Umwelt Bundes Amt
For our Environment

TÜVRheinland®
Precisely Right.

CERTIFICATE

on Product Conformity (QAL1)

Number of Certificate: 0000035012_01

Certified AMS:	AR602Z/Hg for Hg
Manufacturer:	Opsis AB Skytteskogsvägen 16 24402 Furulund Sweden
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: 2007 and EN 14181: 2004

Certification is awarded in respect of the conditions stated in this certificate (see also the following pages).
The present certificate replaces Certificate No. 0000035012 of 16 March 2012

www.tuv.com TÜVRheinland® ID: 0000035012

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

Publication in the German Federal Gazette (BAnz.) of 20 July 2012

The certificate is valid until:
01 March 2017

Umweltbundesamt
Dessau, 20 August 2012

i. A. Marion Wichmann-Fiebig

TÜV Rheinland Energie und Umwelt GmbH
Köln, 17 August 2012

ppa. Dr. Peter Wilbring

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

Test report:	936/21215492/B of 09 March 2012
First certification:	02 March 2012
Validity ends:	01 March 2017
Publication:	BAnz AT 20 July 2012 B11, chapter I, No. 2.2

Approved application
The tested AMS is suitable for measurements at waste incineration plants (according to directive 2001-80-EC without co-combustion plants (article 3 No. 5 of the directive).

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 +5 °C to +40 °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 936/21215492/A of 10 October 2011 of TÜV Rheinland Energie und Umwelt GmbH and test report 936/21215492/B of 09 March 2012 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 AT 20 July 2012 B11, chapter I, No. 2.2

AMS name:
AR602Z/Hg for Hg

Manufacturer:
Opsis AB, Furulund, Sweden

Approval:
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 measurement range	Unit
Hg	0 - 45	0 - 100	µg/m³

Software version:
7.21

Restrictions:
During the suitability testing, the requirement of EN 15267-3 with regard to the response time was not met.

Remarks:

1. The maintenance interval is two months.
2. Regular controls of the span point during the maintenance interval require the test gas generator HovaCal.
3. During the laboratory and field tests a heated test gas line of 10 m length was used.
4. In order to compensate for cross-sensitivity, the SO_2 content has to be determined in the measuring cell.
5. After revision or malfunctioning of the flue gas cleaning, filters in the sampling probe need to be checked and replaced where necessary.
6. Complementary testing (extension of the maintenance interval) to Federal Environmental Agency notice of 23 February 2012 (Federal Journal (BAnz.) p. 920, Chapter I, No. 3.1).

Test report:
TÜV Rheinland Energie und Umwelt GmbH, Köln
Report No.: 936/21215492/B of 09 March 2012

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

The AR602Z/Hg is an extractive AMS and consists of a rack with a measuring cell, an AR602 UV analyser, a heated sampling probe as well as a heated test gas line (10m length). The rack with measuring cell also houses all external devices.

The 2-metre-long measuring cell consists of stainless steel pipes of 89 centimetres in diameter, which is closed at both ends with fused quartz glass. Light emitters and receivers are fitted at either end of the measuring cell.

The emitter sends a light beam through the measuring cell. The emitter's high-pressure xenon lamp is powered by the supply unit PS150. The receiver registers the emitted light and concentrates it on a light conductor (fibre optic cable) which is connected to the analyser. This cable merely serves to enable the analyser being mounted at a location protected from dust, excessive moisture and temperature fluctuations.

The measuring gas is transported toward the measuring cell via a heated sampling probe (M&C SP2000) and a heated test gas line (10m length during the test). The sampling probe is equipped with a separate calibration gas connector. It is situated in front of the filter and is thus suited for the admission of external test gas as well as for adjustments and calibration.
On its way into the measuring cell, the test gas passes through a catalyser. This causes the chemical reaction to reverse and splits Hg-compounds to elementary Hg^0. This can be measured with the help of the UV-DOAS technology.
Gas exits the cell at the opposite end. To ensure a stable flow rate, an ejector pump is installed at the exit side of the measuring cell. A flow monitor monitors the flow rate inside the measuring cell.

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 AR602Z/Hg 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. 0000035012: 16 March 2012

Validity of the certificate: 01 March 2017

Test report: 936/21215492/A of 10 October 2011
TÜV Rheinland Energie und Umwelt GmbH, Köln

Publication: BAnz. 02 March 2012, No. 36, p. 920, chapter I, No. 3.1
Announcement by UBA from 23 February 2012

Supplementary testing according to EN 15267

Certificate No. 0000035012_01: 20 August 2012

Validity of the certificate: 01 March 2017

Test report: 936/21215492/B of 09 March 2012
TÜV Rheinland Energie und Umwelt GmbH, Köln

Publication: BAnz AT 20 July 2012 B11, chapter I, No. 2.2
Announcement by UBA from 06 July 2012

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

Measuring system			
Manufacturer		Opsis AB	
Name of measuring system		AR602Z/Hg	
Serial number of the candidates		1498 / 1499	
Measuring principle		UV - DOAS	
Test report		936/21215492/A	936/21215492/B
Test laboratory		TÜV Rheinland	TÜV Rheinland
Date of report		2011-10-10	2012-03-09
Measured component		Hg	
Certification range		0 - 45 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		-0.50 µg/m³	
Sum of postive CS at reference point		1.00 µg/m³	
Sum of negative CS at reference point		-1.10 µg/m³	
Maximum sum of cross sensitivities		1.20 µg/m³	
Uncertainty of cross sensitivity		0.694 µg/m³	

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Standard deviation from paired measurements under field conditions *	u_D	0.736 µg/m³		0.542	(µg/m³)²
Lack of fit	u_{lof}	0.404 µg/m³		0.163	(µg/m³)²
Zero drift from field test	$u_{d,z}$	0.442 µg/m³		0.195	(µg/m³)²
Span drift from field test	$u_{d,s}$	1.039 µg/m³		1.080	(µg/m³)²
Influence of ambient temperature at span	u_t	0.153 µg/m³		0.023	(µg/m³)²
Influence of supply voltage	u_v	0.208 µg/m³		0.043	(µg/m³)²
Cross sensitivity (interference)	u_i	0.694 µg/m³		0.481	(µg/m³)²
Influence of sample gas flow	u_p	-0.049 µg/m³		0.002	(µg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.364 µg/m³		0.132	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.63	µg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	3.20	µg/m³

Relative total expanded uncertainty	**U in % of the ELV 30 µg/m³**	**10.7**
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