Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate number: 0000028730_01

Certified AMS:	GCS for HF, N_2O, CO, NO, NO_2, SO_2, HCl, NH_3, H_2O and CO_2
Manufacturer:	General Impianti S.r.l. Via Collefreddo 8/9 60030 Maiolati Spontini (AN) Italy
Test Institute:	TÜV Rheinland Energy GmbH

This is to certify that the AMS has been tested and certified according to the standards

EN 15267-1 (2009), EN 15267-2 (2009), EN 15267-3 (2007) and EN 14181 (2004)

Certification is awarded in respect of the conditions stated in this certificate (this certificate contains 16 pages).

TÜVRheinland® CERTIFIED

Suitability Tested
EN 15267
QAL1 Certified
Regular
Surveillance

www.tuv.com
ID 0000028730

Publication in the German Federal Gazette (BAnz.) of 29 July 2011

German Federal Environment Agency
Dessau, 22 July 2016

Dr. Marcel Langner
Head of Section II 4.1

This certificate will expire on:
28 July 2021

TÜV Rheinland Energy GmbH
Cologne, 21 July 2016

ppa. Dr. Peter Wilbring

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TÜV Rheinland Energy GmbH
Am Grauen Stein
51105 Köln

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

Test report:	936/21211855/B of 25 March 2011
Initial certification:	29 July 2011
Expiry date:	28 July 2021
Certificate	renewal (previous certificate 0000028730 dated from 19 August 2011 with validity up to the 28 July 2016)
Publication:	BAnz. 29 July 2011, No. 113, page 2725, chapter I No. 4.3

Approved application
The tested AMS is suitable for use at combustion plants according to Directive 2010/75/EU, chapter III (13. BImSchV), at waste incineration plants according to Directive 2010/75/EU, chapter IV (17. BImSchV) and other plants requiring official approval. The measured ranges have been selected considering 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 more than 12 months field test at a waste incineration plant. For the components HF and N_2O the field test was done at a tunnel kiln plant for firing refractory and acid proof bricks.

The AMS is approved for an ambient temperature range of +5 °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 the installation at which it will be installed.

Basis of the certification
This certification is based on:

- test report 936/21211855/B of 25 March 2011 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. 29 July 2011, No 113, p. 2725, chapter I No. 4.3, Announcement by UBA from 15 July 2011:

AMS designation:

GIGAS 10M for HF, N_2O, CO, NO, NO_2, SO_2, HCl, NH_3, H_2O and CO_2

Manufacturer:

General Impianti S.r.l., Moie di Maiolati, Italy

Field of application:

For measurements at plants requiring official approval and plants according to 27th BImSchV

Measuring ranges during the performance test:

Component	Certification range	Supplementary measurement ranges	Unit
HF	0 - 5	0 - 10, 0 - 20	mg/m³
N_2O	0 - 50	0 - 1000	mg/m³
CO	0 - 75	0 - 300	mg/m³
SO_2	0 - 75	0 - 300	mg/m³
NO	0 - 200	0 - 400	mg/m³
NO_2	0 - 100	0 - 200	mg/m³
HCl	0 - 15	0 - 90	mg/m³
NH_3	0 - 15	-	mg/m³
CO_2	0 - 20	-	Vol.-%
H_2O	0 - 30	-	Vol.-%

Software versions:

Omnic 7.2 GasCalc: 4.4

Restriction:

The measurement system shall only be operated at plants waste gas humidity does not constantly exceed 30 Vol.-%.

Notes:

1. Wet test gases shall be used for the testing of HF, HCl and NH_3.
2. A six month period has been determined as maintenance interval.
3. Supplementary testing (including the components N_2O and HF, instrument changes and conversion of test results to standard EN 15267-3) on the announcements of the Federal Environment Agency on 12 August 2008 (BAnz. p. 3243, chapter I No 2.3).
4. For the measuring component CO the requirement for the total uncertainty according to EN 15267-3 is not fulfilled.
5. The measuring unit works with wet process gases.

Test report:

TÜV Rheinland Energie und Umwelt GmbH, Cologne
Report No.: 936/21211855/B of 25 March 2011

Publication in the German Federal Gazette: BAnz. 02 March 2012, No. 36, p. 920, chapter V notice 8, Announcement by UBA from 23 February 2012:

8 Notification as regards Federal Environment Agency (UBA) notices of 15 July 2011 (Federal Gazette BAnz. p. 2725, chapter I, number 4.3)

The new name of the GIGAS 10M multi-component measuring system manufactured by General Impianti s.r.l. is:

GCS

Statement of TÜV Rheinland Energie und Umwelt GmbH of 29 September 2011

Publication in the German Federal Gazette: BAnz AT 14.03.2016 B7, chapter V notice 23, Announcement by UBA from 18 February 2016:

23 Notification as regards Federal Environment Agency (UBA) notices of 15 July 2011 (BAnz. page 2725, chapter I number 4.3) and of 23 February 2012 (BAnz. page 920, chapter V notification 8 as well as chapter VI correction 1)

The measuring equipment GCS for CO, NO, NO_2, N_2O, SO_2, HCl, HF, NH_3, H_2O and CO_2 of General Impianti s.r.l can being installed in cabinet ETA mod. ENUX-121808PR also. For this cabinet the air conditioning system of Kelvin Jet 20 in the case of wall mounting and Stulz 20002207000 at roof mounting can be used.

The new address of the manufacturer is Via Collefreddo 8/9 - 60030 Maiolati Spontini (AT), Italy.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 21 October 2015

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

The GCS measuring system is an extractive multiple-component measuring system based on the measuring principle of FTIR spectrometry which measures at high temperatures. It comprises the main components as described below:

Sampling

Sampling probe:	General Impianti GL – SRPF (180 °C) coated
Sampling tube:	RACO (Length during suitability testing approx. 10 m, heated to 180 °C)
Heated filter:	M&C – FT-H2 (180 °C)

Analyser

FTIR:	GIGAS 10M , temperature of the cuvette: 180 °C

Sample gas post-treatment
The following components are installed after the sample gas outlet:

Sample gas cooler:	General Impianti – FRIGO GI PELLTIER R
Sample gas pump:	KNF – N.814.KTE

Control modules

DAQ module:	GL-AnDe
Omron module:	GL-TPReg

Calculator
Standard PC of the following minimum requirements:

Operating system:	MS Windows XP
Processor:	Intel Pentium III, 1 GHz
Primary storage:	512 MB
Hard disk:	40 GB
Interfaces:	USB Interface Network interface RJ 45 Serial Interface RS 232

A Siemens Industry PC with 17'' Touch Screen Display has been installed during the suitability test.

Software
Evaluation-Software: GasCalc 4.4 and Omnic 7.2

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 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 Energy 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 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 GCS for HF, N_2O, CO, NO, NO_2, SO_2, HCl, NH_3, H_2O and CO_2 is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

Basic test

Test report: 936/21206517/A from 08 July 2007
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne
Publication: BAnz. 06 November 2007, No 206, p. 7925, chapter I No 2.1
UBA announcement from 23 September 2007

Test report: 936/21206517/B from 09 November 2007
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne
Publication: BAnz. 07 March 2008, No 38, p. 901, chapter I No 2.3
UBA announcement from 14 February 2008

Test report: 936/21206517/C from 27 February 2008
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne
Publication: BAnz. 03 September 2008, No 133, p. 3242, chapter I No 2.3
UBA announcement from 12 August 2008

Notification

Statement of TÜV Rheinland Energie und Umwelt GmbH of 12 November 2010
Publication: BAnz. 26 January 2011, No 14, p. 294, chapter IV notification 29
UBA announcement from 10 January 2011
(Software changing)

Initial certification according to EN 15267

Certificate No. 0000028730: 19 August 2011
Expiry date of the certificate: 28 July 2011
Test report: 936/21211855/B of 25 March 2011
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Publication: BAnz. 29 July 2011, No 113, p. 2725, chapter I No 4.3
Announcement by UBA from 15 July 2011

Notification according to EN 15267

Statement of TÜV Rheinland Energie und Umwelt GmbH of 29. September 2011
Publication: BAnz. 2 March 2012, No. 36, p. 920, chapter VI correction 1
Announcement by UBA from 23 February 2012
(correction certification range of NH_3)

Statement of TÜV Rheinland Energie und Umwelt GmbH of 29 September 2011
Publication: BAnz. 2 March 2012, No. 36, p. 920, chapter V notification 8
Announcement by UBA from 23 February 2012
(changing name of AMS)

Statement of TÜV Rheinland Energie und Umwelt GmbH of 21 October 2015
Publication: BAnz AT 14.03.2016 B7, chapter V notification 23,
Announcement by UBA from 18 February 2016
(hardware addition)

Renewal of the certificate

Certificate No. 0000028730_01: 22 July 2016
Expiry date of the certificate: 28 July 2021

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

Measuring system			
Manufacturer			General Impianti
Name of measuring system			GIGAS 10M
Serial number of the candidates			RSE09/TUV/H1 / RSE09/TUV/H2
Measuring principle			FTIR
Test report			936/21211855/B
Test laboratory			TÜV Rheinland
Date of report			2011-03-25
Measured component			HF
Certification range			0 - 5 mg/m³

Evaluation of the cross sensitivity (CS)		
(system with largest CS)		
Sum of positive CS at zero point	0.20	mg/m³
Sum of negative CS at zero point	0.00	mg/m³
Sum of postive CS at reference point	0.15	mg/m³
Sum of negative CS at reference point	0.00	mg/m³
Maximum sum of cross sensitivities	0.20	mg/m³
Uncertainty of cross sensitivity	0.12	mg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Repeatability standard deviation at set point *	u_r	0.080	mg/m³	0.006	(mg/m³)²
Lack of fit	u_{lof}	-0.052	mg/m³	0.003	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.066	mg/m³	0.004	(mg/m³)²
Span drift from field test	$u_{d,s}$	0.084	mg/m³	0.007	(mg/m³)²
Influence of ambient temperature at span	u_t	0.051	mg/m³	0.003	(mg/m³)²
Influence of supply voltage	u_v	0.029	mg/m³	0.001	(mg/m³)²
Cross sensitivity (interference)	u_i	0.115	mg/m³	0.013	(mg/m³)²
Influence of sample gas flow	u_p	0.046	mg/m³	0.002	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.040	mg/m³	0.002	(mg/m³)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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.20	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.40	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 2 mg/m³**	**19.9**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 2 mg/m³**	**40.0**
Requirement of EN 15267-3	U in % of the ELV 2 mg/m³	30.0

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

Measuring system			
Manufacturer			General Impianti
Name of measuring system			GIGAS 10M
Serial number of the candidates			RSE09/TUV/H1 / RSE09/TUV/H2
Measuring principle			FTIR
Test report			936/21211855/B
Test laboratory			TÜV Rheinland
Date of report			2011-03-25
Measured component			N_2O
Certification range			0 - 50 mg/m³

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point	0.31	mg/m³
Sum of negative CS at zero point	0.00	mg/m³
Sum of postive CS at reference point	0.93	mg/m³
Sum of negative CS at reference point	-1.98	mg/m³
Maximum sum of cross sensitivities	-1.98	mg/m³
Uncertainty of cross sensitivity	-1.14	mg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u^2	
Repeatability standard deviation at set point *	u_r	0.100	mg/m³	0.010	(mg/m³)²
Lack of fit	u_{lof}	0.231	mg/m³	0.053	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.231	mg/m³	0.053	(mg/m³)²
Span drift from field test	$u_{d,s}$	0.808	mg/m³	0.653	(mg/m³)²
Influence of ambient temperature at span	u_t	0.321	mg/m³	0.103	(mg/m³)²
Influence of supply voltage	u_v	0.128	mg/m³	0.016	(mg/m³)²
Cross sensitivity (interference)	u_i	-1.143	mg/m³	1.307	(mg/m³)²
Influence of sample pressure	u_p	0.225	mg/m³	0.051	(mg/m³)²
Influence of sample gas flow	u_p	0.000	mg/m³	0.000	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.404	mg/m³	0.163	(mg/m³)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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.55	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	3.04	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 20 mg/m³**	**15.2**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 20 mg/m³**	**20.0 ****
Requirement of EN 15267-3	U in % of the ELV 20 mg/m³	15.0

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
A value of 20.0 % was used for this.

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

Measuring system			
Manufacturer	General Impianti		
Name of measuring system	GIGAS 10M		
Serial number of the candidates	S1 A210015 / S2 A20016 ***		
Measuring principle	FTIR		
Test report	936/21211855/B		
Test laboratory	TÜV Rheinland		
Date of report	2011-03-25		
Measured component	CO		
Certification range	0 - 75	mg/m³	

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point	0.41	mg/m³
Sum of negative CS at zero point	0.00	mg/m³
Sum of postive CS at reference point	3.00	mg/m³
Sum of negative CS at reference point	0.00	mg/m³
Maximum sum of cross sensitivities	3.00	mg/m³
Uncertainty of cross sensitivity	1.732	mg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Standard deviation from paired measurements under field conditions *	u_D	0.407	mg/m³	0.166	(mg/m³)²
Lack of fit	u_{lof}	-0.404	mg/m³	0.163	(mg/m³)²
Zero drift from field test	$u_{d,z}$	-0.476	mg/m³	0.227	(mg/m³)²
Span drift from field test	$u_{d,s}$	0.996	mg/m³	0.992	(mg/m³)²
Influence of ambient temperature at span	u_t	0.321	mg/m³	0.103	(mg/m³)²
Influence of supply voltage	u_v	0.093	mg/m³	0.009	(mg/m³)²
Cross sensitivity (interference)	u_i	1.732	mg/m³	3.000	(mg/m³)²
Influence of sample gas flow	u_p	0.433	mg/m³	0.187	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.606	mg/m³	0.368	(mg/m³)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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	2.28	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	4.48	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 50 mg/m³**	**9.0**
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

*** and RSE09/TUV/H1 / RSE09/TUV/H2

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

Measuring system			
Manufacturer	General Impianti		
Name of measuring system	GIGAS 10M		
Serial number of the candidates	S1 A210015 / S2 A20016 ***		
Measuring principle	FTIR		
Test report	936/21211855/B		
Test laboratory	TÜV Rheinland		
Date of report	2011-03-25		
Measured component	NO		
Certification range	0 - 200	mg/m³	

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point	0.00	mg/m³
Sum of negative CS at zero point	-6.80	mg/m³
Sum of postive CS at reference point	2.60	mg/m³
Sum of negative CS at reference point	-5.20	mg/m³
Maximum sum of cross sensitivities	-6.80	mg/m³
Uncertainty of cross sensitivity	-3.926	mg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Standard deviation from paired measurements under field conditions *	u_D	1.782	mg/m³	3.176	(mg/m³)²
Lack of fit	u_{lof}	1.155	mg/m³	1.334	(mg/m³)²
Zero drift from field test	$u_{d,z}$	-0.808	mg/m³	0.653	(mg/m³)²
Span drift from field test	$u_{d,s}$	-3.002	mg/m³	9.012	(mg/m³)²
Influence of ambient temperature at span	u_t	1.650	mg/m³	2.723	(mg/m³)²
Influence of supply voltage	u_v	0.513	mg/m³	0.263	(mg/m³)²
Cross sensitivity (interference)	u_i	-3.926	mg/m³	15.413	(mg/m³)²
Influence of sample gas flow	u_p	1.155	mg/m³	1.334	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	1.617	mg/m³	2.613	(mg/m³)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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	6.04	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	11.84	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 130.4 mg/m³**	**9.1**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 130.4 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 130.4 mg/m³	15.0

*** and RSE09/TUV/H1 / RSE09/TUV/H2

Certificate:
0000028730_01 / 22 July 2016

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

Measuring system			
Manufacturer	General Impianti		
Name of measuring system	GIGAS 10M		
Serial number of the candidates	S1 A210015 / S2 A20016 ***		
Measuring principle	FTIR		
Test report	936/21211855/B		
Test laboratory	TÜV Rheinland		
Date of report	2011-03-25		
Measured component	NO_2		
Certification range	0 - 100	mg/m³	

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point	3.99	mg/m³
Sum of negative CS at zero point	0.00	mg/m³
Sum of postive CS at reference point	3.50	mg/m³
Sum of negative CS at reference point	0.00	mg/m³
Maximum sum of cross sensitivities	3.99	mg/m³
Uncertainty of cross sensitivity	2.304	mg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Standard deviation from paired measurements under field conditions *	u_D	0.864	mg/m³	0.746	(mg/m³)²
Lack of fit	u_{lof}	0.924	mg/m³	0.854	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.346	mg/m³	0.120	(mg/m³)²
Span drift from field test	$u_{d,s}$	-1.559	mg/m³	2.430	(mg/m³)²
Influence of ambient temperature at span	u_t	0.306	mg/m³	0.094	(mg/m³)²
Influence of supply voltage	u_v	0.289	mg/m³	0.084	(mg/m³)²
Cross sensitivity (interference)	u_i	2.304	mg/m³	5.307	(mg/m³)²
Influence of sample gas flow	u_p	0.577	mg/m³	0.333	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.808	mg/m³	0.653	(mg/m³)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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	3.26	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	6.39	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 60 mg/m³**	**10.6**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 60 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 60 mg/m³	15.0

*** and RSE09/TUV/H1 / RSE09/TUV/H2

Umwelt Bundesamt

Certificate:
0000028730_01 / 22 July 2016

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

Measuring system					
Manufacturer			General Impianti		
Name of measuring system			GIGAS 10M		
Serial number of the candidates			S1 A210015 / S2 A20016 ***		
Measuring principle			FTIR		
Test report			936/21211855/B		
Test laboratory			TÜV Rheinland		
Date of report			2011-03-25		
Measured component			SO_2		
Certification range			0 - 75	mg/m³	
Evaluation of the cross sensitivity (CS)					
(system with largest CS)					
Sum of positive CS at zero point			0.89	mg/m³	
Sum of negative CS at zero point			-0.53	mg/m³	
Sum of postive CS at reference point			3.00	mg/m³	
Sum of negative CS at reference point			0.00	mg/m³	
Maximum sum of cross sensitivities			3.00	mg/m³	
Uncertainty of cross sensitivity			1.732	mg/m³	

Calculation of the combined standard uncertainty

Tested parameter		u		u^2	
Repeatability standard deviation at set point *	u_r	0.263	mg/m³	0.069	$(mg/m^3)^2$
Lack of fit	u_{lof}	-0.572	mg/m³	0.327	$(mg/m^3)^2$
Zero drift from field test	$u_{d,z}$	0.563	mg/m³	0.317	$(mg/m^3)^2$
Span drift from field test	$u_{d,s}$	1.212	mg/m³	1.469	$(mg/m^3)^2$
Influence of ambient temperature at span	u_t	1.664	mg/m³	2.769	$(mg/m^3)^2$
Influence of supply voltage	u_v	0.179	mg/m³	0.032	$(mg/m^3)^2$
Cross sensitivity (interference)	u_i	1.732	mg/m³	3.000	$(mg/m^3)^2$
Influence of sample gas flow	u_p	0.433	mg/m³	0.187	$(mg/m^3)^2$
Uncertainty of reference material at 70% of certification range	u_{rm}	0.606	mg/m³	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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	2.92	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	5.73	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 50 mg/m³**	**11.5**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 50 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 50 mg/m³	15.0

*** and RSE09/TUV/H1 / RSE09/TUV/H2

Umwelt Bundesamt

Certificate:
0000028730_01 / 22 July 2016

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

Measuring system			
Manufacturer	General Impianti		
Name of measuring system	GIGAS 10M		
Serial number of the candidates	S1 A210015 / S2 A20016 ***		
Measuring principle	FTIR		
Test report	936/21211855/B		
Test laboratory	TÜV Rheinland		
Date of report	2011-03-25		
Measured component	HCl		
Certification range	0 - 15	mg/m³	

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point	0.49	mg/m³
Sum of negative CS at zero point	-0.61	mg/m³
Sum of postive CS at reference point	0.60	mg/m³
Sum of negative CS at reference point	-0.15	mg/m³
Maximum sum of cross sensitivities	-0.61	mg/m³
Uncertainty of cross sensitivity	-0.350	mg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Repeatability standard deviation at set point *	u_r	0.144	mg/m³	0.021	(mg/m³)²
Lack of fit	u_{lof}	-0.104	mg/m³	0.011	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.251	mg/m³	0.063	(mg/m³)²
Span drift from field test	$u_{d,s}$	0.251	mg/m³	0.063	(mg/m³)²
Influence of ambient temperature at span	u_t	0.186	mg/m³	0.035	(mg/m³)²
Influence of supply voltage	u_v	0.026	mg/m³	0.001	(mg/m³)²
Cross sensitivity (interference)	u_i	-0.350	mg/m³	0.122	(mg/m³)²
Influence of sample gas flow	u_p	0.087	mg/m³	0.008	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.121	mg/m³	0.015	(mg/m³)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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.58	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	1.14	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 10 mg/m³**	**11.4**
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

*** and RSE09/TUV/H1 / RSE09/TUV/H2

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

Measuring system			
Manufacturer		General Impianti	
Name of measuring system		GIGAS 10M	
Serial number of the candidates		S1 A210015 / S2 A20016 ***	
Measuring principle		FTIR	
Test report		936/21211855/B	
Test laboratory		TÜV Rheinland	
Date of report		2011-03-25	
Measured component		NH_3	
Certification range		0 - 15	mg/m³
Evaluation of the cross sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point		0.52	mg/m³
Sum of negative CS at zero point		-0.27	mg/m³
Sum of postive CS at reference point		0.60	mg/m³
Sum of negative CS at reference point		-0.15	mg/m³
Maximum sum of cross sensitivities		0.60	mg/m³
Uncertainty of cross sensitivity		0.346	mg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.086	mg/m³	0.007	(mg/m³)²
Lack of fit	u_{lof}	0.165	mg/m³	0.027	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.147	mg/m³	0.022	(mg/m³)²
Span drift from field test	$u_{d,s}$	0.251	mg/m³	0.063	(mg/m³)²
Influence of ambient temperature at span	u_t	0.173	mg/m³	0.030	(mg/m³)²
Influence of supply voltage	u_v	0.017	mg/m³	0.000	(mg/m³)²
Cross sensitivity (interference)	u_i	0.346	mg/m³	0.120	(mg/m³)²
Influence of sample gas flow	u_p	0.087	mg/m³	0.008	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.121	mg/m³	0.015	(mg/m³)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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.54	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	1.06	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 10 mg/m³**	**10.6**
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

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
A value of 40.0 % was used for this.

*** and RSE09/TUV/H1 / RSE09/TUV/H2

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

Measuring system	
Manufacturer	General Impianti
Name of measuring system	GIGAS 10M
Serial number of the candidates	S1 A210015 / S2 A20016 ***
Measuring principle	FTIR
Test report	936/21211855/B
Test laboratory	TÜV Rheinland
Date of report	2011-03-25
Measured component	CO_2
Certification range	0 - 20 Vol.-%

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 postive 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	0.067	Vol.-%	0.004	(Vol.-%)²
Lack of fit	u_{lof}	-0.104	Vol.-%	0.011	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	-0.058	Vol.-%	0.003	(Vol.-%)²
Span drift from field test	$u_{d,s}$	-0.231	Vol.-%	0.053	(Vol.-%)²
Influence of ambient temperature at span	u_t	0.252	Vol.-%	0.064	(Vol.-%)²
Influence of supply voltage	u_v	0.026	Vol.-%	0.001	(Vol.-%)²
Cross sensitivity (interference)	u_i	0.000	Vol.-%	0.000	(Vol.-%)²
Influence of sample gas flow	u_p	0.115	Vol.-%	0.013	(Vol.-%)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.162	Vol.-%	0.026	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.42	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.82	Vol.-%

Relative total expanded uncertainty	**U in % of the range 20 Vol.-%**	**4.1**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the range 20 Vol.-%**	**10.0 ****
Requirement of EN 15267-3	U in % of the range 20 Vol.-%	7.5

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
A value of 10.0 % was used for this.

*** and RSE09/TUV/H1 / RSE09/TUV/H2

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

Measuring system	
Manufacturer	General Impianti
Name of measuring system	GIGAS 10M
Serial number of the candidates	S1 A210015 / S2 A20016 ***
Measuring principle	FTIR
Test report	936/21211855/B
Test laboratory	TÜV Rheinland
Date of report	2011-03-25
Measured component	H_2O
Certification range	0 - 30 Vol.-%

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 postive 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	0.208	Vol.-%	0.043	(Vol.-%)²
Lack of fit	u_{lof}	-0.173	Vol.-%	0.030	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	-0.017	Vol.-%	0.000	(Vol.-%)²
Span drift from field test	$u_{d,s}$	0.468	Vol.-%	0.219	(Vol.-%)²
Influence of ambient temperature at span	u_t	0.172	Vol.-%	0.030	(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	0.173	Vol.-%	0.030	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.64	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	1.26	Vol.-%

Relative total expanded uncertainty	**U in % of the range 30 Vol.-%**	**4.2**
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.
A value of 10.0 % was used for this.

*** and RSE09/TUV/H1 / RSE09/TUV/H2