

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000085401_00

Certified AMS: LasIR for NH₃ and H₂O

Manufacturer: Unisearch Associates Inc.
96 Bradwick Drive
Concord, Ontario / L4K 1K8
Canada

Test Institute: TÜV Rheinland Energy & Environment GmbH

**This is to certify that the AMS has been tested
and found to comply with the standards
EN 15267-1 (2009), EN 15267-2 (2023), EN 15267-3 (2023),
as well as EN 14181 (2014).**

Certification is awarded in respect of the conditions stated in this certificate
(this certificate contains 7 pages).



Suitability Tested
EN 15267
QAL1 Certified
Regular
Surveillance

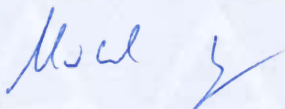
www.tuv.com
ID 0000085401

Publication in the German Federal Gazette
(BAnz) of 31 October 2024

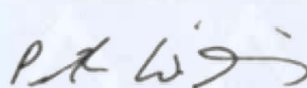
This certificate will expire on:
30 October 2029

German Environment Agency
Dessau, 15 November 2024

TÜV Rheinland Energy & Environment
GmbH Cologne, 8 November 2024



Dr. Marcel Langner
Head of Section II 4



ppa. Dr. Peter Wilbring

www.umwelt-tuv.eu
tre@umwelt-tuv.eu
Tel. + 49 221 806-5200

TÜV Rheinland Energy & Environment GmbH
Am Grauen Stein
51105 Köln

Test institute accredited to EN ISO/IEC 17025 by DAkkS (German Accreditation Body).
This accreditation is limited to the accreditation scope defined in the enclosure to the certificate D-PL-11120-02-00.

Test report:	EuL/21255746/A dated 1 March 2024
Initial certification	31 October 2024
Expiry date:	30 October 2029
Publication:	BAnz AT 31.10.2024 B9, chapter I No. 2.3

Approved application

The tested AMS is suitable for use at plants according to Directive 2010/75/EC, chapter III (combustion plants / 13th BImSchV:2021), chapter IV (waste incineration plants / 17th BImSchV:2021), Directive 2015/2193/EC (44th BImSchV:2022), TA Luft:2021, 30th BImSchV:2019 and 27th BImSchV:2013. The measured ranges have been selected so as to ensure as broad a field of application as possible.

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a three month field test at a waste incineration plants.

The AMS is approved for an ambient temperature range for analyser of +5 °C to +40 °C and for measuring heads of -20 °C to +50 °C.

The notification of suitability of the AMS, performance testing and the uncertainty calculation have been effected on the basis of the regulations applicable at the time of testing. As changes in legal provisions are possible, any potential user should ensure that this AMS is suitable for monitoring the emission limit values relevant to the application.

Any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for the installation at which it will be installed.

Note

The legal regulations mentioned correspond to the current state of legislation during certification. Each user should, if necessary, in consultation with the competent authority, ensure that this AMS meets the legal requirements for the intended use. In addition, it cannot be ruled out that legal regulations governing the use of a measuring device for emission monitoring may change during the lifetime of the certificate.

Basis of the certification

This certification is based on:

- Test report EuL/21255746/A dated 1 March 2024 of TÜV Rheinland Energy & Environment 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 31.10.2024 B9, chapter I No. 2.3,
Announcement by UBA dated 21 August 2024:

AMS designation:

LasIR for NH₃ and H₂O

Manufacturer:

Unisearch Associates Inc., Concord, Canada

Field of application:

For plants according to directive 2010/75/EC, chapter III (combustion plants / 13th BImSchV), chapter IV (waste incineration plants / 17th BImSchV), Directive 2015/2193/EC (44th BImSchV), 30th BImSchV, TA Luft and 27th BImSchV.

Measuring ranges during the performance test:

Component	Certification range	Supplementary measuring ranges		Unit
NH ₃	0 - 10*	0 - 50*	-	mg/m ³
H ₂ O	0 - 40*	0 - 30*	-	Vol.-%

* based on a measuring path length of 1.0 m

Software version:

4.96x2

Restrictions:

none

Notes:

1. The QAL3 test of NH₃ can be carried out with dry test gases from pressurised gas cylinders and an unheated test gas cell.
2. The maintenance interval is 4 weeks.
3. The measuring system has been suitability-tested with the dual-pass optical unit.
4. If the tested measuring path length of 1 m is exceeded, it must be checked on site when installing the measuring system whether the minimum requirement for cross-sensitivity according to DIN EN 15267-3 is still met.

Test institute:

TÜV Rheinland Energy & Environment GmbH, Cologne
Report No.: EuL/21255746/A dated 1 March 2024

Certified product

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

The LasIR measuring system is based on the principle of light absorption of a tunable diode laser in the near infrared range. It is designed for the in-situ measurement of NH₃/H₂O in waste gas emissions. The core of the LasIR measuring system is the laser diode, which serves as a light source in the near infrared range. These diodes emit a light beam in a narrow but adjustable wavelength spectrum. The high spectral resolution and the adjustability of the laser diodes make it possible to measure the optical absorption of a single rotation/vibration line in the spectrum of the molecule to be measured. This means that the gas under test can be clearly identified and there is a high degree of differentiation from interfering gases.

The measuring system consists of:

- LasIR control and analysis unit
- Transmitter and receiver unit with purging device
- Reflector unit with purging device
- Optical cable (between analysis unit and transmitter/receiver unit)
- Unheated sample gas cell (length 12.5 cm)
- Heated sample gas cell (length 1 m)

The LasIR measuring system consists of two main components: the LasIR control (analysis) unit and the optical heads.

The control analysis unit

The analyser unit is housed in its own casing. The laser contained in the analyser is selected and set for the spectral absorption wavelength of the gas to be monitored. It is mounted on a thermo-electric cooler, which roughly adjusts the wavelength via the temperature of the laser. The fine adjustment is made by the laser current.

The laser is coupled to an optical cable, which in turn is connected to an optical beam splitter. This beam splitter divides the light into two paths. One output (in the range 2 % to 10 %) directs the laser beam to a reference channel. Light from the output for the reference channel passes through a small reference cell, which contains a high concentration of the gas to be measured for this laser. The signal from the reference channel is used to tune the wavelength of the laser to the absorption line. The other output (in the range 90 % to 98 %) is used for the measurement channels.

The analyser also contains a laser temperature and power control circuit, a data acquisition and control board and an integrated computer for automatic data control and analysis.

Optical heads

There are a number of different configurations of transmit/receive modules available for in-situ emission monitoring. Currently, only the transmitter/receiver unit version with retroreflector (dual-pass option) has been performance-tested.

In the dual-pass version, the light beam is guided to the duct optics via an optical fiber, which is coupled to a specially designed launch/receive element with an APC connector. The laser beam is guided through the exhaust duct/chimney. When it hits the opposite side, it is deflected back onto the detector by a reflector. The output voltage of the receiver is transmitted to the LasIR analyser via a coaxial cable.

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 Energy & Environment 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 certification mark may be applied to the product or used in advertising materials for the certified product.

This document as well as the certification mark remains property of TÜV Rheinland Energy & Environment GmbH. With revocation of the publication the certificate loses its validity. After the expiration of the certificate and on requests of the TÜV Rheinland Energy & Environment 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: gal1.de.

History of documents

Certification of LasIR NH₃/H₂O 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. 0000085401_00: 12 November 2024

Expiry date of the certificate: 30 October 2029

Test report: EuL/21255746/A dated 1 March 2024

TÜV Rheinland Energy & Environment GmbH

Publication: BAnz AT 31.10.2024 B9, chapter I number 2.3

UBA announcement dated 21 August 2024

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

Measuring system

Manufacturer	Unisearch
AMS designation	LasIR
Serial number of units under test	13/14
Measuring principle	Laser-Spectroscopy

Test report

Test laboratory	EuL/21255746/A TÜV Rheinland
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Measured component

Certification range	NH ₃ 0 - 10 mg/m ³
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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 ³
Sum of negative CS at zero point	0,00 mg/m ³
Sum of positive CS at span point	0,04 mg/m ³
Sum of negative CS at span point	-0,17 mg/m ³
Maximum sum of cross-sensitivities	-0,17 mg/m ³
Uncertainty of cross-sensitivity	u_i -0,098 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

		u^2
Lack of fit	u_D 0,131 mg/m ³	0,017 (mg/m ³) ²
Zero drift from field test	u_{krf} -0,058 mg/m ³	0,003 (mg/m ³) ²
Span drift from field test	$u_{d,z}$ 0,040 mg/m ³	0,002 (mg/m ³) ²
Influence of ambient temperature at span	$u_{d,s}$ 0,121 mg/m ³	0,015 (mg/m ³) ²
Influence of supply voltage	u_t 0,115 mg/m ³	0,013 (mg/m ³) ²
Cross-sensitivity (interference)	u_v 0,042 mg/m ³	0,002 (mg/m ³) ²
Influence of sample gas pressure	u_i -0,098 mg/m ³	0,010 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u_n 0,031 mg/m ³	0,001 (mg/m ³) ²
Excursion of measurement beam	u_{rm} 0,081 mg/m ³	0,007 (mg/m ³) ²
	u_{mb} 0,075 mg/m ³	0,006 (mg/m ³) ²

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

Combined standard uncertainty (u_c)	$u_c = \sqrt{\sum (u_{max, j})^2}$	0,27 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0,53 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the ELV 6,66 mg/m³	8,0
Requirement of EN 15267-3	U in % of the ELV 6,66 mg/m³	40,0 **
	U in % of the ELV 6,66 mg/m ³	30,0

** The EU-directive 2010/75/EC on industrial emissions does not define requirements for this component.
A value of 40,0 % was used instead.

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

Measuring system

Manufacturer	Unisearch
AMS designation	LasIR
Serial number of units under test	13/14
Measuring principle	Laser-Spectroscopy

Test report

Test laboratory	EuL/21255746/A TÜV Rheinland
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Measured component

Certification range	H ₂ O 0 - 40 Vol.-%
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0,00 Vol.-%
Sum of negative CS at zero point	0,00 Vol.-%
Sum of positive CS at span point	0,19 Vol.-%
Sum of negative CS at span point	0,00 Vol.-%
Maximum sum of cross-sensitivities	0,19 Vol.-%
Uncertainty of cross-sensitivity	u_i 0,109 Vol.-%

Calculation of the combined standard uncertainty

Tested parameter

			u^2
Lack of fit	u_D 0,134 Vol.-%		0,018 (Vol.-%) ²
Zero drift from field test	u_{krf} -0,192 Vol.-%		0,037 (Vol.-%) ²
Span drift from field test	$u_{d,z}$ -0,046 Vol.-%		0,002 (Vol.-%) ²
Influence of ambient temperature at span	$u_{d,s}$ 0,370 Vol.-%		0,137 (Vol.-%) ²
Influence of supply voltage	u_t 0,115 Vol.-%		0,013 (Vol.-%) ²
Cross-sensitivity (interference)	u_v 0,127 Vol.-%		0,016 (Vol.-%) ²
Influence of sample gas pressure	u_i 0,109 Vol.-%		0,012 (Vol.-%) ²
Uncertainty of reference material at 70% of certification range	u_n 0,086 Vol.-%		0,007 (Vol.-%) ²
Excursion of measurement beam	u_{rm} 0,323 Vol.-%		0,105 (Vol.-%) ²
	u_{mb} 0,277 Vol.-%		0,077 (Vol.-%) ²

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

Combined standard uncertainty (u_c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0,65 Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	1,28 Vol.-%

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the range 40 Vol.-%	3,2
Requirement of EN 15267-3	U in % of the range 40 Vol.-%	10,0 **
	U in % of the range 40 Vol.-%	7,5

** The EU-directive 2010/75/EC on industrial emissions does not define requirements for this component.
A value of 10,0 % was used instead.