

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000040217_02

AMS designation: Model 42i for NO, NO₂ and NO_x

Manufacturer: Thermo Fisher Scientific
27, Forge Parkway
Franklin, MA 02038
USA

Test Laboratory: TÜV Rheinland Energy GmbH

This is to certify that the AMS has been tested
and found to comply with the standards:
VDI 4202-1 (2002), VDI 4203-3 (2004), EN 14211 (2012),
EN 15267-1 (2009) and EN 15267-2 (2009).

Certification is awarded in respect of the conditions stated in this certificate
(this certificate contains 15 pages).

The present certificate replaces certificate 0000040217_01 of 01 April 2019.



Suitability Tested
Equivalent to
2008/50/EC
EN 15267
Regular Surveillance

www.tuv.com
ID 0000040217

Publication in the German Federal Gazette
(BAnz) of 01 April 2014

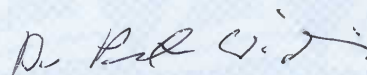
This certificate will expire on:
30 June 2025

German Federal Environment Agency
Dessau, 01 July 2020

TÜV Rheinland Energy GmbH
Cologne, 30 June 2020



Dr. Marcel Langner
Head of Section II 4.1



ppa. Dr. Peter Wilbring

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

TÜV Rheinland Energy 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 certificate D-PL-11120-02-00.

Test Report:	936/21203248/C1 of 05 January 2006 Addendum 936/21221382/B dated 21 September 2013
Initial certification:	01 April 2014
Expiry date:	30 June 2025
Certificate:	Renewal (of previous certificate 0000040217_01 dated 01 April 2019 valid until 30 June 2020)
Publication:	BAnz AT 01.04.2014 B12, chapter VI notification 22

Approved application

The certified AMS is suitable for continuous ambient air monitoring of NO, NO₂ and NO_x (stationary operation).

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a three-months field test.

The AMS is approved for an ambient temperature range of 0 °C to +30 °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, in consultation with the manufacturer, that this AMS is suitable for monitoring the AMS readings relevant to the application.

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

Basis of the certification

This certification is based on:

- Test report no. 936/21203248/C1 of 05 January 2006 issued by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH and Addendum 936/21221382/B dated 21 September 2013 issued by 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. 08 April 2006, no. 70, p. 2653, chapter IV number 4.1, UBA announcement dated 21 February 2006:

AMS designation:

Analyser model 42i

Manufacturer:

Thermo Electron Corporation Franklin, MA 02038 USA and 91056 Erlangen

Field of application:

For continuous monitoring of NO, NO₂ und NO_x in ambient air (stationary operation)

Measuring ranges during performance testing

NO₂ 0–400 µg/m³
0–500 µg/m³
NO 0–1200 µg/m³

Software:

Version: 01.03.00.094

Test Laboratory:

TÜV Immissionsschutz und Energiesysteme GmbH, Cologne,
TÜV Rheinland Group

Test Report:

Report no.: 936/21203248/C dated 5 January 2006

Publication in the German Federal Gazette: BAnz. 20 April 2007, no. 75, p. 4139, chapter IV notification 1, UBA announcement dated 12 April 2007:

1 Notification issued by the Federal Environment Agency

Thermo Electron Corp., Franklin, USA, now trade under the new name Thermo Fisher Scientific, Franklin, USA.

Statement issued by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, 51101 Cologne, Dr Peter Wilbring, dated 20 December 2006

Publication in the German Federal Gazette: BAnz. 20 April 2007, no. 75, p. 4139, chapter IV notification 6, UBA announcement dated 12 April 2007:

6 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (BAnz. p. 2653) and of 12 September 2006 (BAnz. p. 6715)

The measuring systems model 42i for nitrogen oxide, model 43i for sulphur dioxide, model 48i for carbon monoxide and model 49i for ozone, manufactured by Thermo Fisher Scientific, MA 02038, USA, are also manufactured and sold identically and to the same standards by MLU-Monitoring für Leben und Umwelt Ges.m.b.H., Mödling, Austria.

Statement issued by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, 51101 Cologne, Dr Peter Wilbring, dated 14 December 2006

Publication in the German Federal Gazette: BAnz. 03 September 2008, no. 133, p. 3243, chapter IV notification 12, UBA announcement dated 12 August 2008:

12 Notification as regards Federal Environment Agency (UBA) notice of 21 February 2006 (BAnz. p. 2655)

The current software version for the Model 42i air quality monitor manufactured by Thermo Fisher Scientific is:

V 01.05.01 (105646-00)

Statement issued by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, dated 10 March 2008

Publication in the German Federal Gazette: BAnz. 25 August 2009, no. 125, p. 2929, chapter III notification 16, UBA announcement dated 03 August 2009:

16 Notification as regards Federal Environment Agency (UBA) notice of 21 February 2006 (BAnz. p. 2655)

The current software version for the Model 42i air quality monitor manufactured by Thermo Fisher Scientific is:

V 01.06.01 (108456-00)

Statement issued by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH dated 1 April 2009

Publication in the German Federal Gazette: BAnz. 28 July 2010, No. 111, p. 2597, chapter III notification 4, UBA announcement dated 12 July 2010:

4 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (BAnz. p. 2655) and of 3 August 2009 (BAnz. p. 2936)

The current software version for the Model 42i air quality monitor manufactured by is:

V 01.06.02 (108957-00)

The Model 42i air quality monitor manufactured by Thermo Fisher Scientific can also be used with the PU1961-N811-3.07 sample gas pump manufactured by KNF.

Statement issued by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH dated 23 March 2010

Publication in the German Federal Gazette: BAnz AT 20.07.2012 B11, chapter IV notification 23, UBA announcement dated 06 July 2012:

23 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (BAnz. p. 2653, chapter IV number 4.1) and of 12 July 2010 (BAnz. p. 2597, chapter III 4th notification)

The operational voltage of the photomultiplier cooler of the model 42i ambient air measuring system for NO_x manufactured by Thermo Fisher Scientific was changed from 15 V to 13 V to extend the component's lifecycle'.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 20 March 2012

Publication in the German Federal Gazette: BAnz AT 01.04.2014 B12, chapter VI notification 22, UBA announcement dated 27 February 2014:

22 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (BAnz. p. 2653, chapter IV number 4.1) and of 6 July 2012 (BAnz AT 20.07.2012 B11, chapter IV 23rd notification)

The Model 42i air quality monitor for NO, NO₂ and NO_x manufactured by Thermo Fisher Scientific complies with the requirements of EN 14211 (August 2012 version). Furthermore, the manufacturing process and the quality management for the Model 42i for NO, NO₂ and NO_x measuring system meet the requirements of EN 15267.

The test report on performance testing No. 936/21203248/C1 and the addendum no. 936/21221382/B as an integral part of this report are available online at www.qal1.de.

The position of the permeation dryer inside the measuring system, previously upstream of the ozone generator, has been modified.

Production of the Arcturus Bd. 101491-xx processor board has been discontinued and will be replaced by the Arcturus Bd. 110570-xx processor board.

The current software version of the measuring system is:
V 02.00.05 (113760-00)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 1 October 2013

Publication in the German Federal Gazette: BAnz AT 05.08.2014 B11, chapter V notification 20, UBA announcement dated 17 July 2014:

20 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (p. 2653, chapter IV number 4.1) and of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter VI 22nd notification)

The latest software version of the model 42i measuring system for NO, NO₂ and NO_x manufactured by Thermo Fisher Scientific is: V 02.00.06 (114180-00)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH
dated 28 March 2014

Publication in the German Federal Gazette: BAnz AT 02.04.2015 B5, chapter IV notification 16, UBA announcement dated 25 February 2015:

16 Notification as regards Federal Environment Notices (UBA) of 21 February 2006 (BAnz. p. 2653, chapter IV number 4.1) and of 17 July 2014 (BAnz AT 05.08.2014 B11, chapter V 20th notification)

The latest software version of the model 42i measuring system for NO, NO₂ and NO_x manufactured by Thermo Fisher Scientific is:
V 02.02.00 (114535-00)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH
dated 22 September 2014

Publication in the German Federal Gazette: BAnz AT 14.03.2016 B7, chapter V notification 12, UBA announcement dated 18 February 2016:

12 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (p. 2653, chapter IV number 4.1) and of 25 February 2015 (BAnz AT 02.04.2015 B5, chapter IV 16th notification)

The latest software version of the model 42i measuring system for NO, NO₂ and NO_x manufactured by Thermo Fisher Scientific is:

V 02.02.04

Statement issued by TÜV Rheinland Energie und Umwelt GmbH
dated 22 October 2015

Publication in the German Federal Gazette: BAnz AT 01.08.2016 B11, chapter V notification 36, UBA announcement dated 14 July 2016:

36 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (p. 2653, chapter IV number 4.1) and of 18 February 2016 (BAnz AT 14.03.2016 B7, chapter V 12th notification)

The latest software version of the model 42i measuring system for NO, NO₂ and NO_x manufactured by Thermo Fisher Scientific is:
V 02.02.05

Statement issued by TÜV Rheinland Energie und Umwelt GmbH
dated 29 February 2016.

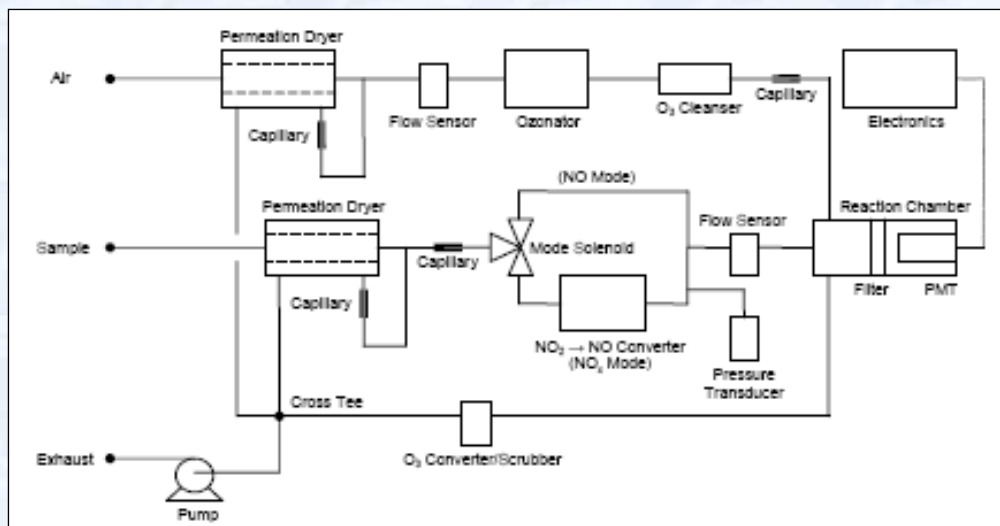
Certified product

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

The Model 42i operates on the principle that nitric oxide (NO) and ozone (O₃) react to produce a characteristic luminescence with an intensity linearly proportional to the NO concentration.



The sample gas passes through a particle filter and a permeation dryer and reaches the reaction chamber via a flow controller and a converter. At a temperature of 325 °C, the converter converts the nitrogen dioxide contained in the sample gas into nitrogen monoxide. To this effect, ozone is required, which an ozone generator produces from dry air. This is performed using UV radiation. A proportion of NO equivalent to the ozone concentration is oxidised to produce NO₂; this is referred to as gas phase titration. The photomultiplier tube (PMT), which is located in a thermoelectric cooler, detects the luminescence. The model 42i then calculates the NO, NO₂ and NO_x concentrations.



This measuring principle corresponds to the standard reference method as described in EN 14211.

General remarks

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 manufacturing process for 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 document as well as the certification mark remains property of TÜV Rheinland Energy GmbH. Upon revocation of the publication the certificate loses its validity. After the expiration of the certificate and on request of TÜV Rheinland Energy GmbH this document shall be returned and the certificate mark must no longer be used.

The relevant version of this certificate and its expiration date are also accessible on the internet at qal1.de.

Document history

Certification of the Model 42i measuring system is based on the documents listed below and the regular, continuous surveillance of the manufacturer's quality management system:

Basic testing

Test Report: 936/21203248/C1 of 05 January 2006
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne
Publication: BAnz. 08 April 2006, no. 70, p. 2653, chapter IV no. 4.1
UBA announcement dated 21 February 2006

Notifications

Statement issued by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH dated 20 December 2006
Publication: BAnz. 20 April 2007, no. 75, p. 4139, chapter IV notification 1,
UBA announcement dated 12 April 2007
(New company name)

Statement issued by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH dated 14 December 2006
Publication: BAnz. 20 April 2007, no. 75, p. 4139, chapter IV notification 6,
UBA announcement dated 12 April 2007
(Production and distribution by MLU)

Statement issued by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH
dated 10 March 2008
Publication: BAnz. 03 September 2008, no. 133, p. 3243, chapter IV notification 12
UBA announcement dated 12 August 2008
(software updates)

Statement issued by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH
dated 01 April 2009
Publication: 25 August 2009, no. 125, p. 2929, chapter III notification 16
UBA announcement dated 3 August 2009
(software updates)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 23 October 2010
Publication: BAnz. 28 July 2010, No. 111, p. 2597, chapter III notification 4
UBA announcement dated 12 July 2010
(Design and software changes)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 20 March 2012
Publication: BAnz AT 20.07.2012 B11, chapter IV notification 23
UBA announcement dated 6 July 2012
(Design changes)

Initial certification according to EN 15267

Certificate no. 0000040217: 29 April 2014
Expiry date of the certificate: 31 March 2019
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 1 October 2013
Test report: 936/21221382/B dated 21 September 2013
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Publication: BAnz AT 01.04.2014 B12, chapter VI notification 22
UBA announcement dated 27 February 2014

Notifications in accordance with EN 15267

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 28 March 2014
Publication: BAnz AT 05.08.2014 B11, chapter V notification 20
UBA announcement dated 17 July 2014
(software updates)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 22 September 2014
Publication: BAnz AT 02.04.2015 B5, chapter IV notification 16
UBA announcement dated 25 February 2015
(software updates)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 22 October 2015
Publication: BAnz AT 14.03.2016 B7, chapter V notification 12
UBA announcement dated 18 February 2016
(software updates)

Statement issued by TÜV Rheinland Energy GmbH dated 29 February 2016
Publication: BAnz AT 01.08.2016 B11, chapter V notification 36
UBA announcement dated 14 July 2016
(software updates)

Renewal of the certificate

Certificate no. 0000040217_01: 01 April 2019
Expiry date of the certificate: 30 June 2020

Renewal of the certificate

Certificate no. 0000040217_02: 01 July 2020
Expiry date of the certificate: 30 June 2025

Expanded uncertainty from the results obtained in the laboratory tests for analyser 1

Measuring device:		Thermo Fisher Scientific		Serial-No.:		Device 1	
Measured component:		Modell 421		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	0.330	$U_{r,z}$	0.10	0.0097	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.860	$U_{r,h}$	0.05	0.0028	
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	-0.400	$U_{l,h}$	-0.24	0.0584	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 8.0 nmol/mol/kPa	1.580	U_{gp}	3.98	15.8064	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 3.0 nmol/mol/K	-0.310	U_{gt}	-0.90	0.8075	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 3.0 nmol/mol/K	0.390	U_{st}	1.13	1.2781	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.040	U_v	0.16	0.0264	
8a	Interferent H ₂ O with 21 nmol/mol	≤ 10 nmol/mol (Zero) ≤ 10 nmol/mol (Span)	0.830 -1.340	U_{H_2O}	0.35	0.1258	
8b	Interferent CO ₂ with 500 µmol/mol	≤ 5.0 nmol/mol (Zero) ≤ 5.0 nmol/mol (Span)	-0.100 -2.330	$U_{int,pos}$ or	0.38	0.1458	
8c	Interferent NH ₃ mit 200 nmol/mol	≤ 5.0 nmol/mol (Zero) ≤ 5.0 nmol/mol (Span)	-0.040 -1.000	$U_{int,neg}$			
9	Averaging effect	≤ 7.0% of measured value	-2.680	U_{av}	-1.62	2.6195	
18	Difference sampler/calibration port	≤ 1.0%	0.000	$U_{s,c}$	0.00	0.0000	
21	Converter efficiency	≥ 98	98.00	U_{EC}	2.09	4.3765	
23	Uncertainty of test gas	≤ 3.0%	2.000	U_{cg}	1.05	1.0941	
				Combined standard uncertainty	u_c	5.1345 nmol/mol	
				Expanded uncertainty	U	10.2691 nmol/mol	
				Relative expanded uncertainty	W	9.82 %	
				Maximum allowed expanded uncertainty	W_{req}	15 %	

Expanded uncertainty from the results obtained in the laboratory tests for analyser 2

Measuring device:		Thermo Fisher Scientific		Serial-No.:		Device 2	
Measured component:		Modell 42i		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}	0.07	0.0056	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.360	U _{r,1h}	0.02	0.0005	
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0.500	U _{l,1h}	0.30	0.0912	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 8.0 nmol/mol/kPa	1.460	U _{sp}	3.67	13.4966	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 3.0 nmol/mol/K	-0.300	U _{gt}	-0.87	0.7563	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 3.0 nmol/mol/K	0.370	U _{s1}	1.07	1.1503	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.040	U _v	0.16	0.0264	
8a	Interferent H ₂ O with 21 mmol/mol	≤ 10 nmol/mol (Zero)	0.000	U _{H2O}	0.42	0.1773	
8b	Interferent CO ₂ with 500 µmol/mol	≤ 10 nmol/mol (Span)	0.000	U _{int,pos} or U _{int,neg}	0.27	0.0705	
		≤ 5.0 nmol/mol (Zero)	-0.100				
		≤ 5.0 nmol/mol (Span)	-1.660				
8c	Interferent NH ₃ mit 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.070				
9	Averaging effect	≤ 5.0 nmol/mol (Span)	-1.000				
18	Difference sample/calibration port	≤ 7.0% of measured value	-1.100	U _{av}	-0.66	0.4413	
21	Converter efficiency	≤ 1.0%	0.000	U _{usc}	0.00	0.0000	
23	Uncertainty of test gas	≥ 98	98.00	U _{EC}	2.09	4.3765	
		≤ 3.0%	2.000	U _{cg}	1.05	1.0941	
				Combined standard uncertainty		u _c	
				Expanded uncertainty		U	
				Relative expanded uncertainty		W	
				Maximum allowed expanded uncertainty		W _{req}	
						15 %	

Expanded uncertainty from the results obtained in the laboratory and field tests for
analyser 1

Measuring device:		Serial-No.:		Device 1	
Thermo Fisher Scientific		1h-limit value:		104.6	
Modell 42i		Partial uncertainty		Square of partial uncertainty	
No.	Performance characteristic	Performance criterion	Result	U _{i,z}	U _{i,th}
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.330	U _{i,z}	0.0097
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.860	U _{i,th}	-
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	-0.400	U _{i,th}	0.0584
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 8.0 nmol/mol/kPa	1.560	U _{sp}	15.8064
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 3.0 nmol/mol/K	-0.310	U _{pt}	0.8075
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 3.0 nmol/mol/K	0.390	U _{st}	1.2781
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.040	U _y	0.0264
8a	Interferent H ₂ O with 21 nmol/mol	≤ 10 nmol/mol (Zero)	0.830	U _{H2O}	0.1258
		≤ 10 nmol/mol (Span)	-1.340		
8b	Interferent CO ₂ with 500 µmol/mol	≤ 5.0 nmol/mol (Zero)	-0.100	U _{int,pos}	
		≤ 5.0 nmol/mol (Span)	-2.330		
8c	Interferent NH ₃ mit 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	-0.040	0	0.1458
		≤ 5.0 nmol/mol (Span)	-1.000	U _{int,neg}	
9	Averaging effect	≤ 7.0% of measured value	-2.680	U _{av}	2.6195
10	Reproducibility standard deviation under field conditions	≤ 5.0% of average over 3 months	3.850	U _{r,f}	16.2175
11	Long term drift at zero level	≤ 5.0 nmol/mol	-0.640	U _{l,z}	0.1365
12	Long term drift at span level	≤ 5.0% of max. of certification range	5.000	U _{l,th}	9.1176
18	Difference sample/calibration port	≤ 1.0%	0.000	U _{Δsc}	0.0000
21	Converter efficiency	≥ 98	98.000	U _{ec}	4.3765
23	Uncertainty of test gas	≤ 3.0%	2.000	U _{cg}	1.0941
Combined standard uncertainty				U _c	7.1993
Expanded uncertainty				U	14.3986
Relative expanded uncertainty				W	13.77
Maximum allowed expanded uncertainty				W _{req}	15

Expanded uncertainty from the results obtained in the laboratory and field tests for
analyser 2

Measuring device:		Thermo Fisher Scientific		Serial-No.:		Device 2	
Measured component:		Modell 42i		1h-limit value:		104.6	
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty	nmol/mol	
1	Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.250	U _{r,z}	0.07	0.0056	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	0.360	U _{r,ih}	not considered, as $\sqrt{2} \cdot u_{r,ih} = 0.03 < u_{r,f}$	-	
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	0.500	U _{i,ih}	0.30	0.0912	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 8.0 nmol/mol/kPa	1.460	U _{sp}	3.67	13.4966	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 3.0 nmol/mol/K	-0.300	U _{gt}	-0.87	0.7563	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 3.0 nmol/mol/K	0.370	U _{st}	1.07	1.1503	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.040	U _v	0.16	0.0264	
8a	Interferent H ₂ O with 21 nmol/mol	≤ 10 nmol/mol (Zero) ≤ 10 nmol/mol (Span)	0.870 -1.000	U _{H2O}	0.42	0.1773	
8b	Interferent CO ₂ with 500 µmol/mol	≤ 5.0 nmol/mol (Zero) ≤ 5.0 nmol/mol (Span)	-0.100 -1.660	U _{int,pos} or	0.27	0.0705	
8c	Interferent NH ₃ mit 200 nmol/mol	≤ 5.0 nmol/mol (Zero) ≤ 5.0 nmol/mol (Span)	0.070 -1.000	U _{int,neg}			
9	Averaging effect	≤ 7.0% of measured value	-1.100	U _{av}	-0.66	0.4413	
10	Reproducibility standard deviation under field conditions	≤ 5.0% of average over 3 months	3.850	U _{r,f}	4.03	16.2175	
11	Long term drift at zero level	≤ 5.0 nmol/mol	1.140	U _{gl,z}	0.66	0.4332	
12	Long term drift at span level	≤ 5.0% of max. of certification range	5.000	U _{d,ih}	3.02	9.1176	
18	Difference sample/calibration port	≤ 1.0%	0.000	U _{ss}	0.00	0.0000	
21	Converter efficiency	≥ 98	98.000	U _{EC}	2.09	4.3765	
23	Uncertainty of test gas	≤ 3.0%	2.000	U _{sg}	1.05	1.0941	
				Combined standard uncertainty	u _c	6.8891	nmol/mol
				Expanded uncertainty	U	13.7782	nmol/mol
				Relative expanded uncertainty	W	13.17	%
				Maximum allowed expanded uncertainty	W _{req}	15	%