

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000081161_00

Certified AMS: N300 for CO

Manufacturer: Teledyne API
9970 Carroll Canyon Road
San Diego, CA, 92131
USA

Test Institute: TÜV Rheinland Energy GmbH

**This is to certify that the AMS has been tested
and found to comply with the standards
VDI 4202-1 (2018), EN 14626 (2012),
as well as EN 15267-1 (2009) and EN 15267-2 (2009).**

Certification is awarded in respect of the conditions stated in this certificate
(this certificate contains 7 pages).



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

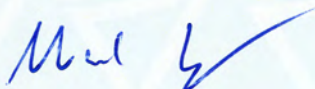
www.tuv.com
ID 0000081161

Publication in the German Federal Gazette
(BAnz) of 02 August 2023

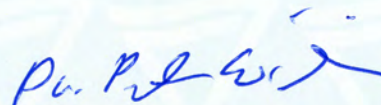
German Environment Agency
Dessau, 05 September 2023

This certificate will expire on:
01 August 2028

TÜV Rheinland Energy GmbH
Cologne, 04 September 2023



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Test institute accredited to EN ISO/IEC 17025 by DAkkS (German Accreditation Body).
This accreditation is limited to the accreditation scope defined in the enclosure to the certificate D-PL-11120-02-00.

Test report: 936/21255654/B dated 25 January 2023
Initial certification: 02 August 2023
Expiry date: 01 August 2028
Publication: BAnz AT 02.08.2023 B7, chapter II No. 3.1

Approved application

The tested AMS is suitable for continuous ambient air monitoring of CO (stationary operation).

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

The AMS is approved for an ambient temperature range of +0 °C to 45 °C.

The notification of suitability of the AMS, performance testing and the uncertainty calculation have been effected on the basis of the regulations applicable at the time of testing. As changes in legal provisions are possible, any potential user should ensure that this AMS is suitable for monitoring the measured values relevant to the application.

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

Basis of the certification

This certification is based on:

- Test report 936/21255654/B dated 25 January 2023 of TÜV Rheinland Energy GmbH
- Suitability announced by the German Federal Environment Agency (UBA) as the relevant body
- The ongoing surveillance of the product and the manufacturing process

Publication in the German Federal Gazette: BAnz AT 02.08.2023 B7, chapter II No. 3.1,
Announcement by UBA dated 05 July 2023:

AMS designation:

N300 for carbon monoxide

Manufacturer:

Teledyne API, San Diego, USA

Field of application:

For the continuous determination of the ambient air concentrations of carbon monoxide in stationary use.

Measuring ranges during the performance test:

Component	Certification range	Unit
Carbon monoxide	0 - 100	mg/m ³

Software version:

Rev. 1.9.0

Restrictions:

None

Notes:

1. The performance test report can be found online at www.qal1.de.
2. The measuring system is approved for an ambient temperature range of 0 - 45 °C.
3. The N300 measuring system can be equipped with a controlled pump (PID controlled) as well as with a non-controlled pump (HD Non-PID).
4. The N300 measuring system can be equipped with a standard Teflon particle filter with a pore size of 5 µm and a diameter of 47 mm as well as with a DFU filter cartridge with a pore size of 0.01 µm.

Test institute: TÜV Rheinland Energy GmbH,, Cologne

Report No.: 936/21255654/B dated 25 January 2023

Certified product

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

The immission measuring device N300 is a continuous carbon monoxide analyzer. The measurement principle is based on non-dispersive infrared photometry.

The N300 analyzer uses a heated infrared source to generate a beam of broadband IR light with a known intensity (measured during instrument calibration). This beam is sent several times through the measurement chamber, which is filled with sample gas. The measurement chamber uses mirrors at each end to send the IR beam back and forth through the measurement chamber several times (see Figure 3) to create a long absorption path. The absolute length that the reflected light travels is directly related to the intended accuracy of the instrument. The lower the concentrations the instrument is intended to detect, the longer the light path must be to produce detectable attenuations.

Upon exiting the measurement chamber, the light beam passes through a bandpass filter that only allows light with a wavelength of 4.7 μm to pass through. Finally, the beam hits a photodetector, which converts the light signal to a modulated voltage signal representing the attenuated intensity of the beam.

Since water vapor also absorbs light at 4.7 μm , a gas filter correlation (GFC) wheel is added to the IR light path to prevent the interference effect of water vapor. The GFC wheel is a metallic wheel with two chambers. The chambers are hermetically sealed on both sides with a material transparent to 4.7 μm IR radiation. Each cavity is mainly filled with gas mixtures. One chamber is filled with pure N_2 (the measurement chamber). The other is filled with a mixture of N_2 and a high concentration of CO (the reference chamber). As the GFC wheel rotates, the IR light passes alternately through these two cavities. When the beam hits the reference chamber, the CO in the gas filter wheel clears the beam of most of the 4.7 μm IR. When the beam hits the measurement chamber, the N_2 in the filter wheel does not absorb the IR light. Thus, a fluctuation in the intensity of the IR light is produced on the photodetector, allowing a measurement signal to be determined.

General notes

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

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

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

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

The relevant version of this certificate and its expiration is also accessible on the internet: gal1.de.

History of documents

Certification of N300 is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

Initial certification according to EN 15267

Certificate No. 0000081161_00: 05 September 2023
Expiry date of the certificate: 01 August 2028
Test report: 936/21255654/B dated 25 January 2023
TÜV Rheinland Energy GmbH
Publication: BAnz AT 02.08.2023 B7, chapter II number 3.1
UBA announcement dated 5 July 2023

Expanded uncertainty laboratory, system 1

N300		Serial-No.: 54		
CO		8h-limit value: 8,62 $\mu\text{mol/mol}$		
Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty
Repeatability standard deviation at zero	$\leq 0.3 \mu\text{mol/mol}$	0,030	$u_{r,z}$ 0,01	0,0000
Repeatability standard deviation at 8h-limit value	$\leq 0.4 \mu\text{mol/mol}$	0,050	u_r 0,01	0,0001
"lack of fit" at 8h-limit value	$\leq 4.0\%$ of measured value	2,250	u_f 0,11	0,0125
Sensitivity coefficient of sample gas pressure at 8h-limit value	$\leq 0.7 \mu\text{mol/mol/kPa}$	0,110	u_{sp} 0,25	0,0638
Sensitivity coefficient of sample gas temperature at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/K}$	0,000	u_{st} 0,00	0,0000
Sensitivity coefficient of surrounding temperature at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/K}$	0,076	u_{st} 0,17	0,0305
Sensitivity coefficient of electrical voltage at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/V}$	0,000	u_v 0,00	0,0000
Interferent H ₂ O with 19 mmol/mol	$\leq 1.0 \mu\text{mol/mol (Zero)}$	-0,270	u_{k2O} -0,20	0,0408
	$\leq 1.0 \mu\text{mol/mol (Span)}$	-0,020		
Interferent CO ₂ with 500 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$	0,000	$u_{int,pos}$ 0,12	0,0148
	$\leq 0.5 \mu\text{mol/mol (Span)}$	-0,060		
Interferent NO with 1 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$	0,000	or	0,0148
	$\leq 0.5 \mu\text{mol/mol (Span)}$	-0,020		
Interferent N ₂ O with 50 nmol/mol	$\leq 0.5 \mu\text{mol/mol (Zero)}$	0,020	$u_{int,neg}$ -0,130	0,0148
	$\leq 0.5 \mu\text{mol/mol (Span)}$	-0,130		
Averaging effect	$\leq 7.0\%$ of measured value	4,300	u_{av} 0,21	0,0458
Difference sample/calibration port	$\leq 1.0\%$	0,140	u_{sc} 0,01	0,0001
Uncertainty of test gas	$\leq 3.0\%$	2,000	u_{tg} 0,09	0,0074
Combined standard uncertainty			u_c	0,4647 $\mu\text{mol/mol}$
Expanded uncertainty			U	0,9293 $\mu\text{mol/mol}$
Relative expanded uncertainty			W	10,78 %
Maximum allowed expanded uncertainty			W_{req}	15 %

Expanded uncertainty laboratory, system 2

Measuring device: N300		Serial-No.: 55			
Measured component: CO		8h-limit value: 8,62 $\mu\text{mol/mol}$			
No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty
1	Repeatability standard deviation at zero	$\leq 0.3 \mu\text{mol/mol}$	0,030	$u_{r,z}$ 0,01	0,0000
2	Repeatability standard deviation at 8h-limit value	$\leq 0.4 \mu\text{mol/mol}$	0,050	u_r 0,01	0,0001
3	"lack of fit" at 8h-limit value	$\leq 4.0\%$ of measured value	2,210	u_f 0,11	0,0121
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	$\leq 0.7 \mu\text{mol/mol/kPa}$	0,020	u_{sp} 0,05	0,0021
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/K}$	0,000	u_{st} 0,00	0,0000
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/K}$	0,064	u_{st} 0,15	0,0216
7	Sensitivity coefficient of electrical voltage at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/V}$	0,000	u_v 0,00	0,0000
8a	Interferent H ₂ O with 19 mmol/mol	$\leq 1.0 \mu\text{mol/mol (Zero)}$	-0,140	u_{k2O} -0,10	0,0109
		$\leq 1.0 \mu\text{mol/mol (Span)}$	-0,110		
8b	Interferent CO ₂ with 500 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$	0,170	$u_{int,pos}$ 0,06	0,0040
		$\leq 0.5 \mu\text{mol/mol (Span)}$	0,050		
8c	Interferent NO with 1 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$	0,000	or	0,0040
		$\leq 0.5 \mu\text{mol/mol (Span)}$	0,060		
8d	Interferent N ₂ O with 50 nmol/mol	$\leq 0.5 \mu\text{mol/mol (Zero)}$	0,050	$u_{int,neg}$ -0,090	0,0040
		$\leq 0.5 \mu\text{mol/mol (Span)}$	-0,090		
9	Averaging effect	$\leq 7.0\%$ of measured value	5,800	u_{av} 0,29	0,0833
18	Difference sample/calibration port	$\leq 1.0\%$	-0,060	u_{sc} -0,01	0,0000
21	Uncertainty of test gas	$\leq 3.0\%$	2,000	u_{tg} 0,09	0,0074
Combined standard uncertainty			u_c	0,3764 $\mu\text{mol/mol}$	
Expanded uncertainty			U	0,7528 $\mu\text{mol/mol}$	
Relative expanded uncertainty			W	8,73 %	
Maximum allowed expanded uncertainty			W_{req}	15 %	

Combined uncertainty, laboratory and field, system 1

Measuring device:	N300	Serial-No.:	54
Measured component:	CO	8h-limit value:	8,62 $\mu\text{mol/mol}$

No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty
1	Repeatability standard deviation at zero	$\leq 0.3 \mu\text{mol/mol}$	0,030	$u_{r,z}$	0,01
2	Repeatability standard deviation at 8h-limit value	$\leq 0.4 \mu\text{mol/mol}$	0,050	u_r	not considered, as $u_r = 0,01 < u_{r,f}$
3	"lack of fit" at 8h-limit value	$\leq 4.0\%$ of measured value	2,250	u_f	0,11
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	$\leq 0.7 \mu\text{mol/mol/kPa}$	0,110	u_{sp}	0,25
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/K}$	0,000	u_{st}	0,00
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/K}$	0,076	u_{st}	0,17
7	Sensitivity coefficient of electrical voltage at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/V}$	0,000	u_v	0,00
8a	Interferent H ₂ O with 19 mmol/mol	$\leq 1.0 \mu\text{mol/mol (Zero)}$	-0,020	u_{iCO}	-0,20
		$\leq 1.0 \mu\text{mol/mol (Span)}$	-0,270		
8b	Interferent CO ₂ with 500 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$	0,000	u_{i,CO_2}	0,12
		$\leq 0.5 \mu\text{mol/mol (Span)}$	-0,060		
8c	Interferent NO with 1 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$	0,000	or	0,12
		$\leq 0.5 \mu\text{mol/mol (Span)}$	-0,020		
8d	Interferent N ₂ O with 50 nmol/mol	$\leq 0.5 \mu\text{mol/mol (Zero)}$	0,020	u_{i,N_2O}	0,148
		$\leq 0.5 \mu\text{mol/mol (Span)}$	-0,130		
9	Averaging effect	$\leq 7.0\%$ of measured value	4,300	u_{av}	0,21
10	Reproducibility standard deviation under field conditions	$\leq 5.0\%$ of average over 3 months	1,080	u_f	0,09
11	Long term drift at zero level	$\leq 0.5 \mu\text{mol/mol}$	0,020	$u_{l,z}$	0,01
12	Long term drift at span level	$\leq 5.0\%$ of max. of certification range	-1,560	$u_{l,sp}$	-0,08
18	Difference sample/calibration port	$\leq 1.0\%$	0,140	u_{sc}	0,01
21	Uncertainty of test gas	$\leq 3.0\%$	2,000	u_{tg}	0,09

Combined standard uncertainty	u_c	0,4802	$\mu\text{mol/mol}$
Expanded uncertainty	U	0,9605	$\mu\text{mol/mol}$
Relative expanded uncertainty	W	11,14	%
Maximum allowed expanded uncertainty	W_{reg}	15	%

Combined uncertainty, laboratory and field, system 2

Measuring device:	N300	Serial-No.:	55
Measured component:	CO	8h-limit value:	8,62 $\mu\text{mol/mol}$

No.	Performance characteristic	Performance criterion	Result	Partial uncertainty	Square of partial uncertainty
1	Repeatability standard deviation at zero	$\leq 0.3 \mu\text{mol/mol}$	0,030	$u_{r,z}$	0,01
2	Repeatability standard deviation at 8h-limit value	$\leq 0.4 \mu\text{mol/mol}$	0,050	u_r	not considered, as $u_r = 0,01 < u_{r,f}$
3	"lack of fit" at 8h-limit value	$\leq 4.0\%$ of measured value	2,210	u_f	0,11
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	$\leq 0.7 \mu\text{mol/mol/kPa}$	0,020	u_{sp}	0,05
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/K}$	0,000	u_{st}	0,00
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/K}$	0,064	u_{st}	0,15
7	Sensitivity coefficient of electrical voltage at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/V}$	0,000	u_v	0,00
8a	Interferent H ₂ O with 19 mmol/mol	$\leq 1.0 \mu\text{mol/mol (Zero)}$	-0,110	u_{iCO}	-0,10
		$\leq 1.0 \mu\text{mol/mol (Span)}$	-0,140		
8b	Interferent CO ₂ with 500 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$	0,170	u_{i,CO_2}	0,06
		$\leq 0.5 \mu\text{mol/mol (Span)}$	0,050		
8c	Interferent NO with 1 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$	0,000	or	0,06
		$\leq 0.5 \mu\text{mol/mol (Span)}$	0,060		
8d	Interferent N ₂ O with 50 nmol/mol	$\leq 0.5 \mu\text{mol/mol (Zero)}$	0,050	u_{i,N_2O}	0,074
		$\leq 0.5 \mu\text{mol/mol (Span)}$	-0,090		
9	Averaging effect	$\leq 7.0\%$ of measured value	5,800	u_{av}	0,29
10	Reproducibility standard deviation under field conditions	$\leq 5.0\%$ of average over 3 months	1,080	u_f	0,09
11	Long term drift at zero level	$\leq 0.5 \mu\text{mol/mol}$	0,040	$u_{l,z}$	0,02
12	Long term drift at span level	$\leq 5.0\%$ of max. of certification range	1,560	$u_{l,sp}$	0,08
18	Difference sample/calibration port	$\leq 1.0\%$	-0,060	u_{sc}	-0,01
21	Uncertainty of test gas	$\leq 3.0\%$	2,000	u_{tg}	0,09

Combined standard uncertainty	u_c	0,3960	$\mu\text{mol/mol}$
Expanded uncertainty	U	0,7920	$\mu\text{mol/mol}$
Relative expanded uncertainty	W	9,19	%
Maximum allowed expanded uncertainty	W_{reg}	15	%