

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000050626_02

Certified AMS: CO12e for CO

Manufacturer: ENVEA
111, Boulevard Robespierre
78304 Poissy Cedex
France

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 (2018), EN 14626 (2012), EN 14626 (2024)
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 13 pages).

The present certificate replaces certificate 0000050626_01 dated 13 March 2021.



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

www.tuv.com
ID 0000050626

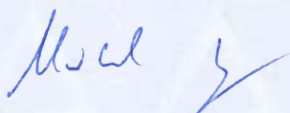
Publication in the German Federal Gazette
(BAnz) of 14 March 2016

German Environment Agency

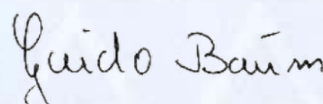
Dessau, 23 March 2026

This certificate will expire on:
22 March 2031

TÜV Rheinland
Energy & Environment GmbH
Cologne, 20 March 2026



Dr. Marcel Langner
Head of Section II 4



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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:	936/21228317/A dated 9 October 2015 and Addendum EuL/21264142/D_V1 dated 7 February 2025
Initial certification:	14 March 2016
Expiry date:	22 March 2031
Publication:	BAnz AT 14.03.2016 B7, chapter III No. 1.1 and BAnz AT 31.10.2025 B5, chapter IV notification 37

Approved application

The tested AMS is suitable for continuous immission measurement of CO 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 at a location close to transport links.

The AMS is approved for an ambient temperature range of +0 °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 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 936/21228317/A dated 9 October 2015 of TÜV Rheinland Energie und Umwelt GmbH and Addendum EuL/21264142/D_V1 dated 7 February 2025 of TÜV Rheinland Energy & Environment 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 14.03.2016 B7, chapter III No. 1.1
Announcement by UBA dated 18 February 2016:

AMS designation:

CO 12e for CO

Manufacturer:

Environnement S.A., Poissy, France

Field of application:

For continuous monitoring of CO in ambient air (stationary operation)

Measuring ranges during the performance test:

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

Software version:

Firmware: 1.0.d

Restrictions:

None

Notes:

1. The performance test also includes the Version CO 12e* instrument version without integrated display. In this case, the measured value is displayed via a PC or laptop belonging to the measuring device.
2. The report on the performance test is available online at www.qal1.de.

Test Report:

TÜV Rheinland Energie und Umwelt GmbH, Cologne
Report No.: 936/21228317/A dated 9 October 2015

Publication in the German Federal Gazette: BAnz AT 03.05.2021 B9, chap. IV notification 21,
Announcement by UBA dated 31 March 2021

21 Notification as regards Federal Environment Agency (UBA) notices of 18 February 2016 (BAnz AT 14.03.2016 B7, chapter III number 1.1) and of 24 February 2020 (BAnz AT 24.03.2020 B7, chapter IV notification 29)

The latest software version of the CO₁₂e*/CO₁₂e measuring system for CO manufactured by ENVEA is:

v1.1.e

Statement issued by TÜV Rheinland Energy GmbH dated 12 November 2020

Publication in the German Federal Gazette: BAnz AT 11.04.2022 B10, chap. VI notification 13,
Announcement by UBA dated 9 March 2022

13 Notification as regards Federal Environment Agency (UBA) notices of 18 February 2016 (BAnz AT 14.03.2016 B7, chapter III number 1.1) and of 31 March 2021 (BAnz AT 03.05.2021 B9, chapter III notification 21)

The current software version for the measuring device CO₁₂e*/CO₁₂e for CO of the company ENVEA is:

v1.1.h

Furthermore, the software version v1.1.f and v1.1.g can be used.

Statement issued by TÜV Rheinland Energy GmbH dated 16 September 2021

Publication in the German Federal Gazette: BAnz AT 20.03.2023 B6, chap. IV notification 67,
Announcement by UBA dated 21 February 2023

67 Notification as regards Federal Environment Agency (UBA) notices of 18 February 2016 (BAnz AT 14.03.2016 B7, chapter III number 1.1) and of 9 March 2022 (BAnz AT 11.04.2022 B10, chapter VI notification 13)

The current software version of the CO₁₂e*/CO₁₂e measuring system for CO from ENVEA is:

v1.1.j

Furthermore, the software version v1.1.i can be used.

Statement issued by TÜV Rheinland Energy GmbH dated 9 September 2022

Publication in the German Federal Gazette: BAnz AT 19.05.2025 B3, chap. IV notification 92,
Announcement by UBA dated 2 April 2025

92 Notification as regards Federal Environment Agency (UBA) notices of 18 February 2016 (BAnz AT 14.03.2016 B7, chapter III number 1.1) and of 21 February 2023 (BAnz AT 20.03.2023 B6, chapter IV notification 67)

The current software version for the CO12e*/CO12e for CO measuring system from ENVEA is:

v1.2.b

Software version v1.2.a can also be used.

The measuring system can be equipped with a revised version of the ARM20 board.

Statement issued by TÜV Rheinland Energy & Environment GmbH dated 4 October 2024

The basis for this certificate is the publication of the following announcement:

Publication in the German Federal Gazette: BAnz AT 31.10.2025 B5, chap. IV notification 37,
Announcement by UBA dated 27 August 2025

37 Notification as regards Federal Environment Agency (UBA) notices of 18 February 2016 (BAnz AT 14.03.2016 B7, chapter III number 1.1) and of 2 April 2025 (BAnz AT 19.05.2025 B3, Chapter IV, notification 92).

The current software version for the CO12e*/CO12e for CO measuring system from ENVEA is
v1.3.a

From software version v1.3.a, the measuring system fulfils the requirements of EN 14626 (2024 version).

An addendum to the test report with the report number EuL/21264142/D_V1 can be viewed on the internet at www.qal1.de.

Statement issued by TÜV Rheinland Energy & Environment GmbH dated 20 May 2025

Certified product

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

The CO12e is a continuous carbon monoxide analyser which uses the method of non-dispersive infrared photometry, designed for the continuous measurement of carbon monoxide in ambient air.

The CO12e uses the method of infrared absorption according to the Beer-Lambert Law.

The AMS is available in two versions:

- The version CO12e is fitted with a TFT LCD coloured display with backlight and a touch screen function. Signal output as well as operation can also be carried out via the web browser using an external PC connected via Ethernet.
- The version CO12e* is not fitted with a display. Signal output as well as operation can only be operated via the web browser on an external PC connected via Ethernet.

Additionally, the AMS front side is fitted with the main switch.

Apart from that, both versions of the AMS are of identical design.

Fluid inputs and outputs as well as electrical connections are located on the rear side of the AMS.

The analyser's inside can be roughly divided in two components:

The mechanical component consists of an electro valve filter unit as well as the measuring cell. The sample to be analysed is led through a dust filter to the module which consists of two magnet valves. The pump draws the sample via the measurement cell in which the CO molecules selectively absorb infrared radiation centered to a wavelength of 4.67 μm . An optical sensor as well as a light source are located within the measurement cell. A selective CO filter allows for zero point correction.

The electronic component consists of a power supply providing a supply voltage of 24 V. It is connected to the outlet as well as the connection chip. The supply card provides additional internal supply voltage (24 V, 15 V, 5 V, 3.3 V). The control card controls general operation of the analyser (magnet valves, pressure and temperature control). The measurement card processes the measurement data and controls the motor and the infrared source. The HMI card controls the data output as well as the visualisation on the touch screen display.

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 request of 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 CO12e 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. 0000050626_00: 25 April 2016
Expiry date of the certificate: 13 March 2021
Test report: 936/21228317/A dated 9 October 2015
TÜV Rheinland Energie und Umwelt GmbH
Publication: BAnz AT 14.03.2016 B7, chapter III number 1.1
UBA announcement dated 18 February 2016

Notifications

Statement issued by TÜV Rheinland Energy GmbH dated 27 September 2018
Publication: BAnz AT 26.03.2019 B7, chapter IV notification 24
UBA announcement dated 27 February 2019
(Software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 1 October 2019
Publication: BAnz AT 24.03.2020 B7, chapter IV notification 29
UBA announcement dated 24 February 2020
(Software changes and new producer name formerly Environnement S.A.)

Renewal of certificates

Certificate No. 0000050626_01: 13 March 2021
Expiry date of the certificate: 13 March 2026

Notifications

Statement issued by TÜV Rheinland Energy GmbH dated 12 November 2020
Publication: BAnz AT 03.05.2021 B9, chapter III notification 21
UBA announcement dated 31 March 2021
(Software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 16 September 2021
Publication: BAnz AT 11.04.2022 B10, chapter VI notification 13
UBA announcement dated 9 March 2022
(Software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 9 September 2022
Publication: BAnz AT 20.03.2023 B6, chapter IV notification 67
UBA announcement dated 21 February 2023
(Software changes)

Statement issued by TÜV Rheinland Energy & Environment GmbH dated 4 October 2024
Publication: BAnz AT 19.05.2025 B3, chapter IV notification 92
UBA announcement dated 2 April 2025
(Software changes)

Certificate based on a notification

Certificate No. 0000050626_02: 23 March 2026

Expiry date of the certificate: 22 March 2031

Statement issued by TÜV Rheinland Energy & Environment GmbH dated 20 May 2025

Addendum: EuL/21264142/D_V1 dated 7 February 2025

Publication: BAnz AT 31.10.2025 B5, chapter IV notification 37

UBA announcement dated 27 August 2025

Expanded uncertainty laboratory (EN 14626:2012), system 1

Measuring device:		CO 12e		Serial-No.:		SN 11	
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	$\leq 0.3 \mu\text{mol/mol}$	0,000	$u_{r,z}$	0,00	0,0000	
2	Repeatability standard deviation at 8h-limit value	$\leq 0.4 \mu\text{mol/mol}$	0,030	u_r	0,01	0,0001	
3	"lack of fit" at 8h-limit value	$\leq 4.0\%$ of measured value	1,940	u_f	0,10	0,0093	
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	$\leq 0.7 \mu\text{mol/mol/kPa}$	0,050	u_{sp}	0,11	0,0128	
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	$\leq 0.3 \mu\text{mol/mol/K}$	0,019	u_{st}	0,04	0,0020	
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 21 mmol/mol	$\leq 1.0 \mu\text{mol/mol (Zero)}$ $\leq 1.0 \mu\text{mol/mol (Span)}$	0,290 0,330	u_{iCO}	0,25	0,0607	
8b	Interferent CO ₂ with 500 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$ $\leq 0.5 \mu\text{mol/mol (Span)}$	-0,150 -0,140	u_{iCO_2}	0,08	0,0065	
8c	Interferent NO with 1 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$ $\leq 0.5 \mu\text{mol/mol (Span)}$	-0,060 0,040	or			
8d	Interferent N ₂ O with 50 nmol/mol	$\leq 0.5 \mu\text{mol/mol (Zero)}$ $\leq 0.5 \mu\text{mol/mol (Span)}$	-0,050 0,060	u_{iN_2O}			
9	Averaging effect	$\leq 7.0\%$ of measured value	-2,560	u_{av}	-0,13	0,0162	
18	Difference sample/calibration port	$\leq 1.0\%$	0,390	u_{sc}	0,03	0,0011	
21	Uncertainty of test gas	$\leq 3.0\%$	2,000	u_{tg}	0,09	0,0074	
Combined standard uncertainty				u_c		0,3408	$\mu\text{mol/mol}$
Expanded uncertainty				U		0,6815	$\mu\text{mol/mol}$
Relative expanded uncertainty				W		7,91	%
Maximum allowed expanded uncertainty				W_{req}		15	%

Expanded uncertainty laboratory (EN 14626:2012), system 2

Measuring device:		CO 12e		Serial-No.:		SN 12	
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	0,0001	
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	2,060	u_f	0,10	0,0105	
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	$\leq 0.7 \mu\text{mol/mol/kPa}$	0,050	u_{sp}	0,11	0,0128	
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	$\leq 0.3 \mu\text{mol/mol/K}$	0,019	u_{st}	0,05	0,0020	
7	Sensitivity coefficient of electrical voltage at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/V}$	0,010	u_v	0,03	0,0008	
8a	Interferent H ₂ O with 21 mmol/mol	$\leq 1.0 \mu\text{mol/mol (Zero)}$ $\leq 1.0 \mu\text{mol/mol (Span)}$	0,220 0,320	u_{iCO}	0,24	0,0571	
8b	Interferent CO ₂ with 500 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$ $\leq 0.5 \mu\text{mol/mol (Span)}$	-0,210 -0,090	u_{iCO_2}	0,05	0,0027	
8c	Interferent NO with 1 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$ $\leq 0.5 \mu\text{mol/mol (Span)}$	-0,030 0,000	or			
8d	Interferent N ₂ O with 50 nmol/mol	$\leq 0.5 \mu\text{mol/mol (Zero)}$ $\leq 0.5 \mu\text{mol/mol (Span)}$	-0,160 0,010	u_{iN_2O}			
9	Averaging effect	$\leq 7.0\%$ of measured value	-2,610	u_{av}	-0,13	0,0169	
18	Difference sample/calibration port	$\leq 1.0\%$	0,220	u_{sc}	0,02	0,0004	
21	Uncertainty of test gas	$\leq 3.0\%$	2,000	u_{tg}	0,09	0,0074	
Combined standard uncertainty				u_c		0,3327	$\mu\text{mol/mol}$
Expanded uncertainty				U		0,6655	$\mu\text{mol/mol}$
Relative expanded uncertainty				W		7,72	%
Maximum allowed expanded uncertainty				W_{req}		15	%

Combined uncertainty, laboratory and field (EN 14626:2012), system 1

Measuring device:		CO 12e		Serial-No.:		SN 11	
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	$\leq 0.3 \mu\text{mol/mol}$	0,000	$u_{r,z}$	0,00	0,0000	
2	Repeatability standard deviation at 8h-limit value	$\leq 0.4 \mu\text{mol/mol}$	0,030	u_r	not considered, as $u_r = 0 < u_{r,f}$	-	
3	"lack of fit" at 8h-limit value	$\leq 4.0\%$ of measured value	1,940	u_f	0,10	0,0093	
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	$\leq 0.7 \mu\text{mol/mol/kPa}$	0,050	u_{sp}	0,11	0,0128	
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	$\leq 0.3 \mu\text{mol/mol/K}$	0,019	u_{st}	0,04	0,0020	
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 21 mmol/mol	$\leq 1.0 \mu\text{mol/mol (Zero)}$ $\leq 1.0 \mu\text{mol/mol (Span)}$	0,290 0,330	u_{iCO}	0,25	0,0607	
8b	Interferent CO ₂ with 500 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$ $\leq 0.5 \mu\text{mol/mol (Span)}$	-0,150 -0,140	u_{iCO_2}	0,08	0,0065	
8c	Interferent NO with 1 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$ $\leq 0.5 \mu\text{mol/mol (Span)}$	-0,060 0,040	or			
8d	Interferent N ₂ O with 50 nmol/mol	$\leq 0.5 \mu\text{mol/mol (Zero)}$ $\leq 0.5 \mu\text{mol/mol (Span)}$	-0,050 0,060	u_{iN_2O}			
9	Averaging effect	$\leq 7.0\%$ of measured value	-2,560	u_{av}	-0,13	0,0162	
10	Reproducibility standard deviation under field conditions	$\leq 5.0\%$ of average over 3 months	1,790	$u_{r,f}$	0,15	0,0238	
11	Long term drift at zero level	$\leq 0.5 \mu\text{mol/mol}$	0,230	$u_{d,z}$	0,13	0,0176	
12	Long term drift at span level	$\leq 5.0\%$ of max. of certification range	0,700	$u_{d,span}$	0,03	0,0012	
18	Difference sample/calibration port	$\leq 1.0\%$	0,390	u_{sc}	0,03	0,0011	
21	Uncertainty of test gas	$\leq 3.0\%$	2,000	u_{tg}	0,09	0,0074	
Combined standard uncertainty				u_c		0,3984	$\mu\text{mol/mol}$
Expanded uncertainty				U		0,7968	$\mu\text{mol/mol}$
Relative expanded uncertainty				W		9,24	%
Maximum allowed expanded uncertainty				W_{req}		15	%

Combined uncertainty, laboratory and field (EN 14626:2012), system 2

Measuring device:		CO 12e		Serial-No.:		SN 12	
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	0,0001	
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	2,060	u_f	0,10	0,0105	
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	$\leq 0.7 \mu\text{mol/mol/kPa}$	0,050	u_{sp}	0,11	0,0128	
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	$\leq 0.3 \mu\text{mol/mol/K}$	0,019	u_{st}	0,05	0,0020	
7	Sensitivity coefficient of electrical voltage at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/V}$	0,010	u_v	0,03	0,0008	
8a	Interferent H ₂ O with 21 mmol/mol	$\leq 1.0 \mu\text{mol/mol}$ (Zero)	0,220	u_{iCO}	0,24	0,0571	
		$\leq 1.0 \mu\text{mol/mol}$ (Span)	0,320				
8b	Interferent CO ₂ with 500 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol}$ (Zero)	-0,210	u_{i,CO_2}	0,05	0,0027	
		$\leq 0.5 \mu\text{mol/mol}$ (Span)	-0,090				
8c	Interferent NO with 1 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol}$ (Zero)	-0,030	or	0,05	0,0027	
		$\leq 0.5 \mu\text{mol/mol}$ (Span)	0,000				
8d	Interferent N ₂ O with 50 nmol/mol	$\leq 0.5 \mu\text{mol/mol}$ (Zero)	-0,160	u_{i,N_2O}	-0,13	0,0169	
		$\leq 0.5 \mu\text{mol/mol}$ (Span)	0,010				
9	Averaging effect	$\leq 7.0\%$ of measured value	-2,610	u_{av}	-0,13	0,0169	
10	Reproducibility standard deviation under field conditions	$\leq 5.0\%$ of average over 3 months	1,790	$u_{r,f}$	0,15	0,0238	
11	Long term drift at zero level	$\leq 0.5 \mu\text{mol/mol}$	0,160	$u_{l,z}$	0,09	0,0085	
12	Long term drift at span level	$\leq 5.0\%$ of max. of certification range	0,890	$u_{l,span}$	0,04	0,0020	
18	Difference sample/calibration port	$\leq 1.0\%$	0,220	u_{scc}	0,02	0,0004	
21	Uncertainty of test gas	$\leq 3.0\%$	2,000	u_{tg}	0,09	0,0074	
Combined standard uncertainty				u_c		0,3806 $\mu\text{mol/mol}$	
Expanded uncertainty				U		0,7613 $\mu\text{mol/mol}$	
Relative expanded uncertainty				W		8,83 %	
Maximum allowed expanded uncertainty				W_{req}		15 %	

Expanded uncertainty laboratory (EN 14626:2024), system 1

Measuring device:		CO12e		Serial-No.:		SN 11 / 1862	
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	$\leq 0.3 \mu\text{mol/mol}$	0,000	$u_{r,z}$	0,00	0,00	
2	Repeatability standard deviation at 8h-limit value	$\leq 0.4 \mu\text{mol/mol}$	0,030	u_r	0,01	0,00	
3	"lack of fit" at 8h-limit value	$\leq 4.0\%$ of measured value	2,030	u_l	0,10	0,01	
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	$\leq 0.7 \mu\text{mol/mol/kPa}$	0,070	u_{gp}	0,11	0,01	
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/K}$	0,010	u_{gt}	0,03	0,00	
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/K}$	0,021	u_{st}	0,06	0,00	
7	Sensitivity coefficient of electrical voltage at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/V}$	0,000	u_v	0,00	0,00	
8a	Interferent H ₂ O with 21 mmol/mol	$\leq 1.0 \mu\text{mol/mol (Zero)}$	0,290	u_{H_2O}	0,25	0,06	
		$\leq 1.0 \mu\text{mol/mol (Span)}$	0,330				
8b	Interferent CO ₂ with 500 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$	-0,150	$u_{int,pos}$	0,20	0,04	
		$\leq 0.5 \mu\text{mol/mol (Span)}$	-0,140				
8c	Interferent NO with 1 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$	-0,060	or	0,20	0,04	
		$\leq 0.5 \mu\text{mol/mol (Span)}$	0,040				
8d	Interferent N ₂ O with 50 nmol/mol	$\leq 0.5 \mu\text{mol/mol (Zero)}$	-0,050	$u_{int,neg}$	0,20	0,04	
		$\leq 0.5 \mu\text{mol/mol (Span)}$	0,030				
9	Averaging effect	$\leq 7.0\%$ of measured value	-2,560	u_{av}	-0,13	0,02	
18	Difference sample/calibration port	$\leq 1.0\%$	0,390	u_{sc}	0,03	0,00	
21	Uncertainty of test gas	$\leq 3.0\%$	2,000	u_{cg}	0,09	0,01	
Combined standard uncertainty				u_c	0,39	$\mu\text{mol/mol}$	
Expanded uncertainty				U	0,77	$\mu\text{mol/mol}$	
Relative expanded uncertainty				W	8,98	%	
Maximum allowed expanded uncertainty				W_{req}	15	%	

Expanded uncertainty laboratory (EN 14626:2024), system 2

Measuring device:		CO12e		Serial-No.:		SN 12 / 1873	
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	0,00	
2	Repeatability standard deviation at 8h-limit value	$\leq 0.4 \mu\text{mol/mol}$	0,050	u_r	0,01	0,00	
3	"lack of fit" at 8h-limit value	$\leq 4.0\%$ of measured value	2,260	u_l	0,11	0,01	
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	$\leq 0.7 \mu\text{mol/mol/kPa}$	0,070	u_{gp}	0,11	0,01	
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/K}$	0,010	u_{gt}	0,03	0,00	
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/K}$	0,035	u_{st}	0,10	0,01	
7	Sensitivity coefficient of electrical voltage at 8h-limit value	$\leq 0.3 \mu\text{mol/mol/V}$	0,010	u_v	0,03	0,00	
8a	Interferent H ₂ O with 21 mmol/mol	$\leq 1.0 \mu\text{mol/mol (Zero)}$	0,220	u_{H_2O}	0,24	0,06	
		$\leq 1.0 \mu\text{mol/mol (Span)}$	0,320				
8b	Interferent CO ₂ with 500 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$	-0,210	$u_{int,pos}$	0,12	0,01	
		$\leq 0.5 \mu\text{mol/mol (Span)}$	-0,090				
8c	Interferent NO with 1 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol (Zero)}$	-0,030	or	0,12	0,01	
		$\leq 0.5 \mu\text{mol/mol (Span)}$	0,000				
8d	Interferent N ₂ O with 50 nmol/mol	$\leq 0.5 \mu\text{mol/mol (Zero)}$	0,050	$u_{int,neg}$	0,12	0,01	
		$\leq 0.5 \mu\text{mol/mol (Span)}$	0,020				
9	Averaging effect	$\leq 7.0\%$ of measured value	-2,610	u_{av}	-0,13	0,02	
18	Difference sample/calibration port	$\leq 1.0\%$	0,220	u_{sc}	0,02	0,00	
21	Uncertainty of test gas	$\leq 3.0\%$	2,000	u_{cg}	0,09	0,01	
Combined standard uncertainty				u_c	0,36	$\mu\text{mol/mol}$	
Expanded uncertainty				U	0,72	$\mu\text{mol/mol}$	
Relative expanded uncertainty				W	8,36	%	
Maximum allowed expanded uncertainty				W_{req}	15	%	

Combined uncertainty, laboratory and field (EN 14626:2024), system 1

Measuring device:		CO12e		Serial-No.:		SN 11 / 1862	
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 $\mu\text{mol/mol}$	0,000	$u_{r,z}$	0,00	0,00	
2	Repeatability standard deviation at 8h-limit value	\leq 0,4 $\mu\text{mol/mol}$	0,030	u_r	not considered, as $u_r = 0 < u_{r,f}$	-	
3	"lack of fit" at 8h-limit value	\leq 4,0% of measured value	2,030	u_f	0,10	0,01	
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	\leq 0,7 $\mu\text{mol/mol/kPa}$	0,070	u_{sp}	0,11	0,01	
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	\leq 0,3 $\mu\text{mol/mol/K}$	0,010	u_{st}	0,03	0,00	
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	\leq 0,3 $\mu\text{mol/mol/K}$	0,021	u_{st}	0,06	0,00	
7	Sensitivity coefficient of electrical voltage at 8h-limit value	\leq 0,3 $\mu\text{mol/mol/V}$	0,000	u_v	0,00	0,00	
8a	Interferent H ₂ O with 21 mmol/mol	\leq 1,0 $\mu\text{mol/mol}$ (Zero) \leq 1,0 $\mu\text{mol/mol}$ (Span)	0,290 0,330	u_{H_2O}	0,25	0,06	
8b	Interferent CO ₂ with 500 $\mu\text{mol/mol}$	\leq 0,5 $\mu\text{mol/mol}$ (Zero) \leq 0,5 $\mu\text{mol/mol}$ (Span)	-0,150 -0,140	$u_{int,pos}$			
8c	Interferent NO with 1 $\mu\text{mol/mol}$	\leq 0,5 $\mu\text{mol/mol}$ (Zero) \leq 0,5 $\mu\text{mol/mol}$ (Span)	-0,060 0,040	or	0,20	0,04	
8d	Interferent N ₂ O with 50 nmol/mol	\leq 0,5 $\mu\text{mol/mol}$ (Zero) \leq 0,5 $\mu\text{mol/mol}$ (Span)	-0,050 0,030	$u_{int,neg}$			
9	Averaging effect	\leq 7,0% of measured value	-2,560	u_{av}	-0,13	0,02	
10	Reproducibility standard deviation under field conditions	\leq 5,0% of average over 3 months	1,790	$u_{r,f}$	0,15	0,02	
11	Long term drift at zero level	\leq 0,5 $\mu\text{mol/mol}$	0,230	$u_{d,l,z}$	0,13	0,02	
12	Long term drift at span level	\leq 5,0% of max. of certification range	0,700	$u_{d,l,sh}$	0,03	0,00	
18	Difference sample/calibration port	\leq 1,0%	0,390	u_{ssc}	0,03	0,00	
21	Uncertainty of test gas	\leq 3,0%	2,000	u_{tg}	0,09	0,01	
Combined standard uncertainty				u_c	0,44	$\mu\text{mol/mol}$	
Expanded uncertainty				U	0,88	$\mu\text{mol/mol}$	
Relative expanded uncertainty				W	10,18	%	
Maximum allowed expanded uncertainty				W_{req}	15	%	

Combined uncertainty, laboratory and field (EN 14626:2024), system 2

Measuring device:		CO12e		Serial-No.:		SN 12 / 1873	
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	0,00	
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	2,260	u_f	0,11	0,01	
4	Sensitivity coefficient of sample gas pressure at 8h-limit value	\leq 0,7 $\mu\text{mol/mol/kPa}$	0,070	u_{sp}	0,11	0,01	
5	Sensitivity coefficient of sample gas temperature at 8h-limit value	\leq 0,3 $\mu\text{mol/mol/K}$	0,010	u_{st}	0,03	0,00	
6	Sensitivity coefficient of surrounding temperature at 8h-limit value	\leq 0,3 $\mu\text{mol/mol/K}$	0,035	u_{st}	0,10	0,01	
7	Sensitivity coefficient of electrical voltage at 8h-limit value	\leq 0,3 $\mu\text{mol/mol/V}$	0,010	u_v	0,03	0,00	
8a	Interferent H ₂ O with 21 mmol/mol	\leq 1,0 $\mu\text{mol/mol}$ (Zero) \leq 1,0 $\mu\text{mol/mol}$ (Span)	0,220 0,320	u_{H_2O}	0,24	0,06	
8b	Interferent CO ₂ with 500 $\mu\text{mol/mol}$	\leq 0,5 $\mu\text{mol/mol}$ (Zero) \leq 0,5 $\mu\text{mol/mol}$ (Span)	-0,210 -0,090	$u_{int,pos}$			
8c	Interferent NO with 1 $\mu\text{mol/mol}$	\leq 0,5 $\mu\text{mol/mol}$ (Zero) \leq 0,5 $\mu\text{mol/mol}$ (Span)	-0,030 0,000	or	0,12	0,01	
8d	Interferent N ₂ O with 50 nmol/mol	\leq 0,5 $\mu\text{mol/mol}$ (Zero) \leq 0,5 $\mu\text{mol/mol}$ (Span)	0,050 0,020	$u_{int,neg}$			
9	Averaging effect	\leq 7,0% of measured value	-2,610	u_{av}	-0,13	0,02	
10	Reproducibility standard deviation under field conditions	\leq 5,0% of average over 3 months	1,790	$u_{r,f}$	0,15	0,02	
11	Long term drift at zero level	\leq 0,5 $\mu\text{mol/mol}$	0,160	$u_{d,l,z}$	0,09	0,01	
12	Long term drift at span level	\leq 5,0% of max. of certification range	0,890	$u_{d,l,sh}$	0,04	0,00	
18	Difference sample/calibration port	\leq 1,0%	0,220	u_{ssc}	0,02	0,00	
21	Uncertainty of test gas	\leq 3,0%	2,000	u_{tg}	0,09	0,01	
Combined standard uncertainty				u_c	0,40	$\mu\text{mol/mol}$	
Expanded uncertainty				U	0,81	$\mu\text{mol/mol}$	
Relative expanded uncertainty				W	9,40	%	
Maximum allowed expanded uncertainty				W_{req}	15	%	