

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000028754_02

Certified AMS: APMA 370 for CO

Manufacturer: HORIBA, Ltd.
2 Miyanohigashi
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 found to comply with:**

**VDI 4202-1: 2002, VDI 4203-3: 2004, EN 14626: 2012,
EN 15267-1: 2009 and 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 0000028754_01 dated 16 March 2012




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

www.tuv.com
ID 0000028754

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

German Federal Environment Agency
Dessau, 29 April 2014


i. A. Dr. Marcel Langner

This certificate will expire on:
25 January 2016

TÜV Rheinland Energie und Umwelt GmbH
Cologne, 28 April 2014


ppa. Dr. Peter Wilbring

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Am Grauen Stein
51105 Cologne

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

Certificate:
0000028754_02 / 29 April 2014

Test report: 936/21204643/B of 05 January 2006
Initial certification: 26 January 2011
Date of expiry: 25 January 2016
Publication: BAnz. 08 April 2006, No. 70, p. 2653, chapter IV, No. 2.1

Approved application

The certified AMS is suitable for continuous ambient air monitoring of CO (stationary operation).

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a three months 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 ambient air applications at which it will be installed.

Basis of the certification

This certification is based on:

- test report 936/21204643/B dated 05 January 2006 of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH and on the addenda to the test report 936/21204643/B1 of 27 July 2011 and 936/21222689/B 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. 08 April 2006, No. 70, p. 2653, chapter IV, No. 2.1, UBA publication from 21 February 2006)
- publication in the German Federal Gazette (BAnz. 25 August 2009, No. 125, p. 2929, chapter III, notification 1, UBA announcement from 03 August 2009)
- publication in the German Federal Gazette (BAnz. 26 January 2011, No. 14, p. 294, chapter IV, notification 5, UBA announcement from 10 January 2011)
- publication in the German Federal Gazette (BAnz. 02 March 2012, No. 36, p. 920, chapter V, notification 16, UBA announcement from 23 February 2012)
- publication in the German Federal Gazette (BAnz AT 05 March 2013 B10, chapter V, notification 7, UBA announcement from 12 February 2013)
- publication in the German Federal Gazette (BAnz AT 01 April 2014 B12, Chapter VI, notification 26, UBA announcement from 27 February 2014)

AMS name:

APMA 370

Manufacturer:

HORIBA, Ltd., Kyoto 610 - 8510, Japan

Distributor:

HORIBA Europe GmbH, 42799 Leichlingen

Approval:

For continuous monitoring of CO (stationary operation).

Measuring ranges during the performance test:

CO 0 - 60 mg/m³
0 - 100 mg/m³

Software version:

Version P1000878001C

Test report:

TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne
Report-No: 936/21204643/B of 05 January 2006

1 Notification on the announcement of the Federal Environment Agency of 21 February 2006 (BAnz. p. 2655)

The current software version of the ambient air measuring system APMA 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

5 Notification on the announcement of the Federal Environment Agency of 21 February 2006 (BAnz. p. 2653, chapter IV No 2.1) and of 03 August 2009 (BAnz. p. 2929, chapter III, 1st notification)

The APMA 370 measuring system by Horiba Ltd., Japan and Horiba Europe GmbH for component CO fulfils the requirements of EN 14626. Moreover, the production and quality management of the APMA 370 measuring system for component CO 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 06 October 2010

16 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 5th notification)

There is an addendum to the test report 936/21204643/B for the APMA 370 measuring system by Horiba Ltd., Japan and Horiba Europe GmbH for the component CO. The addendum has the report number 936/21204643/B1 and is an integral part of the test report 936/21204643/B after its publication and is also published on www.qal1.de.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 03 November 2011

7 Notification on the announcement of the Federal Environment Agency of 21 February 2006 (Federal Gazette (BAnz.) p. 2653, chapter IV, No. 2.1) and of 23 February 2012 (Federal Gazette (BAnz.) p. 920, chapter V 16th notification)

The APMA 370 measuring system for CO 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

26 Notification on the announcement of the Federal Environment Agency of 21 February 2006 (BAnz. p. 2653, chapter IV No 2.1) and of 12 February 2013 (BAnz AT 05 March 2013 B10, chapter V 7th notification)

The measuring system APMA 370 for CO by Horiba Ltd., Japan and Horiba Europe GmbH fulfils the requirements of Standard EN 14626 (dated December 2012). An addendum that is an integral part of the test report 936/21222689/B can be viewed on the internet at www.qal1.de.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 5 October 2013

Certified product

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

The CO-Analyser operates based on the principle of non-dispersal infrared absorption. This measurement principle complies with the reference measuring method described in section 5.2 of Standard EN 14626. The attenuation of infrared light is measured after passing through the test cuvette. According to Lambert-Beer law, attenuation is a measure of the concentration of CO within the cuvette.

The APMA-370 measuring system uses the modulation effect of infrared absorption within the test gas itself if zero and test gas are led to the measuring cell at specific flow rates. The switch is made via a solenoid valve which is clocked at a frequency of 1 Hz. As long as the concentration of the measured component within the cell does not change, the output of the detector is practically zero. Thus, no zero drift occurs.

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 APMA 370 for CO 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/B of 05 January 2006
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Köln
Publication: BAnz. 08 April 2006, No. 70, p. 2653, chapter IV, No. 2.1
Announcement by UBA from 21 February 2006

Notifications:

Publication: BAnz. 25 August 2009, No. 125, p. 2929, chapter III, notification 1
Announcement by UBA from 03 August 2009

Publication: BAnz. 26 January 2011, No. 14, p. 294, chapter IV, notification 5
Announcement by UBA from 10 January 2011

Publication: BAnz. 02 March 2012, No. 36, p. 920, chapter V, notification 16
Announcement by UBA from 23 February 2012

Publication: BAnz AT 05 March 2013 B10, chapter V, notification 7,
announcement by UBA from 12 February 2013

Publication: BAnz AT 01 April 2014 B12, Chapter VI, notification 26
Announcement by UBA 27 February 2013

Initial certification according to EN 15267:

Certificate No. 0000028754: 09 February 2011

Validity of the certificate until: 25 January 2016

Test report: 936/21204643/B dated 05 January 2006
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Köln
Publication: BAnz. 26 January 2011, No. 14, p. 294, chapter IV, notification 5
Announcement by UBA from 10 January 2011

Notification according to EN 15267:

Certificate No. 0000028754_01: 16 March 2012

Validity of the certificate until: 25 January 2016

Certificate No. 0000028754_02: 29 April 2014

Validity of the certificate until: 25 January 2016

1st notification on changes to the certificate according to EN 15267

Addendum to test report 936/21204643/B1 from 27 July 2011

TÜV Rheinland Energie und Umwelt GmbH, Köln

Publication: BAnz. 02 March 2012, No. 36, p. 920, chapter V, notification 16
UBA announcement from 23 February 2012

2nd notification on changes to the certificate according to EN 15267

Addendum to test report 936/21222689/B from 05 October 2013

TÜV Rheinland Energie und Umwelt GmbH, Köln

Publication: BAnz AT 01 April 2014 B12, chapter VI, notification 26
Announcement by UBA from 27 February 2014

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

Measuring device:		Serial-No.:		SN 10031		µmol/mol	
Measured component:		8h-limit value:		8.62			
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty		
1	Repeatability standard deviation at zero	≤ 0.3 µmol/mol	0.035	u _{r,z}	0.0001		
2	Repeatability standard deviation at 8h-limit value	≤ 0.4 µmol/mol	0.064	u _r	0.0000		
3	"lack of fit" at 8h-limit value	≤ 4.0% of measured value	0.700	u _i	0.0012		
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	≤ 0.7 µmol/mol/kPa	0.006	u _{gp}	0.0002		
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.005	u _{gt}	0.0002		
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.077	u _{st}	0.0398		
7	Sensitivity coefficient of electrical voltage at 8h-limit value	≤ 0.3 µmol/mol/V	0.006	u _v	0.0030		
8a	Interferent H ₂ O with 21 mmol/mol	≤ 1.0 µmol/mol (Zero)	0.233	u _{H2O}	0.0003		
		≤ 1.0 µmol/mol (Span)	-0.009				
8b	Interferent CO ₂ with 500 µmol/mol	≤ 0.5 µmol/mol (Zero)	0.017	u _{CO2,pos}			
		≤ 0.5 µmol/mol (Span)	-0.164				
8c	Interferent NO with 1 µmol/mol	≤ 0.5 µmol/mol (Zero)	-0.026		0.0105		
		≤ 0.5 µmol/mol (Span)	-0.353				
8d	Interferent N ₂ O with 50 nmol/mol	≤ 0.5 µmol/mol (Zero)	0.009				
		≤ 0.5 µmol/mol (Span)	-0.164	u _{N2O,neg}			
9	Averaging effect	≤ 7.0% of measured value	1.250	u _{av}	0.0039		
18	Difference sample/calibration port	≤ 1.0%	0.000	u _{asc}	0.0000		
21	Uncertainty of test gas	≤ 3.0%	2.000	u _{cg}	0.0074		
Combined standard uncertainty				u _c	0.2582	µmol/mol	
Expanded uncertainty				U	0.5165	µmol/mol	
Relative expanded uncertainty				W	5.99	%	
Maximum allowed expanded uncertainty				W _{req}	15	%	

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

Measuring device:		Serial-No.:		SN 10032	
Measured component:		8h-limit value:		8.62	
Horiba APMA 370		CO		µmol/mol	
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty
1	Repeatability standard deviation at zero	≤ 0.3 µmol/mol	0.028	u _{r,z} 0.01	0.0000
2	Repeatability standard deviation at 8h-limit value	≤ 0.4 µmol/mol	0.070	u _r 0.00	0.0000
3	"lack of fit" at 8h-limit value	≤ 4.0% of measured value	0.800	u _l 0.04	0.0016
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	≤ 0.7 µmol/mol/kPa	0.009	u _{gp} 0.02	0.0005
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.004	u _{gt} 0.01	0.0001
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.067	u _{st} 0.17	0.0304
7	Sensitivity coefficient of electrical voltage at 8h-limit value	≤ 0.3 µmol/mol/V	-0.007	u _v -0.06	0.0041
8a	Interferent H ₂ O with 21 mmol/mol	≤ 1.0 µmol/mol (Zero)	0.181	u _{H2O} 0.01	0.0001
8b	Interferent CO ₂ with 500 µmol/mol	≤ 1.0 µmol/mol (Span)	-0.009		
8c	Interferent NO with 1 µmol/mol	≤ 0.5 µmol/mol (Zero)	0.017	u _{int,pos}	
8d	Interferent N ₂ O with 50 nmol/mol	≤ 0.5 µmol/mol (Span)	-0.086		
9	Averaging effect	≤ 7.0% of measured value	-1.100	0.01	0.0000
18	Difference sample/calibration port	≤ 1.0%	0.000	or	
21	Uncertainty of test gas	≤ 3.0%	2.000	u _{int,neg}	
				U _{av} -0.05	0.0030
				U _{asc} 0.00	0.0000
				U _{cg} 0.09	0.0074
		Combined standard uncertainty		u _c	0.2176
		Expanded uncertainty		U	0.4353
		Relative expanded uncertainty		W	5.05
		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 10031	
Measured component:		8h-limit value:		8.62	
CO		8h-limit value:		8.62	
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty
1	Repeatability standard deviation at zero	≤ 0.3 µmol/mol	0.035	u _{r,z}	0.0001
2	Repeatability standard deviation at 8h-limit value	≤ 0.4 µmol/mol	0.064	u _r	not considered, as u _r = 0 < u _{r,f}
3	"lack of fit" at 8h-limit value	≤ 4.0% of measured value	0.700	u _i	0.0012
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	≤ 0.7 µmol/mol/kPa	0.006	u _{gp}	0.0002
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.005	u _{gt}	0.0002
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.077	u _{st}	0.0098
7	Sensitivity coefficient of electrical voltage at 8h-limit value	≤ 0.3 µmol/mol/V	0.006	u _v	0.0030
8a	Interferent H ₂ O with 21 mmol/mol	≤ 1.0 µmol/mol (Zero)	-0.009	u _{H2O}	0.0003
		≤ 1.0 µmol/mol (Span)	0.233		
8b	Interferent CO ₂ with 500 µmol/mol	≤ 0.5 µmol/mol (Zero)	0.017	u _{int,pos}	
		≤ 0.5 µmol/mol (Span)	-0.164		
8c	Interferent NO with 1 µmol/mol	≤ 0.5 µmol/mol (Zero)	-0.026		
		≤ 0.5 µmol/mol (Span)	-0.353		
8d	Interferent N ₂ O with 50 nmol/mol	≤ 0.5 µmol/mol (Zero)	0.009		0.0105
		≤ 0.5 µmol/mol (Span)	-0.164		
9	Averaging effect	≤ 7.0% of measured value	1.250	u _{av}	0.0039
10	Reproducibility standard deviation under field conditions	≤ 5.0% of average over 3 months	3.420	u _{r,f}	0.0869
11	Long term drift at zero level	≤ 0.5 µmol/mol	-0.172	u _{d,z}	0.0099
12	Long term drift at span level	≤ 5.0% of max. of certification range	-1.750	u _{d,sh}	0.0076
18	Difference sample/calibration port	≤ 1.0%	0.000	u _{asc}	0.0000
21	Uncertainty of test gas	≤ 3.0%	2.000	u _{cg}	0.0074
Combined standard uncertainty				u _c	0.4136
Expanded uncertainty				U	0.8271
Relative expanded uncertainty				W	9.60
Maximum allowed expanded uncertainty				W _{req}	15

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

Measuring device:		Horiba APMA 370		Serial-No.:		SN 10032		µmol/mol		
Measured component:		CO		8h-limit value:		8.62				
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty					
1	Repeatability standard deviation at zero	≤ 0.3 µmol/mol	0.028	U _{r,z}	0.01	0.0000				
2	Repeatability standard deviation at 8h-limit value	≤ 0.4 µmol/mol	0.070	U _r	not considered, as U _r = 0 < U _{r,f}	-				
3	"lack of fit" at 8h-limit value	≤ 4.0% of measured value	0.800	U _i	0.04	0.0016				
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	≤ 0.7 µmol/mol/kPa	0.009	U _{gp}	0.02	0.0005				
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.004	U _{gt}	0.01	0.0001				
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	≤ 0.3 µmol/mol/K	0.067	U _{st}	0.17	0.0304				
7	Sensitivity coefficient of electrical voltage at 8h-limit value	≤ 0.3 µmol/mol/V	-0.007	U _v	-0.06	0.0041				
8a	Interferent H ₂ O with 21 mmol/mol	≤ 1.0 µmol/mol (Zero) ≤ 1.0 µmol/mol (Span)	-0.009 0.181	U _{H2O}	0.01	0.0001				
8b	Interferent CO ₂ with 500 µmol/mol	≤ 0.5 µmol/mol (Zero) ≤ 0.5 µmol/mol (Span)	0.017 -0.086	U _{int,pos}						
8c	Interferent NO with 1 µmol/mol	≤ 0.5 µmol/mol (Zero) ≤ 0.5 µmol/mol (Span)	-0.009 0.017	or	0.01	0.0000				
8d	Interferent N ₂ O with 50 mmol/mol	≤ 0.5 µmol/mol (Zero) ≤ 0.5 µmol/mol (Span)	0.009 -0.017	U _{int,neg}						
9	Averaging effect	≤ 7.0% of measured value	-1.100	U _{av}	-0.05	0.0030				
10	Reproducibility standard deviation under field conditions	≤ 5.0% of average over 3 months	3.420	U _{r,f}	0.29	0.0869				
11	Long term drift at zero level	≤ 0.5 µmol/mol	-0.164	U _{d,l,z}	-0.09	0.0090				
12	Long term drift at span level	≤ 5.0% of max. of certification range	-1.610	U _{d,l,sh}	-0.08	0.0064				
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 _{c,g}	0.09	0.0074				
Combined standard uncertainty						U _c	0.3669	µmol/mol		
Expanded uncertainty						U	0.7737	µmol/mol		
Relative expanded uncertainty						W	8.98	%		
Maximum allowed expanded uncertainty						W _{req}	15	%		