

# CERTIFICATE

## on Product Conformity (QAL1)

Certificate No.: 0000038495

**Certified AMS:** AR650/N for CO, HCl and CH<sub>4</sub>

**Manufacturer:** OPSIS AB  
Skytteskogsvägen 16  
244 02 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).



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

Publication in the German Federal Gazette  
(BAnz.) of 05 March 2013

This certificate will expire on:  
04 March 2018

German Federal Environment Agency  
Dessau, 22 March 2013

TÜV Rheinland Energie und Umwelt GmbH  
Cologne, 21 March 2013



i. A. Dr. Marcel Langner



ppa. Dr. Peter Wilbring

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51105 Cologne

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

<b>Test report:</b>	936/21220566/A of 11 October 2012
<b>Initial certification:</b>	05 March 2013
<b>Expiry date:</b>	04 March 2018
<b>Publication:</b>	BAnz AT 05 March 2013 B10, chapter I, No. 5.1

#### **Approved application**

The tested AMS is suitable for use at combustion plants according to EC Directive 2001/80/EC and at waste incineration plants according to EC Directive 2000/76/EC 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 threemonth 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 936/21220566/A of 11 October 2012 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 March 2013 B10, chapter I, No. 5.1

**AMS designation:**

AR650/N for CO, HCl and CH<sub>4</sub>

**Manufacturer:**

OP SIS AB, Furulund, Sweden

**Field of application:**

Measurement at plants requiring official approval as well as plants within the scope of 2000/76/EC (waste incineration directive) and 2001/80/EC (large combustion plants directive)

**Measuring ranges during performance test:**

Component	Certification range	Supplementary range	Unit
CO	0 - 75	0 - 500	mg/m <sup>3</sup>
HCl	0 - 15	0 - 90	mg/m <sup>3</sup>
CH <sub>4</sub>	0 - 20	0 - 100	mg/m <sup>3</sup>

**Software version:**

7.21

**Restrictions:**

None

**Notes:**

1. The tested measurement path length was 1 m.
2. The maintenance interval is four weeks.

**Test report:**

TÜV Rheinland Energie und Umwelt GmbH, Cologne  
Report No.: 936/21220566/A of 11 October 2012

**Certified product**

This certificate applies to automated measurement systems conforming to the following description:

The measuring device is an in-situ DOAS open path measuring system.

The AR650/N system consists of a light source, a receiver, an opto-fibre and an opto-analyser. The analyser consists of a spectrometer, a detection system, electronics for the operation of the grating, the detection system and a computer for the evaluation and signal processing.

The measuring section is composed of the optical path between a light transmitter and a light receiver. The light beam is generated by a high-pressure xenon lamp.

The light beam is directed to the receiver. On its path through the medium, the intensity of the light beam is affected by scattering and absorption in the molecules and particles.

The collected light from the receiver is routed to the analyser via a fibre optic cable. This cable is only to enable the preparation of the analyser to a dust, excessive moisture, temperature variations, etc. protected location.

**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 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 its expiration is also accessible on the internet: [qal1.de](http://qal1.de).

Certification of AR650/N for CO, HCl and CH<sub>4</sub> 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. 0000038495: 22 March 2013

Expiry date of the certificate: 04 March 2018

Test report: 936/21220566/A of 11 October 2012  
TÜV Rheinland Energie und Umwelt GmbH, Cologne

Publication: BAnz AT 05 March 2013 B10, chapter I, No. 5.1  
Announcement by UBA from 12 February 2013

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

**Measuring system**

Manufacturer	Opsis AB
Name of measuring system	AR650/N
Serial number of the candidates	448 / 449
Measuring principle	IR-DOAS

**Test report**

Test laboratory	936/21220566/A TÜV Rheinland
Date of report	2012-10-11

**Measured component**

Certification range	CO 0 - 75 mg/m <sup>3</sup>
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**Evaluation of the cross sensitivity (CS)**

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m <sup>3</sup>
Sum of negative CS at zero point	-0.33 mg/m <sup>3</sup>
Sum of positive CS at reference point	0.35 mg/m <sup>3</sup>
Sum of negative CS at reference point	-0.37 mg/m <sup>3</sup>
Maximum sum of cross sensitivities	0.63 mg/m <sup>3</sup>
Uncertainty of cross sensitivity	0.364 mg/m <sup>3</sup>

**Calculation of the combined standard uncertainty**

**Tested parameter**

			$u^2$
Standard deviation from paired measurements under field conditions *	$u_D$	0.805 mg/m <sup>3</sup>	0.648 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$	0.404 mg/m <sup>3</sup>	0.163 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{dz}$	0.173 mg/m <sup>3</sup>	0.030 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{ds}$	0.433 mg/m <sup>3</sup>	0.187 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	0.416 mg/m <sup>3</sup>	0.173 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$	0.202 mg/m <sup>3</sup>	0.041 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross sensitivity (interference)	$u_i$	0.364 mg/m <sup>3</sup>	0.132 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample pressure	$u_p$	0.320 mg/m <sup>3</sup>	0.102 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	0.606 mg/m <sup>3</sup>	0.368 (mg/m <sup>3</sup> ) <sup>2</sup>
Excursion of measurement beam	$u_{mb}$	0.403 mg/m <sup>3</sup>	0.162 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

$$u_c = \sqrt{\sum (u_{max j})^2}$$

Combined standard uncertainty ( $u_c$ )

1.42 mg/m<sup>3</sup>

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96$$

2.78 mg/m<sup>3</sup>

**Relative total expanded uncertainty**

**U in % of the ELV 50 mg/m<sup>3</sup>**

**5.6**

**Requirement of 2000/76/EC and 2001/80/EC**

**U in % of the ELV 50 mg/m<sup>3</sup>**

**10.0**

**Requirement of EN 15267-3**

**U in % of the ELV 50 mg/m<sup>3</sup>**

**7.5**

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

**Measuring system**

Manufacturer	Opsis AB
Name of measuring system	AR650/N
Serial number of the candidates	448 / 449
Measuring principle	IR-DOAS

**Test report**

Test laboratory	TÜV Rheinland
Date of report	2012-10-11

**Measured component**

Certification range	HCl	0 - 15 mg/m <sup>3</sup>
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**Evaluation of the cross sensitivity (CS)**

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m <sup>3</sup>
Sum of negative CS at zero point	0.00 mg/m <sup>3</sup>
Sum of positive CS at reference point	0.14 mg/m <sup>3</sup>
Sum of negative CS at reference point	-0.07 mg/m <sup>3</sup>
Maximum sum of cross sensitivities	0.14 mg/m <sup>3</sup>
Uncertainty of cross sensitivity	0.081 mg/m <sup>3</sup>

**Calculation of the combined standard uncertainty**

**Tested parameter**

			$u^2$
Repeatability standard deviation at set point *	$u_r$	0.190 mg/m <sup>3</sup>	0.036 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$	0.058 mg/m <sup>3</sup>	0.003 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	0.052 mg/m <sup>3</sup>	0.003 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$	0.087 mg/m <sup>3</sup>	0.008 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	0.058 mg/m <sup>3</sup>	0.003 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$	0.089 mg/m <sup>3</sup>	0.008 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross sensitivity (interference)	$u_i$	0.081 mg/m <sup>3</sup>	0.007 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample pressure	$u_p$	0.077 mg/m <sup>3</sup>	0.006 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	0.121 mg/m <sup>3</sup>	0.015 (mg/m <sup>3</sup> ) <sup>2</sup>
Excursion of measurement beam	$u_{mb}$	0.115 mg/m <sup>3</sup>	0.013 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

$$u_c = \sqrt{\sum (u_{max, j})^2}$$

Combined standard uncertainty ( $u_c$ )		0.32 mg/m <sup>3</sup>
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.62 mg/m <sup>3</sup>

**Relative total expanded uncertainty**

**Requirement of 2000/76/EC and 2001/80/EC**

Requirement of EN 15267-3

<b>U in % of the ELV 10 mg/m<sup>3</sup></b>	<b>6.2</b>
<b>U in % of the ELV 10 mg/m<sup>3</sup></b>	<b>40.0</b>
<b>U in % of the ELV 10 mg/m<sup>3</sup></b>	<b>30.0</b>

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

**Measuring system**

Manufacturer	Opsis AB
Name of measuring system	AR650/N
Serial number of the candidates	448 / 449
Measuring principle	IR-DOAS

**Test report**

Test laboratory	936/21220566/A
Date of report	TÜV Rheinland
	2012-10-11

**Measured component**

Certification range	CH <sub>4</sub>	0 - 20 mg/m <sup>3</sup>
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**Evaluation of the cross sensitivity (CS)**

(system with largest CS)

Sum of positive CS at zero point	0.44 mg/m <sup>3</sup>
Sum of negative CS at zero point	-0.24 mg/m <sup>3</sup>
Sum of positive CS at reference point	0.30 mg/m <sup>3</sup>
Sum of negative CS at reference point	-0.50 mg/m <sup>3</sup>
Maximum sum of cross sensitivities	-0.50 mg/m <sup>3</sup>
Uncertainty of cross sensitivity	-0.289 mg/m <sup>3</sup>

**Calculation of the combined standard uncertainty**

**Tested parameter**

			u <sup>2</sup>
Repeatability standard deviation at set point *	U <sub>r</sub>	0.253 mg/m <sup>3</sup>	0.064 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	U <sub>lof</sub>	0.173 mg/m <sup>3</sup>	0.030 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	U <sub>d,z</sub>	0.058 mg/m <sup>3</sup>	0.003 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	U <sub>d,s</sub>	0.104 mg/m <sup>3</sup>	0.011 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	U <sub>t</sub>	0.100 mg/m <sup>3</sup>	0.010 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	U <sub>v</sub>	0.053 mg/m <sup>3</sup>	0.003 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross sensitivity (interference)	U <sub>i</sub>	-0.289 mg/m <sup>3</sup>	0.083 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample pressure	U <sub>p</sub>	0.155 mg/m <sup>3</sup>	0.024 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	U <sub>rm</sub>	0.162 mg/m <sup>3</sup>	0.026 (mg/m <sup>3</sup> ) <sup>2</sup>
Excursion of measurement beam	U <sub>mb</sub>	-0.214 mg/m <sup>3</sup>	0.046 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :  
"Repeatability standard deviation at span" or  
"Standard deviation from paired measurements under field conditions"

$$u_c = \sqrt{\sum (u_{\max, j})^2}$$

Combined standard uncertainty $u_c$		0.55 mg/m <sup>3</sup>
Total expanded uncertainty	$U = u_c \cdot k = u_c \cdot 1.96$	1.07 mg/m <sup>3</sup>

**Relative total expanded uncertainty**

Requirement of 2000/76/EC and 2001/80/EC	<b>U in % of the range 20 mg/m<sup>3</sup></b>	<b>5.4</b>
Requirement of EN 15267-3	<b>U in % of the range 20 mg/m<sup>3</sup></b>	<b>30.0**</b>
	<b>U in % of the range 20 mg/m<sup>3</sup></b>	<b>22.5</b>

\*\* 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.