

# CERTIFICATE

## TÜV Rheinland Immissionsschutz und Energiesysteme GmbH

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**Manufacturer:** Opsi AB  
**Measuring System:** Oxygen Monitor O2000  
**Components:** O<sub>2</sub>  
**Test Report:** 936/808017/A 08.12.1999

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The measurement system fulfils  
the requirements of  
QAL 1  
according to EN 14181 and EN ISO 14956.

Köln, 2009-05-05

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The company is accredited to DIN EN ISO/IEC 17025.

**Calculation of overall uncertainty for QAL1 in EN 14181 and EN 15267-3**

**Manufacturer data**

Manufacturer	Opsis AB
Name of measuring system	Oxygen Monitor O2000
Serial Number	98111_982115 and 98113_982117
Measuring Principle	in-situ Zirkondioxid-Sonde

**TÜV Data**

Approval Report	936/808017/A 08-02-1999
Date	2009-05-05
Editor	Ruth Steinhagen

**Measurement Component**

certificated range	O <sub>2</sub>	25 Vol.-%
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**Evaluation of the cross sensitivity (CS)**

	QE X <sub>max,j</sub>
to 30 Vol.-% Humidity	0.00 Vol.-%
to 300 mg/m <sup>3</sup> Carbon monoxide	0.00 Vol.-%
to 15 Vol.-% Carbon dioxide	0.00 Vol.-%
to 50 mg/m <sup>3</sup> Methane	0.00 Vol.-%
to 20 mg/m <sup>3</sup> Dinitrogen monoxide	0.00 Vol.-%
to 300 mg/m <sup>3</sup> Nitrogen monoxide	0.00 Vol.-%
to 30 mg/m <sup>3</sup> Nitrogen dioxide	0.00 Vol.-%
to 20 mg/m <sup>3</sup> Ammonia	0.00 Vol.-%
to 1000 mg/m <sup>3</sup> Sulphur dioxide	0.00 Vol.-%
to 50 mg/m <sup>3</sup> Hydrogen chloride	0.00 Vol.-%

Sum of positive cross sensitivities	0.00 Vol.-%
Sum of negative cross sensitivities	0.00 Vol.-%

**Calculation of the combined standard uncertainty**

**Test Value**

	$\Delta X_{max,j}$	$u^2$
Standard deviation from paired measurements under field conditions * $u_{lof}$	0.10 Vol.-%	0.010
Lack of fit $u_{d,z}$	0.03 Vol.-%	0.000
Zero drift from field test $u_{d,s}$	0.00 Vol.-%	0.000
Span drift from field test $u_t$	0.03 Vol.-%	0.000
Influence of ambient temperature at span $u_b$	0.03 Vol.-%	0.000
Influence of supply voltage $u_r$	0.00 Vol.-%	0.000
Cross sensitivity (interference) ** $u_v$	0.00 Vol.-%	0.000
Uncertainty of reference material at 70% of certification range $u_{rm}$	0.35 Vol.-%	0.041

\* The bigger value of: "Repeatability standard deviation at span" or "Standard deviation from paired measurements under field conditions"

\*\* The absolut value of the sum of negativ cross sensitivity is greater than sum of positiv cross sensitivity

Combined standard uncertainty ( $u_c$ )	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.2
Total expanded uncertainty	$U = u_c * k = u_c * 1,96$	0.44

**Relative total expanded uncertainty**

Requirement of 2000/76/EC and 2001/80/EC	<b>U in % of the range 25 Vol.-%</b>	<b>1.8</b>
Requirement of EN 15267-3	<b>U in % of the range 25 Vol.-%</b>	<b>10,0</b>
	<b>U in % of the range 25 Vol.-%</b>	<b>7,5</b>