Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

# CERTIFICATE

## of Product Conformity (QAL1)

**Certificate No.: 0000081160_01**

| | |
|---|---|
| **Certified AMS:** | N200 for NO, $NO_2$ and $NO_x$ |
| **Manufacturer:** | Teledyne API<br>9970 Carroll Canyon Road<br>San Diego, CA, 92131<br>USA |
| **Test Institute:** | TÜV Rheinland Energy & Environment GmbH |

**This is to certify that the AMS has been tested and found to comply with the standards VDI 4202-1 (2018), EN 14211 (2012), EN 14211 (2024) as well as EN 15267-1 (2009) and EN 15267-2 (2023).**

Certification is awarded in respect of the conditions stated in this certificate (this certificate contains 11 pages).
This certificate replaces certificate 0000081161_00 dated 5 September 2023.

TÜVRheinland® CERTIFIED
Suitability Tested
Complying with 2008/50/EC
EN 15267
Regular Surveillance
www.tuv.com
ID 0000081160

Publication in the German Federal Gazette (BAnz) of 10 July 2026

This certificate will expire on: 9 July 2031

German Environment Agency
Dessau, 17 September 2026

TÜV Rheinland Energy & Environment GmbH
Cologne, 15 September 2026

Dr. Marcel Langner
Head of Section II 4

Dipl.-Ing. G. Baum


| | |
|---|---|
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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:** | 936/21255654/A dated 25 January 2023 as well as the addendum EuL/212722407/A dated 15 July 2025 |
| **Initial certification:** | 2 August 2023 |
| **Expiry date:** | 9 July 2031 |
| **Publication:** | BAnz AT 02.08.2023 B7, chapter II Number 2.1 and BAnz AT 10.07.2026 B5, chapter VI Notification 74 |

**Approved application**

The tested AMS is suitable for continuous ambient air monitoring of NO, $NO_2$ and $NO_x$ (stationary operation).

The suitability of the AMS for these applications was assessed based on a laboratory test and a three month field test.

The AMS is approved for an ambient temperature range of +0 °C to +45 °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 measured values relevant to the application.

Any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for the intended use.

**Basis of the certification**

This certification is based on:

- Test report 936/21255654/A dated 25 January 2023 of TÜV Rheinland Energy GmbH as well as the Addendum EuL/212722407/A dated 15 July 2025 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 02.08.2023 B7, chapter II Number 2.1, Announcement by UBA dated 05 July 2023:

**AMS designation:**
N200 for NO, $NO_2$ and $NO_x$

**Manufacturer:**
Teledyne API, San Diego, USA

**Field of application:**
For the continuous determination of the ambient air concentrations of nitrogen oxides in stationary use.

**Measuring ranges during the performance test:**

| Component | Certification range | Unit |
|---|---|---|
| Nitrogene monoxide | 0 - 1,200 | µg/m³ |
| Nitrogene dioxide | 0 - 500 | µg/m³ |

**Software version:**
Rev. 1.9.0

**Restrictions:**
None

**Notes:**
1. The performance test report can be found online at www.qal1.de.
2. The measuring system is approved for an ambient temperature range of 0 - 45 °C.
3. The N200 measuring system can be equipped with either an internal or an external pump.
4. The N200 measuring system can be equipped with a standard Teflon particle filter with a pore size of 5 µm and a diameter of 47 mm as well as with a DFU filter cartridge with a pore size of 0.01 µm.

**Test report:** TÜV Rheinland Energy GmbH, Cologne
Report No.: 936/21255654/A dated 25 January 2023

Publication in the German Federal Gazette: BAnz AT 19 May 2025 B3, Chapter IV notification 67, Announcement by UBA dated 2 April 2025:

**67 Notification as regards Federal Environment Agency (UBA) notice dated 5 July 2023 (BAnz AT 02.08.2023 B7, chapter II number 2.1)**

The current software version of the measuring system N200 for NO, $NO_2$ and $NO_x$ manufactured by Teledyne API is:
Rev. 1.11.2
The version 1.11.1 is also covered.

Statement issued by TÜV Rheinland Energy & Environment GmbH dated 26 September 2024

Publication in the German Federal Gazette: BAnz AT 10 July 2026 B5, Chapter VI notification 74, announcement by UBA dated 18 May 2026:

**74 Notification as regards Federal Environment Agency (UBA) notice dated 5 July 2023 (BAnz AT 02.08.2023 B7, number II chapter 2.1) and dated 2 April 2025 (BAnz AT 19.05.2025 B3, chapter IV notification 67)**

The measuring system N200 for NO, $NO_2$ and $NO_x$ from Teledyne API complies with the requirements of EN 14211 (2024 edition). An addendum to the test report, with report number EuL/21272240/A, is available online at www.qal1.de.

Statement issued by TÜV Rheinland Energy & Environment GmbH dated 15 July 2025

**Certified product Produkt**

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

The Nitric Oxide Analyzer N200 determines the concentration of Nitric Oxide (NO), Total Nitric Oxide ($NO_x$, the sum of NO and $NO_2$) and Nitrogen Dioxide ($NO_2$) of a sample drawn into the instrument. For this purpose, sample and calibration gases must be provided at ambient air pressure to ensure a constant gas flow through the reaction chamber. In the reaction chamber, ozone ($O_3$) is applied to the sample gas, causing a light-emitting chemical reaction (chemiluminescence). The instrument measures the amount of chemiluminescence to determine the NO content in the sample gas. A catalytic-reactive converter converts any $NO_2$ in the sample gas to NO, which is then displayed as $NO_x$, including the NO in the sample gas. $NO_2$ is calculated as the difference between $NO_x$ and NO.

The only gas that is actually measured in the N200 is NO. Any $NO_2$ contained in the gas is not detected because $NO_2$ does not react with $O_3$ to be exposed to chemiluminescence. To measure the concentration of NO or $NO_x$, the N200 periodically cycles the sample gas stream through a converter cartridge filled with molybdenum chips and heated to a temperature of 315°C. The heated molybdenum reacts with the $NO_2$ in the sample gas and converts it to NO. After the $NO_2$ in the sample gas is converted to NO, it is passed through the reaction chamber where it is subjected to the chemiluminescence reaction.

By converting the $NO_2$ in the sample gas to NO, the analyzer can measure the total $NO_x$ (NO + $NO_2$) content in the sample gas. By turning the $NO_2$ converter on and off in and out of the gas stream at 6 - 10 second intervals, the analyzer can quasi continuously measure both NO and total $NO_x$ content. The $NO_2$ concentration is ultimately not measured, but calculated by subtracting the known NO content from the sample gas from the known $NO_x$ content.

## 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 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 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 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**.

## History of documents

Certification of N200 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. 0000081160_00: 5 September 2023
Expiry date of the certificate: 1 August 2028
Test report: 936/21255654/A dated 25 January 2023
TÜV Rheinland Energy GmbH
Publication: BAnz AT 02.08.2023 B7, chapter II number 2.1
UBA announcement dated 5 July 2023

**Certificate based on a notification**
Certificate No. 0000081162_01: 17 September 2026
Expiry date of the certificate: 9 July 2031
Statement issued by TÜV Rheinland Energy & Environment GmbH dated 15 July 2025
Addendum EuL/212722407/A dated 15 July 2025
Publication: BAnz AT 10.07.2026 B5, chapter IV notification 74
(It also complies with with EN 14626, an addendum is attached to the test report)
UBA publication dated 18 May 2026

**Notifications**
Statement issued by TÜV Rheinland Energy & Environment GmbH dated 26 September 2024
Publication: BAnz AT 19.05.2025 B3, chapter 3 notification 67,
UBA publication dated 2 April 2025
(Software changes)

## Expanded uncertainty laboratory, system 1 (2012)

| | | | | | |
|---|---|---|---|---|---|
| Measuring device: | N200 | | | Serial-No.: | 55 |
| Measured component: | NO | | | 1h-limit value: | 104,6 nmol/mol |

| No. | Performance characteristic | Performance criterion | Result | Partial uncertainty | | Square of partial uncertainty |
|---|---|---|---|---|---|---|
| 1 | Repeatability standard deviation at zero | ≤ 1.0 nmol/mol | 0,280 | $u_{r,z}$ | 0,05 | 0,0026 |
| 2 | Repeatability standard deviation at 1h-limit value | ≤ 3.0 nmol/mol | 0,560 | $u_{r,lh}$ | 0,02 | 0,0005 |
| 3 | "lack of fit" at 1h-limit value | ≤ 4.0% of measured value | 0,400 | $u_{l,lh}$ | 0,24 | 0,0584 |
| 4 | Sensitivity coefficient of sample gas pressure at 1h-limit value | ≤ 8.0 nmol/mol/kPa | 0,820 | $u_{gp}$ | 2,06 | 4,2574 |
| 5 | Sensitivity coefficient of sample gas temperature at 1h-limit value | ≤ 3.0 nmol/mol/K | 0,050 | $u_{gt}$ | 0,13 | 0,0158 |
| 6 | Sensitivity coefficient of surrounding temperature at 1h-limit value | ≤ 3.0 nmol/mol/K | 0,581 | $u_{st}$ | 2,19 | 4,8090 |
| 7 | Sensitivity coefficient of electrical voltage at 1h-limit value | ≤ 0.30 nmol/mol/V | 0,000 | $u_V$ | 0,00 | 0,0000 |
| 8a | Interferent $H_20$ with 19 mmol/mol | ≤ 10 nmol/mol (Zero) | 1,200 | $u_{H2O}$ | 0,33 | 0,1112 |
| | | ≤ 10 nmol/mol (Span) | -2,400 | | | |
| 8b | Interferent $CO_2$ with 500 µmol/mol | ≤ 5.0 nmol/mol (Zero) | -0,600 | $u_{int,pos}$ | 0,19 or | 0,0373 |
| | | ≤ 5.0 nmol/mol (Span) | 1,600 | | | |
| 8c | Interferent $NH_3$ mit 200 nmol/mol | ≤ 5.0 nmol/mol (Zero) | 0,000 | $u_{int,neg}$ | | |
| | | ≤ 5.0 nmol/mol (Span) | 1,600 | | | |
| 9 | Averaging effect | ≤ 7.0% of measured value | 0,900 | $u_{av}$ | 0,54 | 0,2954 |
| 18 | Difference sample/calibration port | ≤ 1.0% | -0,190 | $u_{\Delta sc}$ | -0,20 | 0,0395 |
| 21 | Converter efficiency | ≥ 98 | 99,20 | $u_{EC}$ | 0,84 | 0,7002 |
| 23 | Uncertainty of test gas | ≤ 3.0% | 2,000 | $u_{cg}$ | 1,05 | 1,0941 |

| | | | |
|---|---|---|---|
| Combined standard uncertainty | $u_c$ | 3,3800 | nmol/mol |
| Expanded uncertainty | U | 6,7600 | nmol/mol |
| Relative expanded uncertainty | W | 6,46 | % |
| Maximum allowed expanded uncertainty | $W_{req}$ | 15 | % |

## Expanded uncertainty laboratory, system 2 (2012)

| | | | | | |
|---|---|---|---|---|---|
| Measuring device: | N200 | | | Serial-No.: | 56 |
| Measured component: | NO | | | 1h-limit value: | 104,6 nmol/mol |

| No. | Performance characteristic | Performance criterion | Result | Partial uncertainty | | Square of partial uncertainty |
|---|---|---|---|---|---|---|
| 1 | Repeatability standard deviation at zero | ≤ 1.0 nmol/mol | 0,250 | $u_{r,z}$ | 0,05 | 0,0021 |
| 2 | Repeatability standard deviation at 1h-limit value | ≤ 3.0 nmol/mol | 0,350 | $u_{r,lh}$ | 0,01 | 0,0002 |
| 3 | "lack of fit" at 1h-limit value | ≤ 4.0% of measured value | 1,070 | $u_{l,lh}$ | 0,65 | 0,4176 |
| 4 | Sensitivity coefficient of sample gas pressure at 1h-limit value | ≤ 8.0 nmol/mol/kPa | 0,860 | $u_{gp}$ | 2,16 | 4,6829 |
| 5 | Sensitivity coefficient of sample gas temperature at 1h-limit value | ≤ 3.0 nmol/mol/K | 0,090 | $u_{gt}$ | 0,23 | 0,0513 |
| 6 | Sensitivity coefficient of surrounding temperature at 1h-limit value | ≤ 3.0 nmol/mol/K | 0,269 | $u_{st}$ | 1,02 | 1,0309 |
| 7 | Sensitivity coefficient of electrical voltage at 1h-limit value | ≤ 0.30 nmol/mol/V | 0,010 | $u_V$ | 0,04 | 0,0015 |
| 8a | Interferent $H_20$ with 19 mmol/mol | ≤ 10 nmol/mol (Zero) | 0,000 | $u_{H2O}$ | 0,40 | 0,1622 |
| | | ≤ 10 nmol/mol (Span) | 0,000 | | | |
| 8b | Interferent $CO_2$ with 500 µmol/mol | ≤ 5.0 nmol/mol (Zero) | -0,600 | $u_{int,pos}$ | 0,24 or | 0,0584 |
| | | ≤ 5.0 nmol/mol (Span) | 0,400 | | | |
| 8c | Interferent $NH_3$ mit 200 nmol/mol | ≤ 5.0 nmol/mol (Zero) | 0,000 | $u_{int,neg}$ | | |
| | | ≤ 5.0 nmol/mol (Span) | 2,000 | | | |
| 9 | Averaging effect | ≤ 7.0% of measured value | -0,300 | $u_{av}$ | -0,18 | 0,0328 |
| 18 | Difference sample/calibration port | ≤ 1.0% | -0,030 | $u_{\Delta sc}$ | -0,03 | 0,0010 |
| 21 | Converter efficiency | ≥ 98 | 99,30 | $u_{EC}$ | 0,73 | 0,5361 |
| 23 | Uncertainty of test gas | ≤ 3.0% | 2,000 | $u_{cg}$ | 1,05 | 1,0941 |

| | | | |
|---|---|---|---|
| Combined standard uncertainty | $u_c$ | 2,8413 | nmol/mol |
| Expanded uncertainty | U | 5,6827 | nmol/mol |
| Relative expanded uncertainty | W | 5,43 | % |
| Maximum allowed expanded uncertainty | $W_{req}$ | 15 | % |

## Expanded uncertainty, laboratory and field, system 1 (2012)

| Measuring device: | N200 | | | | | Serial-No.: | 55 | |
|---|---|---|---|---|---|---|---|---|
| Measured component: | NO | | | | | 1h-limit value: | 104,6 | nmol/mol |

| No. | Performance characteristic | Performance criterion | | Result | Partial uncertainty | | Square of partial uncertainty | |
|---|---|---|---|---|---|---|---|---|
| 1 | Repeatability standard deviation at zero | ≤ | 1.0 nmol/mol | 0,280 | $u_{r,z}$ | 0,05 | 0,0026 | |
| 2 | Repeatability standard deviation at 1h-limit value | ≤ | 3.0 nmol/mol | 0,560 | $u_{r,lh}$ | not considered, as √2*ur,lh = 0,03 < ur,f | - | |
| 3 | "lack of fit" at 1h-limit value | ≤ | 4.0% of measured value | 0,400 | $u_{l,lh}$ | 0,24 | 0,0584 | |
| 4 | Sensitivity coefficient of sample gas pressure at 1h-limit value | ≤ | 8.0 nmol/mol/kPa | 0,820 | $u_{sp}$ | 2,06 | 4,2574 | |
| 5 | Sensitivity coefficient of sample gas temperature at 1h-limit value | ≤ | 3.0 nmol/mol/K | 0,050 | $u_{st}$ | 0,13 | 0,0158 | |
| 6 | Sensitivity coefficient of surrounding temperature at 1h-limit value | ≤ | 3.0 nmol/mol/K | 0,581 | $u_{st}$ | 2,19 | 4,8090 | |
| 7 | Sensitivity coefficient of electrical voltage at 1h-limit value | ≤ | 0.30 nmol/mol/V | 0,000 | $u_v$ | 0,00 | 0,0000 | |
| 8a | Interferent $H_20$ with 19 mmol/mol | ≤ | 10 nmol/mol (Zero) | 1,200 | $u_{H2O}$ | 0,33 | 0,1112 | |
| | | ≤ | 10 nmol/mol (Span) | -2,400 | | | | |
| 8b | Interferent $CO_2$ with 500 µmol/mol | ≤ | 5.0 nmol/mol (Zero) | -0,600 | $u_{int,pos}$ | | | |
| | | ≤ | 5.0 nmol/mol (Span) | 1,600 | | | | |
| 8c | Interferent $NH_3$ mit 200 nmol/mol | ≤ | 5.0 nmol/mol (Zero) | 0,000 | or | 0,19 | 0,0373 | |
| | | ≤ | 5.0 nmol/mol (Span) | 1,600 | $u_{int,neg}$ | | | |
| 9 | Averaging effect | ≤ | 7.0% of measured value | 0,900 | $u_{av}$ | 0,54 | 0,2954 | |
| 10 | Reproducibility standard deviation under field conditions | ≤ | 5.0% of average over 3 months | 3,570 | $u_{r,f}$ | 3,73 | 13,9444 | |
| 11 | Long term drift at zero level | ≤ | 5.0 nmol/mol | 0,840 | $u_{d,l,z}$ | 0,48 | 0,2352 | |
| 12 | Long term drift at span level | ≤ | 5.0% of max. of certification range | -1,190 | $u_{d,l,lh}$ | -0,72 | 0,5165 | |
| 18 | Difference sample/calibration port | ≤ | 1.0% | -0,190 | $u_{Asc}$ | -0,20 | 0,0395 | |
| 21 | Converter efficiency | ≥ | 98 | 99,200 | $u_{EC}$ | 0,84 | 0,7002 | |
| 23 | Uncertainty of test gas | ≤ | 3.0% | 2,000 | $u_{cg}$ | 1,05 | 1,0941 | |

| | | | |
|---|---|---|---|
| Combined standard uncertainty | $u_c$ | 5,1107 | nmol/mol |
| Expanded uncertainty | U | 10,2215 | nmol/mol |
| Relative expanded uncertainty | W | 9,77 | % |
| Maximum allowed expanded uncertainty | $W_{req}$ | 15 | % |

## Expanded uncertainty, laboratory and field, system 2 (2012)

| Measuring device: | N200 | | | | | Serial-No.: | 56 | |
|---|---|---|---|---|---|---|---|---|
| Measured component: | NO | | | | | 1h-limit value: | 104,6 | nmol/mol |

| No. | Performance characteristic | Performance criterion | | Result | Partial uncertainty | | Square of partial uncertainty | |
|---|---|---|---|---|---|---|---|---|
| 1 | Repeatability standard deviation at zero | ≤ | 1.0 nmol/mol | 0,250 | $u_{r,z}$ | 0,05 | 0,0021 | |
| 2 | Repeatability standard deviation at 1h-limit value | ≤ | 3.0 nmol/mol | 0,350 | $u_{r,lh}$ | not considered, as √2*ur,lh = 0,01 < ur,f | - | |
| 3 | "lack of fit" at 1h-limit value | ≤ | 4.0% of measured value | 1,070 | $u_{l,lh}$ | 0,65 | 0,4176 | |
| 4 | Sensitivity coefficient of sample gas pressure at 1h-limit value | ≤ | 8.0 nmol/mol/kPa | 0,860 | $u_{sp}$ | 2,16 | 4,6829 | |
| 5 | Sensitivity coefficient of sample gas temperature at 1h-limit value | ≤ | 3.0 nmol/mol/K | 0,090 | $u_{st}$ | 0,23 | 0,0513 | |
| 6 | Sensitivity coefficient of surrounding temperature at 1h-limit value | ≤ | 3.0 nmol/mol/K | 0,269 | $u_{st}$ | 1,02 | 1,0309 | |
| 7 | Sensitivity coefficient of electrical voltage at 1h-limit value | ≤ | 0.30 nmol/mol/V | 0,010 | $u_v$ | 0,04 | 0,0015 | |
| 8a | Interferent $H_20$ with 19 mmol/mol | ≤ | 10 nmol/mol (Zero) | 1,000 | $u_{H2O}$ | 0,40 | 0,1622 | |
| | | ≤ | 10 nmol/mol (Span) | -1,200 | | | | |
| 8b | Interferent $CO_2$ with 500 µmol/mol | ≤ | 5.0 nmol/mol (Zero) | -0,600 | $u_{int,pos}$ | | | |
| | | ≤ | 5.0 nmol/mol (Span) | 0,400 | | | | |
| 8c | Interferent $NH_3$ mit 200 nmol/mol | ≤ | 5.0 nmol/mol (Zero) | 0,000 | or | 0,24 | 0,0584 | |
| | | ≤ | 5.0 nmol/mol (Span) | 2,000 | $u_{int,neg}$ | | | |
| 9 | Averaging effect | ≤ | 7.0% of measured value | -0,300 | $u_{av}$ | -0,18 | 0,0328 | |
| 10 | Reproducibility standard deviation under field conditions | ≤ | 5.0% of average over 3 months | 3,570 | $u_{r,f}$ | 3,73 | 13,9444 | |
| 11 | Long term drift at zero level | ≤ | 5.0 nmol/mol | 0,960 | $u_{d,l,z}$ | 0,55 | 0,3072 | |
| 12 | Long term drift at span level | ≤ | 5.0% of max. of certification range | -1,270 | $u_{d,l,lh}$ | -0,77 | 0,5882 | |
| 18 | Difference sample/calibration port | ≤ | 1.0% | -0,030 | $u_{Asc}$ | -0,03 | 0,0010 | |
| 21 | Converter efficiency | ≥ | 98 | 99,300 | $u_{EC}$ | 0,73 | 0,5361 | |
| 23 | Uncertainty of test gas | ≤ | 3.0% | 2,000 | $u_{cg}$ | 1,05 | 1,0941 | |

| | | | |
|---|---|---|---|
| Combined standard uncertainty | $u_c$ | 4,7867 | nmol/mol |
| Expanded uncertainty | U | 9,5734 | nmol/mol |
| Relative expanded uncertainty | W | 9,15 | % |
| Maximum allowed expanded uncertainty | $W_{req}$ | 15 | % |

## Expanded uncertainty laboratory, system 1 (2024)

| | | | | | |
|---|---|---|---|---|---|
| Measuring device: | N200 | | | Serial-No.: | 55 | |
| Measured component: | NO | | | 1h-limit value: | 104,6 | nmol/mol |

| No. | Performance characteristic | Performance criterion | Result | Partial uncertainty | | Square of partial uncertainty |
|---|---|---|---|---|---|---|
| 1 | Repeatability standard deviation at zero | ≤ 1.0 nmol/mol | 0,280 | $u_{r,z}$ | 0,05 | 0,0026 |
| 2 | Repeatability standard deviation at 1h-limit value | ≤ 3.0 nmol/mol | 0,560 | $u_{r,lh}$ | 0,02 | 0,0005 |
| 3 | "lack of fit" at 1h-limit value | ≤ 4.0% of measured value | 0,810 | $u_{l,lh}$ | 0,49 | 0,2393 |
| 4 | Sensitivity coefficient of sample gas pressure at 1h-limit value | ≤ 8.0 nmol/mol/kPa | 0,930 | $u_{gp}$ | 1,56 | 2,4339 |
| 5 | Sensitivity coefficient of sample gas temperature at 1h-limit value | ≤ 3.0 nmol/mol/K | 0,020 | $u_{gt}$ | 0,06 | 0,0034 |
| 6 | Sensitivity coefficient of surrounding temperature at 1h-limit value | ≤ 3.0 nmol/mol/K | 0,581 | $u_{st}$ | 2,19 | 4,8090 |
| 7 | Sensitivity coefficient of electrical voltage at 1h-limit value | ≤ 0.30 nmol/mol/V | 0,000 | $u_V$ | 0,00 | 0,0000 |
| 8a | Interferent $H_20$ with 19 mmol/mol | ≤ 10 nmol/mol (Zero) | 1,200 | $u_{H2O}$ | 0,33 | 0,1112 |
| | | ≤ 10 nmol/mol (Span) | -2,400 | | | |
| 8b | Interferent $CO_2$ with 500 µmol/mol | ≤ 5.0 nmol/mol (Zero) | -0,600 | $u_{int,pos}$ or $u_{int,neg}$ | 0,19 | 0,0373 |
| | | ≤ 5.0 nmol/mol (Span) | 1,600 | | | |
| 8c | Interferent $NH_3$ mit 200 nmol/mol | ≤ 5.0 nmol/mol (Zero) | 0,000 | | | |
| | | ≤ 5.0 nmol/mol (Span) | 1,600 | | | |
| 9 | Averaging effect | ≤ 7.0% of measured value | 0,900 | $u_{av}$ | 0,54 | 0,2954 |
| 18 | Difference sample/calibration port | ≤ 1.0% | -0,190 | $u_{\Delta sc}$ | -0,20 | 0,0395 |
| 21 | Converter efficiency | ≥ 98 | 99,20 | $u_{EC}$ | 0,84 | 0,7002 |
| 23 | Uncertainty of test gas | ≤ 3.0% | 2,000 | $u_{cg}$ | 1,05 | 1,0941 |

| | | | |
|---|---|---|---|
| Combined standard uncertainty | $u_c$ | 3,1256 | nmol/mol |
| Expanded uncertainty | U | 6,2513 | nmol/mol |
| Relative expanded uncertainty | W | 5,98 | % |
| Maximum allowed expanded uncertainty | $W_{req}$ | 15 | % |

## Expanded uncertainty laboratory, system 2 (2024)

| | | | | | |
|---|---|---|---|---|---|
| Measuring device: | N200 | | | Serial-No.: | 56 | |
| Measured component: | NO | | | 1h-limit value: | 104,6 | nmol/mol |

| No. | Performance characteristic | Performance criterion | Result | Partial uncertainty | | Square of partial uncertainty |
|---|---|---|---|---|---|---|
| 1 | Repeatability standard deviation at zero | ≤ 1.0 nmol/mol | 0,250 | $u_{r,z}$ | 0,05 | 0,0021 |
| 2 | Repeatability standard deviation at 1h-limit value | ≤ 3.0 nmol/mol | 0,350 | $u_{r,lh}$ | 0,01 | 0,0002 |
| 3 | "lack of fit" at 1h-limit value | ≤ 4.0% of measured value | 1,160 | $u_{l,lh}$ | 0,70 | 0,4907 |
| 4 | Sensitivity coefficient of sample gas pressure at 1h-limit value | ≤ 8.0 nmol/mol/kPa | 0,600 | $u_{gp}$ | 1,01 | 1,0131 |
| 5 | Sensitivity coefficient of sample gas temperature at 1h-limit value | ≤ 3.0 nmol/mol/K | 0,030 | $u_{gt}$ | 0,09 | 0,0078 |
| 6 | Sensitivity coefficient of surrounding temperature at 1h-limit value | ≤ 3.0 nmol/mol/K | 0,269 | $u_{st}$ | 1,02 | 1,0309 |
| 7 | Sensitivity coefficient of electrical voltage at 1h-limit value | ≤ 0.30 nmol/mol/V | 0,010 | $u_V$ | 0,04 | 0,0015 |
| 8a | Interferent $H_20$ with 19 mmol/mol | ≤ 10 nmol/mol (Zero) | 0,000 | $u_{H2O}$ | 0,40 | 0,1622 |
| | | ≤ 10 nmol/mol (Span) | 0,000 | | | |
| 8b | Interferent $CO_2$ with 500 µmol/mol | ≤ 5.0 nmol/mol (Zero) | -0,600 | $u_{int,pos}$ or $u_{int,neg}$ | 0,24 | 0,0584 |
| | | ≤ 5.0 nmol/mol (Span) | 0,400 | | | |
| 8c | Interferent $NH_3$ mit 200 nmol/mol | ≤ 5.0 nmol/mol (Zero) | 0,000 | | | |
| | | ≤ 5.0 nmol/mol (Span) | 2,000 | | | |
| 9 | Averaging effect | ≤ 7.0% of measured value | -0,300 | $u_{av}$ | -0,18 | 0,0328 |
| 18 | Difference sample/calibration port | ≤ 1.0% | -0,030 | $u_{\Delta sc}$ | -0,03 | 0,0010 |
| 21 | Converter efficiency | ≥ 98 | 99,30 | $u_{EC}$ | 0,73 | 0,5361 |
| 23 | Uncertainty of test gas | ≤ 3.0% | 2,000 | $u_{cg}$ | 1,05 | 1,0941 |

| | | | |
|---|---|---|---|
| Combined standard uncertainty | $u_c$ | 2,1055 | nmol/mol |
| Expanded uncertainty | U | 4,2110 | nmol/mol |
| Relative expanded uncertainty | W | 4,03 | % |
| Maximum allowed expanded uncertainty | $W_{req}$ | 15 | % |

## Expanded uncertainty, laboratory and field, system 1 (2024)

| Measuring device: | N200 | | | | | Serial-No.: | 55 | |
|---|---|---|---|---|---|---|---|---|
| Measured component: | NO | | | | | 1h-limit value: | 104,6 | nmol/mol |

| No. | Performance characteristic | Performance criterion | | Result | Partial uncertainty | | Square of partial uncertainty | |
|---|---|---|---|---|---|---|---|---|
| 1 | Repeatability standard deviation at zero | ≤ | 1.0 nmol/mol | 0,280 | $u_{r,z}$ | 0,05 | 0,0026 | |
| 2 | Repeatability standard deviation at 1h-limit value | ≤ | 3.0 nmol/mol | 0,560 | $u_{r,lh}$ | not considered, as √2*ur,lh = 0,03 < ur,f | - | |
| 3 | "lack of fit" at 1h-limit value | ≤ | 4.0% of measured value | 0,810 | $u_{l,lh}$ | 0,49 | 0,2393 | |
| 4 | Sensitivity coefficient of sample gas pressure at 1h-limit value | ≤ | 8.0 nmol/mol/kPa | 0,930 | $u_{gp}$ | 1,56 | 2,4339 | |
| 5 | Sensitivity coefficient of sample gas temperature at 1h-limit value | ≤ | 3.0 nmol/mol/K | 0,020 | $u_{gt}$ | 0,06 | 0,0034 | |
| 6 | Sensitivity coefficient of surrounding temperature at 1h-limit value | ≤ | 3.0 nmol/mol/K | 0,581 | $u_{st}$ | 2,19 | 4,8090 | |
| 7 | Sensitivity coefficient of electrical voltage at 1h-limit value | ≤ | 0.30 nmol/mol/V | 0,000 | $u_V$ | 0,00 | 0,0000 | |
| 8a | Interferent $H_20$ with 19 mmol/mol | ≤ | 10 nmol/mol (Zero) | 1,200 | $u_{H2O}$ | 0,33 | 0,1112 | |
| | | ≤ | 10 nmol/mol (Span) | -2,400 | | | | |
| 8b | Interferent $CO_2$ with 500 µmol/mol | ≤ | 5.0 nmol/mol (Zero) | -0,600 | $u_{int,pos}$ | 0,19 | 0,0373 | |
| | | ≤ | 5.0 nmol/mol (Span) | 1,600 | | | | |
| 8c | Interferent $NH_3$ mit 200 nmol/mol | ≤ | 5.0 nmol/mol (Zero) | 0,000 | or | | | |
| | | ≤ | 5.0 nmol/mol (Span) | 1,600 | $u_{int,neg}$ | | | |
| 9 | Averaging effect | ≤ | 7.0% of measured value | 0,900 | $u_{av}$ | 0,54 | 0,2954 | |
| 10 | Reproducibility standard deviation under field conditions | ≤ | 5.0% of average over 3 months | 0,960 | $u_{r,f}$ | 1,00 | 1,0083 | |
| 11 | Long term drift at zero level | ≤ | 5.0 nmol/mol | 0,840 | $u_{d,l,z}$ | 0,48 | 0,2352 | |
| 12 | Long term drift at span level | ≤ | 5.0% of max. of certification range | -1,190 | $u_{d,l,lh}$ | -0,72 | 0,5165 | |
| 18 | Difference sample/calibration port | ≤ | 1.0% | -0,190 | $u_{\Delta sc}$ | -0,20 | 0,0395 | |
| 21 | Converter efficiency | ≥ | 98 | 99,200 | $u_{EC}$ | 0,84 | 0,7002 | |
| 23 | Uncertainty of test gas | ≤ | 3.0% | 2,000 | $u_{cg}$ | 1,05 | 1,0941 | |

| | | | |
|---|---|---|---|
| Combined standard uncertainty | $u_c$ | 3,3954 | nmol/mol |
| Expanded uncertainty | U | 6,7908 | nmol/mol |
| Relative expanded uncertainty | W | 6,49 | % |
| Maximum allowed expanded uncertainty | $W_{req}$ | 15 | % |

## Expanded uncertainty, laboratory and field, system 2 (2024)

| Measuring device: | N200 | | | | | Serial-No.: | 56 | |
|---|---|---|---|---|---|---|---|---|
| Measured component: | NO | | | | | 1h-limit value: | 104,6 | nmol/mol |

| No. | Performance characteristic | Performance criterion | | Result | Partial uncertainty | | Square of partial uncertainty | |
|---|---|---|---|---|---|---|---|---|
| 1 | Repeatability standard deviation at zero | ≤ | 1.0 nmol/mol | 0,250 | $u_{r,z}$ | 0,05 | 0,0021 | |
| 2 | Repeatability standard deviation at 1h-limit value | ≤ | 3.0 nmol/mol | 0,350 | $u_{r,lh}$ | not considered, as √2*ur,lh = 0,01 < ur,f | - | |
| 3 | "lack of fit" at 1h-limit value | ≤ | 4.0% of measured value | 1,160 | $u_{l,lh}$ | 0,70 | 0,4907 | |
| 4 | Sensitivity coefficient of sample gas pressure at 1h-limit value | ≤ | 8.0 nmol/mol/kPa | 0,600 | $u_{gp}$ | 1,01 | 1,0131 | |
| 5 | Sensitivity coefficient of sample gas temperature at 1h-limit value | ≤ | 3.0 nmol/mol/K | 0,030 | $u_{gt}$ | 0,09 | 0,0078 | |
| 6 | Sensitivity coefficient of surrounding temperature at 1h-limit value | ≤ | 3.0 nmol/mol/K | 0,269 | $u_{st}$ | 1,02 | 1,0309 | |
| 7 | Sensitivity coefficient of electrical voltage at 1h-limit value | ≤ | 0.30 nmol/mol/V | 0,010 | $u_V$ | 0,04 | 0,0015 | |
| 8a | Interferent $H_20$ with 19 mmol/mol | ≤ | 10 nmol/mol (Zero) | 1,000 | $u_{H2O}$ | 0,40 | 0,1622 | |
| | | ≤ | 10 nmol/mol (Span) | -1,200 | | | | |
| 8b | Interferent $CO_2$ with 500 µmol/mol | ≤ | 5.0 nmol/mol (Zero) | -0,600 | $u_{int,pos}$ | 0,24 | 0,0584 | |
| | | ≤ | 5.0 nmol/mol (Span) | 0,400 | | | | |
| 8c | Interferent $NH_3$ mit 200 nmol/mol | ≤ | 5.0 nmol/mol (Zero) | 0,000 | or | | | |
| | | ≤ | 5.0 nmol/mol (Span) | 2,000 | $u_{int,neg}$ | | | |
| 9 | Averaging effect | ≤ | 7.0% of measured value | -0,300 | $u_{av}$ | -0,18 | 0,0328 | |
| 10 | Reproducibility standard deviation under field conditions | ≤ | 5.0% of average over 3 months | 0,960 | $u_{r,f}$ | 1,00 | 1,0083 | |
| 11 | Long term drift at zero level | ≤ | 5.0 nmol/mol | 0,960 | $u_{d,l,z}$ | 0,55 | 0,3072 | |
| 12 | Long term drift at span level | ≤ | 5.0% of max. of certification range | -1,270 | $u_{d,l,lh}$ | -0,77 | 0,5882 | |
| 18 | Difference sample/calibration port | ≤ | 1.0% | -0,030 | $u_{\Delta sc}$ | -0,03 | 0,0010 | |
| 21 | Converter efficiency | ≥ | 98 | 99,300 | $u_{EC}$ | 0,73 | 0,5361 | |
| 23 | Uncertainty of test gas | ≤ | 3.0% | 2,000 | $u_{cg}$ | 1,05 | 1,0941 | |

| | | | |
|---|---|---|---|
| Combined standard uncertainty | $u_c$ | 2,5172 | nmol/mol |
| Expanded uncertainty | U | 5,0345 | nmol/mol |
| Relative expanded uncertainty | W | 4,81 | % |
| Maximum allowed expanded uncertainty | $W_{req}$ | 15 | % |