Umwelt Bundes Amt
For our Environment

TÜVRheinland®
Precisely Right.

CERTIFICATE

about Product Conformity (QAL1)

Number of Certificate: 0000028730

Certified AMS:	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. Via Monteschiaro 3 60030 Moie di Maiolati Italy
Test Institute:	TÜV Rheinland Energie und Umwelt GmbH

This is certifying 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: 2004

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

www.tuv.com TÜVRheinland® ID: 0000028730

- EN 15267-3 tested
- QAL1 certified
- TUV approved
- Annual inspection

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

The certificate is valid until: 28 July 2016

Umweltbundesamt
Dessau, 19 August 2011

i. A. Dr. Hans-Joachim Hummel

TÜV Rheinland Energie und Umwelt GmbH
Köln, 17 August 2011

ppa. Dr. Peter Wilbring

www.umwelt-tuv.de / www.eco-tuv.com teu@umwelt-tuv.de Tel. +49 - 221 - 806 - 2756	TÜV Rheinland Energie und Umwelt GmbH Am Grauen Stein 51105 Köln
Accreditation according to EN ISO/IEC 17025 and certified according to ISO 9001:2008.	

Test report:	936/21211855/B of 25 March 2011
First certification:	29 July 2011
Run of validity until:	28 July 2011
Publication	BAnz. 29 July 2011, No 113, page 2725, chapter I No 4.3

Authorised application

Suitability of the AMS for application at plants requiring licensing and plants according to the 27 BImSchV was assessed on the basis of a laboratory test and a field test over a more than 15 month period of the GIGAS 10M measuring system for monitoring the components HF and N_2O at a tunnel kiln plant for firing refractory and acid proof bricks.

The AMS is approved for the temperature range from +5 °C to +40 °C.

The measuring system had been certified and approved on the basis of extensive laboratory tests and a field test of more than 12 months at a municipal waste incineration plant for measuring the components CO, NO, NO_2, SO_2, HCl, NH_3, CO_2 and H_2O during an earlier suitability test. The tested measurement ranges were selected in order to secure an application range for the AMS as wide as possible.

The results of the earlier tested procedure for CO, NO, NO_2, SO_2, HCl, NH_3, CO_2 and H_2O as well as the test results of the current testing for HF and N_2O have been assessed and found to comply with the requirements of the latest European Standard for pollution control purposes (QAL1 according to EN 15267).

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

Basis of the certification

This certification is based on:

- the test report 936/21211855/B of 25 March 2011 of TÜV Rheinland Energie und Umwelt GmbH
- suitability announced by the German Environmental Agency (UBA) as 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: UBA publication from 15 July 2011)

AMS name:
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

Suitability:
For measurements at plants requiring official permission (i. e. plants in 2000-76-EC, waste incineration directive and 2001-80-EC, large combustion plants directive).

Measurement ranges during the suitability 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.-%.

Remarks:
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, Köln
Report-No: 936/21211855/B of 25 March 2011

Certified product
This certificate applies to automatic measurement systems that comply with the following description:

The GIGAS 10M 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 a long-lasting compliance of the ongoing production process with the requirements of EN 15267. The manufacturer is obliged to maintain a certified quality management system to control the production of the certified product. Both product and quality management system 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 given address on page 1.

The certification mark with the product specific ID-Number which may be applied to the product or used in promotion material of the certified product is presented on page 1 of this certificate.

This document as well as the certification mark remain property of TÜV Rheinland Energie und Umwelt GmbH. Upon revocation of the announcement the certificate loses validity. After expiration of the validity of the certificate or on request of the TÜV Rheinland Energie und Umwelt GmbH this document shall be returned and the certification mark shall longer be used.

The current version of this certificate and its validity is also listed at the Internet Address: **qal1.de**.

Certification of GIGAS 10M 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, Köln

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, Köln

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, Köln

Publication: BAnz. 03 September 2008, No 133, p. 3242, chapter I No 2.3:
UBA announcement from 12 August 2008

Notification

Publication: BAnz. 26 January 2011, No 14, p. 294, chapter IV notification 29:
UBA announcement from 10 January 2011 (Software)

Initial certification according to EN 15267

Certificate No 0000028730 of: 19 August 2011

Validity of the certificate: 28 July 2011

Test report: 936/21211855/B of 25 March 2011
TÜV Rheinland Energie und Umwelt GmbH, Köln

Publication: BAnz. 29 July 2011, No 113, p. 2725, chapter I No 4.3:
UBA publication of 15 July 2011

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		u^2	
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		u²	
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 gas flow	u_p	0.264	mg/m³	0.070	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.56	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	3.05	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 20 mg/m³**	**15.3**
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.
The chosen value is recommended by the certification body.

Umwelt Bundes Amt
For our Environment

Certificate:
0000028730 / 19 August 2011

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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			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

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

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		u²	
Repeatability standard deviation at set point *	u_r	0.263	mg/m³	0.069	(mg/m³)²
Lack of fit	u_{lof}	-0.572	mg/m³	0.327	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.563	mg/m³	0.317	(mg/m³)²
Span drift from field test	$u_{d,s}$	1.212	mg/m³	1.469	(mg/m³)²
Influence of ambient temperature at span	u_t	1.664	mg/m³	2.769	(mg/m³)²
Influence of supply voltage	u_v	0.179	mg/m³	0.032	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	2.92	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

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		u^2	
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		u²	
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.
The chosen value is recommended by the certification body.

*** 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		u²	
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.
The chosen value is recommended by the certification body.
*** and RSE09/TUV/H1 / RSE09/TUV/H2

Umwelt Bundes Amt
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Certificate:
0000028730 / 19 August 2011

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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			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		u²	
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.
The chosen value is recommended by the certification body.

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