Umwelt Bundes Amt
For our Environment

TÜVRheinland®
Precisely Right.

CERTIFICATE

about Product Conformity (QAL1)

Number of Certificate: 0000028729

Certified AMS:	GM700-2 for HF
Manufacturer:	SICK MAIHAK GmbH Nimburger Straße 11 79276 Reute Germany
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: 2008 und 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: 0000028729

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

Publication in the German Federal Gazette (BAnz.) of 26 January 2011

The certificate is valid until: 25 January 2016

Umweltbundesamt
Dessau, 9 February 2011

i. A. Dr. Hans-Joachim Hummel

TÜV Rheinland Energie und Umwelt GmbH
Köln, 7 February 2011

ppa. Dr. Peter Wilbring

www.umwelt-tuv.de / **www.eco-tuv.com** teu@umwelt-tuv.de Tel. +49 - 221 - 806 - 2275	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:	936/21210058/A of 30 September 2010
First certification:	26. January 2011
Run of validity until:	25 January 2016
Publication	BAnz. 26 January 2011, No. 14, page 294, Chapter I No. 2.1

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

Suitability of the AMS for this application was assessed on the basis of a laboratory test and a three months field test at a tunnel kiln plant for the production of ceramic tiles.

The AMS is approved for the temperature range from -20 °C to +50 °C.

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 936/21210058/A of 30 September 2010 of TÜV Rheinland Energie und Umwelt GmbH, on the relevant body (Federal Environment Agency of Germany) assessment and ongoing surveillance of the product and the manufacturing process and the publication in the German Federal Gazette (BAnz. 26 January 2011, No. 14, p. 294, Chapter I No. 2.1: UBA annoucement from 10 January 2011):

AMS name:
GM700-2 for HF

Manufacturer:
SICK MAIHAK GmbH, Reute

Approval:
For measurements at plants requiring official permission (i. e. 2000-76-EC, waste incineration directive).

Measuring ranges during the suitability test:

Component	Certification range	Supplementary measuring range	Unit
HF	0 - 5	0 - 25	mg/m³

Software version:
9105060-UD81

Remarks:
1. Wet test gases shall be used for the testing of HF.
2. A four weeks period has been determined as maintenance interval.
3. The parameterisation of the heating unit shall be adjusted if the ambient temperature range is above 50 °C.

Test report:
TÜV Rheinland Energie und Umwelt GmbH, Köln
Report-No.: 936/21210058/A of 30 September 2010

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

The GM700-2 measuring system is an in-situ laser system for the determination of component HF.

A laser which has been developed especially for gas analysis is operated as light source of the GM700-2 measuring system. Precise stabilisation of the wavelength and temperature is provided by a Peltier element and a temperature sensor built into the housing of the laser diode.

The laser beam transmitted by the transmitter- / receiver unit passes through the active measuring path and hits the detector at the other end of the gas duct, where it is bounced back to the transmitter- / receiver unit. Here, the light is focused onto a photo diode via a light collector.

The light of the laser diode shines through the sample gas and is then detected by a photo diode. The wavelength of the laser diode is tuned to a single absorption line of the test gas component. A corresponding signal processing provides the size of the absorption line which is required for the calculation of the gas concentration. This method is called Tunable Diode Laser Spectroscopy (TDLS) or Tunable Diode Laser Absorption Spectroscopy (TDLAS).

The GM700 measuring system is equipped with a closed reference cuvette in order to stabilise the wavelength of the laser. The tested measuring system comprises the following parts:

- **Sender- / receiver unit (SR unit)** containing the optical and electronical components of the measuring system.
- **Triple reflector**
- **Purge air attachments for SR unit and reflector**
- **Purge air unit**
- **Evaluation unit**
  - Out put of measured values, calculated data and operation states
  - Communication with the peripheral equipment
  - Output of error messages and other status signals
  - Controlling of automatical test functions and access during service (diagnosis)
- **Probe for temperature and pressure measurement**

The certification range is 5 mg/m³ * m. The length of the measuring path which has been used during the test was 1 m.

General notes
This certificate is based upon the tested equipment. The manufacturer is responsible for long-term 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 certified product is found to lose compliance with the applicable European Standard, TÜV Rheinland Energie und Umwelt GmbH should 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 remains the property of TÜV Rheinland Energie und Umwelt GmbH. Upon revocation of the publication 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 GM700-2 for HF is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

Initial certification according to EN 15267:

Certificate No. 0000028729: 9 February 2011

Validity of the certificate until: 25 January 2016

Test report: 936/21210058/A of 30 September 2010
TÜV Rheinland Energie und Umwelt GmbH, Köln,

Publication: BAnz. 26 January 2011, No. 14, p. 294, Chapter I No. 2.1:
Announcement by UBA from 10 January 2011.

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

Measuring system			
Manufacturer	SICK MAIHAK GmbH		
Name of measuring system	GM700-2		
Serial number of the candidates	8308013 / 8308014		
Measuring principle	Tunable Diode Laser Spectroscopy		
Test report	936/2110058A		
Test laboratory	TÜV Rheinland		
Date of report	2010-09-30		
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	0.07	mg/m³	
Sum of negative CS at zero point	0.00	mg/m³	
Sum of postive CS at reference point	0.18	mg/m³	
Sum of negative CS at reference point	-0.11	mg/m³	
Maximum sum of cross sensitivities	0.18	mg/m³	
Uncertainty of cross sensitivity	0.104	mg/m³	

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Repeatability standard deviation at set point *	u_r	0.065	mg/m³	0.004	(mg/m³)²
Lack of fit	u_{lof}	-0.029	mg/m³	0.001	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.072	mg/m³	0.005	(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	0.060	mg/m³	0.004	(mg/m³)²
Influence of supply voltage	u_v	0.017	mg/m³	0.000	(mg/m³)²
Cross sensitivity (interference)	u_i	0.104	mg/m³	0.011	(mg/m³)²
Influence of sample pressure	u_p	0.050	mg/m³	0.003	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.040	mg/m³	0.002	(mg/m³)²
Excursion of measurement beam	u_{mb}	0.035	mg/m³	0.001	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.19	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.38	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 2 mg/m³**	**18.9**
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