Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000028729_02

Certified AMS:	GM700-2 for HF
Manufacturer:	SICK AG Nimburger Str. 11 79276 Reute Germany
Test Institute:	TÜV Rheinland Energie und Umwelt 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 (2008) and EN 14181 (2004)

Certification is awarded in respect of the conditions stated in this certificate
(This certificate contains 8 pages.)

TÜVRheinland®
CERTIFIED

Suitability Tested
EN 15267
QAL1 Certifed
Regular
Surveillance

www.tuv.com
ID 0000028729

Publication in the German Federal Gazette (BAnz.) of 5 August 2014

This certificate will expire on:
25 January 2021

German Federal Environment Agency
Dessau, 21 January 2016

i. A. Dr. Marcel Langner

TÜV Rheinland Energie und Umwelt GmbH
Cologne, 20 January 2016

ppa. Dr. Peter Wilbring

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Am Grauen Stein
51105 Cologne

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.

Certificate:
0000028729_02 / 21 January 2016

Test report:	936/21210058/B of 2 April 2014
Initial certification:	26 January 2011
Certificate:	renewal (previous certificate 0000025926_01 of 09 September 2014 valid until 25 January 2016)
Date of expiry:	25 January 2021
Publication:	BAnz AT 05.08.2014 B11, chapter I, no. 2.1

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 twelve-month field test at a tunnel kiln for the production of ceramic roof tiles.

The AMS is approved for the temperature range of -20 °C to +50 °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 ambient air applications at which it will be installed.

Basis of the certification
This certification is based on:

- test report 936/21210058/B of 2 April 2014 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 05.08.2014 B11, chapter 1, no. 2.1,
Announcement by UBA from 17 July 2014:

AMS designation:
GM700-2 for HF

Manufacturer:
SICK AG, Reute

Field of application:
For measurements at plants requiring official and plants according to 27th BImSchV.

Measuring ranges during the performance test:

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

Software versions:
9105060 VA24 (Measuring head)
9100821 WN42 (Evaluation unit)
9091948 WJ24 (Purge air)

Restriction:
The performance criterion for the expanded uncertainty according to EN 15267-3 was not fulfilled.

Notes:
1. Wet test gases shall be used for the testing of HF.
2. The maintenance interval is six months.
3. If the range of the ambient temperature is >50 °C it is necessary to adjust the parameterisation of the heating element for the transmitter and receiver unit.
4. Supplementary testing (extension of the maintenance interval) to the announcement of the Federal Environmental Agency (UBA) of 10 January 2011 (Federal Gazette, BAnz. p. 249, chapter I, no. 2.1) and of 3 July 2013 (Federal Gazette, BAnz AT 23.07.2013, B4, chapter V, 12th notification [no. 1]).

Test report:
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Report no.: 936/21210058/B of 2 April 2014

Publication in the German Federal Gazette: BAnz AT 26.08.2015 B4, chapter V notification 7, Announcement by UBA from 22 July 2015:

> **7 Notification as regards Federal Environment Agency (UBA) notices of 17 July 2014 (BAnz AT 05.08.2014 B11, chapter 1 no. 2.1)**
>
> The current software versions for the GM700-2 of HF measuring system manufactured by SICK AG are:
> 9105060 (measuring head)
> 9100821 (evaluation unit)
> 9091948 (purge air)
>
> Statement of TÜV Rheinland Energie und Umwelt GmbH of 27 March 2015.

Certified product
This certificate applies to automated measurement systems conforming to 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 specifically 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 reflected back to the transmitter- / receiver unit. There, the light is focused onto a photo diode via a light collector.

The light of the laser diode shines through the sample gas and 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 signal evaluation unit 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 GM700-02 measuring system is equipped with a closed reference cuvette in order to stabilise the wavelength of the laser. The tested measuring system consists of 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**
  - Output of measured values, calculated data and operation states
  - Communication with the peripheral equipment
  - Output of error messages and other status signals
  - Controlling of automatic test functions and access during service (diagnosis)
- **Probe for temperature and pressure measurement**
- **Zero path with GMK10 test cell**

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 equipment tested. The manufacturer is responsible for ensuring that on-going production complies with the requirements of the EN 15267. The manufacturer is required to maintain an approved quality management system controlling the manufacture of the certified product. Both the product and the quality management systems shall be subject to regular surveillance.

If a product of the current production does not conform to the certified product, TÜV Rheinland Energie und Umwelt GmbH must be notified at the address given on page 1.

A certification mark with an ID-Number that is specific to the certified product is presented on page 1 of this certificate. This can be applied to the product or used in publicity material for the certified product is presented on page 1 of this certificate.

This document as well as the certification mark remains property of TÜV Rheinland Energie und Umwelt GmbH. With revocation of the publication the certificate loses its validity. After the expiration of the certificate and on requests of the TÜV Rheinland Energie und Umwelt GmbH this document shall be returned and the certificate mark must not be employed anymore.

The relevant version of this certificate and the validity is also accessible on the internet: **qal1.de**.

Certification of 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
Expiry date of the certificate: 25 January 2016
Test report: 936/21210058/A of 30 September 2010
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Publication: BAnz. 26 January 2011, no. 14, p. 294, chapter I, no. 2.1
UBA announcement of 10 January 2011

Supplementary testing according to EN 15267

Certificate no. 0000028729_01: 9 September 2014
Expiry date of the certificate: 25 January 2016
Test report: 936/21210058/B of 2 April 2014
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Publication: BAnz AT 05.08.2014 B11, chapter I, no. 2.1
UBA announcement of 17 July 2014

Notifications

Statement TÜV Rheinland Energie und Umwelt GmbH of 14 March 2012
Publication: BAnz AT 20.07.2012 B11, chapter IV, notification 15 (changes to software)
UBA announcement of 6 July 2012

Statement TÜV Rheinland Energie und Umwelt GmbH of 6 October 2012
Publication: BAnz AT 05.03.2013 B10, chapter V, notification 26 (changes to software)
UBA announcement of 12 February 2013

Statement TÜV Rheinland Energie und Umwelt GmbH of 25 March 2013
Publication: BAnz AT 23.07.2013 B4, chapter V, notification 12 (manufacturer renamed)
UBA announcement of 3 July 2013

Statement of TÜV Rheinland Energie und Umwelt GmbH of 27 March 2015
Publication: BAnz AT 26.08.2015 B4, chapter V, notification 7 (changes to software)
UBA announcement of 22 July 2015

Renewal of the certificate:
Certificate No.: 0000028729_02: 21 January 2016
Validity of the certificate: 25 January 2021

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

Measuring system					
Manufacturer			Sick AG		
AMS designation			GM700-2		
Serial number of units under test			8308013 / 8308014		
Measuring principle			Tuneable Diode Laser Spectroscopy		
Test report			936/21210058/B		
Test laboratory			TÜV Rheinland		
Date of report			2014-04-02		
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 span point			0.18	mg/m³	
Sum of negative CS at span point			-0.11	mg/m³	
Maximum sum of cross-sensitivities			0.18	mg/m³	
Uncertainty of cross-sensitivity		u_i	0.104	mg/m³	

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *		u_D	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 gas 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 1 mg/m³**	**37.9**
Requirement of 2010/75/EU	**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