

# CERTIFICATE

about Product Conformity (QAL1)

Number of Certificate: 0000028757\_01

**Certified AMS:** APSA 370 for SO<sub>2</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 14212: 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. 0000028757 of 09 February 2011.



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

Publication in the German Federal Gazette  
(BAnz.) of 14 October 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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51105 Köln

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

<b>Test report:</b>	936/21204643/D of 07 July 2006
<b>First certification:</b>	26 January 2011
<b>Run of validity until:</b>	25 January 2016
<b>Publication</b>	BAnz. 14 October 2006, No. 194, p. 6715, chapter IV, No. 2.1

### **Approved application**

The certified AMS is approved for continuous monitoring of SO<sub>2</sub> 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 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/D dated 07 July 2006 of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH and on the addendum to the test report 936/21204643/D1 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. 14 October 2006, No. 194, p. 6715, chapter IV, No. 2.1, UBA announcement from 12 September 2006)
- publication in the German Federal Gazette (BAnz. 25 August 2009, No. 125, p. 2929, chapter III, notification 4, UBA announcement from 03 August 2009)
- publication in the German Federal Gazette (BAnz. 26 January 2011, No. 14, p. 296, chapter IV, notification 7, UBA announcement from 10 January 2011)
- publication in the German Federal Gazette (BAnz. 02 March 2012, No. 36, p. 920, chapter V, notification 18, UBA announcement from 23 February 2012)

**AMS name:**

APSA 370

**Manufacturer:**

HORIBA, Ltd., Kyoto, Japan

**Distributor:**

HORIBA Europe GmbH, Leichlingen

**Approval:**

For continuous monitoring of SO<sub>2</sub> in ambient air (stationary operation).

**Measuring ranges during the suitability test:**

SO<sub>2</sub> 0 bis 700 µg/m<sup>3</sup>  
0 bis 1000 µg/m<sup>3</sup>

**Software version:**

P1000878001C

**Test institute:**

TÜV Immissionsschutz und Energiesysteme GmbH, Köln  
TÜV Rheinland Group

**Test report:**

No. 936/21204643/D of 7 July 2006

4. Notification with regard to the UBA announcements 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

7. Notification with regard to the UBA announcements of 12 September 2006 (BAnz. p. 6715, chapter IV, No. 2.1) and of 3 August 2009 (BAnz. p. 2929, chapter III, 4<sup>th</sup> notification)

The APSA 370 measuring system by Horiba Ltd., Japan and Horiba Europe GmbH for component SO<sub>2</sub> fulfils the requirements of EN 14212. Moreover, the production and quality management of the APSA 370 measuring system for component SO<sub>2</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

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, 7<sup>th</sup> 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 SO<sub>2</sub>. 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](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 SO<sub>2</sub> analyzer measures Sulphur dioxide by means of ultraviolet fluorescence.

UV fluorescence is based on the emission of light by SO<sub>2</sub> molecules excited by UV radiation when they return to their ground state.

In the first reaction step the SO<sub>2</sub> molecules are excited by the UV light. In the second step the excited SO<sub>2</sub> molecule returns to its ground state, emitting an energy  $h\nu'$ . The intensity of the fluorescence radiation is proportional to the number of SO<sub>2</sub> molecules in the detection volume and is therefore proportional to the concentration of SO<sub>2</sub>.

The measuring principle corresponds to the setup and functioning of the measuring principle described in EN 14212 section 5.2 for the component SO<sub>2</sub>.

The sample is passed through a filter 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 SO<sub>2</sub> 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 SO<sub>2</sub> molecules energetic. The 4 mirrors in front of the UV lamp let pass only the wavelengths pass that excite the SO<sub>2</sub> molecules.

If the SO<sub>2</sub> 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.

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](http://qal1.de).

Certification of APSA 370 SO<sub>2</sub> 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, Köln  
Publication: BAnz. 14 October 2006, No. 194, p. 6715, chapter IV, No. 2.1  
Announcement by UBA from 12 September 2006

**Notifications:**

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

Publication: BAnz. 26 January 2011, No. 14, p. 294, chapter IV, notification 7  
Announcement by UBA from 10 January 2011

Publication: BAnz. 02 March 2012, No. 36, p. 920, chapter V, notification 18  
Announcement by UBA from 23 February 2012

Publication: Addendum to test report 936/21204643/D1 from 27 July 2011

**Initial certification according to EN 15267:**

Certificate No. 0000028757: 09 February 2011

Validity of the certificate until: 25 January 2016

Test report: 936/21204643/D of 07 July 2006  
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Köln

Publication: BAnz. 26 January 2011, No. 14, p. 294, chapter IV, notification 7  
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 APSA 370		Serial number		10012	
Component		SO2		Level of the hourly limit value		132	
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	0.070	$u_{i,z}$	0.01	0.0001	
2	Repeatability standard deviation at concentration $c_i$ (at a level of the hourly limit value)	≤ 3.0 nmol/mol	0.140	$u_{i,v}$	0.19	0.0377	
3	Lack of fit at the hourly limit value	4.0% of the measured value	-0.570	$u_{i,v}$	-0.43	0.1887	
4	Variation in sample gas pressure at the hourly limit value	≤ 3.0 nmol/mol/kPa	0.020	$u_{i,p}$	0.17	0.0291	
5	Variation in sample gas temperature at the hourly limit value	≤ 1.0 nmol/mol/K	-0.010	$u_{i,t}$	-0.09	0.0079	
6	Variation in surrounding temperature at the hourly limit value	≤ 1.0 nmol/mol/K	0.060	$u_{i,t}$	0.18	0.0319	
7	Variation in electrical voltage at the hourly limit value	≤ 0.30 nmol/mol/V	-0.010	$u_{i,v}$	-0.10	0.0101	
8a	Presence of water vapour with concentration 21 nmol/mol	≤ 10 nmol/mol	-0.850	$u_{i,p}$	0.57	0.3294	
8b	Presence of H2S with concentration 200 nmol/mol	≤ 5.0 nmol/mol	-0.031	$u_{i,p}$			
8c	Presence of NH3 with concentration 200 nmol/mol	≤ 5.0 nmol/mol	-0.212				
8d	Presence of NO with concentration 500 nmol/mol	≤ 5.0 nmol/mol	0.854	oder	0.65	0.4187	
8e	Presence of NO2 with concentration 200 nmol/mol	≤ 5.0 nmol/mol	-0.226				
8f	Presence of m-Xylol with concentration 1 µmol/mol	≤ 10 nmol/mol	0.267	$u_{i,leg}$			
9	Averaging error	≤ 7.0% of the measured value	-3.600	$u_{i,v}$	-2.74	7.5272	
18	Difference sample / calibration port	≤ 1.0 %	0.000	$u_{i,p}$	0.00	0.0000	
23	Uncertainty calibration gas	≤ 3.0 %	2.000	$u_{i,g}$	1.32	1.7424	
				Combined standard uncertainty		$u_c$	
				Expanded uncertainty		3.2130	
				Relative expanded uncertainty		$U_{c,rel}$	
				Maximum expanded uncertainty		6.4260	
						4.87	
						15	
						%	

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 APSA 370		Serial number		10011	
Component		SO2		Level of the hourly limit value		132	
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	0.080	$u_{r,z}$	0.01	0.0002	
2	Repeatability standard deviation at concentration $c_i$ (at a level of the hourly limit value)	≤ 3.0 nmol/mol	0.130	$u_{r,v}$	0.18	0.0329	
3	Lack of fit at the hourly limit value	≤ 4.0% of the measured value	-0.130	$u_{l,v}$	-0.10	0.0098	
4	Variation in sample gas pressure at the hourly limit value	≤ 3.0 nmol/mol/kPa	0.010	$u_{gp}$	0.09	0.0073	
5	Variation in sample gas temperature at the hourly limit value	≤ 1.0 nmol/mol/K	-0.090	$u_{gt}$	-0.80	0.6361	
6	Variation in surrounding temperature at the hourly limit value	≤ 1.0 nmol/mol/K	0.250	$u_{st}$	0.74	0.5453	
7	Variation in electrical voltage at the hourly limit value	≤ 0.30 nmol/mol/V	0.020	$u_{v}$	0.20	0.0405	
8a	Presence of water vapour with concentration 21 nmol/mol	≤ 10 nmol/mol	-0.883	$u_{wz0}$	0.60	0.3555	
8b	Presence of H2S with concentration 200 nmol/mol	≤ 5.0 nmol/mol	0.291	$u_{H_2S, pos}$			
8c	Presence of NH3 with concentration 200 nmol/mol	≤ 5.0 nmol/mol	-0.144	oder	0.80	0.6334	
8d	Presence of NO with concentration 500 nmol/mol	≤ 5.0 nmol/mol	0.950				
8e	Presence of NO2 with concentration 200 nmol/mol	≤ 5.0 nmol/mol	-0.437				
8f	Presence of m-Xylol with concentration 1 µmol/mol	≤ 10 nmol/mol	0.137	$u_{int, neg}$			
9	Averaging error	≤ value	-4.300	$u_{av}$	-3.28	10.7390	
18	Difference sample / calibration port	≤ 1.0 %	0.000	$u_{ps}$	0.00	0.0000	
23	Uncertainty calibration gas	≤ 3.0 %	2.000	0	1.32	1.7424	
				Combined standard uncertainty	$u_c$	3.8396	
				Expanded uncertainty	$U_c$	7.6792	
				Relative expanded uncertainty	$U_{c, rel}$	5.82	
				Maximum expanded uncertainty	$U_{req, rel}$	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: Component	Horiba APSA 370 SO2	Serial number 10012	Level of the hourly limit value		Value of partial uncertainty	Value of partial uncertainty squared
			Result	Performance criterion		
No	Standard uncertainty due to		Result	Performance criterion	Value of partial uncertainty	Value of partial uncertainty squared
1	Repeatability standard deviation at zero	≤	0.070	1.0 nmol/mol	0.01	0.0001
2	Repeatability standard deviation at concentration $c_1$ (at a level of the hourly limit value)	≤	0.140	3.0 nmol/mol	not considered, because $u_{r,lv} = 0.19 < u_{r,f}$	-
3	Lack of fit (at the hourly limit value)	≤	-0.570	4.0% of the measured value	$u_{lv}$	0.1887
4	Variation in sample gas pressure at the hourly limit value	≤	0.020	3.0 nmol/mol/kPa	$u_{gp}$	0.0291
5	Variation in sample gas temperature at the hourly limit value	≤	-0.010	1.0 nmol/mol/K	$u_{gt}$	0.0079
6	Variation in surrounding temperature at the hourly limit value	≤	0.060	1.0 nmol/mol/K	$u_{st}$	0.0319
7	Variation in electrical voltage at the hourly alert threshold	≤	-0.010	0.30 nmol/mol/V	$u_v$	0.0101
8a	Presence of water vapour with concentration 21 nmol/mol	≤	-0.850	10 nmol/mol	$u_{H2O}$	0.3294
8b	Presence of H2S with concentration 200 nmol/mol	≤	-0.031	5.0 nmol/mol	$u_{H2S, pos}$	
8c	Presence of NH3 with concentration 200 nmol/mol	≤	-0.212	5.0 nmol/mol		
8d	Presence of NO with concentration 500 nmol/mol	≤	0.854	5.0 nmol/mol	0.65	0.4187
8e	Presence of NO2 with concentration 200 nmol/mol	≤	-0.226	5.0 nmol/mol		
8f	Presence of m-Xylol with concentration 1 µmol/mol	≤	0.267	10 nmol/mol	$u_{H2O, neg}$	
9	Averaging error	≤	-3.600	7.0% of the measured value	$u_{av}$	7.5272
10	Reproducibility under field conditions	≤	4.240	5.0% of the average of a three month period	$u_{r,f}$	31.3242
11	Long term drift at zero	≤	0.800	5.0 nmol/mol	$u_{d,lv}$	0.2133
12	Long term drift at the hourly limit value	≤	1.310	5.0% of Max. of cert. range	$u_{d,lv}$	0.9967
18	Difference sample / calibration port	≤	0.000	1.0%	$u_{psc}$	0.0000
23	Uncertainty calibration gas	≤	2.000	3.0%	$u_{cg}$	1.7424
Combined standard uncertainty					$u_c$	6.5437
Expanded uncertainty					$U_c$	13.0874
Relative expanded uncertainty					$U_{c,rel}$	9.91
Maximum expanded uncertainty					$U_{req,rel}$	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:		Horiba AP5A 370		Serial number		10011	
Component		SO2		Level of the hourly limit value		132	
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	0.080	$u_{r,z}$	0.01	0.0002	
2	Repeatability standard deviation at concentration $c_i$ (at a level of the hourly limit value)	≤ 3.0 nmol/mol	0.130	$u_{r,i,v}$	not considered, because $u_{r,i,v} = 0.18 < u_{r,f}$		
3	Lack of fit (at the hourly limit value)	≤ 4.0% of the measured value	-0.130	$u_{i,v}$	-0.10	0.0098	
4	Variation in sample gas pressure at the hourly limit value	≤ 3.0 nmol/mol/kPa	0.010	$u_{gp}$	0.09	0.0073	
5	Variation in sample gas temperature at the hourly limit value	≤ 1.0 nmol/mol/K	-0.090	$u_{gt}$	-0.80	0.6361	
6	Variation in surrounding temperature at the hourly limit value	≤ 1.0 nmol/mol/K	0.250	$u_{st}$	0.74	0.5453	
7	Variation in electrical voltage at the hourly alert threshold	≤ 0.30 nmol/mol/V	0.020	$u_v$	0.20	0.0405	
8a	Presence of water vapour with concentration 21 mmol/mol	≤ 10 nmol/mol	-0.883	$u_{H2O}$	0.60	0.3555	
8b	Presence of H2S with concentration 200 nmol/mol	≤ 5.0 nmol/mol	0.291	$u_{H2S, pos}$			
8c	Presence of NH3 with concentration 200 nmol/mol	≤ 5.0 nmol/mol	-0.144				
8d	Presence of NO with concentration 500 nmol/mol	≤ 5.0 nmol/mol	0.950	oder	0.80	0.6334	
8e	Presence of NO2 with concentration 200 nmol/mol	≤ 5.0 nmol/mol	-0.437				
8f	Presence of m-Xylol with concentration 1 µmol/mol	≤ 10 nmol/mol	0.137	$u_{iq, neg}$			
9	Averaging error	≤ 7.0% of the measured value	-4.300	$u_{av}$	-3.28	10.7390	
10	Reproducibility under field conditions	≤ 5.0% of the average of a three month period	4.240	$u_{r,f}$	5.60	31.3242	
11	Long term drift at zero	≤ 5.0 nmol/mol	0.700	$u_{d,z}$	0.40	0.1633	
12	Long term drift at the hourly limit value	≤ 5.0% of Max. of cert. range	0.630	$u_{d,i,v}$	0.48	0.2305	
18	Difference sample / calibration port	≤ 1.0%	0.000	$u_{pbc}$	0.00	0.0000	
23	Uncertainty calibration gas	≤ 3.0%	2.000	0	1.32	1.7424	
Combined standard uncertainty				$u_c$		6.8138	
Expanded uncertainty				$U_c$		13.6275	
Relative expanded uncertainty				$U_{c,rel}$		10.32	
Maximum expanded uncertainty				$U_{req,rel}$		15	