

# CERTIFICATE

on Product Conformity (QAL1)

Number of Certificate: 0000036413

**Certified AMS:** SERVOTOUGH Laser Model 2930 for H<sub>2</sub>O and NH<sub>3</sub>

**Manufacturer:** Servomex Group Limited,  
Jarvis Brook,  
Crowborough,  
East Sussex,  
TN6 3FB  
UK

**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).

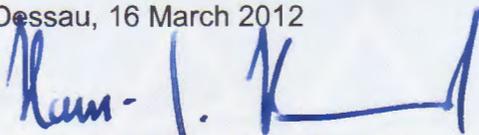


- EN 15267-3 tested
- QAL1 certified
- TUV approved
- Annual inspection

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

<b>Test report:</b>	936/21216873/A of 19 October 2011
<b>First certification:</b>	02 March 2012
<b>Validity ends:</b>	01 March 2017
<b>Publication:</b>	BAnz. 02 March 2012, No. 36, p. 920, chapter I, No. 4.7

#### **Approved application**

The tested AMS is suitable for use at combustion plants according to EC directive 2001-80-EC, at waste incineration plants according to EC directive 2000-76-EC and other plants requiring official approval. 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 twelve months field test at a municipal waste incinerator.

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 936/21216873/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. 4.7, announcement by UBA from 23 February 2012)

**AMS name:**

SERVOTOUGH Laser Model 2930 for H<sub>2</sub>O and NH<sub>3</sub>

**Manufacturer:**

Servomex Group Ltd., Crowborough, England

**Field of application:**

For measurements at plants requiring official approval (i. e. plants in 2000-76-EC, waste incineration directive and 2001-80-EC large combustion plants directive).

**Measuring ranges during the suitability test:**

Component	Certification range	Supplementary measurement ranges		Unit
NH <sub>3</sub>	0 – 10	0 – 15		mg/m <sup>3*</sup>
H <sub>2</sub> O	0 – 40	0 – 30	0 – 50	Vol.-%*

\* at 1 m measurement path length

**Software version:**

STL 6.1e2

**Restrictions:**

None

**Notes:**

1. The actual measuring path length was 0.513 m during the laboratory test and 1.0 m during the field test
2. Dry test gases can be used with an unheated measuring cell for measuring NH<sub>3</sub>.
3. The maintenance interval is six months.
4. The AMS contains an internal cell for automated span checks of NH<sub>3</sub>.
5. Additional testing (transposition into DIN EN 15267, modified housing, distribution by a different manufacturer) for publications made by the Federal Environment Agency dated 19 February 2009 (BAZ. p. 899, chapter I No. 2.3) and 25 January 2010 (BAZ. p. 552 chapter IV 14<sup>th</sup> notification).

**Test report:**

TÜV Rheinland Energie und Umwelt GmbH, Köln  
Report-No.: 936/21216873/A dated 19 October 2011

### **Certified product**

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

The SERVOTOUGH Laser Model 2930 is an optical instrument that transmits infrared laser light from the transmitter unit straight through a duct, chimney etc. to the receiver unit on the opposite side. The measured results are derived from the absorption of infrared radiation by the gas molecules in the measuring path.

The measuring principle of "single-line spectroscopy" is based on the fact that most gases absorb light at specific wavelengths. Thus, absorption is a direct indicator for gas concentrations in the measuring path. The wavelength of the laser diode is modified by means of the selected absorption line.

Absorption is assessed as a function of the wavelength.

The tested AMS comprises the following parts:

- Transmitter with purge gas device and evaluation system
- Receiver unit with purge gas device and internal reference cuvette
- Data cable of 5 m length for connecting the transmitter and receiver unit
- Energy supply
- Heated measuring path (active measuring path length: 0.513 m)
- Unheated measuring path (active measuring path length: 0.712 m)
- System software, version STL 6.1e2 for SERVOTOUGH Laser Model 2930

The transmitter unit is mounted to a DN50 flange. It contains a temperature-stabilised laser diode, an optical means to focus the laser beam and a main board. The laser is adjusted to a specific wavelength and frequency used for gas detection. Servotough Laser Systems are available for measuring various gases. The transmitter unit also comprises the display for measured values. An external computer can be connected via the RS232 interface or an Ethernet interface for maintenance works.

The receiver unit is also mounted to a DN50 flange. It contains a lens, which focusses the laser beam onto the detector. The received signal is amplified and returned to the transmitter unit via a cable.

Both the transmitter and the receiver unit have a degree of protection of IP66. The optical window withstands pressures of up to six bars. The mounting flanges include purge gas connections and a tilting mechanism for easy alignment.

### **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 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 SERVOTOUGH Laser Model 2930 for H<sub>2</sub>O and NH<sub>3</sub> 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. 0000036413: 16 March 2012

Validity of the certificate until: 01 March 2017

Test report: 936/21216873/A of 19 October 2011,  
TÜV Rheinland Energie und Umwelt GmbH, Köln

Publication: BAnz. 02 March 2012, No. 36, p. 920, chapter I, No. 4.7:  
Announcement by UBA from 23 February 2012

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

**Manufacturer data**

Manufacturer	NEO monitors / Servomex Group Ltd.
Name of measuring system	LaserGas II / SERVOTOUGH Laser
Serial Number	3187 / 3188 / 3473 / 3474
Measuring Principle	Spectroscopy

**TÜV Data**

Approval Report	936/21216873/A
Date	2011-10-19
Editor	Carsten Röllig

**Measurement Component**

certificated range	Ammonia 10 mg/m <sup>3</sup>
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**Evaluation of the cross sensitivity (CS)**

to 21 Vol.-% Oxygen	QE X <sub>max,j</sub> 0.00 mg/m <sup>3</sup>
to 30 Vol.-% Humidity	0.00 mg/m <sup>3</sup>
to 300 mg/m <sup>3</sup> Carbon monoxide	-0.05 mg/m <sup>3</sup>
to 15 Vol.-% Carbon dioxide	-0.04 mg/m <sup>3</sup>
to 50 mg/m <sup>3</sup> Methane	0.08 mg/m <sup>3</sup>
to 100 mg/m <sup>3</sup> Dinitrogen monoxide	-0.04 mg/m <sup>3</sup>
to 300 mg/m <sup>3</sup> Nitrogen monoxide	0.00 mg/m <sup>3</sup>
to 30 mg/m <sup>3</sup> Nitrogen dioxide	0.00 mg/m <sup>3</sup>
to 1000 mg/m <sup>3</sup> Sulphur dioxide	-0.12 mg/m <sup>3</sup>
to 200 mg/m <sup>3</sup> Hydrogen chloride	0.00 mg/m <sup>3</sup>

Sum of positive cross sensitivities	0.08 mg/m <sup>3</sup>
Sum of negative cross sensitivities	-0.25 mg/m <sup>3</sup>

**Calculation of the combined standard uncertainty**

Test Value	$\Delta X_{max,j}$	$U^2$
Standard deviation from paired measurements under field conditions $U_{lof}$	0.14 mg/m <sup>3</sup>	0.020
Lack of fit $U_{d,z}$	0.10 mg/m <sup>3</sup>	0.003
Zero drift from field test $U_{d,s}$	0.05 mg/m <sup>3</sup>	0.001
Span drift from field test $U_t$	-0.13 mg/m <sup>3</sup>	0.006
Influence of ambient temperature at span $U_p$	-0.20 mg/m <sup>3</sup>	0.013
Influence of supply voltage $U_f$	-0.02 mg/m <sup>3</sup>	0.000
Cross sensitivity (interference) ** $U_v$	-0.25 mg/m <sup>3</sup>	0.021
Uncertainty of reference material at 70% of certification range $U_{rm}$	0.14 mg/m <sup>3</sup>	0.007
Excursion of measurement beam $U_{mb}$	0.12 mg/m <sup>3</sup>	0.005

\* 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 ( $u_c$ )	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.3
Total expanded uncertainty	$U = u_c * k = u_c * 1,96$	0.54

<b>Relative total expanded uncertainty</b>	<b>U in % of the ELV 10 mg/m<sup>3</sup></b>	<b>5.4</b>
<b>Requirement of 2000/76/EC and 2001/80/EC</b>	<b>U in % of the ELV 10 mg/m<sup>3</sup></b>	<b>40.0</b>
Requirement of EN 15267-3	U in % of the ELV 10 mg/m <sup>3</sup>	30.0

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

**Manufacturer data**

Manufacturer	NEO monitors / Servomex Group Ltd.
Name of measuring system	LaserGas II / SERVOTOUGH Laser
Serial Number	3187 / 3188 / 3473 / 3474
Measuring Principle	Spectroscopy

**TÜV Data**

Approval Report	936/21216873/A
Date	2011-10-19
Editor	Carsten Röllig

**Measurement Component**

certificated range (CR)	water	40	Vol.-%
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**Evaluation of the cross sensitivity (CS)**

to 21 Vol.-% Oxygen	QE $X_{max,j}$	0.20	Vol.-%
to 300 mg/m <sup>3</sup> Carbon monoxide		0.00	Vol.-%
to 15 Vol.-% Carbon dioxide		0.28	Vol.-%
to 50 mg/m <sup>3</sup> Methane		-0.17	Vol.-%
to 100 mg/m <sup>3</sup> Dinitrogen monoxide		-0.22	Vol.-%
to 300 mg/m <sup>3</sup> Nitrogen monoxide		0.18	Vol.-%
to 30 mg/m <sup>3</sup> Nitrogen dioxide		-0.20	Vol.-%
to 1000 mg/m <sup>3</sup> Sulphur dioxide		-0.22	Vol.-%
to 200 mg/m <sup>3</sup> Hydrogen chloride		0.00	Vol.-%
Sum of positive cross sensitivities		0.66	Vol.-%
Sum of negative cross sensitivities		-0.81	Vol.-%

**Calculation of the combined standard uncertainty**

Test Value		$\Delta X_{max,j}$	$u^2$
Standard deviation from paired measurements under field conditions	$u_{lof}$	0.39 Vol.-%	0.152
Lack of fit	$u_{d,z}$	-0.56 Vol.-%	0.105
Zero drift from field test	$u_{d,s}$	0.04 Vol.-%	0.001
Span drift from field test	$u_t$	-0.16 Vol.-%	0.009
Influence of ambient temperature at span	$u_o$	0.20 Vol.-%	0.013
Influence of supply voltage	$u_f$	-0.08 Vol.-%	0.002
Cross sensitivity (interference) **	$u_v$	-0.81 Vol.-%	0.220
Uncertainty of reference material at 70% of certification range	$u_{rm}$	0.56 Vol.-%	0.105
Excursion of measurement beam	$u_{mb}$	0.26 Vol.-%	0.023

\* 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 ( $u_c$ )	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.8
Total expanded uncertainty	$U = u_c * k = u_c * 1,96$	1.55

<b>Relative total expanded uncertainty</b>	<b>U in % of the CR 40 Vol.-%</b>	<b>3.9</b>
<b>Requirement based on 2000/76/EC and 2001/80/EC</b>	<b>U in % of the CR 40 Vol.-%</b>	<b>10.0</b>
Requirement of EN 15267-3	U in % of the CR 40 Vol.-%	7.5