

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000028757_03

Certified AMS: APSA 370 for SO₂

Manufacturer: HORIBA, Ltd.
2 Miyano Higashi
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 certified
according to the standards**

**VDI 4202-1 (2002), VDI 4203-3 (2004), EN 14212 (2012),
EN 15267-1 (2009) and EN 15267-2 (2009)**

Certification is awarded in respect of the conditions stated in this certificate
(This certificate contains 10 pages).

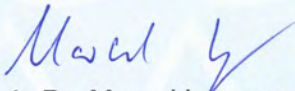


Suitability Tested
Complying with
2008/50/EC
EN 15267
Regular
Surveillance

www.tuv.com
ID 0000028757


Publication in the German Federal Gazette
(BAnz.) of 26 January 2011

German Federal Environment Agency
Dessau, 21 January 2016


i. A. Dr. Marcel Langner

This certificate will expire on:
25 January 2021

TÜV Rheinland Energie und Umwelt GmbH
Cologne, 20 January 2016


ppa. Dr. Peter Wilbring

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TÜV Rheinland Energie und Umwelt GmbH
Am Grauen Stein
51105 Cologne

Test institute accredited to EN ISO/IEC 17025:2005 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.

Certificate:
0000028757_03 / 21 January 2016

Test report: 936/21204643/D of 07 July 2006
Initial certification: 26 January 2011
Certification: renewal (previous certificate 0000028757_02 of 29 April 2014
valid until 25 January 2016)
Date of expiry: 25 January 2021
Publication: BAnz. 14 October 2006, No. 194, p. 6715, chapter IV, No. 2.1

Approved application

The certified AMS is approved for continuous monitoring of SO₂ in ambient air (stationary operation). The suitability of the product for this application was assessed on the basis of a laboratory test and a four month field test.

The AMS is approved for the 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 valid at the time of performance testing. As changes in legal regulations are possible, any potential user should ensure that this AMS is suitable for monitoring the limit value relevant to the application.

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/D dated 07 July 2006 of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH
- addenda 936/21204643/D1 of 27 July 2011 and 936/21222689/D 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. 14 October 2006, No. 194, p. 6715, chapter IV, No. 2.1, Announcement by UBA from 12 September 2006:

AMS name:

APSA 370

Manufacturer:

HORIBA, Ltd., Kyoto, Japan

Distributor:

HORIBA Europe GmbH, Leichlingen

Approval:

For continuous monitoring of SO₂ in ambient air (stationary operation).

Measuring ranges during the suitability test:

SO₂ 0 bis 700 µg/m³
0 bis 1000 µg/m³

Software version:

P1000878001C

Test institute:

TÜV Immissionsschutz und Energiesysteme GmbH, Köln
TÜV Rheinland Group

Test report:

No. 936/21204643/D of 7 July 2006

Publication in the German Federal Gazette: BAnz. 25 August 2009, No. 125, p. 2929, chapter III, notification 4, Announcement by UBA from 03 August 2009:

4 Notification on the announcement of the Federal Environment Agency of 12 September 2006 (BAnz. p. 6717)

The current software version of the ambient air measuring system APSA 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 86.0 KNE of the company KNF.

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

Publication in the German Federal Gazette: BAnz. 26 January 2011, No. 14, p. 294, chapter IV, notification 7, announcement by UBA from 10 January 2011:

7 Notification on the announcement of the Federal Environment Agency of 12 September 2006 (BAnz. p. 6715, chapter IV, No. 2.1) and of 3 August 2009 (BAnz. p. 2929, chapter III 4th notification)

The APSA 370 measuring system by Horiba Ltd., Japan and Horiba Europe GmbH for component SO₂ fulfils the requirements of EN 14212. Moreover, the production and quality management of the APSA 370 measuring system for component SO₂ 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

Publication in the German Federal Gazette: BAnz. 02 March 2012, No. 36, p. 920, chapter V, notification 18, announcement by UBA from 23 February 2012:

18 Notification on the announcement of the Federal Environment Agency of 12 September 2006 (BAnz. p. 6715, chapter IV, No. 2.1) and of 10 January 2011 (BAnz. p. 294, chapter IV 7th notification)

There is an addendum to the test report 936/21204643/D for the APSA 370 measuring system by Horiba Ltd., Japan and Horiba Europe GmbH for the component SO₂.

The addendum has the report number 936/21204643/D1 and is an integral part of the test report 936/21204643/D after its publication and is also published on www.qal1.de.

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

Publication in the German Federal Gazette: BAnz AT 05.03.2013 B10, chapter V, notification 10, announcement by UBA from 12 February 2013:

10 Notification on the announcement of the Federal Environment Agency of 12 September 2006 (BAnz. p. 6715, chapter IV, No. 2.1) and of 23 February 2012 (BAnz. p. 920, chapter V 18th notification)

The APSA 370 measuring system for SO₂ 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

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

29 Notification on the announcement of the Federal Environment Agency of 12 September 2006 (BAnz. p. 6715, chapter IV No 2.1) and of 12 February 2013 (BAnz AT 05.03.2013 B10, chapter V 10th notification)

The measuring system APSA 370 for SO₂ by Horiba Ltd., Japan and Horiba Europe GmbH fulfils the requirements of Standard EN 14212 (dated November 2012). An addendum that is an integral part of the test report 936/21222689/D can be viewed on the internet at www.qal1.de. In addition to the type S7798 reference diode for the measurement of the UV lamp intensity, the type S12698 (TO5) can also be used.

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 APSA 370 SO₂ analyzer 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 SO₂.

The sample is passed through a filter in the APSA 370 in order to exclude interferences caused by contamination with particles. 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. The SO₂ molecules are not influenced by this. The sample is then introduced into a reaction chamber, where it is irradiated by UV light in the wavelength range between 200 nm and 220 nm. The radiation excites the SO₂ molecules energetic. The 4 mirrors in front of the UV lamp let pass only the wavelengths pass that excite the SO₂ molecules.

If the SO₂ molecules fall back to a lower energy state they emit UV fluorescence light in a wavelength range of 240 nm to 420 nm. Only this gets through the filter to the photo multiplier (PMT). The PMT measures the UV emission and converts it to an electric signal. A photo detector at the end of the reaction chamber measures continuously the lamp radiation and corrects the measuring result if fluctuations occur.

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 APSA 370 SO₂ 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/D of 07 July 2006
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne
Publication: BAnz. 14 October 2006, No. 194, p. 6715, chapter IV, No. 2.1
Announcement by UBA from 12 September 2006

Notifications:

Statement of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH of 31 March 2009
Publication: BAnz. 25 August 2009, No. 125, p. 2929, chapter III, notification 4
Announcement by UBA from 03 August 2009 (Software changes and hardware extension)

Initial certification according to EN 15267:

Certificate No. 0000028757: 09 February 2011
Validity of the certificate: 25 January 2016
Statement of TÜV Rheinland Energie und Umwelt GmbH of 6 October 2010
Test report: 936/21204643/D of 07 July 2006
Publication: BAnz. 26 January 2011, No. 14, p. 294, chapter IV, notification 7
Announcement by UBA from 10 January 2011

Notification according to EN 15267:

Statement of TÜV Rheinland Energie und Umwelt GmbH of 3 November 2011
with Addendum 936/21204643/D1 from 27 July 2011
Publication: BAnz. 02 March 2012, No. 36, p. 920, chapter V, notification 18
UBA announcement from 23 February 2012, (addition of an Addendum)
Certificate No. 0000028757_01: 16 March 2012
Validity of the certificate: 25 January 2016

Statement of TÜV Rheinland Energie und Umwelt GmbH of 11 October 2012
Publication: BAnz AT 05.03.2013 B10, chapter V, notification 10,
announcement by UBA from 12 February 2013 (hardware extension)

Statement of TÜV Rheinland Energie und Umwelt GmbH of 8 October 2013
with Addendum 936/21222689/D from 05 October 2013
Publication: BAnz AT 01.04.2014 B12, chapter VI, notification 29
Announcement by UBA from 27 February 2014, (EN 14212 (2012) and hardware extension),
Certificate No. 0000028757_02: 29 April 2014
Validity of the certificate: 25 January 2016

Renewal of the certificate:

Certificate No : 0000028757_03: 21 January 2016
Validity of the certificate: 25 January 2021

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

Measuring device:		Serial No.:		SN 10012		nmol/mol	
Measured component:		1h-limit value:		132			
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	$U_{r,1h}$ 0.39	0.1507		
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0.600	$U_{l,1h}$ 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 ₂ O with 21 nmol/mol	≤ 10 nmol/mol (Zero)	0.070	U_{H_2O} -0.56	0.3179		
8b	Interferent H ₂ S with 200 nmol/mol	≤ 10 nmol/mol (Span)	-1.500				
8c	Interferent NH ₃ with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	-0.100	$U_{int, pos}$			
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Span)	0.030				
8e	Interferent NO ₂ with 200 nmol/mol	≤ 5.0 nmol/mol (Span)	0.000				
8f	Interferent m-Xylene with 1 µmol/mol	≤ 5.0 nmol/mol (Span)	0.000				
9	Averaging effect	≤ 5.0 nmol/mol (Span)	4.200	or	5.0840		
18	Difference sample/calibration port	≤ 5.0 nmol/mol (Zero)	0.070				
21	Uncertainty of test gas	≤ 10 nmol/mol (Zero)	0.030	$U_{int, neg}$			
		≤ 7.0% of measured value	0.470	U_{av} -2.74	7.5272		
		≤ 1.0%	0.000	U_{ssc} 0.00	0.0000		
		≤ 3.0%	2.000	U_{scg} 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	%	

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

Measuring device:		Serial-No.:		1h-limit value:		nmol/mol	
Horiba AFSA 370		SN 10011		132			
Measured component:		Performance criterion		Result		Square of partial uncertainty	
SO2		≤ 1.0 nmol/mol		0.080		0.0006	
		≤ 3.0 nmol/mol		0.130		0.1315	
		≤ 4.0% of measured value		-0.800		0.3717	
		≤ 2.0 nmol/mol/kPa		0.010		0.0073	
		≤ 1.0 nmol/mol/K		-0.090		0.6361	
		≤ 1.0 nmol/mol/K		0.250		4.9081	
		≤ 0.30 nmol/mol/V		0.020		0.0405	
		≤ 10 nmol/mol (Zero)		0.070		0.3432	
		≤ 10 nmol/mol (Span)		-1.530			
		≤ 5.0 nmol/mol (Zero)		-0.030			
		≤ 5.0 nmol/mol (Span)		0.570			
		≤ 5.0 nmol/mol (Zero)		0.000			
		≤ 5.0 nmol/mol (Span)		-0.270			
		≤ 5.0 nmol/mol (Zero)		3.100		4.9344	
		≤ 5.0 nmol/mol (Span)		3.710			
		≤ 5.0 nmol/mol (Zero)		0.100			
		≤ 5.0 nmol/mol (Span)		-0.930			
		≤ 10 nmol/mol (Zero)		0.030			
		≤ 10 nmol/mol (Span)		0.230			
		≤ 7.0% of measured value		-4.300		10.7390	
		≤ 1.0%		0.000		0.0000	
		≤ 3.0%		2.000		1.7424	
		Combined standard uncertainty		u _c		4.8841	
		Expanded uncertainty		U		9.7683	
		Relative expanded uncertainty		W		7.40	
		Maximum allowed expanded uncertainty		W _{req}		15	

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

Measuring device:		Serial-No.:		SN 10012		nmol/mol	
Measured component:		1h-limit value:		132			
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		
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.140	$u_{r,h}$	not considered, as $u_{r,h} = 0.38 < u_{r,f}$		
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0.600	$u_{l,h}$	0.46	0.2091	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0.020	$u_{p,p}$	0.17	0.0291	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	-0.010	$u_{g,t}$	-0.09	0.0079	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.060	$u_{s,t}$	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 ₂ O with 21 nmol/mol	≤ 10 nmol/mol (Zero)	0.070				
		≤ 10 nmol/mol (Span)	-1.500				
8b	Interferent H ₂ S with 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	-0.100	u_{H_2O}	-0.56	0.3179	
		≤ 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				
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	$u_{d,z}$	0.46	0.2133	
12	Long term drift at span level	≤ 5.0% of max. of certification range	1.310	$u_{d,h}$	1.00	0.9967	
18	Difference sample/calibration port	≤ 1.0%	0.000	u_{asc}	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
Expanded uncertainty						U	13.8202
Relative expanded uncertainty						W	10.47
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.:		nmol/mol	
Horiba AFS3 370		SN 10011			
Measured component:		1h-limit value:		132	
SO2					
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}	0.0006
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.130	U _{r,ln} not considered, as U _{r,ln} = 0,36 < U _{r,f}	-
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	-0.800	U _{l,ln}	0.3717
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 2.0 nmol/mol/kPa	0.010	U _{sp}	0.0073
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 1.0 nmol/mol/K	-0.090	U _t	0.6361
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 1.0 nmol/mol/K	0.250	U _{st}	4.9081
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.020	U _v	0.0405
8a	Interferent H ₂ O with 21 nmol/mol	≤ 10 nmol/mol (Zero)	0.070		
8b	Interferent H ₂ S with 200 nmol/mol	≤ 10 nmol/mol (Span) ≤ 5.0 nmol/mol (Zero)	-1.530 -0.030	U _{H2O}	0.3432
8c	Interferent NH ₃ with 200 nmol/mol	≤ 5.0 nmol/mol (Span)	0.570	U _{int,pos}	
8d	Interferent NO with 500 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.000		
8e	Interferent NO ₂ with 200 nmol/mol	≤ 5.0 nmol/mol (Span) ≤ 5.0 nmol/mol (Zero)	-0.270 3.100		
8f	Interferent m-Xylene with 1 µmol/mol	≤ 5.0 nmol/mol (Zero)	3.710	or	4.9344
9	Averaging effect	≤ 7.0% of measured value	-0.930	U _{int,neg}	
10	Reproducibility standard deviation under field conditions	≤ 5.0% of average over 3 months	0.230	U _{av}	10.7390
11	Long term drift at zero level	≤ 5.0% of average over 3 months	-4.300	U _{r,f}	31.3242
12	Long term drift at span level	≤ 5.0% of max. of certification range	4.240	U _{d,i,z}	0.1633
18	Difference sample/calibration port	≤ 1.0%	0.630	U _{d,i,ln}	0.2305
21	Uncertainty of test gas	≤ 3.0%	0.000	U _{isc}	0.0000
				U _{cg}	1.7424
Combined standard uncertainty				U _c	7.4459
Expanded uncertainty				U	14.8918
Relative expanded uncertainty				W	11.28
Maximum allowed expanded uncertainty				W _{req}	15