



# CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 00000038503\_02

AMS designation:

300E / T300 for CO

Manufacturer:

Teledyne Advanced Pollution Instrumentation

9480 Carroll Park Drive

San Diego CA 92121-5201

USA

**Test Laboratory:** 

TÜV Rheinland Energy GmbH

This is to certify that the AMS has been tested and certified according to the standards
VDI 4202-1 (2002), VDI 4203-3 (2004), EN 14626 (2012),
EN 15267-1 (2009) and DIN EN 15267-2 (2009).

Certification is awarded in respect of the conditions stated in this certificate (this certificate contains 11 pages).



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

www.tuv.com ID 00000038503

Publication in the German Federal Gazette (BAnz) of 29 October 2005

This certificate will expire on: 04 March 2023

German Federal Environment Agency Dessau, 05 March 2018 TÜV Rheinland Energy GmbH Cologne, 04 March 2018

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Dr. Marcel Langner Head of Section II 4.1

ppa. Dr. Peter Wilbring

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Am Grauen Stein 51105 Köln

Test institute accredited to EN ISO/IEC 17025:2005 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.



#### Certificate:

00000038503\_02 / 05 March 2018



**Test Report:** 936/21207124/B1\_DE dated 22 August 2007

Addendum 936/21219874/C dated 31 October 2012 Addendum 936/21221556/C dated 16 March 2013

Initial certification: 05 March 2013 Expiry date: 04 March 2023

Certificate: Renewal (of previous certificate 00000038503\_01 dated

20 August 2013 valid until 04 March 2018)

Publication: BAnz 29 October 2005, no. 206, p. 15700, chapter IV no.

2.1

#### Approved application

The certified AMS is suitable for continuous ambient air monitoring of CO (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 +5 °C to +40 °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 limit values relevant to the application.

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 936/21207124/B1\_DE dated 22 August 2007 issued by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, addendum 936/21219874/C dated 31 October 2012 issued by TÜV Rheinland Energie und Umwelt GmbH and addendum 936/21221556/C dated 16 March 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



#### Certificate:

00000038503\_02 / 05 March 2018



Publication in the German Federal Gazette: BAnz 29 October 2005, no. 206, p. 15700, chapter IV no. 2.1,

UBA announcement dated 25 July 2005:

#### **AMS** designation:

Model 300E for CO

#### Manufacturer:

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

#### Field of application:

For continuous ambient air monitoring of CO (stationary operation)

#### Measuring ranges during performance testing:

CO: 0-60 mg/m<sup>3</sup>

0-100 mg/m<sup>3</sup>

#### Software:

Version F.3b

#### **Test Laboratory:**

TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne

TÜV Rheinland Group, Cologne

Report no.: 936/21201601/B of 10 July 2005

Publication in the German Federal Gazette: BAnz. 20 April 2007, no. 75, p. 4139, chapter IV notification 7,

UBA announcement dated 12 April 2007:

### 7 Notification as regards Federal Environment Agency notice of 25 July 2005 (BAnz p. 15700)

The model 300E measuring system for carbon monoxide and the model 400E for ozone manufactured by Teledyne Instruments, San Diego, USA, will no longer be distributed by the company named in the announcement, MLU-Monitoring für Leben und Umwelt Ges.m.b.H. in A-2340 Mödling, Austria. In the future, they will be exclusively distributed by EAS Envimet Analytical Systems Ges.m.b.H., Brunn, Austria.

Statement issued by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, 51105 Cologne, Dr. Peter Wilbring, dated 14 October 2006





Publication in the German Federal Gazette: BAnz. 26 January 2011, no. 14, p. 295, chapter IV notification 23,

UBA announcement dated 10 January 2011:

23 Notification as regards Federal Environment Agency notices of 25 July 2005 (BAnz p. 15700, chapter IV no. 2.1) and of 12 April 2007 (BAnz p. 4139, chapter IV, 7<sup>th</sup> notification)

The current software version of the ambient air measuring system Modell 300E (=M300E) for CO manufactured by Teledyne Advanced Pollution Instrumentation is:

L.8 incl. Library Version 6.3

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 29 September 2010

Publication in the German Federal Gazette: BAnz. 26 January 2011, no. 14, p. 295, chapter IV notification 24,

UBA announcement dated 10 January 2011:

24 Notification as regards Federal Environment Agency notices of 25 July 2005 (BAnz p. 15700, chapter IV no. 2.1) and of 12 April 2007 (BAnz p. 4139, chapter IV, 7<sup>th</sup> notification)

The measuring system 300E for CO manufactured by Teledyne Advanced Pollution Instrumentation is manufactured both in its old design M300E and in its new design Model T300. The new design differs from the old design only in that it has a new display, a new front plate and offers extended possibilities for communication.

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

Model T300

The current software version of the new design of the measuring system is: 1.0.0 bld 54 incl. Library Version 7.0.0 bld 57

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 29 September 2010





Publication in the German Federal Gazette: BAnz AT 05.03.2013 B10, chapter V notification 5

UBA announcement dated 12 February 2013:

Notification as regards Federal Environment Agency (UBA) notices of 25 July 2005 (BAnz p. 15700, chapter IV no. 2.1) and of 10 January 2011 (BAnz p. 294, chapter IV, 23<sup>rd</sup> and 24<sup>th</sup> notification)

The M300E and T300 versions of the measuring system for CO manufactured by Teledyne Advanced Pollution Instrumentation meet the requirements of EN 14626 (Issue July 2005). Furthermore the manufacturing process and the quality management for the M300E and T300 versions of the measuring system for CO meet the requirements of EN 15267.

The test report on performance testing, report no. 936/21207124/B1\_DE, and addendum to the test report, no. 936/21219874/C, which is an integral part of the test report, are available on the internet at www.gal1.de.

The current software version of the M300E measuring system is:

M.0 incl. Library Version 6.4

The current software version of the T300 measuring system is:

1.0.4 incl. Library Version 7.0.3

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 11 October 2012

Publication in the German Federal Gazette: BAnz AT 23.07.2013 B4, chapter V notification 17.

UBA announcement dated 03 July 2013:

17 Notification as regards Federal Environment Agency (UBA) notices of 25 July 2005 (BAnz p. 15700, chapter IV no. 2.1) and of 12 February 2013 (BAnz AT 05.03.2013 B10, chapter V 5<sup>th</sup> notification)

The M300E and T300 versions of the measuring system for CO manufactured by Teledyne Advanced Pollution Instrumentation meet the requirements of EN 14626 (Issue December 2012). An addendum as integral part of test report no. 936/21221556/C is available online at <a href="https://www.qal1.de">www.qal1.de</a>.

The new designation of the M300E measuring system for CO is 300E.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 16 March 2013





Publication in the German Federal Gazette: BAnz AT 05.08.2014 B11, chapter V notification

UBA announcement dated 17 July 2014:

Notification as regards Federal Environment Agency (UBA) notices of 25 July 2005 (BAnz p. 15 700, chapter IV no 2.1) and of 3 July 2013 (BAnz AT 23.07.2013 B4, chapter V 17<sup>th</sup> notification)

The 300E and T300 measuring systems for monitoring CO manufactured by Teledyne Advanced Pollution Instrumentation will be equipped with the PU3060-N811 (115/230V) vacuum pump manufactured by KNF in the future.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 27 March 2014

Publication in the German Federal Gazette: BAnz AT 14.03.2016 B7, chapter V notification

UBA announcement dated 18 February 2016:

Notification as regards Federal Environment Agency (UBA) notices of 25 July 2005 (BAnz p. 15700, chapter IV no 2.1) and of 17 July 2014 (BAnz AT 05.08.2014 B11, chapter V 18<sup>th</sup> notification)

The current software versions of the 300E/T300 measuring system for CO manufactured by Teledyne Advanced Pollution Instrumentation are:

Package Version:

1.0.1

Driver Version:

1.0.6

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 19 October

2015

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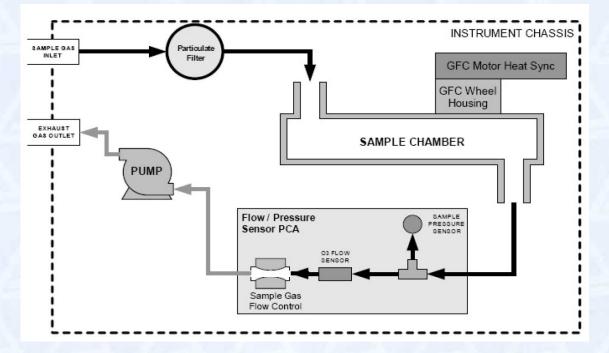


#### **Certified product**

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

To measure CO concentrations, the 300E and T300 versions of the measuring system rely on the determination of IR light absorbed by the gas to be measured in the range of wavelength which is characteristic for that gas. This corresponds to the reference method described in standard EN 14626.

The schematic set-up / flow diagram of the 300E and T300 versions of the measuring system is as follows:



The current software version is: Package version: 1.0.1

Driver Version: 1.0.6

The current manual version is: 6864 Rev. B, 14 February 2012

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#### **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**.

Certification of the 300E / T300 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: 936/21201601/B dated 10 July 2005

TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne Publication: BAnz 29 October 2005, no. 206, p. 15700, chapter IV no. 2.1

UBA announcement dated 25 July 2005

#### **Notifications**

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 7

UBA announcement dated 12 April 2007

(Name changed)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 29 September 2010 Publication: BAnz 26 January 2011, no. 14, p. 294, chapter IV notification 23 and 24, UBA announcement dated 10 January 2011 (Software & design changes)





#### Initial certification according to EN 15267

Certificate no. 0000038503: 22 March 2013 Expiry date of the certificate: 04 March 2018

Test report: 936/21207124/B1\_DE dated 22 August 2007

TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne

Addendum: 936/21219874/C dated 31 October 2012 TÜV Rheinland Energie und Umwelt GmbH, Cologne

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 11 October 2012

Publication: BAnz AT 05.03.2013 B10, chapter V notification 5

UBA announcement dated 12 February 2013

#### Supplementary testing according to EN 15267

Certificate no. 0000038503\_01: 20 August 2013 Expiry date of the certificate: 04 March 2018 Test report: 936/21207124/B1 DE dated 22 August 2007

TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne

Addendum: 936/21219874/C dated 31 October 2012 issued by TÜV Rheinland Energie und

**Umwelt GmbH** 

Addendum: 936/21221556/C dated 16 March 2013 der TÜV Rheinland Energie und Umwelt

GmbH

Publication: BAnz AT 23.07.2013 B4, chapter V notification 17

UBA announcement dated 03 July 2013

#### Notifications in accordance with EN 15267

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 27 March 2014 Publication: BAnz AT 05.08.2014 B11, chapter V notification 18 UBA announcement dated 17 July 2014 (New vacuum pump)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 19 October 2015 Publication: BAnz AT 14.03.2016 B7, chapter V notification 9 UBA announcement dated 18 February 2016 (New software version)

#### Renewal of the certificate

Certificate no. 00000038503\_02: 05 March 2018 Expiry date of the certificate: 04 March 2023





#### Calculation of overall uncertainty (device 1)

Measuring device:	Teledyne API M300E / T300					Serial number:	SN 370	
Measured component:	со					8h-Limit value:	8.62	µmol/mo
No.	Performance characteristic	Per	formance criterion	Result	Partia	I uncertainty	Square of partial uncertainty	
1	Repeatability standard deviation at zero	≤	1.0 µmol/mol	0.100	U <sub>r,z</sub>	0.02	0.0006	
2	Repeatability standard deviation at 8h-limit value	≤	3.0 µmol/mol	0.100	u <sub>r</sub>	0.02	0.0005	
3	"lack of fit" at 8h-limit value	≤	4.0% of meas. value	0.300	uı	0.01	0.0002	
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	≤	0.7 µmol/mol/kPa	0.150	Ugp	0.16	0.0252	
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	≤	0.3 µmol/mol/K	0.010	u <sub>at</sub>	0.02	0.0006	
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	≤	0.3 µmol/mol/K	0.030	Ust	0.07	0.0056	
7	Sensitivity coefficient of electrical voltage at 8h-limit value	≤	0.3 µmol/mol/V	0.000	u <sub>V</sub>	0.00	0.0000	
8a	Interferent H <sub>2</sub> 0 with 21 mmol/mol	≤	1.0 µmol/mol (Zero)	-0.160	U <sub>H2O</sub>	-0.11	0.0114	
		≤	1.0 µmol/mol (Span)	-0.140				
8b	Interferent CO <sub>2</sub> with 500 µmol/mol	≤	0.5 µmol/mol (Zero)	-0.030	U <sub>int,pos</sub>	0.07	0.0043	
		≤	0.5 µmol/mol (Span)	0.100				
8c	Interferent NO with 1 µmol/mol	≤	0.5 µmol/mol (Zero)	0.010				
	inconstant to with a phobinor	≤	0.5 µmol/mol (Span)	0.020		or	or	0.0040
8d	Interferent N <sub>2</sub> O with 50 nmol/mol	≤	0.5 µmol/mol (Zero)	-0.030				
		≤	0.5 µmol/mol (Span)	-0.020	U <sub>int,neg</sub>			_
9	Averaging effect	≤	7.0% of meas. value	0.800	u <sub>av</sub>	0.04	0.0016	
18	Difference sample/calibration port	≤	1%	-0.020	$u_{\scriptscriptstyle\Deltasc}$	0.00	0.0000	1
21	Uncertainty of test gas	≤	3%	2.000	u <sub>cg</sub>	0.09	0.0074	
			Combined standard uncertainty			uc	0.2396	µmol/mo
			Expanded uncertainty Relative expanded uncertainty			U	0.4793	µmol/mo
		L				W	5.56	%
			Maximum allowed e	expanded u	incertainty	W <sub>req</sub>	15	%

Expanded uncertainty U 0.8904 µr	sured component	со					8h-Limit value:	8.62	µmol/mo
1 Repeatability standard deviation at zero ≤ 1.0 μmol/mol 0.100 u <sub>r</sub> 0.002 0.0006  2 Repeatability standard deviation at 8h-limit value ≤ 3.0 μmol/mol 0.100 u <sub>r</sub> not considered, as ur = 0.02 < ur, f  3 "lack of fit" at 8h-limit value ≤ 4.0% of meas. value 0.300 u <sub>t</sub> 0.001 0.0002  4 Sensitivity coefficient of sample gas pressure at 8h-limit value ≤ 0.7 μmol/mol/kPa 0.150 U <sub>gp</sub> 0.16 0.0252  5 Sensitivity coefficient of sample gas temperature at 8h-limit value ≤ 0.3 μmol/mol/k 0.010 U <sub>gr</sub> 0.02 0.0006  6 Sensitivity coefficient of surrounding temperature at 8h-limit value ≤ 0.3 μmol/mol/k 0.010 U <sub>gr</sub> 0.02 0.0006  7 Sensitivity coefficient of electrical voltage at 8h-limit value ≤ 0.3 μmol/mol/k 0.000 U <sub>gr</sub> 0.00 0.0000  8a Interferent H <sub>2</sub> 0 with 21 mmol/mol ≤ 1.0 μmol/mol (Zero) 0.0140 ≤ 1.0 μmol/mol (Span) 0.160  S not jumol/mol (Span) 0.100  8c Interferent No with 1 μmol/mol ≤ 0.5 μmol/mol (Span) 0.000  8d Interferent No with 1 μmol/mol ≤ 0.5 μmol/mol (Span) 0.000  8d Interferent No with 50 nmol/mol ≤ 0.5 μmol/mol (Span) 0.000  9 Averaging effect ≤ 7.0% of meas. value 0.800 U <sub>gr</sub> 0.04 0.0016  10 Reproducibility standard deviation under field conditions ≤ 5.0% of 3 month average 3.470 U <sub>eff</sub> 0.30 0.0895  11 Long term drift at zero level ≤ 0.5 μmol/mol 0.340 U <sub>dut. reg</sub> 0.00 0.0000  21 Uncertainty of test gas ≤ 5.0% of max, of cert, range - 2.320 U <sub>dut. Reg</sub> 0.00 0.0000  Expanded uncertainty U 0.0800 U <sub>gr</sub> 0.04452 µr	No.	Performance characteristic		Performance criterion	Result	Part	ial uncertainty	Square of partial uncertainty	
2 Repeatability standard deviation at 8h-limit value	1	Repeatability standard deviation at zero	≤	1.0 µmol/mol	0.100	U <sub>r,z</sub>	0.02		
4 Sensitivity coefficient of sample gas pressure at 8h-limit value ≤ 0.7 μmol/mol/kPa 0.150 Ugp 0.16 0.0252  5 Sensitivity coefficient of sample gas temperature at 8h-limit value ≤ 0.3 μmol/mol/K 0.010 Ugt 0.02 0.0006  6 Sensitivity coefficient of surrounding temperature at 8h-limit value ≤ 0.3 μmol/mol/K 0.030 Ugt 0.007 0.0056  7 Sensitivity coefficient of electrical voltage at 8h-limit value ≤ 0.3 μmol/mol/K 0.030 Ugt 0.00 0.0000  8a Interferent H₂0 with 21 mmol/mol ≤ 0.5 μmol/mol (Zero) 4.0140 Ugt 0.0114  8b Interferent CO₂ with 500 μmol/mol ≤ 0.5 μmol/mol (Zero) 4.0160 Ugt 0.0114  8c Interferent NO with 1 μmol/mol ≤ 0.5 μmol/mol (Zero) 4.0100 Ugt 0.000 Ugt 0.0014  8c Interferent NO with 1 μmol/mol ≤ 0.5 μmol/mol (Zero) 0.010 Sqam) 0.020 Or 0.07 0.0043  8d Interferent N₂0 with 50 nmol/mol ≤ 0.5 μmol/mol (Zero) 0.010 Squm) 0.020 Ugt 0.000 Ugt 0.000 Or 0.0000 Ugt 0.	2	Repeatability standard deviation at 8h-limit value	≤	3.0 µmol/mol	0.100	u <sub>r</sub>			
5 Sensitivity coefficient of sample gas temperature at 8h-limit value ≤ 0.3 µmol/mol/K 0.010 Ugt 0.02 0.0006 6 Sensitivity coefficient of surrounding temperature at 8h-limit value ≤ 0.3 µmol/mol/K 0.030 Ust 0.007 0.0056 7 Sensitivity coefficient of electrical voltage at 8h-limit value ≤ 0.3 µmol/mol/V 0.000 Uy 0.00 0.0000 8a Interferent H₂0 with 21 mmol/mol ≤ 1.0 µmol/mol (Span) 0.160 UH₂0 -0.11 0.0114  8b Interferent CO₂ with 500 µmol/mol ≤ 0.5 µmol/mol (Span) 0.100 UH₂0 -0.11 0.0114  8c Interferent No with 1 µmol/mol ≤ 0.5 µmol/mol (Span) 0.100 UH₂0 Or 0.07 0.0043  8d Interferent N₂0 with 50 nmol/mol ≤ 0.5 µmol/mol (Span) 0.020 Or 0.0000 Or 0.00	3	"lack of fit" at 8h-limit value	≤	4.0% of meas. value	0.300	uı	0.01	0.0002	
6 Sensitivity coefficient of surrounding temperature at 8h-limit value	4	Sensitivity coefficient of sample gas pressure at 8h-limit value	≤	0.7 µmol/mol/kPa	0.150	U <sub>ap</sub>	0.16	0.0252	
6 Sensitivity coefficient of surrounding temperature at 8h-limit value	5	Sensitivity coefficient of sample gas temperature at 8h-limit value	≤	0.3 µmol/mol/K	0.010	Uat	0.02	0.0006	
8a	6	Sensitivity coefficient of surrounding temperature at 8h-limit value	≤	0.3 µmol/mol/K	0.030		0.07	0.0056	
Second   Interferent H20 with 21 mmol/mol   Second   Se	7	Sensitivity coefficient of electrical voltage at 8h-limit value	≤	0.3 µmol/mol/V	0.000	U <sub>V</sub>	0.00	0.0000	
Second   S			≤	1.0 umol/mol (Zero)	-0.140				
Second   Interferent Now   N	8a	Interferent H <sub>2</sub> U with 21 mmol/mol	≤	1.0 µmol/mol (Span)	-0.160	U <sub>H2O</sub>	-0.11	0.0114	
Sec	Oh	laterferent CO with 500 week/mad	≤	0.5 µmol/mol (Zero)	-0.030	U <sub>int.pos</sub>			
Sc	OD	interierent CO2 with 500 µmoi/moi	≤	0.5 µmol/mol (Span)	0.100				
Section   Sect	8c	Interferent NO with 1 umol/mol					0.07	0.0043	
Section   Sec	00	and order to that I particulate	_			or	0.01	0.0010	
9 Averaging effect ≤ 7.0% of meas: value 0.800 u <sub>av</sub> 0.04 0.0016  10 Reproducibility standard deviation under field conditions ≤ 5.0% of 3 month average 3.470 u <sub>r.f</sub> 0.30 0.0895  11 Long term drift at zero level ≤ 0.5 μmol/mol 0.340 u <sub>d.l.z</sub> 0.20 0.0385  12 Long term drift at 8h-limit value ≤ 5.0% of max. of cert. range 2.320 u <sub>d.l.8h</sub> 0.12 0.0133  18 Difference sample/calibration port ≤ 1% 0.020 u <sub>osc</sub> 0.00 0.0000  21 Uncertainty of test gas ≤ 3% 2.000 u <sub>cg</sub> 0.09 0.0074  Combined standard uncertainty u <sub>c</sub> 0.4452 μμ Expanded uncertainty U 0.8904 μμ	8d	Interferent N <sub>2</sub> O with 50 nmol/mol							
10 Reproducibility standard deviation under field conditions ≤ 5.0% of 3 month average 3.470 u <sub>r,f</sub> 0.30 0.0895  11 Long term drift at zero level ≤ 0.5 μmol/mol 0.340 u <sub>d,t,z</sub> 0.20 0.0385  12 Long term drift at 8h-limit value ≤ 5.0% of max. of cert. range 2.320 u <sub>d,t,8h</sub> -0.12 0.0133  18 Difference sample/calibration port ≤ 1% -0.020 u <sub>ssc</sub> 0.00 0.0000  21 Uncertainty of test gas ≤ 3% 2.000 u <sub>cg</sub> 0.09 0.0074  Combined standard uncertainty u <sub>c</sub> 0.4452 μr  Expanded uncertainty U 0.8904 μr			_					2 22 42	
11 Long term drift at zero level ≤ 0.5 μmol/mol 0.340 u <sub>d,1.2</sub> 0.20 0.0385  12 Long term drift at 8h-limit value ≤ 5.0% of max. of cert. range -2.320 u <sub>d,1.8h</sub> -0.12 0.0133  18 Difference sample/calibration port ≤ 1% -0.020 u <sub>asc</sub> 0.00 0.0000  21 Uncertainty of test gas ≤ 3% 2.000 u <sub>cg</sub> 0.09 0.0074  Combined standard uncertainty u <sub>c</sub> 0.4452 μr  Expanded uncertainty U 0.8904 μr		9 0							
12   Long term drift at 8h-limit value   ≤ 5.0% of max. of cert. range   -2.320   u <sub>d,1,8h</sub>   -0.12   0.0133     18   Difference sample/calibration port   ≤ 1%   -0.020   u <sub>Asc</sub>   0.00   0.0000     21   Uncertainty of test gas   ≤ 3%   2.000   u <sub>cg</sub>   0.09   0.0074     Combined standard uncertainty   U <sub>c</sub>   0.4452   µr     Expanded uncertainty   U   0.8904   µr									
18         Difference sample/calibration port         ≤         1%         -0.020         u <sub>Asc</sub> 0.00         0.0000           21         Uncertainty of test gas         ≤         3%         2.000         u <sub>G</sub> 0.09         0.0074           Combined standard uncertainty         U <sub>G</sub> 0.4452         µr           Expanded uncertainty         U         0.8904         µr		Ü	_						
21         Uncertainty of test gas         ≤         3%         2.000         u <sub>cg</sub> 0.09         0.0074           Combined standard uncertainty         U <sub>c</sub> 0.4452         µr           Expanded uncertainty         U         0.8904         µr		9				U <sub>d,I,8h</sub>		******	<b>1</b>
Combined standard uncertainty U <sub>c</sub> 0.4452 µr Expanded uncertainty U 0.8904 µr	18	Difference sample/calibration port	≤			$U_{\Delta SC}$	0.00		
Expanded uncertainty U 0.8904 µr	21	Uncertainty of test gas	≤	3%	2.000	Ucg	0.09	0.0074	
				Combined standard uncertainty			uc	0.4452	µmol/m
Relative expanded uncertainty W 10.33 %							_		µmol/m
Maximum allowed expanded uncertainty Wren 15 %							W		%

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#### Calculation of overall uncertainty (device 2)

Measuring device:	Teledyne API M300E / T300				Serial number	SN 512 / 1385		
Measured component:	со					8h-Limit value	8.62	µmol/mo
No.	Performance characteristic	Pe	rformance criterion	Result	Partial	uncertainty	Square of partial uncertainty	
1	Repeatability standard deviation at zero	≤	1.0 µmol/mol	0.100	u <sub>r,z</sub>	0.02	0.0006	
2	Repeatability standard deviation at 8h-limit value	≤	3.0 µmol/mol	0.000	ur	0.00	0.0000	
3	"lack of fit" at 8h-limit value	≤	4.0% of meas. value	1.200	u <sub>i</sub>	0.06	0.0036	
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	≤	0.7 µmol/mol/kPa	0.180	Ugp	0.19	0.0362	
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	≤	0.3 µmol/mol/K	0.010	u <sub>at</sub>	0.02	0.0006	
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	≤	0.3 µmol/mol/K	0.030	u <sub>st</sub>	0.07	0.0056	
7	Sensitivity coefficient of electrical voltage at 8h-limit value	≤	0.3 µmol/mol/V	0.010	u <sub>V</sub>	0.03	0.0011	
8a	Interferent H <sub>2</sub> 0 with 21 mmol/mol	≤	1.0 µmol/mol (Zero)	-0.040	U <sub>H2O</sub>	-0.07	0.0056	
		≤	1.0 µmol/mol (Span)	-0.110				
8b	Interferent CO <sub>2</sub> with 500 µmol/mol	≤	0.5 µmol/mol (Zero)	0.010	U <sub>int,pos</sub>	0.05	0.0020	
		≤	0.5 µmol/mol (Span)	0.070				
8c	Interferent NO with 1 µmol/mol	≤	0.5 µmol/mol (Zero)	0.030				
		≤	0.5 µmol/mol (Span)	0.010	or			
8d	Interferent N <sub>2</sub> O with 50 nmol/mol	≤	0.5 µmol/mol (Zero)	0.020				
		≤	0.5 µmol/mol (Span)	-0.020	U <sub>int,neg</sub>			
9	Averaging effect	¥	7.0% of meas. value	-0.700	u <sub>av</sub>	-0.03	0.0012	
18	Difference sample/calibration port	≤	1%	-0.050	U∆sc	0.00	0.0000	
21	Uncertainty of test gas	≤	3%	2.000	Ucg	0.09	0.0074	
			Combined	standard u	ncertainty	uc	0.2529	µmol/mo
			E	xpanded u	ncertainty	U	0.5058	µmol/mo
			Relative e	expanded u	ncertainty	W	5.87	%
			Maximum allowed e	expanded u	ncertainty	W <sub>req</sub>	15	%

No.   Performance characteristic   Performance criterion   Result   Partial uncertainty   Square	0.0006		_
2 Repeatability standard deviation at 8h-limit value ≤ 3.0 μmol/mol 0.000 u <sub>r</sub> not considered, as ur = 0 < ur, f  3 "lack of fit" at 8h-limit value ≤ 4.0% of meas. value 1.200 u <sub>t</sub> 0.06  4 Sensitivity coefficient of sample gas pressure at 8h-limit value ≤ 0.7 μmol/mol/kPa 0.180 u <sub>gp</sub> 0.19  5 Sensitivity coefficient of sample gas temperature at 8h-limit value ≤ 0.3 μmol/mol/k 0.010 u <sub>gt</sub> 0.02  6 Sensitivity coefficient of surrounding temperature at 8h-limit value ≤ 0.3 μmol/mol/k 0.030 u <sub>st</sub> 0.07  7 Sensitivity coefficient of electrical voltage at 8h-limit value ≤ 0.3 μmol/mol/k 0.030 u <sub>st</sub> 0.07  8a Interferent H₂0 with 21 mmol/mol ≤ 1.0 μmol/mol (Zero) 0.010 u <sub>t/20</sub> 0.03  8b Interferent CO₂ with 500 μmol/mol  5 1.0 μmol/mol (Zero) 0.010 u <sub>t/20</sub> 0.07  8c Interferent No with 1 μmol/mol ≤ 0.5 μmol/mol (Zero) 0.030 or 0.05 u <sub>tot, tot, tot, tot, tot, tot, tot, tot,</sub>		ty	
Repeatability standard devation at 8h-limit value   S   3.0 µmol/mol   0.000   U <sub>r</sub>   ur = 0 < ur, f	0.0000		
4 Sensitivity coefficient of sample gas pressure at 8h-limit value ≤ 0.7 μmol/mol/kPa 0.180 u <sub>gp</sub> 0.19  5 Sensitivity coefficient of sample gas temperature at 8h-limit value ≤ 0.3 μmol/mol/K 0.010 u <sub>gt</sub> 0.02  6 Sensitivity coefficient of surrounding temperature at 8h-limit value ≤ 0.3 μmol/mol/K 0.030 u <sub>st</sub> 0.07  7 Sensitivity coefficient of electrical voltage at 8h-limit value ≤ 0.3 μmol/mol/K 0.030 u <sub>st</sub> 0.07  8a Interferent H₂0 with 21 mmol/mol ≤ 1.0 μmol/mol/ (Span) -0.040  8b Interferent CO₂ with 500 μmol/mol ≤ 0.5 μmol/mol (Span) -0.040  8c Interferent No with 1 μmol/mol ≤ 0.5 μmol/mol (Span) 0.070  8c Interferent No with 1 μmol/mol ≤ 0.5 μmol/mol (Span) 0.070  8d Interferent N₂0 with 50 nmol/mol ≤ 0.5 μmol/mol (Span) 0.070  8d Interferent N₂0 with 50 nmol/mol ≤ 0.5 μmol/mol (Span) 0.010  8d Interferent N₂0 with 50 nmol/mol ≤ 0.5 μmol/mol (Span) 0.020  8d Interferent N₂0 with 50 nmol/mol ≤ 0.5 μmol/mol (Span) 0.020  10 Reproducibility standard deviation under field conditions ≤ 5.0% of 3 month average 3.470 u <sub>t,t</sub> 0.30  11 Long term drift at zero level ≤ 0.5 μmol/mol 0.710 u <sub>d,l,z</sub> 0.41  12 Long term drift at 8h-limit value ≤ 5.0% of max. of cert. range 4.960 u <sub>d,l,sh</sub> 0.25  18 Difference sample/calibration port ≤ 1% -0.050 u <sub>d,ac</sub> 0.000			
5 Sensitivity coefficient of sample gas temperature at 8h-limit value ≤ 0.3 μmol/mol/K 0.010 ugt 0.02 6 Sensitivity coefficient of surrounding temperature at 8h-limit value ≤ 0.3 μmol/mol/K 0.030 ust 0.07 7 Sensitivity coefficient of electrical voltage at 8h-limit value ≤ 0.3 μmol/mol/K 0.030 ust 0.07 8 Interferent H₂0 with 21 mmol/mol ≤ 1.0 μmol/mol (Zero) -0.110 ≤ 1.0 μmol/mol (Span) -0.040 uh;20 -0.07 8 Interferent CO₂ with 500 μmol/mol ≤ 0.5 μmol/mol (Zero) 0.010 ∪ Uh;20 -0.07 8 Interferent No with 1 μmol/mol ≤ 0.5 μmol/mol (Zero) 0.030 ∪ Uh;10 ∪ 0.05 8 Interferent N₂0 with 50 nmol/mol ≤ 0.5 μmol/mol (Zero) 0.030 ∪ 0.000 ∪ 0.	0.0036		
6 Sensitivity coefficient of surrounding temperature at 8h-limit value ≤ 0.3 μmol/mol/K 0.030 ust 0.07  7 Sensitivity coefficient of electrical voltage at 8h-limit value ≤ 0.3 μmol/mol/V 0.010 u <sub>V</sub> 0.03  8a Interferent H₂0 with 21 mmol/mol ≤ 1.0 μmol/mol (Zero) -0.110 ≤ 1.0 μmol/mol (Span) -0.040 u <sub>H₂0</sub> -0.07  8b Interferent CO₂ with 500 μmol/mol ≤ 0.5 μmol/mol (Span) 0.070 ≤ 0.5 μmol/mol (Span) 0.070  8c Interferent No with 1 μmol/mol ≤ 0.5 μmol/mol (Span) 0.010 ≤ 0.5 μmol/mol (Span) 0.010 solution or 0.05  8d Interferent N₂O with 50 nmol/mol ≤ 0.5 μmol/mol (Span) 0.010 solution or 0.05  8d Interferent N₂O with 50 nmol/mol ≤ 0.5 μmol/mol (Span) 0.010 solution or 0.05  9 Averaging effect ≤ 7.0% of meas. value -0.700 u <sub>sv</sub> -0.03  10 Reproducibility standard deviation under field conditions ≤ 5.0% of 3 month average 3.470 u <sub>v.f</sub> 0.30  11 Long term drift at Zero level ≤ 0.5 μmol/mol 0.710 u <sub>d.l.z</sub> 0.41  12 Long term drift at 8h-limit value ≤ 5.0% of max. of cert. range -4.960 u <sub>d.l.8h</sub> -0.25  18 Difference sample/calibration port ≤ 1% -0.050 u <sub>Asc</sub> 0.000	0.0362		
7 Sensitivity coefficient of electrical voltage at 8h-limit value ≤ 0.3 μmol/mol/V 0.010 U <sub>V</sub> 0.03  8a Interferent H₂0 with 21 mmol/mol ≤ 1.0 μmol/mol (Zero) -0.110  U₁20 -0.07  8b Interferent CO₂ with 500 μmol/mol ≤ 0.5 μmol/mol (Zero) 0.010  U₂10  U₁20 -0.07  8c Interferent NO with 1 μmol/mol ≤ 0.5 μmol/mol (Zero) 0.010  S 0.5 μmol/mol (Zero) 0.010  U₂10  Or  S 0.5 μmol/mol (Zero) 0.020  S 0.5 μmol/mol (Span) 0.010  Or  S 0.5 μmol/mol (Span) 0.020  Or  Or  Or  Or  Or  Or  Or  Or  Or  O	0.0006		
8a	0.0056		
Search	0.0011		
S   1.0 µmol/mol (Span)   -0.040	0.0056		
Se			
Sec   Interferent NO with 1 μmol/mol   Sec   S. μmol/mol (Span)   0.070   Sec   S. μmol/mol (Zero)   0.030   Sec   S. μmol/mol (Zero)   0.030   Sec   S. μmol/mol (Zero)   0.040   Sec   S. μmol/mol (Zero)   0.020   Sec   S. μmol/mol (Span)   0.020   Sec			
Sc			
Section   Sec	0.0020		
8d			
9 Averaging effect ≤ 7.0% of meas. value -0.700 U <sub>av</sub> -0.03  10 Reproducibility standard devlation under field conditions ≤ 5.0% of 3 month average 3.470 U <sub>t,t</sub> 0.30  11 Long term drift at zero level ≤ 0.5 μmol/mol 0.710 U <sub>d,1,z</sub> 0.41  12 Long term drift at 8h-limit value ≤ 5.0% of max. of cert. range -4.960 U <sub>d,1,8h</sub> -0.25  18 Difference sample/calibration port ≤ 1% -0.050 U <sub>Asc</sub> 0.00			
10   Reproducibility standard deviation under field conditions   ≤   5.0% of 3 month average   3.470   u <sub>r.f</sub>   0.30       11   Long term drift at zero level   ≤   0.5 μmol/mol   0.710   u <sub>d.1.2</sub>   0.41       12   Long term drift at 8h-limit value   ≤   5.0% of max. of cert. range   -4.960   u <sub>d.1.9h</sub>   -0.25       18   Difference sample/calibration port   ≤   1%   -0.050   u <sub>Asc</sub>   0.00	0.0012		
11 Long term drift at zero level ≤ 0.5 μmol/mol 0.710 u <sub>d.t.z</sub> 0.41  12 Long term drift at 8h-limit value ≤ 5.0% of max. of cert. range -4.960 u <sub>d.t.9h</sub> -0.25  18 Difference sample/calibration port ≤ 1% -0.050 u <sub>Λac</sub> 0.00	0.0895		
12         Long term drift at 8h-limit value         ≤ 5.0% of max. of cert. range         -4.960         U <sub>d.1.8h</sub> -0.25           18         Difference sample/calibration port         ≤ 1%         -0.050         U <sub>Asc</sub> 0.00	0.1680		
18 Difference sample/calibration port ≤ 1% -0.050 u <sub>Asc</sub> 0.00	0.0609		
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.0009		
21 Shoettanky of test gas 3 570 2.000 Ucg 0.09	0.0004		
Openhina di atau dandan antalata di U		um	µmol
Combined standard uncertainty Uc  Expanded uncertainty U	·	_	_
Expanded uncertainty U  Relative expanded uncertainty W		µm %	µmol.