

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000038502_01

Certified AMS: 200E / T200 for NO, NO₂ and NO_x

Manufacturer: Teledyne Advanced Pollution Instrumentation
9480 Carroll Park Drive
San Diego
CA 92121-5201
USA

Test Institute: TÜV Rheinland Energie und Umwelt GmbH

**This is to certify that the AMS has been tested
and found to comply with:**

**VDI 4202-1: 2002, VDI 4203-2: 2004, EN 14211: 2012,
EN 15267-1: 2009, EN 15267-2: 2009**

Certification is awarded in respect of the conditions stated in this certificate
(see also the following pages).

The present certificate replaces Certificate No. 0000038502 of 22 March 2013



Publication in the German Federal Gazette
(BAnz.) of 06 November 2007

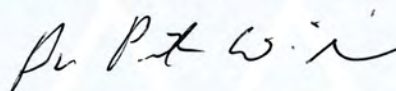
German Federal Environment Agency
Dessau, 20 August 2013



i. A. Dr. Marcel Langner

This certificate will expire on:
04 March 2018

TÜV Rheinland Energie und Umwelt GmbH
Cologne, 19 August 2013



ppa. Dr. Peter Wilbring

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TÜV Rheinland Energie und Umwelt GmbH
Am Grauen Stein
51105 Cologne

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

Certificate:
0000038502_01 / 20 August 2013

Test report: 936/21205926/A of 22 June 2007
Addendum 936/21219874/B of 11 October 2012
Addendum 936/21221556/B of 16 March 2013

Initial certification: 05 March 2013

Date of expiry: 04 March 2018

Publication: BAnz AT 23 July 2013 B4, chapter V, notification 16

Approved application

The certified AMS is suitable for continuous ambient air monitoring (stationary operation).

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 the temperature range of +5 °C to +40 °C.

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

Basis of the certification

This certification is based on:

- test report 936/21205926/A of 22 June 2007 of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, addendum 936/21219874/B of 11 October 2012 of TÜV Rheinland Energie und Umwelt GmbH and addendum 936/21221556/B of 16 March 2013 of TÜV Rheinland Energie und Umwelt GmbH
- suitability announced by the German Federal Environment Agency (UBA) as the relevant body
- the on-going surveillance of the product and the manufacturing process
- publication in the German Federal Gazette (BAnz. 06 November 2007, p. 7925, chapter II, No. 2.1)
- publication in the German Federal Gazette (BAnz. 26 January 2011, p. 294, chapter IV, notification 21 and 22)
- publication in the German Federal Gazette (BAnz AT 05 March 2013 B10, chapter V, notification 4)
- publication in the German Federal Gazette (BAnz AT 23 July 2013 B4, chapter V, notification 16)

AMS designation:

M200E for NO, NO₂ and NO_x

Manufacturer:

Teledyne Advanced Pollution Instrumentation, San Diego, USA / EAS GmbH, Brunn, Austria

Field of application:

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

Measuring ranges during the performance test:

NO₂ 0 - 400 µg/m³

0 - 500 µg/m³

NO 0 - 1200 µg/m³

Software version:

Revision G.2

Test report:

TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne

TÜV Rheinland Group, Cologne

Report No.: 936/21205926/A dated 22 June 2007

21 Notification as regards Federal Environmental Agency notices of 23 September 2007 (BAnz. p. 7925, chapter II No. 2.1)

The current software version of the ambient air measuring system M200E for NO, NO₂ and NO_x of the company Teledyne Advanced Pollution Instrumentation is:

K.4 with Library Version 6.3

Opinion stated by TÜV Rheinland Energie und Umwelt GmbH of 29 September 2010

22 Notification as regards Federal Environmental Agency notices of 23 September 2007 (BAnz. p. 7925, chapter II No. 2.1)

The measuring system M200E for NO, NO₂ and NO_x of the company Teledyne Advanced Pollution Instrumentation is manufactured in the old design M200E as well as in the new design Model T200. The new design differs from the old design only by a new display, a new front plate and extended possibilities for communication.

The current name of the new design of the measuring system is:

Model T200

The current software version of the new design of the measuring system is:

1.0.0 bld 54 with Library Version 7.0.0 bld 57

Opinion stated by TÜV Rheinland Energie und Umwelt GmbH of 29 September 2010

4 Notification as regards Federal Environmental Agency notices of 23 September 2007 (BAnz. p. 7925, chapter II No. 2.1) and of 10 January 2011 (BAnz. p. 294, chapter IV, 21th and 22th notification)

The measuring system M200E respectively T200 for NO, NO₂ and NO_x of the company Teledyne Advanced Pollution Instrumentation fulfills the requirements of EN 14211 (issue June 2005). Furthermore the manufacturing and the quality management of the measuring system M200E respectively T200 for NO, NO₂ and NO_x fulfill the requirements of EN 15267.

The test report on the type approval with the report no. 936/21205926/A as well as an addendum to the test report with the report no. 936/21219874/B are available on the internet at www.qal1.de.

The current software version of the measuring system M200E is:

K.7 with Library Version 6.4

The current software version of the measuring system T200 is:

1.0.4 with Library Version 7.0.3

Opinion stated by TÜV Rheinland Energie und Umwelt GmbH of 11 October 2012

16 Notification on announcements of the Federal Environmental Agency of 23 September 2007 (BAnz. p. 7925, chapter II, no. 2.1) and of 12 February 2013 (BAnz. AT of 5 March 2013 B10, chapter V, 4th notification)

The M200E / T200 measuring system for NO, NO₂ and NO_x manufactured by Teledyne Advanced Pollution Instrumentation fulfills the requirements of Standard EN 14211 (November 2012). An addendum as integral part of the test report no. 936/21221556/B is available online at www.qal1.de.

Instead of the valve used so far as NO/NO_x valve and auto-zero valve (VA0000007), the measuring system may alternatively use the new valve (VA0000059).

The measuring system is fitted with an additional mixing nozzle in order to further extend its life cycle.

The new designation of the M200E measuring system for NO, NO₂ und NO_x is 200E.

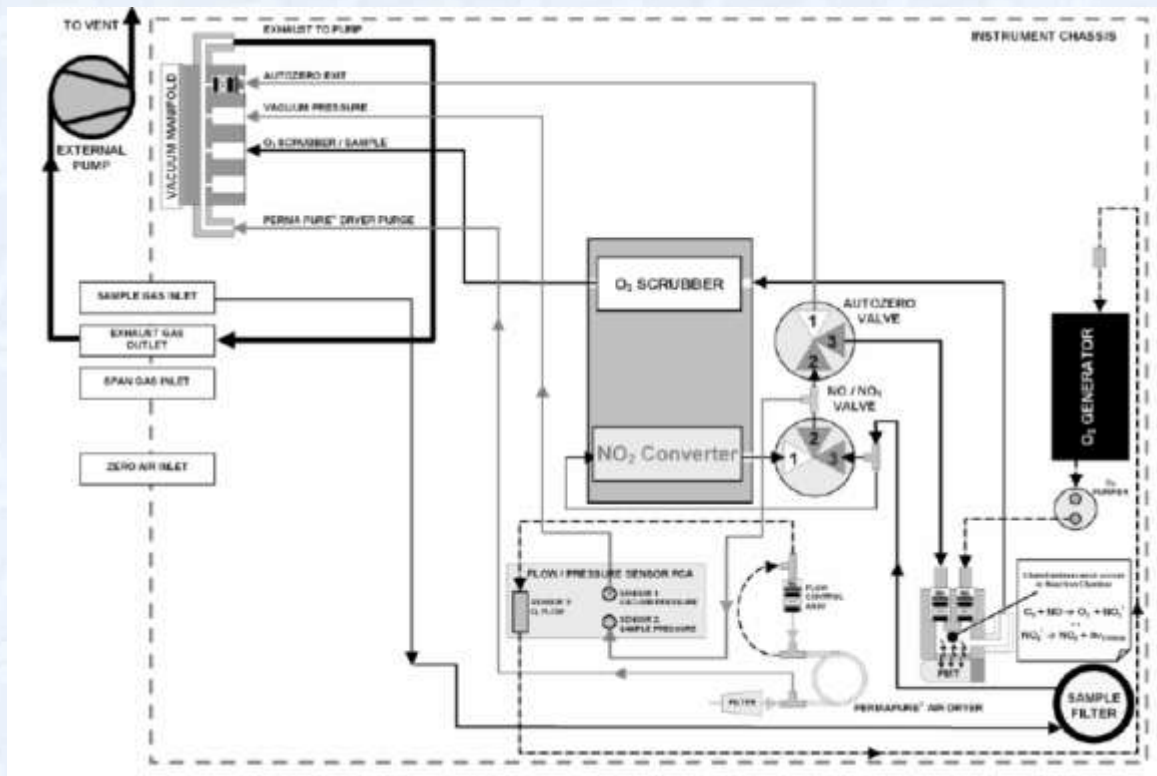
Statement of TÜV Rheinland Energie und Umwelt GmbH of 16 March 2013.

Certified product

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

The measuring principle of the measuring system 200E respectively T200 is based on the determination of the chemiluminescence caused by reaction of nitrogen monoxide (NO) with ozone (O₃) thus complies with the reference method described in the standard EN 14211.

The schematic set-up / flow diagram of the measuring system 200E respectively T200 (with optional zero/span gas port) is as follows:



General notes

This certificate is based upon the equipment tested. The manufacturer is responsible for ensuring that on-going production complies with the requirements of the EN 15267. The manufacturer is required to maintain an approved quality management system controlling the manufacture of the certified product. Both the product and the quality management systems shall be subject to regular surveillance.

If a product of the current production does not conform to the certified product, TÜV Rheinland Energie und Umwelt GmbH must be notified at the address given on page 1.

A certification mark with an ID-Number that is specific to the certified product is presented on page 1 of this certificate. This can be applied to the product or used in publicity material for the certified product is presented on page 1 of this certificate.

This document as well as the certification mark remains property of TÜV Rheinland Energie und Umwelt GmbH. With revocation of the publication the certificate loses its validity. After the expiration of the certificate and on requests of the TÜV Rheinland Energie und Umwelt GmbH this document shall be returned and the certificate mark must not be employed anymore.

The relevant version of this certificate and the validity is also accessible on the internet: qal1.de.

Certification of 200E / T200 for NO, NO₂ and NO_x is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

Basic test:

Test report: 936/21205926/A dated 22 June 2007
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne

Publication: BAnz. 6 November 2007, No. 206, p. 7925, chapter II, No. 2.1
Announcement by UBA from 23 September 2007

Notification:

Publication: BAnz. 26 January 2011, No. 14, p. 294, chapter IV, notification 21 and notification 22
Announcement by UBA from 10 January 2011 (*software change + design*)

Publication: BAnz AT 05 March 2013 B10, chapter V, notification 4
Announcement by UBA from 12 February 2013 (*standard change*)

Initial certification according to EN 15267:

Certificate No. 0000038502: 22 March 2013

Expiration date of the certificate: 04 March 2018

Test report: 936/21205926/A dated 22 June 2007
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne

Addendum: 936/21219874/B dated 11 October 2012
TÜV Rheinland Energie und Umwelt GmbH, Cologne

Statement of TÜV Rheinland Energie und Umwelt GmbH from 11 October 2012

Publication: BAnz AT 05 March 2013 B10, chapter V, notification 4
Announcement by UBA from 12 February 2013

Supplementary testing according to EN 15267:

Certificate No. 0000038502_01: 20 August 2013

Expiration date of the certificate: 04 March 2018

Test report: 936/21205926/A of 22 June 2007
TÜV Rheinland Energie und Umwelt GmbH, Cologne

Addendum: 936/21219874/B of 11 October 2012 of TÜV Rheinland Energie und Umwelt GmbH
Addendum: 936/21221556/B of 16 March 2013 of TÜV Rheinland Energie und Umwelt GmbH

Publication: BAnz AT 23 July 2013 B4, chapter V, notification 16
Announcement by UBA from 03 July 2013

Calculation of overall uncertainty (device 1)

Measuring device:		Teledyne API M200E/T200		Serial-No.:		SN 1 (1253)	
Measured component:		NO2		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	0.940	$u_{r,z}$	0.22	0.0466	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	1.050	$u_{r,th}$	0.05	0.0023	
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	-0.600	$u_{l,th}$	-0.36	0.1313	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 8.0 nmol/mol/kPa	0.140	u_{gp}	1.29	1.6656	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 3.0 nmol/mol/K	0.040	u_{gt}	0.10	0.0106	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 3.0 nmol/mol/K	0.520	u_{st}	1.35	1.8113	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.010	u_v	0.04	0.0013	
8a	Interferent H ₂ O with 21 mmol/mol	≤ 10 nmol/mol (Zero)	3.300	u_{H_2O}	1.43	2.0510	
		≤ 10 nmol/mol (Span)	-3.300				
8b	Interferent CO ₂ with 500 µmol/mol	≤ 5.0 nmol/mol (Zero)	0.300	$u_{int,pos}$ or	0.63	0.3915	
		≤ 5.0 nmol/mol (Span)	0.700				
		≤ 5.0 nmol/mol (Zero)	0.700				
8c	Interferent NH ₃ mit 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.700	$u_{int,neg}$			
		≤ 5.0 nmol/mol (Span)	0.700				
9	Averaging effect	≤ 7.0% of measured value	0.800	u_{av}	0.48	0.2334	
18	Difference sample/calibration port	≤ 1%	0.000	u_{15C}	0.00	0.0000	
21	Converter efficiency	≥ 98	98.00	u_{EC}	2.09	4.3765	
23	Uncertainty of test gas	≤ 3%	2.000	u_{CG}	1.05	1.0941	
Combined standard uncertainty				u_c		3.4445	nmol/mol
Expanded uncertainty				U		6.8890	nmol/mol
Relative expanded uncertainty				W		6.59	%
Maximum allowed expanded uncertainty				W_{req}		15	%

Measuring device:		Teledyne API M200E/T200		Serial-No.:		SN 2 (1257)	
Measured component:		NO2		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	0.830	$u_{r,z}$	0.19	0.0379	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	1.230	$u_{r,th}$	0.06	0.0032	
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	-0.200	$u_{l,th}$	-0.12	0.0146	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 8.0 nmol/mol/kPa	0.060	u_{gp}	0.55	0.3003	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 3.0 nmol/mol/K	0.030	u_{gt}	0.08	0.0060	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 3.0 nmol/mol/K	0.180	u_{st}	0.47	0.2170	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.030	u_v	0.11	0.0114	
8a	Interferent H ₂ O with 21 mmol/mol	≤ 10 nmol/mol (Zero)	0.000	u_{H_2O}	0.19	0.0359	
		≤ 10 nmol/mol (Span)	0.000				
8b	Interferent CO ₂ with 500 µmol/mol	≤ 5.0 nmol/mol (Zero)	0.700	$u_{int,pos}$ or	0.68	0.4650	
		≤ 5.0 nmol/mol (Span)	1.300				
		≤ 5.0 nmol/mol (Zero)	0.000				
8c	Interferent NH ₃ mit 200 nmol/mol	≤ 5.0 nmol/mol (Zero)	0.000	$u_{int,neg}$			
		≤ 5.0 nmol/mol (Span)	1.700				
9	Averaging effect	≤ 7.0% of measured value	1.000	u_{av}	0.60	0.3647	
18	Difference sample/calibration port	≤ 1%	0.000	u_{15C}	0.00	0.0000	
21	Converter efficiency	≥ 98	98.20	u_{EC}	1.88	3.5449	
23	Uncertainty of test gas	≤ 3%	2.000	u_{CG}	1.05	1.0941	
Combined standard uncertainty				u_c		2.4771	nmol/mol
Expanded uncertainty				U		4.9543	nmol/mol
Relative expanded uncertainty				W		4.74	%
Maximum allowed expanded uncertainty				W_{req}		15	%

Calculation of overall uncertainty (device 2)

Measuring device:		Teledyne API M200E/T200		Serial-No.:		SN 1 (1253)	
Measured component:		NO2		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	0.940	$u_{r,z}$	0.22	0.0466	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	1.050	$u_{r,1h}$	not considered, as $\sqrt{2} \cdot u_{r,1h} = 0.06 < u_{r,f}$		-
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	-0.600	$u_{l,1h}$	-0.36	0.1313	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 8.0 nmol/mol/kPa	0.140	u_{sp}	1.29	1.6656	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 3.0 nmol/mol/K	0.040	u_{gt}	0.10	0.0106	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 3.0 nmol/mol/K	0.520	u_{st}	1.35	1.8113	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.010	u_v	0.04	0.0013	
8a	Interferent H ₂ O with 21 nmol/mol	≤ 10 nmol/mol (Zero)	3.300	u_{H2O}	1.43	2.0510	
8b		≤ 10 nmol/mol (Span)	-3.300				
8c	Interferent CO ₂ with 500 µmol/mol	≤ 5.0 nmol/mol (Zero)	0.300	$u_{int, pos}$	0.63	0.3915	
		≤ 5.0 nmol/mol (Span)	0.700				
		≤ 5.0 nmol/mol (Zero)	0.700				
9	Interferent NH ₃ mit 200 nmol/mol	≤ 5.0 nmol/mol (Span)	0.700	$u_{int, neg}$	0.48	0.2334	
		≤ 7.0% of measured value	0.800				
9	Averaging effect	≤ 7.0% of measured value	0.800	u_{av}	0.48	0.2334	
10	Reproducibility standard deviation under field conditions	≤ 5.0% of average over 3 months	1.770	$u_{r,f}$	1.85	3.4278	
11	Long term drift at zero level	≤ 5.0 nmol/mol	0.400	$u_{d,l,z}$	0.23	0.0533	
12	Long term drift at span level	≤ 5.0% of max. of certification range	1.030	$u_{d,l,1h}$	0.62	0.3869	
18	Difference sample/calibration port	≤ 1%	0.000	u_{ssc}	0.00	0.0000	
21	Converter efficiency	≥ 98	98.000	u_{EC}	2.09	4.3765	
23	Uncertainty of test gas	≤ 3%	2.000	u_{CG}	1.05	1.0941	
Combined standard uncertainty				u_c		3.9658	nmol/mol
Expanded uncertainty				U		7.9317	nmol/mol
Relative expanded uncertainty				W		7.58	%
Maximum allowed expanded uncertainty				W_{req}		15	%

Measuring device:		Teledyne API M200E/T200		Serial-No.:		SN 2 (1257)	
Measured component:		NO2		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	0.830	$u_{r,z}$	0.19	0.0379	
2	Repeatability standard deviation at 1h-limit value	≤ 3.0 nmol/mol	1.230	$u_{r,1h}$	not considered, as $\sqrt{2} \cdot u_{r,1h} = 0.08 < u_{r,f}$		-
3	"lack of fit" at 1h-limit value	≤ 4.0% of measured value	-0.200	$u_{l,1h}$	-0.12	0.0146	
4	Sensitivity coefficient of sample gas pressure at 1h-limit value	≤ 8.0 nmol/mol/kPa	0.060	u_{sp}	0.55	0.3003	
5	Sensitivity coefficient of sample gas temperature at 1h-limit value	≤ 3.0 nmol/mol/K	0.030	u_{gt}	0.08	0.0060	
6	Sensitivity coefficient of surrounding temperature at 1h-limit value	≤ 3.0 nmol/mol/K	0.180	u_{st}	0.47	0.2170	
7	Sensitivity coefficient of electrical voltage at 1h-limit value	≤ 0.30 nmol/mol/V	0.030	u_v	0.11	0.0114	
8a	Interferent H ₂ O with 21 nmol/mol	≤ 10 nmol/mol (Zero)	1.300	u_{H2O}	0.19	0.0359	
8b		≤ 10 nmol/mol (Span)	-3.700				
8c	Interferent CO ₂ with 500 µmol/mol	≤ 5.0 nmol/mol (Zero)	0.700	$u_{int, pos}$	0.68	0.4650	
		≤ 5.0 nmol/mol (Span)	1.300				
		≤ 5.0 nmol/mol (Zero)	0.000				
9	Interferent NH ₃ mit 200 nmol/mol	≤ 5.0 nmol/mol (Span)	1.700	$u_{int, neg}$	0.60	0.3647	
		≤ 7.0% of measured value	1.000				
9	Averaging effect	≤ 7.0% of measured value	1.000	u_{av}	0.60	0.3647	
10	Reproducibility standard deviation under field conditions	≤ 5.0% of average over 3 months	1.770	$u_{r,f}$	1.85	3.4278	
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	-0.950	$u_{d,l,1h}$	-0.57	0.3291	
18	Difference sample/calibration port	≤ 1%	0.000	u_{ssc}	0.00	0.0000	
21	Converter efficiency	≥ 98	98.200	u_{EC}	1.88	3.5449	
23	Uncertainty of test gas	≤ 3%	2.000	u_{CG}	1.05	1.0941	
Combined standard uncertainty				u_c		3.1815	nmol/mol
Expanded uncertainty				U		6.3630	nmol/mol
Relative expanded uncertainty				W		6.08	%
Maximum allowed expanded uncertainty				W_{req}		15	%