

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000001013_02

Certified AMS: CEMS II for CO, NO, NO₂, N₂O, SO₂, HCl, HF, NH₃, CO₂, H₂O and O₂

Manufacturer: Gasmot Technologies Oy
Pultitie 8 A 1
00880 Helsinki
Finland

Test Institute: TÜV Rheinland Energie und Umwelt GmbH

**This is to certify that the AMS has been tested
and found to comply with:**

**EN 15267-1: 2009, EN 15267-2: 2009, EN 15267-3: 2007
and EN 14181: 2008**

Certification is awarded in respect of the conditions stated in this certificate
(see also the following pages).

The present certificate replaces Certificate No. 0000001013_01 of 20 August 2012



Suitability Tested
EN 15267
QAL1 Certified
Regular
Surveillance

www.tuv.com
ID 0000001013

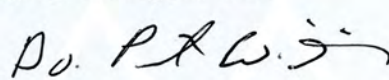
Publication in the German Federal Gazette
(BAnz.) of 23 July 2013

German Federal Environment Agency
Dessau, 20 August 2013


i. A. Dr. Marcel Langner

This certificate will expire on:
28 July 2016

TÜV Rheinland Energie und Umwelt GmbH
Cologne, 19 August 2013


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.

Test report:	936/21220683/A of 27 March 2013
Initial certification:	29 July 2011
Expiry date:	28 July 2016
Publication:	BAnz AT 23 July 2013 B4, chapter I, No. 3.1

Approved application

The tested AMS is suitable for use at combustion plants according to EC directive 2001/80/EC, at waste incineration plants according to EC directive 2000/76/EC and other plants requiring official approval. The tested ranges have been chosen with respect to the wide application range of the AMS.

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

The AMS is approved for an ambient temperature range of +5 °C to +40 °C.

Any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for the installation at which it will be installed.

Basis of the certification

This certification is based on:

- test report 936/21220683/A of 27 March 2013 of TÜV Rheinland Energie und Umwelt GmbH
- 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 AT 23 July 2013 B4, chapter I, No. 3.1)

AMS designation:

CEMS II for CO, NO, NO₂, N₂O, SO₂, HCl, HF, NH₃, CO₂, H₂O and O₂

Manufacturer:

Gasmet Technologies Oy, Helsinki, Finland

Field of application:

For measurements at plants requiring official approval (i.e. 2000/76/EC waste incineration directive and 2001/80/EC large combustion plants directive).

Measuring ranges during the performance test:

Component	Certification range	Supplementary measurement ranges		Unit
CO	0 - 75	0 - 300	0 - 1500	mg/m ³
NO	0 - 200	0 - 600	0 - 2000	mg/m ³
NO ₂	0 - 200	0 - 500	-	mg/m ³
N ₂ O	0 - 100	0 - 500	-	mg/m ³
SO ₂	0 - 75	0 - 300	0 - 1500	mg/m ³
HCl	0 - 15	0 - 90	-	mg/m ³
HF	0 - 3	0 - 10	-	mg/m ³
NH ₃	0 - 15	0 - 50	-	mg/m ³
CO ₂	0 - 25	-	-	Vol.-%
H ₂ O	0 - 30	0 - 40	-	Vol.-%
O ₂	0 - 25	-	-	Vol.-%

Software versions:

Calcmnet: 11.101 with evaluation module 4.42.2 and OXITEC Ver. 1.50 np

Restrictions:

None

Notes:

1. During test with HF, HCl and NH₃ wet test gases shall be used.
2. The maintenance interval of the AMS is four weeks.
3. The sample probe should be cleansed after plant failures.
4. The analyser OXITEC 500E SME 5 from the company ENOTEC GmbH, Marienheide, Germany is employed for O₂ measurements.
5. The performance test was carried out for the following models:

Type	FTIR 1	FTIR 2 (HF)	O ₂
A 1	X		X
A 2	X		
A 3		X	X
A 4		X	
B 1	X		X
B 2	X		
B 3	X	X	X
B 4	X	X	

6. Supplementary testing (approval of instrument configurations CEMS II) for notification of the German Federal Environment Agency (UBA) dated 6 July 2012 (BAnz AT 20 July 2012 B11, chapter I, No. 3.1).

Test report:

TÜV Rheinland Energie und Umwelt GmbH, Cologne
Report No.: 936/21220683/A of 27 March 2013

Certified product

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

The measuring equipment CEMS II consist of the following parts:

1) Sampling system

Sampling probe: SP2000H of the company of M & C, 1 m length,
to 180 °C heated, with PTFE filter element: 2 µm

Heated line: 180 °C with 4 mm Teflon tube, 25 m length,
(standard 5 to 30 m)

Pump: heated to 180 °C, with Teflon membrane

2) Analysers

FTIR 1: Gaset CX-4000 (for all components except of HF), cell temperature: 180 °C,
cell with optical path length: 5 m

FTIR HF: Gaset CX-4001 for HF, cell temperature: 180 °C, optical path length: 10 m

O₂: ZrO₂ test cell OXITEC 500E SME 5 in the 19"-box
to the company ENOTEC with the software OXITEC Ver. 1,50 np

The measuring gas is pressed continuously through maximum three analysers in parallel (FTIR1, FTIR HF and O₂-measurement (Example Type B3)) by the sample pump. The amount of the gas is controlled.

3) Computer

PC standard with at least 512 MB RAM, 2 serial interfaces, network access and Windows XP.
For the evaluation of the spectrums of the analyser, the spectrums are transferred via a RS232-
interface into the computer and processed there. The computer takes over the control of sampling
and the gas flows of the analysers.

4) Software

The evaluation software Calcmet 11.101 for the CEMS II measuring system is Windows-based.

5) Measuring cabinet with

Air-conditioning adjusted to approx. 30 °C,
Sampling pump, control units, analysers and computer

The CEMS II has two different cabinet versions. The versions differ at first glance through various
cabinet designs. Type A is installed in a smaller cabinet and the air conditioner sits on top of the
cabinet. The B variant is installed in a larger cabinet and the air conditioner is located in the rear
part of the cabinet. Depending on the configuration not all analyzers are used.

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 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 its expiration is also accessible on the internet: qal1.de.

Certification of CEMS II for CO, NO, NO₂, N₂O, SO₂, HCl, HF, NH₃, CO₂, H₂O and O₂ is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

Initial test:

Baseline report 936/21200448/A dated 07 July 2006
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne

Publication: Federal Gazette (BAnz.) of 14 October 2006, No. 194, p. 6715
Notification of the Federal Environmental Agency on 12 September 2006

Supplementary test report (Additional component: O₂) 936/21203240/B dated 03 September 2007
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne

Publication: Federal Gazette (BAnz.) of 07 March 2008, No. 38, p. 901
Notification of the Federal Environmental Agency of 14 February 2008

Notifications:

Publication: Federal Gazette (BAnz.) 20 April 2007, No. 75, p. 4139
Notification of the Federal Environmental Agency of 12 April 2007 (enclosure variants)

Publication: Federal Gazette (BAnz.) 29 July 2011, No. 133, p. 2725
Notification of the Federal Environmental Agency of 15 July 2011 (changes in software version)

Initial certification according to EN 15267:

Certificate No 0000001013: 19 August 2011

Validity of the certificate: 28 July 2016

Test report: 936/21210692/A of 30 March 2011
TÜV Rheinland Energie und Umwelt GmbH, Köln

Publication: BAnz. 29 July 2011, No. 113, p. 2725, chapter I, No. 4.1
Announcement by UBA from 15 July 2011

Supplementary testing according to EN 15267:

Certificate No. 0000001013_01: 20 August 2012

Validity of the certificate: 28 July 2016

Test report: 936/21218384/A of 16 March 2012
TÜV Rheinland Energie und Umwelt GmbH, Köln

Publication: BAnz AT 20 July 2012 B11, chapter 1, No. 3.1
Announcement by UBA from 06 July 2012

Supplementary testing according to EN 15267:

Certificate No. 0000001013_02: 20 August 2013

Validity of the certificate: 28 July 2016

Test report: 936/21220683/A of 27 March 2013
TÜV Rheinland Energie und Umwelt GmbH, Köln

Publication: BAnz AT 23 July 2013 B4, chapter I, No. 3.1
Announcement by UBA from 03 July 2013

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	Gasmet Technologies Oy
Name of measuring system	GASMET CEMS II
Serial number of the candidates	305 / 306
Measuring principle	FTIR

Test report

Test laboratory	936/21220683/A
Date of report	TÜV Rheinland
	2013-03-27

Measured component

	CO
Certification range	0 - 75 mg/m ³

Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.32 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at reference point	1.90 mg/m ³
Sum of negative CS at reference point	-1.00 mg/m ³
Maximum sum of cross sensitivities	1.90 mg/m ³
Uncertainty of cross sensitivity	1.096 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

	u	u ²
Standard deviation from paired measurements under field conditions *	u _D 0.478 mg/m ³	0.228 (mg/m ³) ²
Lack of fit	u _{lof} 0.554 mg/m ³	0.307 (mg/m ³) ²
Zero drift from field test	u _{d,z} 0.173 mg/m ³	0.030 (mg/m ³) ²
Span drift from field test	u _{d,s} 0.289 mg/m ³	0.084 (mg/m ³) ²
Influence of ambient temperature at span	u _t 0.208 mg/m ³	0.043 (mg/m ³) ²
Influence of supply voltage	u _v 0.298 mg/m ³	0.089 (mg/m ³) ²
Cross sensitivity (interference)	u _i 1.096 mg/m ³	1.200 (mg/m ³) ²
Influence of sample gas flow	u _p 0.117 mg/m ³	0.014 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm} 0.606 mg/m ³	0.368 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)

$$u_c = \sqrt{\sum (u_{\max, j})^2} \quad 1.54 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 3.01 \text{ mg/m}^3$$

Relative total expanded uncertainty

U in % of the ELV 50 mg/m³ 6.0

Requirement of 2000/76/EC and 2001/80/EC

U in % of the ELV 50 mg/m³ 10.0

Requirement of EN 15267-3

U in % of the ELV 50 mg/m³ 7.5

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	Gasmet Technologies Oy
Name of measuring system	GASMET CEMS II
Serial number of the candidates	305 / 306
Measuring principle	FTIR

Test report

Test laboratory	TÜV Rheinland
Date of report	2013-03-27

Measured component

Certification range	NO 0 - 200 mg/m ³
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	1.14 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at reference point	2.40 mg/m ³
Sum of negative CS at reference point	-5.70 mg/m ³
Maximum sum of cross sensitivities	-5.70 mg/m ³
Uncertainty of cross sensitivity	-3.291 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

	u	u ²
Repeatability standard deviation at set point *	u _r 0.859 mg/m ³	0.738 (mg/m ³) ²
Lack of fit	u _{lof} -0.635 mg/m ³	0.403 (mg/m ³) ²
Zero drift from field test	u _{d,z} 1.097 mg/m ³	1.203 (mg/m ³) ²
Span drift from field test	u _{d,s} -1.155 mg/m ³	1.334 (mg/m ³) ²
Influence of ambient temperature at span	u _t 0.874 mg/m ³	0.764 (mg/m ³) ²
Influence of supply voltage	u _v 0.920 mg/m ³	0.846 (mg/m ³) ²
Cross sensitivity (interference)	u _i -3.291 mg/m ³	10.830 (mg/m ³) ²
Influence of sample gas flow	u _p 0.553 mg/m ³	0.306 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm} 1.617 mg/m ³	2.613 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u _c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	4.36 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	8.55 mg/m ³

Relative total expanded uncertainty

Requirement of 2000/76/EC and 2001/80/EC

Requirement of EN 15267-3

U in % of the ELV 131 mg/m³	6.5
U in % of the ELV 131 mg/m³	20.0
U in % of the ELV 131 mg/m ³	15.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	Gasmet Technologies Oy
Name of measuring system	GASMET CEMS II
Serial number of the candidates	305 / 306
Measuring principle	FTIR

Test report

Test laboratory	TÜV Rheinland
Date of report	2013-03-27

Measured component

Certification range	NO ₂ 0 - 200 mg/m ³
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	1.66 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at reference point	7.90 mg/m ³
Sum of negative CS at reference point	-1.60 mg/m ³
Maximum sum of cross sensitivities	7.90 mg/m ³
Uncertainty of cross sensitivity	4.561 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

	u	u ²
Standard deviation from paired measurements under field conditions *	u _D 1.200 mg/m ³	1.440 (mg/m ³) ²
Lack of fit	u _{lof} -0.520 mg/m ³	0.270 (mg/m ³) ²
Zero drift from field test	u _{d,z} 0.404 mg/m ³	0.163 (mg/m ³) ²
Span drift from field test	u _{d,s} 2.887 mg/m ³	8.335 (mg/m ³) ²
Influence of ambient temperature at span	u _t 0.529 mg/m ³	0.280 (mg/m ³) ²
Influence of supply voltage	u _v 0.571 mg/m ³	0.326 (mg/m ³) ²
Cross sensitivity (interference)	u _i 4.561 mg/m ³	20.803 (mg/m ³) ²
Influence of sample gas flow	u _p -0.313 mg/m ³	0.098 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm} 1.617 mg/m ³	2.613 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)

$$u_c = \sqrt{\sum (u_{max, j})^2} \quad 5.86 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 11.48 \text{ mg/m}^3$$

Relative total expanded uncertainty

U in % of the ELV 200 mg/m³ 5.7

Requirement of 2000/76/EC and 2001/80/EC

U in % of the ELV 200 mg/m³ 20.0

Requirement of EN 15267-3

U in % of the ELV 200 mg/m³ 15.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	Gasmet Technologies Oy
Name of measuring system	GASMET CEMS II
Serial number of the candidates	305 / 306
Measuring principle	FTIR

Test report

Test laboratory	TÜV Rheinland
Date of report	2013-03-27

Measured component

Certification range	N ₂ O 0 - 100 mg/m ³
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at reference point	3.20 mg/m ³
Sum of negative CS at reference point	-0.80 mg/m ³
Maximum sum of cross sensitivities	3.20 mg/m ³
Uncertainty of cross sensitivity	1.848 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

	u	u ²
Standard deviation from paired measurements under field conditions *	u _D 0.630 mg/m ³	0.397 (mg/m ³) ²
Lack of fit	u _{lof} -0.231 mg/m ³	0.053 (mg/m ³) ²
Zero drift from field test	u _{d,z} 0.115 mg/m ³	0.013 (mg/m ³) ²
Span drift from field test	u _{d,s} 0.577 mg/m ³	0.333 (mg/m ³) ²
Influence of ambient temperature at span	u _t 0.252 mg/m ³	0.064 (mg/m ³) ²
Influence of supply voltage	u _v 0.314 mg/m ³	0.099 (mg/m ³) ²
Cross sensitivity (interference)	u _i 1.848 mg/m ³	3.413 (mg/m ³) ²
Influence of sample gas flow	u _p -0.120 mg/m ³	0.014 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm} 0.808 mg/m ³	0.653 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u _c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	2.24 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	4.40 mg/m ³

Relative total expanded uncertainty

Requirement of 2000/76/EC and 2001/80/EC

Requirement of EN 15267-3

U in % of the range 100 mg/m³	4.4
U in % of the range 100 mg/m³	20.0**
U in % of the range 100 mg/m ³	15.0

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
The chosen value is recommended by the certification body.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	Gasmet Technologies Oy
Name of measuring system	GASMET CEMS II
Serial number of the candidates	305 / 306
Measuring principle	FTIR

Test report

Test laboratory	TÜV Rheinland
Date of report	2013-03-27

Measured component

Certification range	SO ₂	0 - 75 mg/m ³
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.24 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at reference point	2.30 mg/m ³
Sum of negative CS at reference point	-2.90 mg/m ³
Maximum sum of cross sensitivities	-2.90 mg/m ³
Uncertainty of cross sensitivity	-1.676 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

	u	u ²
Repeatability standard deviation at set point *	u _r 0.357 mg/m ³	0.127 (mg/m ³) ²
Lack of fit	u _{lof} -0.316 mg/m ³	0.100 (mg/m ³) ²
Zero drift from field test	u _{d,z} 0.346 mg/m ³	0.120 (mg/m ³) ²
Span drift from field test	u _{d,s} -1.039 mg/m ³	1.080 (mg/m ³) ²
Influence of ambient temperature at span	u _t 0.557 mg/m ³	0.310 (mg/m ³) ²
Influence of supply voltage	u _v 0.898 mg/m ³	0.806 (mg/m ³) ²
Cross sensitivity (interference)	u _i -1.676 mg/m ³	2.808 (mg/m ³) ²
Influence of sample gas flow	u _p 0.226 mg/m ³	0.051 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm} 0.606 mg/m ³	0.368 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u _c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	2.40 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	4.71 mg/m ³

Relative total expanded uncertainty

Requirement of 2000/76/EC and 2001/80/EC

Requirement of EN 15267-3

U in % of the ELV 50 mg/m³	9.4
U in % of the ELV 50 mg/m³	20.0
U in % of the ELV 50 mg/m ³	15.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	Gasmet Technologies Oy
Name of measuring system	GASMET CEMS II
Serial number of the candidates	305 / 306
Measuring principle	FTIR

Test report

Test laboratory	TÜV Rheinland
Date of report	2013-03-27

Measured component

Certification range	HCL	0 - 15 mg/m ³
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m ³
Sum of negative CS at zero point	-0.06 mg/m ³
Sum of positive CS at reference point	0.60 mg/m ³
Sum of negative CS at reference point	-0.10 mg/m ³
Maximum sum of cross sensitivities	0.60 mg/m ³
Uncertainty of cross sensitivity	0.346 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

	u	u ²
Standard deviation from paired measurements under field conditions *	u _D 0.209 mg/m ³	0.044 (mg/m ³) ²
Lack of fit	u _{lof} 0.173 mg/m ³	0.030 (mg/m ³) ²
Zero drift from field test	u _{d,z} 0.058 mg/m ³	0.003 (mg/m ³) ²
Span drift from field test	u _{d,s} -0.289 mg/m ³	0.084 (mg/m ³) ²
Influence of ambient temperature at span	u _t 0.265 mg/m ³	0.070 (mg/m ³) ²
Influence of supply voltage	u _v 0.091 mg/m ³	0.008 (mg/m ³) ²
Cross sensitivity (interference)	u _i 0.346 mg/m ³	0.120 (mg/m ³) ²
Influence of sample gas flow	u _p -0.045 mg/m ³	0.002 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm} 0.121 mg/m ³	0.015 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 0.61 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 1.20 \text{ mg/m}^3$$

Relative total expanded uncertainty

U in % of the ELV 10 mg/m³ 12.0

Requirement of 2000/76/EC and 2001/80/EC

U in % of the ELV 10 mg/m³ 40.0

Requirement of EN 15267-3

U in % of the ELV 10 mg/m³ 30.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	Gasmet Technologies Oy
Name of measuring system	GASMET CEMS II
Serial number of the candidates	305 / 306
Measuring principle	FTIR

Test report

Test laboratory	TÜV Rheinland
Date of report	2013-03-27

Measured component

Certification range	NH ₃ 0 - 15 mg/m ³
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.06 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at reference point	0.30 mg/m ³
Sum of negative CS at reference point	-0.60 mg/m ³
Maximum sum of cross sensitivities	-0.60 mg/m ³
Uncertainty of cross sensitivity	-0.346 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

	u	u ²
Standard deviation from paired measurements under field conditions *	u _D 0.074 mg/m ³	0.005 (mg/m ³) ²
Lack of fit	u _{lof} -0.139 mg/m ³	0.019 (mg/m ³) ²
Zero drift from field test	u _{d,z} 0.058 mg/m ³	0.003 (mg/m ³) ²
Span drift from field test	u _{d,s} 0.231 mg/m ³	0.053 (mg/m ³) ²
Influence of ambient temperature at span	u _t 0.115 mg/m ³	0.013 (mg/m ³) ²
Influence of supply voltage	u _v 0.091 mg/m ³	0.008 (mg/m ³) ²
Cross sensitivity (interference)	u _i -0.346 mg/m ³	0.120 (mg/m ³) ²
Influence of sample gas flow	u _p 0.061 mg/m ³	0.004 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm} 0.121 mg/m ³	0.015 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u _c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.49 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.96 mg/m ³

Relative total expanded uncertainty

Requirement of 2000/76/EC and 2001/80/EC

Requirement of EN 15267-3

U in % of the ELV 10 mg/m³	9.6
U in % of the ELV 10 mg/m³	40.0**
U in % of the ELV 10 mg/m ³	30.0

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
The chosen value is recommended by the certification body.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	Gasmet Technologies Oy
Name of measuring system	GASMET CEMS II
Serial number of the candidates	434 / 435
Measuring principle	FTIR

Test report

Test laboratory	TÜV Rheinland
Date of report	2013-03-27

Measured component

Certification range	HF	0 - 3 mg/m ³
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.02 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at reference point	0.00 mg/m ³
Sum of negative CS at reference point	-0.08 mg/m ³
Maximum sum of cross sensitivities	-0.08 mg/m ³
Uncertainty of cross sensitivity	-0.046 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

	u	u ²
Standard deviation from paired measurements under field conditions *	u _D 0.030 mg/m ³	0.001 (mg/m ³) ²
Lack of fit	u _{lof} 0.029 mg/m ³	0.001 (mg/m ³) ²
Zero drift from field test	u _{d,z} 0.000 mg/m ³	0.000 (mg/m ³) ²
Span drift from field test	u _{d,s} 0.052 mg/m ³	0.003 (mg/m ³) ²
Influence of ambient temperature at span	u _t 0.035 mg/m ³	0.001 (mg/m ³) ²
Influence of supply voltage	u _v 0.015 mg/m ³	0.000 (mg/m ³) ²
Cross sensitivity (interference)	u _i -0.046 mg/m ³	0.002 (mg/m ³) ²
Influence of sample gas flow	u _p -0.013 mg/m ³	0.000 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm} 0.024 mg/m ³	0.001 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)

$$u_c = \sqrt{\sum (u_{\max, j})^2} \quad 0.09 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c \cdot k = u_c \cdot 1.96 \quad 0.18 \text{ mg/m}^3$$

Relative total expanded uncertainty

U in % of the ELV 1 mg/m³ 18.4

Requirement of 2000/76/EC and 2001/80/EC

U in % of the ELV 1 mg/m³ 40.0

Requirement of EN 15267-3

U in % of the ELV 1 mg/m³ 30.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	Gasmet Technologies Oy
Name of measuring system	GASMET CEMS II
Serial number of the candidates	305 / 306
Measuring principle	FTIR

Test report

Test laboratory	TÜV Rheinland
Date of report	2013-03-27

Measured component

Certification range	H ₂ O	0 - 30 Vol.-%
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 Vol.-%
Sum of negative CS at zero point	0.00 Vol.-%
Sum of positive CS at reference point	1.10 Vol.-%
Sum of negative CS at reference point	-0.10 Vol.-%
Maximum sum of cross sensitivities	1.10 Vol.-%
Uncertainty of cross sensitivity	0.632 Vol.-%

Calculation of the combined standard uncertainty

Tested parameter

	u	u ²
Standard deviation from paired measurements under field conditions *	u _D 0.292 Vol.-%	0.085 (Vol.-%) ²
Lack of fit	u _{lof} 0.230 Vol.-%	0.053 (Vol.-%) ²
Zero drift from field test	u _{d,z} 0.058 Vol.-%	0.003 (Vol.-%) ²
Span drift from field test	u _{d,s} 0.404 Vol.-%	0.163 (Vol.-%) ²
Influence of ambient temperature at span	u _t 0.231 Vol.-%	0.053 (Vol.-%) ²
Influence of supply voltage	u _v 0.262 Vol.-%	0.069 (Vol.-%) ²
Cross sensitivity (interference)	u _i 0.632 Vol.-%	0.400 (Vol.-%) ²
Influence of sample gas flow	u _p 0.112 Vol.-%	0.013 (Vol.-%) ²
Uncertainty of reference material at 70% of certification range	u _{rm} 0.242 Vol.-%	0.059 (Vol.-%) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 0.95 \text{ Vol.-%}$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 1.86 \text{ Vol.-%}$$

Relative total expanded uncertainty

U in % of the range 30 Vol.-% **6.2**

Requirement of 2000/76/EC and 2001/80/EC

U in % of the range 30 Vol.-% **10.0****

Requirement of EN 15267-3

U in % of the range 30 Vol.-% **7.5**

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
The chosen value is recommended by the certification body.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	Gasmet Technologies Oy
Name of measuring system	GASMET CEMS II
Serial number of the candidates	305 / 306
Measuring principle	FTIR

Test report

Test laboratory	TÜV Rheinland
Date of report	2013-03-27

Measured component

Certification range	CO ₂	0 - 25 Vol.-%
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 Vol.-%
Sum of negative CS at zero point	0.00 Vol.-%
Sum of positive CS at reference point	0.10 Vol.-%
Sum of negative CS at reference point	-0.90 Vol.-%
Maximum sum of cross sensitivities	-0.90 Vol.-%
Uncertainty of cross sensitivity	-0.520 Vol.-%

Calculation of the combined standard uncertainty

Tested parameter

	u	u ²
Standard deviation from paired measurements under field conditions *	u _D 0.100 Vol.-%	0.010 (Vol.-%) ²
Lack of fit	u _{lof} 0.115 Vol.-%	0.013 (Vol.-%) ²
Zero drift from field test	u _{d,z} 0.058 Vol.-%	0.003 (Vol.-%) ²
Span drift from field test	u _{d,s} 0.058 Vol.-%	0.003 (Vol.-%) ²
Influence of ambient temperature at span	u _t 0.231 Vol.-%	0.053 (Vol.-%) ²
Influence of supply voltage	u _v 0.099 Vol.-%	0.010 (Vol.-%) ²
Cross sensitivity (interference)	u _i -0.520 Vol.-%	0.270 (Vol.-%) ²
Influence of sample gas flow	u _p -0.060 Vol.-%	0.004 (Vol.-%) ²
Uncertainty of reference material at 70% of certification range	u _{rm} 0.202 Vol.-%	0.041 (Vol.-%) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u _c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.64 Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	1.25 Vol.-%

Relative total expanded uncertainty

Requirement of 2000/76/EC and 2001/80/EC

Requirement of EN 15267-3

U in % of the range 25 Vol.-%	5.0
U in % of the range 25 Vol.-%	10.0**
U in % of the range 25 Vol.-%	7.5

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
The chosen value is recommended by the certification body.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system

Manufacturer	Gasmet Technologies Oy
Name of measuring system	GASMET CEMS II
Serial number of the candidates	161104 / 141104
Measuring principle	Zirkondioxid

Test report

Test laboratory	TÜV Rheinland
Date of report	2013-03-27

Measured component

Certification range	O ₂	0 - 25 Vol.-%
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Evaluation of the cross sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00	Vol.-%
Sum of negative CS at zero point	0.00	Vol.-%
Sum of positive CS at reference point	0.00	Vol.-%
Sum of negative CS at reference point	0.00	Vol.-%
Maximum sum of cross sensitivities	0.00	Vol.-%
Uncertainty of cross sensitivity	0.000	Vol.-%

Calculation of the combined standard uncertainty

Tested parameter

	u		u ²	
Standard deviation from paired measurements under field conditions *	u _D 0.047	Vol.-%	0.002	(Vol.-%) ²
Lack of fit	u _{lof} -0.104	Vol.-%	0.011	(Vol.-%) ²
Zero drift from field test	u _{d,z} 0.029	Vol.-%	0.001	(Vol.-%) ²
Span drift from field test	u _{d,s} 0.110	Vol.-%	0.012	(Vol.-%) ²
Influence of ambient temperature at span	u _t 0.165	Vol.-%	0.027	(Vol.-%) ²
Influence of supply voltage	u _v 0.015	Vol.-%	0.000	(Vol.-%) ²
Cross sensitivity (interference)	u _i 0.000	Vol.-%	0.000	(Vol.-%) ²
Influence of sample gas flow	u _p -0.012	Vol.-%	0.000	(Vol.-%) ²
Uncertainty of reference material at 70% of certification range	u _{rm} 0.202	Vol.-%	0.041	(Vol.-%) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u _c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.31	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.60	Vol.-%

Relative total expanded uncertainty

Requirement of 2000/76/EC and 2001/80/EC

Requirement of EN 15267-3

U in % of the range 25 Vol.-%	2.4
U in % of the range 25 Vol.-%	10.0**
U in % of the range 25 Vol.-%	7.5

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
The chosen value is recommended by the certification body.