



CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000040217 04

Certified AMS:

Modell 42i for NO, NO₂ and NO_x

Manufacturer:

Thermo Fisher Scientific

27, Forge Parkway Franklin, MA 02038

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 (2002), VDI 4203 (2004), EN 14211 (2012) 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 15 pages).

The present certificate replaces certificate 0000040217 02 dated 1 July 2020.



Suitability Tested Complying with 2008/50/EC EN 15267 Regular Surveillance

www.tuv.com ID 0000040217

Publication in the German Federal Gazette (BAnz) of 8 April 2006

German Environment Agency

Dessau, 27 June 2025

This certificate will expire on:

30 June 2030

TÜV Rheinland Energy & Environment GmbH Cologne, 26 June 2025

Dr. Marcel Langner Head of Section II 4 Pメムラ ppa. Dr. Peter Wilbring

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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: 936/21203248/C1 dated 5 January 2006 and

Addendum 936/21221382/B dated 21 September 2013

Initial certification: 1 April 2014 Expiry date: 30 June 2030

Certificate: Renewal (of previous certificate 0000040217_02 of

1 July 2020 valid until 30 June 2025)

Publication: BAnz. 08 April 2006, No. 70, p. 2653, chapter IV No. 4.1 and

Banz AT 01.04.2014 B12, chapter VI notification 22

Approved application

The tested AMS is suitable for continuous immission measurement of NO, NO₂ and NO_x in stationary use.

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a three month 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 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 936/21203248/C1 dated 5 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 No. 4.1, Announcement by UBA 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 the performance test:

NO ₂	0 – 400	µg/m³
	0 – 500	µg/m³
NO	0 – 1,200	µg/m³

Software version:

Version: 01.03.00.094

Test institute:

TÜV Immissionsschutz und Energiesysteme GmbH, Cologne

TÜV Rheinland Group

Report No.: 936/21203248/C1 dated 5 January 2006

Publication in the German Federal Gazette: BAnz. 20. April 2007, No. 75, S. 4139, Chap. IV notification 1, Announcement by UBA dated 12 April 2007:

1 Notification of Federal Environment Agency (UBA)

The new name of Thermo Electron Corp., Franklin, USA, is Thermo Fisher Scientific, Franklin, USA.

Statement by TÜV Rheinland Immissionsschutz und Energiesysteme, 51101 Köln, Dr. Peter Wilbring, dated 20 December 2006





Publication in the German Federal Gazette: BAnz. 3 September 2008, No. 133, S. 3243, Chap. IV, notification 12, Announcement by UBA dated 12 August 2008:

12 Notification of announcement by the Federal Environment Agency (UBA) of 21 February 2006 (BAnz. p. 2655)

The current software version of the ambient air measuring system 42i by Thermo Fisher Scientific is: V 01.05.01 (105646-00)

Statement by TÜV Rheinland Immissionsschutz und Energiesysteme of 10 March 2008

Publication in the German Federal Gazette: BAnz. 25 August 2009, No. 125, S. 2929, Chap. III, notification 16, Announcement by UBA dated 3 August 2009:

Notification of announcement by the Federal Environment Agency (UBA) of 21 February 2006 (BAnz. p. 2655)

The current software version of the ambient air measuring system 42i by Thermo Fisher Scientific is: V 01.06.01 (108456-00)

Statement by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH of 1 April 2009

Publication in the German Federal Gazette: BAnz. 28 Juli 2010, No. 111, S. 2597, Chap. III notification 4, Announcement by UBA dated 12 July 2010:

4 Notification of announcements by the Federal Environment Agency (UBA) of 21 February 2006 (BAnz. p. 2655) and 3 August 2009 (BAnz. p. 2936)

The current software version of the ambient air measuring system 42i by Thermo Fisher Scientific is: V 01.06.02 (108957-00)

The ambient air measuring system 42i by Thermo Fisher Scientific can now also be operated with a sample gas pump of type PU1961-N811-3.07 manufactured by KNF.

Statement by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH of 23 March 2010





Publication in the German Federal Gazette: BAnz AT 20.07.2012 B11, Chap. IV notification 23, Announcement by UBA dated 6 July 2012:

Notification of announcements by the German Federal Environment Agency of 21 February 2006 (BAnz. p. 2653, Chapter IV Number 4.1) and of 12 July 2010 (BAnz. p. 2597, Chapter III notification 4)

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

Statement by TÜV Rheinland Energie und Umwelt GmbH of 20 March 2012

Publication in the German Federal Gazette: BAnz AT 01.04.2014 B12, Chap. VI notification 22, Announcement by UBA dated 27 February 2014:

Notification of announcements by the German Federal Environment Agency 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, notification 23)

The measuring system model 42i for NO, NO₂ and NO_x by Thermo Fisher Scientific fulfils the requirements of EN 14211 (November 2012). Furthermore, the manufacturing process and the quality management system of the measuring system model 42i for NO, NO₂, and NO_x fulfill the requirements of EN 15267.

The test report of the performance test with report number 936/21203248/C1 as well as an addendum as an integral part of to the test report with report number 936/21221382/B can be viewed on the internet at www.qal1.de.

The positioning of the permeation dryer before the ozone generator was changed within the measuring system.

The Arcturus Bd. 101491-xx processor board was withdrawn and replaced by the new Arcturus Bd. 110570-xx processor board.

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

Statement by TÜV Rheinland Energie und Umwelt GmbH of 1 October 2013





Publication in the German Federal Gazette: BAnz AT 05.08.2014 B11, Chap. V notification 20, Announcement by UBA dated 17 July 2014:

Notification as regards Federal Environmental Agency notices of 21 February 2006 (BAnz. p. 2653, chapter IV, No. 4.1) and of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter VI, notification 22)

The current software version for the Modell 42i measuring system for monitoring NO, NO_2 and NO_x manufactured by Thermo Fisher Scientific is: V 02.00.06 (114180-00)

Statement of TÜV Rheinland Energie und Umwelt GmbH of 28 March 2014

Publication in the German Federal Gazette: BAnz AT 02.04.2015 B5, Chap. IV notification 16, Announcement by UBA dated 25 February 2015:

Notification as regards Federal Environment Agency (UBA) notices 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 notification 20)

The current software version for the measuring system Model 42i for NO, NO_2 and NO_x , manufactured by Thermo Fisher Scientific, is: V 02.02.00 (114535-00)

Statement of TÜV Rheinland Energie und Umwelt GmbH of 22 September 2014

Publication in the German Federal Gazette: BAnz AT 14.03.2016 B7, Chap. V notification 12, Announcement by UBA dated 18 February 2016:

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

The current software version of the measuring equipment Model 42i for NO, NO_2 and NO_x of Thermo Fisher Scientific is: V 02.02.04

Statement of TÜV Rheinland Energie und Umwelt GmbH of 22 October 2015





Publication in the German Federal Gazette: BAnz AT 01.08.2016 B11, Chap. V notification 36, Announcement by UBA dated 14 July 2016:

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

The current software version of the model 42i measuring system for NO, NO $_2$ and NO $_x$ manufactured by Thermo Fisher Scientific is: V 02.02.05

Statement by TÜV Rheinland Energie und Umwelt GmbH of 29 February 2016

Publication in the German Federal Gazette: BAnz AT 05.08.2021 B5, Chap. IV notification 8, Announcement by UBA dated 29 June 2021:

Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (BAnz. p. 2653, chapter IV number 4.1) and of 14 July 2016 (BAnz AT 01.08.2016 B11, chapter V notification 36)

The latest software version of the Model 42i measuring system for NO, NO $_2$ and NO $_x$ manufactured by Thermo Fisher Scientific is:

V 03.00.02

In addition to this revision number, the following interim version is also valid: V 03.00.01

Statement by TÜV Rheinland Energy GmbH dated 25 February 2021

Publication in the German Federal Gazette: BAnz AT 28.07.2022 B4, Chap. III notification 45, Announcement by UBA dated 28 June 2022:

45 Notification as regards Federal Environment Agency (UBA) notices of 21 February 2006 (BAnz. p. 2653, chapter IV number 4.1) and of 29 June 2021 (BAnz AT 05.08.2021 B5, chapter IV notification 8)

The following hardware changes have been introduced for the Model 42i measuring device for NO, NO₂ and NO_x from Thermo Fisher Scientific:

- The measuring device can now also be equipped with the Arcturus CPU (53281) processor board.
- The measuring device can now also be equipped with a SUNON housing fan (part No. PMD2408PMB-A).
- The pump head of the measuring device can also be equipped with a new intermediate plate made of coated PTFE and a valve plate with a stainless steel flap valve.

Statement issued by TÜV Rheinland Energy GmbH dated 18 May 2022





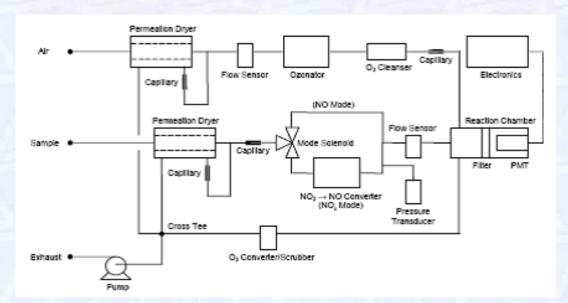
Certified product

This certificate 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.

$$NO + O_3 \rightarrow NO_2 + O_2 + h \upsilon$$

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 per-formed using UV radiation. A proportion of NO equivalent to the ozone concentration is oxi-dised to produce NO_2 ; 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_1 , NO_2 and NO_3 concentrations.



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





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: **qal1.de**.





History of documents

Certification of Modell 42i is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

Basic test

Test report: 936/21203248/C1 dated 5 January 2006 TÜV Immissionsschutz und Energiesysteme GmbH

Publication: BAnz. 08 April 2006, No. 70, p. 2653, chapter IV number 4.1

UBA announcement dated 21 February 2006

Notifications

Statement 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 manufacturer name)

Statement by TÜV 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 changes)

Statement issued by TÜV Immissionsschutz und Energiesysteme GmbH dated 1 April 2009 Publication: BAnz. 25 August 2009, No. 125, p. 2929, chapter III notification 16 UBA announcement dated 3 August 2009 (Software changes)

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 (Soft- and hardware 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 (Hardware changes)

Initial certification according to EN 15267

Certificate No. 0000040217_00: 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: 936/21203248/C1 dated 5 January 2006 and 936/21221382/B dated 21

September 2013

Publication: BAnz AT 01.04.2014 B12, chapter VI notification 22

UBA announcement dated 27 February 2014

Notifications

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 changes)

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 changes)

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 changes)

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 changes)

Renewal of certificates

Certificate No. 0000040217_01: 1 April 2019 Expiry date of the certificate: 30 June 2020

Renewal of certificates

Certificate No. 0000040217_02: 1 July 2020 Expiry date of the certificate: 30 June 2025

Notifications

Statement issued by TÜV Rheinland Energy GmbH dated 25 February 2021 Publication: BAnz AT 05.08.2021 B5, chapter IV notification 8 UBA announcement dated 29 June 2021 (Software changeSoftwareänderung)

Statement issued by TÜV Rheinland Energy GmbH dated 18 May 2022 Publication: BAnz AT 28.07.2022 B4, chapter III notification 45 UBA announcement dated 28 June 2022 (Hardware changes)

Renewal of certificates

Certificate No. 0000040217_03: 27 June 2025 Expiry date of the certificate: 30 June 2030

Renewal of certificates

Certificate No. 0000040217_04: 27 June 2025 Expiry date of the certificate: 30 June 2030 (Certificate correction, status of guidelines updated)





Expanded uncertainty laboratory, system 1

	lom/lomu	,																		lom/lomn	lom/lomn	%	%
Device 1	104.6	Square of partial uncertainty	2600.0	0.0028	0.0584	15.8064	0.8075	1.2781	0.0264	0.1258	0031:0		0 4460	0.1438		2.6195	00000	4.3765	1.0941	5.1345	10.2691	9.82	15
Serial-No.:	1h-limit value:	Partial uncertainty	0.10	0.05	-0.24	3.98	-0.90	1.13	0.16	0.35	0.00		00.00	0.30		-1.62	0.00	2.09	1.05	n°	Π	W	Wreg
		Partial	Ur,z	U _{r, h}	U,Ih	Ugp	ugt	Ust	Λ'n	=	4H20	U _{int, pos}		5	Uint, neg	Uav	UAsc	UEC	Под	certainty	certainty	certainty	certainty
		Result	0.330	0.860	-0.400	1.580	-0.310	0.390	0.040	0.830	-1.340	-0.100	-2.330	-0.040	-1.000	-2.680	0.000	00.86	2.000	andard un	Expanded uncertainty	panded un	panded un
		Performance criterion	1.0 nmol/mol	3.0 nmol/mol	4.0% of measured value	8.0 nmol/mol/kPa	3.0 nmol/mol/K	3.0 nmol/mol/K	0.30 nmol/mol/V	10 nmol/mol (Zero)	10 nmol/mol (Span)	5.0 nmol/mol (Zero)	5.0 nmol/mol (Span)	5.0 nmol/mol (Zero)	5.0 nmol/mol (Span)	7.0% of measured value	1.0%	86	3.0%	Combined standard uncertainty	Exi	Relative expanded uncertainty	Maximum allowed expanded uncertainty
		P	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	VI	ΛΙ	VI				
Thermo Fisher Scientific	Modell 42i	Performance characteristic	Repeatability standard deviation at zero	Repeatability standard deviation at 1h-limit value	"lack of fit" at 1h-limit value	Sensitivity coefficient of sample gas pressure at 1h-limit value	Sensitivity coefficient of sample gas temperature at 1h-limit value	Sensitivity coefficient of surrounding temperature at 1h-limit value	Sensitivity coefficient of electrical voltage at 1h-limit value	Interferent H.0 with 21 mmol/mol	Inches of the second of the se	Interferent CO with 500 Immal	medicine Co2 with 500 principal		III LUB IIII LUB IIIII LUU IIII III III LUU IIII III III	Averaging effect	Difference sample/calibration port	Converter efficiency	Uncertainty of test gas				
Measuring device:	Measured component:	No.	1	2	3	4	5	9	7	č	3	8	8	00	36	6	18	21	23				





Expanded uncertainty laboratory, system 2

	lom/lomn	nty									1									lom/lomn	lom/lomn	%	%
Device 2	104.6	Square of partial uncertainty	0.0056	0.0005	0.0912	13.4966	0.7563	1.1503	0.0264	0.1773			0.0206	0.0703		0.4413	0.0000	4.3765	1.0941	4.6575	9.3151	8.91	15
Serial-No.:	1h-limit value:	Partial uncertainty	0.07	0.02	0:30	3.67	-0.87	1.07	0.16	0.42	24.0		76.0	0.27		99.0-	00.00	2.09	1.05	°n	n	M	W
		Partial	U _{r,z}	Ur.Ih	UI,Ih	d [®] n	Ugt	Ust	Λn	-	uH20	Uint, pos		5	U _{int,neg}	U _{av}	UASO	UEC	nœ	incertainty	incertainty	Relative expanded uncertainty	incertainty
		Result	0.250	0.360	0.500	1.460	-0.300	0.370	0.040	0.000	0.000	-0.100	-1.660	0.070	-1.000	-1.100	0.000	98.00	2.000	standard u	Expanded uncertainty	x panded u	xpanded 1
		Performance criterion	1.0 nmol/mol	3.0 nmol/mol	4.0% of measured value	8.0 nmol/mol/kPa	3.0 nmol/mol/K	3.0 nmol/mol/K	0.30 nmol/mol/V	10 nmol/mol (Zero)	10 nmol/mol (Span)	5.0 nmol/mol (Zero)	5.0 nmol/mol (Span)	5.0 nmol/mol (Zero)	5.0 nmol/mol (Span)	7.0% of measured value	1.0%	86	3.0%	Combined standard uncertainty	Ш	Relative e	Maximum allowed expanded uncertainty
		-	VI	VI	VI	VI	⊳ en	> an	VI	VI	VI	VI	VI	VI	VI	VI	VI	ΛΙ	VI				
Thermo Fisher Scientific	: Modell 42i	Performance characteristic	Repeatability standard deviation at zero	Repeatability standard deviation at 1h-limit value	"lack of fit" at 1h-limit value	Sensitivity coefficient of sample gas pressure at 1h-limit value	Sensitivity coefficient of sample gas temperature at 1h-limit value	Sensitivity coefficient of surrounding temperature at 1h-limit value	Sensitivity coefficient of electrical voltage at 1h-limit value	Interferent H.O with 21 mmol/mol	THE PROPERTY OF THE PROPERTY O	Interferent CO with 500 umol/mol	interferent CO2 with 500 principles		Interferent NH ₃ mit 200 nmol/mol	Averaging effect	Difference sample/calibration port	Converter efficiency	Uncertainty of test gas				
Measuring device:	Measured component:	No.	1	2	3	4	5	9	7	co	3	48	8		SS	6	18	21	23				





Combined uncertainty, laboratory and field, system 1

				Serial-No.:	Dewce 1	
Modell 42i				1h-limit value:	104.6	nmol/mol
Performance characteristic	Performance criterion	Result		Partial uncertainty	Square of partial uncertainty	Ł
Repeatability standard deviation at zero	≤ 1.0 nmol/mol	0.330	z'h (0.10	0.0097	
Repeatability standard deviation at 1h-limit value	≥ 3.0 nmol/mol	0.860	ď.h	not considered, as √2*ur,lh = 0.07 < ur,f		
"lack of fit" at 1h-limit value	≤ 4.0% of measured value	o.400	n'h	-0.24	0.0584	
Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 8.0 nmol/mol/kPa	1.580	din (3.98	15.8064	
Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 3.0 nmol/mol/K	-0.310) Ugt	06:0-	0.8075	
Sensitivity coefficient of surrounding temperature at 1h-limit value	≥ 3.0 nmol/mol/K	0.390	U _{St}	1.13	1.2781	
Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.040	· nγ	0.16	0.0264	
Interferent H-0 with 21 mmol/mol	10 nmol/mol (Zero)	0.830		0.35	0.1258	
Interior of the 120 with 2.1 Illino/ Illo	10 nmol/mol (Span)	-1.340	0 (450	00	0.1230	
om/pan 600 twith 500 load and	≤ 5.0 nmol/mol (Zero)	-0.100	Uint,pos			
interested to Co2 with 500 printing	5.0 nmol/mol (Span)	-2.330		0 00	0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
low/lower OOC first LIM procedured	5.0 nmol/mol (Zero)	-0.040		0.30	0.1450	
Interieren na ₃ mit 200 mito/mol	≤ 5.0 nmol/mol (Span)	-1.000	Uint,neg			
Averaging effect	≥ 7.0% of measured value	Je -2.680) U _{av}	-1.62	2.6195	
Reproducibility standard deviation under field conditions	5.0% of average over 3 months	onths 3.850) U _{f,f}	4.03	16.2175	
Long term drift at zero level	≤ 5.0 nmol/mol	-0.640	J Ud.I.z	-0.37	0.1365	
Long term drift at span level	5.0% of max. of certification range	n range 5.000	H,I,h	3.02	9.1176	
Difference sample/calibration port	≥ 1.0%	000.00	U _{Asc}	00:00	0.0000	
Converter efficiency	86 <	000.86	0 UEC	2.09	4.3765	
Uncertainty of test gas	≥ 3.0%	2.000	n _{cg}	1.05	1.0941	
	33	Combined standard uncertainty	uncertaint	y ue	7.1993	lom/lomn
		Expanded	Expanded uncertainty	y U	14.3986	nmol/mol
	Я	Relative expanded uncertainty	l uncertaint	y W	13.77	%
	Maximum a	Maximum allowed expanded uncertainty	uncertaint	W _{req} V	15	%





Combined uncertainty, laboratory and field, system 2

No. Performance characteristic Performance criterion Result Parifal Investraliny Square of parital Uncertainty 1	Measuring device:	Thermo Fisher Scientific				Serial-No.:	Device 2	
Repeatability standard deviation at the limit value	Measured componen					1h-limit value:	104.6	lom/lomu
Repeatability standard deviation at th-limit value \$ 3.0 mmol/mol/Mol 0.360 \$ \(\triangle \triang	No.	Performance characteristic	Performance criterion	Result	Pa	rtial uncertainty	Square of partial uncertainty	1
Sensitivity coefficient of sample gas temperature at th-limit value \$ 10 mod/mol/KPa \$ 1460 u_{u_{th}} \$ 100 < u_{th}	1		8	0.250	U _{r,z}	0.07	0.0056	
Sensitivity coefficient of sample gas pressure at th-limit value 5 8.0 mmol/mol/kPa 14.60 u _{gp} 3.67 134.966	5	Repeatability standard deviation at 1h-limit value		0.360	Ur,Ih	not considered, as \2*ur,lh = 0.03 < ur,f		
Sensitivity coefficient of sample gas pressure at 1h-limit value \$ 8.0 mol/mol/kPa 1450 u _{yr} 0.87 0.7653 Sensitivity coefficient of sample gas temperature at 1h-limit value \$ 3.0 mol/mol/kPa 0.300 u _{yr} 0.070 u _{yr} 0.075 Sensitivity coefficient of semperature at 1h-limit value \$ 3.0 mol/mol/mol/Span 0.070 u _{yr} 0.075 0.0554 Sensitivity coefficient of electrical voltage at 1h-limit value \$ 0.30 mol/mol/Span 0.070 u _{yr} 0.042 0.042 0.0554 Interferent H ₂ 0 with 21 mol/mol \$ 0.30 mol/mol/Span 0.070 u _{yr} 0.042 0.075 Interferent CO ₂ with 500 mol/mol \$ 0.00 mol/mol/Span 0.070 u _{yr} 0.0564 0.0705 Interferent CO ₂ with 500 mol/mol \$ 0.00 mol/mol/Span 0.070 u _{yr} 0.056 0.0705 Interferent CO ₂ with 500 mol/mol \$ 0.00 0.070 0.070 0.0705 0.0705 Interferent CO ₂ with 500 mol/mol \$ 0.00 mol/mol (Zero) 0.070 0.070 0.0705 0.07	8	"lack of fit" at 1h-limit value		0.500	U,Ih	0:30	0.0912	
Sensitivity coefficient of sample gas temperature at th-limit value \$ 3.0 nmol/mol/K 0.370 \(\underline{\unerline{\underline{\underline{\underline{\underline{\underline{\un	4	Sensitivity coefficient of sample gas pressure at 1h-limit value		1.460	пар	3.67	13.4966	
Sensitivity coefficient of surrounding temperature at 1h-limit value ≤ 3.0 nmol/mol/V 0.040 u _V 0.16 0.0564	5	Sensitivity coefficient of sample gas temperature at 1h-limit value		-0.300	Ugt	-0.87	0.7563	
Sensitivity coefficient of electrical voltage at 1h-limit value s 10 nmol/mol (Zero) 0.040 up 0.16 0.0264 Interferent H20 with 21 mmol/mol s 10 nmol/mol (Span) -1.000 uhzo 0.42 0.1773 Interferent H20 with 21 mmol/mol s 5.0 nmol/mol (Span) -1.000 uhzos 0.27 0.1773 Interferent M20 mmol/mol s 5.0 nmol/mol (Span) -1.000 uhzos -0.66 0.4413 Averaging effect s 5.0 nmol/mol (Span) -1.000 uhzos -0.66 0.4413 Reproducibility standard deviation under field conditions s 5.0 mmol/mol (Span) -1.100 uhzos -0.66 0.4132 Long term drift at zero level s 5.0% of measured value 5.0% of max. of certification range 5.00 u.g.n 0.06 0.4332 Long term drift at span level s 5.0% of max. of certification range 5.00 u.g.n 0.00 0.00 0.00 Converter efficiency s 5.0% of max. of certification range s 2.09 0.00	9	Sensitivity coefficient of surrounding temperature at 1h-limit value		0.370	Ust	1.07	1.1503	ì
Interferent H ₂ 0 with 21 mmol/mol 2	7	Sensitivity coefficient of electrical voltage at 1h-limit value	1	0.040	Λn	0.16	0.0264	
Interferent CO ₂ with 500 µmol/mol \$ 5.0 mmol/mol (Span) -1,000 ont.pos -1,000	co co	Interferent Hof with 21 mmol/mol		0.870	Himo	0.42	0.1773	
Interferent CO2 with 500 µmol/mol S				-1.000	MH20	21.0		
Interferent NHs mit 200 mmol/mol Span 1.660 Or	98	Interferent CO. with 500 mod/mod		-0.100	Uint, pos			
Interferent NH ₃ mit 200 mmol/mol S 5.0 mmol/mol (Span) 0.070 0 mt.neg 0.070 0 mt.neg 0.0413		medicine Co2 with coa binoming		-1.660	10	0.27	0.0706	
Averaging effect ≤ 5.0 mmol/mol (Span) -1.000 u _{m,r} v _w -0.66 0.4413 Reproducibility standard dewiation under field conditions ≤ 7.0% of measured value -1.100 u _w -0.66 0.4413 Reproducibility standard dewiation under field conditions ≤ 5.0% of average over 3 months 3.850 u _{v,f} 4.03 16.2175 Long term drift at zero level ≤ 5.0 mmol/mol 1.140 u _{d,t} 0.66 0.4332 Long term drift at span level ≤ 5.0% of max. of certification range 5.00 u _{d,t} 3.02 9.1176 Difference sample/calibration port ≤ 1.0% 0.00 u _{d,c} 0.00 0.00 0.00 0.0	o	Interferent NHs mit 200 nmol/mol		0.070	5	0.21		
Reproducibility standard deviation under field conditions ≤ 7.0% of measured value -1.100 u _w -0.66 0.4413 Reproducibility standard deviation under field conditions ≤ 5.0% of average over 3 months 3.850 u _{v,f} 4.03 16.2175 Long term drift at zero level ≤ 5.0 mmol/mol 1.140 u _{d,1} 0.66 0.4332 Long term drift at zero level ≤ 5.0 mmol/mol 1.140 u _{d,1} 3.02 9.1176 Difference sample/calibration port ≤ 1.0% 0.00 u _{d,2} 0.00 0.00 0.000 Converter efficiency ≥ 98 98.000 u _c 2.09 4.3765 Uncertainty of test gas ≤ 3.0% zoon 0.00 0.00 0.00 0.00 Annual mallowed expanded uncertainty U 1.05 1.05 1.0541 1.0541 Maximum allowed expanded uncertainty W 13.7782 13.7782 13.7782	30	Interior In 13 IIII 200 IIIII0IIII0		-1.000	Uint,neg			
Reproducibility standard deviation under field conditions ≤ 5.0% of average over 3 months 3.850 u _{i,f} 4.03 16.2175 Long term drift at zero level ≤ 5.0% of max. of certification range 5.00 u _{d,1} 3.02 0.4332 Long term drift at zero level ≤ 5.0% of max. of certification range 5.00 u _{d,1} 3.02 9.1176 Difference sample/calibration port ≤ 7.0% of max. of certification range 5.00 u _{d,0} 0.00 0.00 0.000 Converter efficiency ≥ 98 98.000 u _c 2.09 4.3765 Uncertainty of test gas ≤ 3.0% 2.000 u _c 1.05 1.0941 Combined standard uncertainty U 1.37782 Relative expanded uncertainty W 13.17 Maximum allowed expanded uncertainty W _{req} 15	6	Averaging effect		-1.100	Uav	99.0-	0.4413	
Long term drift at zero level ≤ 5.0% of max. of certification range 6.000 ud.1m 3.02 0.4332 Long term drift at span level ≤ 6.0% of max. of certification range 6.000 ud.1m 3.02 9.176 Difference sample/calibration port ≤ 1.0% 1.0% v. 0.00 0.00 0.000 Converter efficiency ≥ 98 98.000 u.c 2.09 4.3765 Uncertainty of test gas ≤ 3.0% 2.00 u.c 1.05 1.0941 Combined standard Incertainty U 1.37782 Relative expanded uncertainty W 13.17 Maximum allowed expanded uncertainty W _{req} 15	10			3.850	Ur,f	4.03	16.2175	
Long term drift at span level ≤ 5.0% of max. of certification range 6.000 u _{u,u} h 3.02 9.1176 Difference sample/calibration port ≤ 1.0% 1.0% 0.00 u _{u,o} 0.00 0.00 0.000 Converter efficiency ≥ 98 98.000 u _c 2.09 4.3765 Uncertainty of test gas ≤ 3.0% 2.000 u _c 1.05 1.0941 Combined standard Incertainty U 6.8891 Relative expanded uncertainty W 13.7782 Maximum allowed expanded uncertainty W _{req} 15	11	Long term drift at zero level		1.140	U _{d,l,z}	99'0	0.4332	
Difference sample/calibration port ≤ 1.0% 0.000 u _{sso} 0.00 0.000 <	12	Long term drift at span level			Ud.I.h	3.02	9.1176	
Converter efficiency ≥ 98 98.000 u _c 2.09 4.3765 Uncertainty of test gas ≤ 3.0% 0.00 u _c 1.05 1.0941 Combined standard uncertainty u _c 6.8891 Expanded uncertainty U 13.7782 Maximum allowed expanded uncertainty W 13.1782 Maximum allowed expanded uncertainty W 13.17	18	Difference sample/calibration port	Į:	0.000	UASC	0.00	0.0000	
Uncertainty of test gas ≤ 3.0% 1.05 1.05 1.0941	21	Converter efficiency		98.000	UEC	2.09	4.3765	
U _o 6.8891 U 13.7782 W 13.17 Wreq 15	23	Uncertainty of test gas		2.000	nog	1.05	1.0941	
U 13.7782 W 13.17 Wreg 15			Combined	standard un	ncertainty	°n	6.8891	lom/lomu
W 13.17 W _{Req} 15				xpanded ur	certainty	n		nmol/mol
Wreq 15			Relative	expanded ur	certainty	W		%
			Maximum allowed	expanded un	certainty	Wreq	15	%