Umwelt Bundes Amt
For our Environment

TÜVRheinland®
Precisely Right.

CERTIFICATE

on Product Conformity (QAL1)

Number of Certificate: 0000035015

Certified AMS:	MERCEM 300Z for Hg
Manufacturer:	SICK MAIHAK GmbH Dr.-Zimmermann-Straße 18 88709 Meersburg Germany
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: 2008 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: 0000035015

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

Publication in the German Federal Gazette (BAnz.) of 02 March 2012

The certificate is valid until: 01 March 2017

Umweltbundesamt
Dessau, 16 March 2012

i. A. Dr. Hans-Joachim Hummel

TÜV Rheinland Energie und Umwelt GmbH
Köln, 15 March 2012

ppa. Dr. Peter Wilbring

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Am Grauen Stein
51105 Köln

Accreditation according to EN ISO/IEC 17025 and certified according to ISO 9001:2008.

10/221 2.08

Test report:	936/21216054/A of 19 October 2011
First certification:	02 March 2012
Validity ends:	01 March 2017
Publication:	BAnz. 02 March 2012, No. 36, p. 920, chapter I, No. 3.2

Approved application
The tested AMS is suitable for measurements at waste incineration plants according to directive 2000-76-EC) without co-combustion plants (article 3 No 5 of the directive). 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 six months field test at a waste incineration plant.

The AMS is approved for an ambient temperature range of -20 °C to +50 °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 936/21216054/A dated 19 October 2011 of TÜV Rheinland Energie und Umwelt GmbH
- suitability announced by the German Environmental Agency (UBA) as the relevant body
- the ongoing surveillance of the product and the manufacturing process
- publication in the German Federal Gazette (BAnz. 02 March 2012, No. 36, p. 920, chapter I, No. 3.2, announcement by UBA from 23 February 2012)

AMS name:
MERCEM 300Z for Hg

Manufacturer:
SICK MAIHAK GmbH, Meersburg

Field of application:
For measurements at waste incineration plants (according to directive 2000-76-EC) without co-combustion plants (article 3 No. 5 of the directive).

Measuring ranges during the suitability test:

Component	Certification range	Supplementary measuring ranges			Unit
Hg	0 - 10	0 - 45	0 - 100	0 - 1000	µg/m³

Software version:
9162140 VL27

Restrictions:
None

Notes:
1. Humid test gases shall be used for testing the measuring device.
2. A three month period has been determined as maintenance interval.
3. To perform span checks for Hg, a suitable Hg test generator, e. g HovaCal, shall be used. As an option also operation with an internal test gas generator is possible; then an external test gas generator is not required. For short term system checks an internal Hg-cuvette is available. The data of this cuvette must not be used for QAL3 purposes.
4. The length of the measuring line in the field test was 35 m.

Test report:
TÜV Rheinland Energie und Umwelt GmbH, Köln
Report No.: 936/21216054/A dated 19 October 2011

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

The sample gas of the measuring system MERCEM 300Z is taken from the duct with the help of a particular sampling probe heated to 200 °C. The heated test gas line is equipped with two inner liners. The first inner liner is responsible for transporting flue gas to the analyzer. The second inner liner serves to feed in zero and sample gas – application to the system takes place inside the sampling probe.

Hg analysis is performed in a UV photometer. Conversion of the entire mercury contained in the exhaust gas takes place as a directly thermal reaction at a temperature of approximately 1000 °C. In order to compensate for cross-sensitivities, the Zeeman-effect is employed. Gas is transported based on the principle of an ejector pump.

The measuring system is suited for use in the open air at temperatures ranging from -20 °C to 50 °C. The measuring system's control panel is built in to its door. The system features an integrated climate control unit and Ethernet network connectivity for data transfer.

The tested measuring system consists of the following parts:

- the sampling probe heated to 200 °C equipped with a heated filter element and test gas feeding facilities,
- the sampling line heated to 200 °C with two inner liners (a line of 35m length was used during the field test),
- the analyzer rack with a photometer unit including an adjustment cuvette, an optional test gas generator, controllers and data output,
- and software 9162140 VL27.

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 looses its validity. After the expiration of the validity 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 Address: **qal1.de**.

Certification of MERCEM 300Z for Hg 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 0000035015: 16 March 2012

Validity of the certificate: 01 March 2017

Test report: 936/21216054/A of 19 October 2011
TÜV Rheinland Energie und Umwelt GmbH, Köln

Publication: BAnz. 02 March 2012, No. 36, p. 920, chapter I, No. 3.2:
Announcement by UBA from 23 February 2012

Umwelt Bundes Amt
Für Mensch und Umwelt

Certificate:
0000035015 / 16 March 2012

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

Measuring system			
Manufacturer	SICK Maihak GmbH		
Name of measuring system	MERCEM300Z		
Serial number of the candidates	TÜV 1 / TÜV 2		
Measuring principle	UV-Absorption / Zeemann Effekt		
Test report	936/21216054/A		
Test laboratory	TÜV Rheinland		
Date of report	2011-10-19		
Measured component	Hg		
Certification range	0 - 10	µg/m³	

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

Sum of positive CS at zero point	0.00	µg/m³
Sum of negative CS at zero point	-0.12	µg/m³
Sum of postive CS at reference point	0.06	µg/m³
Sum of negative CS at reference point	-0.22	µg/m³
Maximum sum of cross sensitivities	-0.22	µg/m³
Uncertainty of cross sensitivity	-0.127	µg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Standard deviation from paired measurements under field conditions *	u_D	0.138	µg/m³	0.019	(µg/m³)²
Lack of fit	u_{lof}	-0.046	µg/m³	0.002	(µg/m³)²
Zero drift from field test	$u_{d,z}$	0.169	µg/m³	0.029	(µg/m³)²
Span drift from field test	$u_{d,s}$	0.173	µg/m³	0.030	(µg/m³)²
Influence of ambient temperature at span	u_t	0.101	µg/m³	0.010	(µg/m³)²
Influence of supply voltage	u_v	0.055	µg/m³	0.003	(µg/m³)²
Cross sensitivity (interference)	u_i	-0.127	µg/m³	0.016	(µg/m³)²
Influence of sample gas flow	u_p	-0.109	µg/m³	0.012	(µg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.081	µg/m³	0.007	(µg/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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.36	µg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.70	µg/m³

Relative total expanded uncertainty	**U in % of the ELV 30 µg/m³**	**2.3**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 30 µg/m³**	**40.0**
Requirement of EN 15267-3	U in % of the ELV 30 µg/m³	30.0