tured by Horiba Europe GmbH is:
P1000878001J

The type GD-6 EH sample gas pump manufactured by Horiba may be used instead of the N 86.0 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. 02. März 2012, Nr. 36, S. 920, Chap. IV notification 7, Announcement by UBA dated 23 February 2012:

7 Notification as regards Federal Environment Agency (UBA) notices of 12 September 2006 (BAnz. p. 6715, chapter IV number 2.1) and of 3 August 2009 (BAnz. p. 2929, chapter III notification 4)

The APSA 370 measuring system for SO_2 manufactured by Horiba Ltd, Japan, and Horiba Europe GmbH meets the requirements defined in standard EN 14212. Furthermore, the manufacturing process and the quality management for the Model APSA 370 for SO_2 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 18, Announcement by UBA dated 23 February 2012:

18 Notification as regards Federal Environment Agency (UBA) notices of 12 September 2006 (p. 6715, chapter IV number 2.1) and of 10 January 2011 (BAnz. p. 294, chapter IV notification 7)

There is an addendum to test report No. 936/21204643/D for the APSA 370 measuring system for SO_2 manufactured by Horiba, Ltd., Japan and Horiba Europe GmbH. The addendum is assigned report No. 936/21204643/D1 and after its publication is an integral part of the test report No. 936/21204643/D 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 10, Announcement by UBA dated 12 February 2013:

10 Notification as regards Federal Environment Agency (UBA) notices of 12 September 2006 (p. 6715, chapter IV number 2.1) and of 23 February 2012 (BAnz. p. 920, chapter V notification 18)

The APSA 370 measuring system for SO_2 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 October 2012

Publication in the German Federal Gazette: BAnz AT 01.04.2014 B12, Chap. VI notification 29, Announcement by UBA dated 27 February 2014:

29 Notification as regards Federal Environment Agency (UBA) notices of 12 September 2006 (p. 6715, chapter IV number 2.1) and of 12 February 2013 (BAnz AT 05.03.2013 B10, chapter V notification 10)

The APSA 370 measuring system for SO_2 manufactured by Horiba Ltd, Japan, and Horiba Europe GmbH meets the requirements defined in standard EN 14212 (November 2012 version). An addendum as integral part of test report No. 936/21222689/D is available online at www.qal1.de. In addition to the reference diode type S7798 used so far for measuring the UV light intensity a type S12698 (TO5) diode may be used.

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

Publication in the German Federal Gazette: BAnz AT 01.08.2016 B11, Chap. V notification 33, Announcement by UBA dated 14 July 2016:

33 Notification as regards Federal Environment Agency (UBA) notices of 12 September 2006 (BAnz. p. 6715, chapter IV number 2.1) and of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter VI notification 29)

The APSA-370 measuring system for SO_2 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 APSA-370 measuring system for SO_2 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 12, Announcement by UBA dated 28 June 2019:

12 Notification as regards Federal Environment Agency (UBA) notices of 12 September 2006 (BAnz. p. 6715, chapter IV number 2.1) and of 14 July 2016 (BAnz AT 01.08.2016 B11, chapter V notification 33)

The latest software version of the APSA-370 for SO_2 manufactured by HORIBA Ltd. is:
P1000878001L

The rear of the housing was modified to cater for additional cable connections. Instead of the xenon lamp type L4646 with opaque socket, the new version of this lamp with a transparent socket and the same designation may be used.

Statement issued by TÜV Rheinland Energy GmbH dated 5 March 2019

Publication in the German Federal Gazette: BAnz AT 07.05.2020 B8, Chap. III notification 3, Announcement by UBA dated 31 March 2020:

3 Notification as regards Federal Environment Agency (UBA) notices of 12 September 2006 (p. 6715, chapter IV number 2.1) and of 28 June 2019 (BAnz AT 22.07.2019 B8, chapter V notification 12)

The latest software version of the APSA-370 for SO_2 manufactured by HORIBA Ltd. is:
P1000878001M

The xenon lamp may optionally be equipped with an additional fixation.

Statement issued by TÜV Rheinland Energy GmbH dated 06 December 2019

Publication in the German Federal Gazette: BAnz AT 03.05.2021 B9, Chap. III notification 38, Announcement by UBA dated 31 March 2021:

38 Notification as regards Federal Environment Agency (UBA) notices of 12 September 2006 (BAnz. p. 6715, chapter IV number 2.1) and of 31 March 2020 (BAnz AT 07.05.2020 B8, chapter III notification 3)

The latest software version of the APSA-370 measuring system for SO_2 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 15, Announcement by UBA dated 9 March 2022:

18 Notification as regards Federal Environment Agency (UBA) notices of 12 September 2006 (BAnz. p. 6715, chapter IV number 2.1) and of 31 March 2021 (BAnz AT 03.05.2021 B9, chapter III notification 38)

The immission measuring device APSA-370 for SO_2 of the company HORIBA Ltd. can be equipped with a new heater for the measuring cell 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 74, Announcement by UBA dated 21 February 2023:

74 Notification as regards Federal Environment Agency (UBA) notices of 12 September 2006 (BAnz. p. 6715, chapter IV number 2.1) and of 9 March 2022 (BAnz AT 11.04.2022 B10, chapter VI notification 15)

The current software version of the APSA-370 measuring system for SO_2 from the company HORIBA Ltd. is:
P1000878001P

The measuring system can also be equipped with an LCD display of the 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 80, Announcement by UBA dated 2 April 2025:

80 Notification as regards Federal Environment Agency (UBA) notices of 12 September 2006 (BAnz. p. 6715, chapter IV number 2.1) and of 21 February 2023 (BAnz AT 20.03.2023 B6, chapter IV notification 74)

The current software version of the APSA-370 measuring system for SO_2 from HORIBA Ltd. is
P1000878001Q

Statement issued by TÜV Rheinland Energy & Environment GmbH dated 26-9-2024

Certified product

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

The APSA 370 SO_2 analyser measures sulphur dioxide by means of ultraviolet fluorescence.

The measuring principle corresponds to the setup and functioning of the measuring principle described in EN 14212 (2012) section 5.2 for the component SO_2.

The sample air first passes a filter in the APSA 370, where coarse dirt particles are filtered out. The sample is drawn through the appropriate inlet. First, the sampled air is drawn through a hydrocarbon scrubber to remove any interference by aromatic hydrocarbons that may be present. SO_2 molecules remain unaffected. The sample is than introduced into a reaction chamber, where it is irradiated by UV light in the wave-length range between 200 nm and 220 nm. The radiation excites the SO_2 molecules energetically. The 4 mirrors upstream of UV lamp only allow those wavelengths to pass which excite the SO_2 molecules.

When the SO_2 molecules return to their lower energy state, they emit UV fluorescent light in a wavelength range of 240 nm to 420 nm. Only this light reaches the photomultiplier (PMT) after having passed the filter. The PMT measures the UV emission and converts it to an electric signal. A photo detector at the end of the reaction chamber continuously measures the lamp radiation and corrects the measuring result in the event of fluctuations.

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 APSA 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/D dated 7 July 2006
TÜV Immissionsschutz und Energiesysteme GmbH
Publication: BAnz. 14 October 2006, No. 194, p. 6715, chapter IV number 2.1
UBA announcement dated 12 September 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 4
UBA announcement dated 3 August 2009
(Soft- and hardware changes)

Initial certification according to EN 15267
Certificate No. 0000028757_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/D dated 7 July 2006
Publication: BAnz. 02 March 2012, No. 36, p. 920, chapter IV number 7
UBA announcement dated 23 February 2012

Certificate based on a notification
Certificate No. 0000028757_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/D1 dated 27 July 2011
Publication: BAnz. 02 March 2012, No. 36, p. 920, chapter V number 18
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 10
UBA announcement dated 12 February 2013
(Hardware change)

Certificate based on a notification
Certificate No. 0000028757_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/D dated 5 October 2013
Publication: BAnz AT 01.04.2014 B12, chapter VI number 29
UBA announcement dated 27 February 2014

Renewal of certificates
Certificate No. 0000028757_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 33
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 12
UBA announcement dated 28 June 2019
(Soft- and hardware changes)

Statement issued by TÜV Rheinland Energy GmbH dated 6 December 2019
Publication: BAnz AT 07.05.2020 B8, chapter III notification 3
UBA announcement dated 31 March 2020
(Soft- and hardware changes)

Renewal of certificates
Certificate No. 0000028757_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 38
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 15
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 74
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 80
UBA announcement dated 2 April 2025
(Software changes)

Renewal of certificates
Certificate No. 0000028757_05: 22 January 2026
Expiry date of the certificate: 25 January 2031

Expanded uncertainty laboratory, system 1

Measuring device:	Horiba APSA 370	Serial-No.:	SN 10012
Measured component:	SO2	1h-limit value:	132 nmol/mol

No.	Performance characteristic	Performance criterion	Result	Partial uncertainty		Square of partial uncertainty
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.070	$u_{r,z}$	0.02	0.0005
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.140	$u_{r,lh}$	0.39	0.1507
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0.600	$u_{l,lh}$	0.46	0.2091
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0.020	u_{gp}	0.17	0.0291
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	-0.010	u_{gt}	-0.09	0.0079
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.060	u_{st}	0.54	0.2871
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	-0.010	u_V	-0.10	0.0101
8a	Interferent H_20 with 21 mmol/mol	≤ 10 nmol/mol (Zero)	0.070	u_{H2O}	-0.56	0.3179
		≤ 10 nmol/mol (Span)	-1.500			
8b	Interferent H_2S with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	-0.100	$u_{int,pos}$	2.25	5.0840
		≤ 5.0 nmol/mol (Span)	0.030			
8c	Interferent NH_3 with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.000			
		≤ 5.0 nmol/mol (Span)	-0.400			
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Zero)	3.010			
		≤ 5.0 nmol/mol (Span)	4.200	or		
8e	Interferent NO_2 with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.070			
		≤ 5.0 nmol/mol (Span)	-0.500			
8f	Interferent m-Xylene with 1 µmol/mol	≤ 10 nmol/mol (Zero)	0.030			
		≤ 10 nmol/mol (Span)	0.470	$u_{int,neg}$		
9	Averaging effect	≤ 7.0% of measured value	-3.600	u_{av}	-2.74	7.5272
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}	1.32	1.7424

Combined standard uncertainty	u_c	3.9200	nmol/mol
Expanded uncertainty	U	7.8399	nmol/mol
Relative expanded uncertainty	W	5.94	%
Maximum allowed expanded uncertainty	W_{req}	15	%

TÜVRheinland®
Precisely Right.

Expanded uncertainty laboratory, system 2

Measuring device:	Horiba APSA 370	Serial-No.:	SN 10011		
Measured component:	SO2	1h-limit value:	132	nmol/mol	

No.	Performance characteristic	Performance criterion	Result	Partial uncertainty		Square of partial uncertainty	
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.080	$u_{r,z}$	0.02	0.0006	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.130	$u_{r,lh}$	0.36	0.1315	
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	-0.800	$u_{l,lh}$	-0.61	0.3717	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0.010	u_{gp}	0.09	0.0073	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	-0.090	u_{gt}	-0.80	0.6361	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.250	u_{st}	2.22	4.9081	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.020	u_V	0.20	0.0405	
8a	Interferent H_2O with 21 mmol/mol	≤ 10 nmol/mol (Zero)	0.070	u_{H2O}	-0.59	0.3432	
		≤ 10 nmol/mol (Span)	-1.530				
8b	Interferent H_2S with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	-0.030	$u_{int,pos}$		4.9344	
		≤ 5.0 nmol/mol (Span)	0.570				
8c	Interferent NH_3 with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.000	or	2.22		
		≤ 5.0 nmol/mol (Span)	-0.270				
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Zero)	3.100				
		≤ 5.0 nmol/mol (Span)	3.710				
8e	Interferent NO_2 with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.100				
		≤ 5.0 nmol/mol (Span)	-0.930				
8f	Interferent m-Xylene with 1 µmol/mol	≤ 10 nmol/mol (Zero)	0.030				
		≤ 10 nmol/mol (Span)	0.230	$u_{int,neg}$			
9	Averaging effect	≤ 7.0% of measured value	-4.300	u_{av}	-3.28	10.7390	
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}	1.32	1.7424	

Combined standard uncertainty	u_c	4.8841	nmol/mol
Expanded uncertainty	U	9.7683	nmol/mol
Relative expanded uncertainty	W	7.40	%
Maximum allowed expanded uncertainty	W_{req}	15	%

Combined uncertainty, laboratory and field, system 1

Measuring device: Horiba APSA 370 | Serial-No.: SN 10012

Measured component: SO2 | 1h-limit value: 132 nmol/mol

No.	Performance characteristic		Performance criterion	Result	Partial uncertainty		Square of partial uncertainty	
1	Repeatability standard deviation at zero	≤	1.0 nmol/mol	0.070	$u_{r,z}$	0.02	0.0005	
2	Repeatability standard deviation at 1h-limit value	≤	3.0 nmol/mol	0.140	$u_{r,lh}$	not considered, as $u_{r,lh} = 0{,}38 < u_{r,f}$	-	
3	"lack of fit" at 1h-limit value	≤	4.0% of measured value	0.600	$u_{l,lh}$	0.46	0.2091	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤	2.0 nmol/mol/kPa	0.020	u_{gp}	0.17	0.0291	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤	1.0 nmol/mol/K	-0.010	u_{gt}	-0.09	0.0079	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤	1.0 nmol/mol/K	0.060	u_{st}	0.54	0.2871	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤	0.30 nmol/mol/V	-0.010	u_V	-0.10	0.0101	
8a	Interferent H_20 with 21 mmol/mol	≤	10 nmol/mol (Zero)	0.070				
		≤	10 nmol/mol (Span)	-1.500	u_{H2O}	-0.56	0.3179	
8b	Interferent H_2S with 200 nmol/mol	≤	5.0 nmol/mol (Zero)	-0.100				
		≤	5.0 nmol/mol (Span)	0.030	$u_{int,pos}$			
8c	Interferent NH_3 with 200 nmol/mol	≤	5.0 nmol/mol (Zero)	0.000				
		≤	5.0 nmol/mol (Span)	-0.400				
8d	Interferent NO with 500 nmol/mol	≤	5.0 nmol/mol (Zero)	3.010				
		≤	5.0 nmol/mol (Span)	4.200	or	2.25	5.0840	
8e	Interferent NO_2 with 200 nmol/mol	≤	5.0 nmol/mol (Zero)	0.070				
		≤	5.0 nmol/mol (Span)	-0.500				
8f	Interferent m-Xylene with 1 µmol/mol	≤	10 nmol/mol (Zero)	0.030				
		≤	10 nmol/mol (Span)	0.470	$u_{int,neg}$			
9	Averaging effect	≤	7.0% of measured value	-3.600	u_{av}	-2.74	7.5272	
10	Reproducibility standard deviation under field conditions	≤	5.0% of average over 3 months	4.240	$u_{r,f}$	5.60	31.3242	
11	Long term drift at zero level	≤	4.0 nmol/mol	0.800	$u_{d,l,z}$	0.46	0.2133	
12	Long term drift at span level	≤	5.0% of max. of certification range	1.310	$u_{d,l,lh}$	1.00	0.9967	
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}	1.32	1.7424	
					Combined standard uncertainty	u_c	6.9101	nmol/mol
					Expanded uncertainty	U	13.8202	nmol/mol
					Relative expanded uncertainty	W	10.47	%
					Maximum allowed expanded uncertainty	W_{req}	15	%

Combined uncertainty, laboratory and field, system 2

Measuring device: Horiba APSA 370 — Serial-No.: SN 10011

Measured component: SO2 — 1h-limit value: 132 nmol/mol

No.	Performance characteristic		Performance criterion	Result	Partial uncertainty		Square of partial uncertainty
1	Repeatability standard deviation at zero	≤	1.0 nmol/mol	0.080	$u_{r,z}$	0.02	0.0006
2	Repeatability standard deviation at 1h-limit value	≤	3.0 nmol/mol	0.130	$u_{r,lh}$	not considered, as $u_{r,lh} = 0,36 < u_{r,f}$	-
3	"lack of fit" at 1h-limit value	≤	4.0% of measured value	-0.800	$u_{l,lh}$	-0.61	0.3717
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤	2.0 nmol/mol/kPa	0.010	u_{gp}	0.09	0.0073
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤	1.0 nmol/mol/K	-0.090	u_{gt}	-0.80	0.6361
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤	1.0 nmol/mol/K	0.250	u_{st}	2.22	4.9081
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤	0.30 nmol/mol/V	0.020	u_V	0.20	0.0405
8a	Interferent H_20 with 21 mmol/mol	≤	10 nmol/mol (Zero)	0.070			
		≤	10 nmol/mol (Span)	-1.530	u_{H2O}	-0.59	0.3432
8b	Interferent H_2S with 200 nmol/mol	≤	5.0 nmol/mol (Zero)	-0.030			
		≤	5.0 nmol/mol (Span)	0.570	$u_{int,pos}$		
8c	Interferent NH_3 with 200 nmol/mol	≤	5.0 nmol/mol (Zero)	0.000			
		≤	5.0 nmol/mol (Span)	-0.270			
8d	Interferent NO with 500 nmol/mol	≤	5.0 nmol/mol (Zero)	3.100			
		≤	5.0 nmol/mol (Span)	3.710	or	2.22	4.9344
8e	Interferent NO_2 with 200 nmol/mol	≤	5.0 nmol/mol (Zero)	0.100			
		≤	5.0 nmol/mol (Span)	-0.930			
8f	Interferent m-Xylene with 1 µmol/mol	≤	10 nmol/mol (Zero)	0.030			
		≤	10 nmol/mol (Span)	0.230	$u_{int,neg}$		
9	Averaging effect	≤	7.0% of measured value	-4.300	u_{av}	-3.28	10.7390
10	Reproducibility standard deviation under field conditions	≤	5.0% of average over 3 months	4.240	$u_{r,f}$	5.60	31.3242
11	Long term drift at zero level	≤	4.0 nmol/mol	0.700	$u_{d,l,z}$	0.40	0.1633
12	Long term drift at span level	≤	5.0% of max. of certification range	0.630	$u_{d,l,lh}$	0.48	0.2305
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}	1.32	1.7424

Combined standard uncertainty	u_c	7.4459 nmol/mol
Expanded uncertainty	U	14.8918 nmol/mol
Relative expanded uncertainty	W	11.28 %
Maximum allowed expanded uncertainty	W_{req}	15 %