Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000040335_02

AMS designation:	CEMSelect OEM for CO, NO, SO_2, CO_2, NO_2, NO_X and O_2
Manufacturer:	Bühler Technologies GmbH Harkortstraße 29 40880 Ratingen Germany
Test Laboratory:	TÜV Rheinland Energy GmbH

This is to certify that the AMS has been tested and found to comply with the standards EN 15267-1 (2009), EN 15267-2 (2009), EN 15267-3 (2007) and EN 14181 (2014).

Certification is awarded in respect of the conditions stated in this certificate (this certificate contains 31 pages).
The present certificate replaces certificate 0000040335_01 of 30 September 2015.

TÜVRheinland®
ZERTIFIZIERT

Suitability Tested
EN 15267
QAL1 Certified
Regular Surveillance

www.tuv.com
ID 0000040335

Publication in the German Federal Gazette (BAnz) of 24 March 2020

This certificate will expire on:
23 March 2025

German Federal Environment Agency
Dessau, 04 June 2020

Dr. Marcel Langner
Head of Section II 4.1

TÜV Rheinland Energy GmbH
Cologne, 03 June 2020

ppa. Dr Peter Wilbring

www.umwelt-tuv.eu
tre@umwelt-tuv.eu
Phone: + 49 221 806-5200

TÜV Rheinland Energy GmbH
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 certificate D-PL-11120-02-00.

10/221 2.08

Test Report:	936/21247820/A dated 24 September 2019
Initial certification:	05 March 2013
Expiry date:	23 March 2025
Publication:	BAnz AT 24.03.2020 B7, chapter I number 3.2

Approved application
The tested AMS is suitable for use at combustion plants according to Directive 2010/75/EU, chapter III (13th BImSchV), plants in compliance with TA Luft and plants according to the 27th BImSchV. Equipped with the SIPROCESS UV600-7MB2621 module the AMS is additionally suitable for waste incineration plants according to Directive 2010/75/EU, chapter IV (17th BImSchV) for monitoring the components NO, NO_2 and SO_2.Finally, when equipped with the ULTRAMAT 6, ULTRAMAT 6-2K or ULTRAMAT/OXYMAT 6, the AMS is fit for use at plants according to EU Directive 2010/75/EU chapter IV (17th BImSchV) for monitoring components CO, NO and SO_2. The measured ranges have been selected so as to ensure as broad a field of application as possible.

The suitability of the AMS for this application was assessed on the basis of a laboratory test and several field tests at various waste incineration plants.

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 that this AMS is suitable for monitoring the limit values and oxygen concentrations relevant to the application.

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

Basis of the certification
This certification is based on:

- Test report no. 936/21247820/A dated 24 September 2019 issued by 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 24.03.2020 B7, chapter I number 3.2, UBA announcement dated 24 February 2020:

AMS designation:
CEMSelect OEM for CO, NO, SO_2, CO_2, NO_2, NO_X and O_2

Manufacturer:
Bühler Technologies GmbH, Ratingen

Field of application:
Modular measuring system for plants according to the 13th and 27th BImSchV as well as TA Luft

Measuring ranges during performance testing:

Component	Modul Type	Certification range	Additional ranges		Unit	Base of certification
NO_2	SIPROCESS UV600-7MB2621 - Z - Y17	0 - 50	0 - 500	-	mg/m³	3 Month with a weekly adjustment with the calibration cell, otherwise 2 weeks
SO_2	Ultramat 23 / BA 5000-7MB2355 - Z - T13 / T23 / T33	0 - 400	0 - 2000	0 - 7000	mg/m³	12 Month
	Ultramat 23 / BA 5000-7MB2357 - Z - T13 / T23 / T33	0 - 400	0 - 2000	0 - 7000	mg/m³	12 Month
	Ultramat 23 / BA 5000-7MB2358 - Z - T13 / T23	0 - 400	0 - 2000	0 - 7000	mg/m³	6 Month
	SIPROCESS UV600-7MB2621 - Z - Y17	0 - 75	0 - 130	0 - 2000	mg/m³	3 Month with a weekly adjustment with the calibration cell, otherwise 2 weeks
	Ultramat 6 LR - Z + Y27	0 - 75	0 - 1500	-	mg/m³	6 Month
	Ultramat 6-2K LR - Z + Y27 + Y 28	0 - 75	0 - 1500	-	mg/m³	6 Month
	Ultramat/Oxymat 6 LR - Z + Y27 + Y28	0 - 75	0 - 1500	-	mg/m³	6 Month
CO_2	Ultramat 23 / BA 5000-7MB2355 - Z - T13 / T23 / T33	0 - 25	-	-	Vol.-%	12 Month
	Ultramat 23 / BA 5000-7MB2357 - Z - T13 / T23 / T33	0 - 25	-	-	Vol.-%	12 Month
O_2 (paramagnetic)	Ultramat 23 / BA 5000-7MB2355 - Z - T13 / T14	0 - 25	-	-	Vol.-%	12 Month
	Ultramat 23 / BA 5000-7MB2357 - Z - T13 / T14	0 - 25	-	-	Vol.-%	12 Month
	Ultramat 23 / BA 5000-7MB2358 - Z - T13 / T14	0 - 25	-	-	Vol.-%	6 Month
	Oxymat 6 - Z + Y27	0 - 25	0 - 5	-	Vol.-%	6 Month
	Ultramat / Oxymat 6 - Z + Y27 + Y28	0 - 25	0 - 5	-		6 Month
O_2 (electrochemic)	Ultramat 23 / BA 5000-7MB2355 - Z - T23 / T24	0 - 25	0 - 5	-	Vol.-%	12 Month
	Ultramat 23 / BA 5000-7MB2357 - Z - T23 / T24	0 - 25	0 - 5	-	Vol.-%	12 Month
	Ultramat 23 / BA 5000-7MB2358 - Z - T23 / T24	0 - 25	0 - 5	-	Vol.-%	6 Month

Component	Modul Type	Certification range	Additional ranges		Unit	Maintenence Intervall
CO	Ultramat 23 / BA 5000-7MB2355 - Z - T13 / T23 / T33	0 - 200	0 - 1250	-	mg/m³	12 Month
	Ultramat 23 / BA 5000-7MB2357 - Z - T13 /T23 / T33	0 - 200	0 - 1250	-	mg/m³	12 Month
	Ultramat 23 / BA 5000-7MB2358 - Z - T13 / T23	0 - 250	0 - 1250	-	mg/m³	6 Month
	Ultramat 23 / BA 5000-7MB2355 - Z - T14 / T24 / T34	0 - 1250	0 - 6000	-	mg/m³	12 Month
	Ultramat 23 / BA 5000-7MB2357 - Z - T14 / T24 / T34	0 - 1250	0 - 6000	-	mg/m³	12 Month
	Ultramat 6 LR - Z + Y27	0 - 75	0 - 1250	0 - 3000	mg/m³	6 Month
	Ultramat 6-2K LR - Z + Y27 + Y 28	0 - 75	0 - 1250	0 - 3000	mg/m³	6 Month
	Ultramat/Oxymat 6 LR - Z + Y27 + Y28	0 - 75	0 - 1250	0 - 3000	mg/m³	6 Month
	Ultramat 6 HR - Z + Y27	0 - 1000	0 - 10000	-	mg/m³	6 Month
	Ultramat 6-2K HR - Z + Y27 + Y 28	0 - 1000	0 - 10000	-	mg/m³	6 Month
	Ultramat/Oxymat 6 HR - Z + Y27 + Y28	0 - 1000	0 - 10000	-	mg/m³	6 Month
	Ultramat 6-2K LR - HR - Z - Y27 + Y28	0 - 75 [3] 0 - 1000 [4]	0 - 1250 [3] 0 - 10000 [4]	-	mg/m³	6 Month
NOx	Ultramat 23 / BA 5000-7MB2355 - Z - T13 / T23 / T33	0 - 150 [1] 0 - 230 [2]	0 - 750 [1] 0 - 1150 [2]	0 - 2000 [1] 0 - 3067 [2]	mg/m³	12 Month
	Ultramat 23 / BA 5000-7MB2357 - Z - T13 /T23 / T33	0 - 150 [1] 0 - 230 [2]	0 - 400 [1] 0 - 613 [2]	0 - 2000 [1] 0 - 3067 [2]	mg/m³	12 Month
	Ultramat 23 / BA 5000-7MB2358 - Z - T13 / T23	0 - 400 [1] 0 - 613 [2]	0 - 2000 [1] 0 - 3067 [2]	-	mg/m³	6 Month
NO	SIPROCESS UV600-7MB2621 - Z - Y17	0 - 50	0 - 200	0 - 2000	mg/m³	2 Weeks
	Ultramat 23 / BA 5000-7MB2355 - Z - T14 / T24 / T34	0 - 600	0 - 3000	-	mg/m³	12 Month
	Ultramat 23 / BA 5000-7MB2357 - Z - T14 / T24 / T34	0 - 600	0 - 3000	-	mg/m³	12 Month
	Ultramat 6 LR - Z + Y27	0 - 100	0 - 2000	-	mg/m³	6 Month
	Ultramat 6-2K LR - Z + Y27 + Y 28	0 - 100	0 - 2000	-	mg/m³	6 Month
	Ultramat/Oxymat 6 LR - Z + Y27 + Y28	0 - 100	0 - 2000	-	mg/m³	6 Month
	Ultramat 6 HR - Z + Y27	0 - 1000	0 - 10000	-	mg/m³	6 Month
	Ultramat 6-2K HR- Z + Y27 + Y 28	0 - 1000	0 - 10000	-	mg/m³	6 Month
	Ultramat/Oxymat 6 HR - Z + Y27 + Y28	0 - 1000	0 - 10000	-	mg/m³	6 Month
	Ultramat 6-2K LR - HR - Z - Y27 + Y28	0 - 100 [3] 0 - 1000 [4]	0 - 2000 [3] 0 - 10000 [4]	-	mg/m³	6 Month

Software versions:

Software versions:

ULTRAMAT-7MB2355	4.02.04
ULTRAMAT 23-7MB2357	4.02.04
ULTRAMAT 23-7MB2358	4.02.04
ULTRAMAT 6	4.8.6
ULTRAMAT 6-2K	4.8.6
OXYMAT 6	4.8.6
ULTRAMAT / OXYMAT6	4.8.6
SIEMENS SIMATIC	Set CEM CERT 7MB1957 Rev. 1.0

SIPROCESS UV600-7MB2621

BCU:	9150883_3.003
Gas module:	9137582_3.002
UV modules:	9139736_3.005

Restrictions:

1. The ULTRAMAT 23-7MB2358 / BA 5000-7MB2358 module did not meet uncertainty requirement specified for CO in standard EN 15267 during the performance test.
2. When using the ULTRAMAT 23-7MB2355, ULTRAMAT 23-7MB2357 or ULTRAMAT 23-7MB2358 and BA 5000-7MB2355, BA 5000-7MB2357 and BA 5000-7MB2358 modules respectively, the system cabinet must be equipped with an A/C unit.

Notes:

1. Equipped with the SIPROCESS UV600-7MB2621 module, the modular CEMSelect OEM measuring system is additionally suitable for monitoring the components NO, NO_2 and SO_2. Finally, when equipped with the ULTRAMAT 6, ULTRAMAT 6-2K or ULTRAMAT/OXYMAT 6, the AMS is fit for use at plants according to EU Directive 2010/75/EU chapter IV (17th BImSchV) for monitoring components CO, NO and SO_2.
2. For automatic zero adjustments, the modules of the ULTRAMAT 23/BA 5000 series must be operated at a 24h interval. The modules of the ULTRAMAT 6 series must be operated at a one-week interval for automatic zero and span point adjustments.
3. In order to optimise the cross-sensitivity of the CO measurement channel in relation to CO_2, the modules ULTRAMAT 23 / BA 5000-7MB2355, ULTRAMAT 23 / BA 5000-7MB2357 and ULTRAMAT 23 / BA 5000-7MB2358 of the CEMSelect OEM measuring system will be distributed with a modified CO-receptor starting from the production month April 2014. A serial number starting with E4 in the central block will be used for identification purposes.
4. The modules ULTRAMAT 23 / BA 5000-7MB2355, ULTRAMAT 23 / BA 5000-7MB2357 and ULTRAMAT 23 / BA 5000-7MB2358 must be operated with the Thermo-AUTOCAL function.
5. The modular CEMSelect OEM measuring system may alternatively be equipped with a sampling probe (SP2000-H) manufactured by M&C TechGroup Germany GmbH and a sample gas cooler (EGK 2-19) manufactured by Bühler Technologies GmbH.
6. The sample gas cooler (EGK 2-19) manufactured by Bühler Technologies GmbH implemented in the modular CEMSelect OEM measuring system may be equipped with a PVDF or glass cooling element. In any case, a glass cooling element shall be used for the SIPROCESS UV600-7MB2621 module.
7. For determining NO_x, the modular CEMSelect OEM measuring system is equipped with an NO_x-converter, type Gas Konverter CG-2, manufactured by M&C Tech Group Germany GmbH.
8. When adding additional modules to the CEMSelect OEM measuring system, each combination of modules needs to be checked for functionality as part of testing proper installation and the maintenance interval has to be determined.
9. The ULTRAMAT 6, ULTRAMAT 6-2K, ULTRAMAT / OXYMAT 6 and OXYMAT 6 modules need to be operated with weekly AUTO zero and AUTO span adjustments using test gases from pressurised gas bottles.
10. A system cabinet with a degree of protection of IP40 is part of the modular CEMSelect OEM measuring system. The system cabinet can be equipped with an air conditioning unit or a ventilator unit.
11. Supplementary testing (additional measuring modules and gas treatment components, software updates) as regards Federal Environment Agency notice of 13 July 2017 (BAnz AT 31.07.2017 B12, chapter I number 3.2) and of 21 February 2018 (BAnz AT 26.03.2018 B8, chapter V 21st notification).

Test Report:
TÜV Rheinland Energy GmbH, Cologne
Report no.: 936/21247820/A dated 24 September 2019

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

The complete modular CEMSelect OEM measuring system comprises a heated sampling probe, a heated sample gas line, a two-stage sample gas cooler, a delivery pump and a maximum of three multi-component analysers from the ULTRAMAT 6, ULTRAMAT 6 2-K, OXYMAT 6, ULTRAMAT/OXYMAT 6, ULTRAMAT 23 / BA 5000-7MB2355, ULTRAMAT 23 / BA 5000-7MB2357, ULTRAMAT 23 / BA 5000-7MB2358 or SIPROCESS UV600-7MB2621.
A system cabinet with a degree of protection of IP40 is part of the modular CEMSelect OEM measuring system. The system cabinet can be equipped with an air conditioning unit or a ventilator unit.
The modular ULTRAMAT 23 / BA 5000 measuring system uses non-dispersive infrared absorption (NDIR method) to measure CO, NO and SO_2. For measuring oxygen either an electrochemical or a paramagnetic oxygen measuring cell is used. The SIPROCESS UV600 analyser of the modular measuring system uses gas filter correlation (GFC) to measures NO and interference filter correlation (IFC) to measure NO_2 and SO_2.

A sample gas pump with integrated vapour recovery for the purpose of controlling sample gas flows is situated between the first and the second stage of cooling. A fine particle filter for dust separation is integrated in the cooler housing. Downstream of the sample gas cooler, the gas flow is divided into two to three partial flows to simultaneously supply analyser modules arranged in parallel with sample gas. Gas oversupply is led out via a bypass. A condensate filter is placed immediately upstream of each analyser modules which blocks the gas path in the event of moisture coming through in order to protect the analysers. In the ULTRAMAT 23 measuring modules, a (heated) converter is placed upstream of the condensate filter for measuring NO_x. A three-way valve is placed in front of the pump which serves to feed zero gas for automatic zero gas adjustment (AutoCal) and is controlled via the SIMATIC.

A second three-way valve is installed downstream of the pump which, controlled by SIMATIC, is able to time the supply of zero/test gases for automatic adjustments of zero and span points. Test gases may alternatively be fed manually via a third three-way valve.

The modular measuring system consists of the following components:

Measuring cabinet	CEMSelect OEM system cabinet	
Probe	Manufacturer	Bühler Technologies GmbH
	Type	Gas 222.20-Cal-twin incl. ceramic filter
Alternative probe	Manufacturer	M&C TechGroup Germany GmbH
	Type	SP2000-H incl. ceramic filter (length 100 cm), heated to 180 °C
Heated sample gas line	Temperature	180 °C
	Length:	50 m in the field, 10 m in the lab
	Diameter	(inner):4 mm
	Material	PTFE
Compressor cooler	Manufacturer	M&C TechGroup Germany GmbH
	Type	CSS V1-S
Alternative cooler	Manufacturer	Bühler Technologies GmbH
	Type	EGK 2-19, 2 stage, dew point 3 C
Sample gas pump	Manufacturer	Bühler Technologies GmbH
	Type	P2.3:
NO_x converter	Manufacturer	M&C TechGroup Germany GmbH
	Type	Gas Konverter CG-2
Analyser modules	Manufacturer	Siemens AG / Bühler Technologies GmbH
	Type	ULTRAMAT 6 ULTRAMAT 6 2-K OXYMAT 6 ULTRAMAT / OXYMAT 6 ULTRAMAT 23 / BA 5000-7MB2355 ULTRAMAT 23 / BA 5000-7MB2357 ULTRAMAT 23 / BA 5000-7MB2358 SIPROCESS UV600

The current software versions are:

Ult ULTRAMAT 23-7MB2355	4.02.04
ULTRAMAT 23-7MB2357	4.02.04
ULTRAMAT 23-7MB2358	4.02.04
ULTRAMAT 6	4.8.6
ULTRAMAT 6-2K	4.8.6
OXYMAT 6	4.8.6
ULTRAMAT / OXYMAT 6	4.8.6
SIEMENS SIMATIC	Set CEM CERT 7MB1957 Rev. 1.0

SIPROCESS UV600-7MB2621

BCU:	9150883_3.003
Gas module:	9137582_3.002
UV Module:	9139736_3.005

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**.

Document history

Certification of the CEMSelect OEM measuring system is based on the documents listed below and the regular, continuous surveillance of the manufacturer's quality management system:

Initial certification according to EN 15267

Certificate no. 0000040335: 09 September 2014
Expiry date of the certificate: 04 August 2019
test report: 936/21224909/A dated 03 April 2014
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Publication: BAnz AT 05.08.2014 B11, chapter I number 5.2
UBA announcement dated 17 July 2014

Supplementary testing according to EN 15267

Certificate no. 0000040335_01: 30 September 2015
Expiry date of the certificate: 04 August 2019
Test report 936/21224909/B dated 26 March 2015
TÜV Rheinland Energy GmbH, Cologne
Publication: BAnz AT 26.08.2015 B4, chapter I number 3.1
UBA announcement dated 22 July 2015

Notifications in accordance with EN 15267

Statement issued by TÜV Rheinland Energy GmbH dated 13 October 2016
Publication: BAnz AT 15.03.2017 B6, chapter IV correction 1
UBA announcement dated 22 February 2017
(Correction of a mistake in the public announcement)

Supplementary testing according to EN 15267

Statement issued by TÜV Rheinland Energy GmbH dated 7 March 2017
Test Report: 936/21239467/A dated 7 March 2017
Publication: BAnz AT 31.07.2017 B12, chapter I number 3.2
UBA announcement dated 13 July 2017
(Supplementary testing)

Statement issued by TÜV Rheinland Energy GmbH dated 6 October 2017
Test Report: 936/21239467/B dated 5 October 2017
Publication: BAnz AT 02.02.2018 B5, chapter I notification 1
UBA announcement dated 17 January 2018
(Correction of the public announcement)

Statement issued by TÜV Rheinland Energy GmbH dated 8 December 2017
Publication: BAnz AT 26.03.2018 B8, chapter V notification 21
UBA announcement dated 21 February 2018
(software updates)

Certificate no. 0000040335_02: 04 June 2020
Expiry date of the certificate: 23 March 2025
Test report 936/21247820/A dated 24 September 2019
TÜV Rheinland Energy GmbH, Cologne
Publication: BAnz AT 24.03.2020 B7, chapter I number 3.2
UBA announcement dated 24 February 2020

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Bühler Technologies GmbH	
AMS designation		CEMSelcet OEM Ultramat 6	
Serial number of units under test		System 1 / System 3 / System 2 / System 4	
Measuring principle		NDIR	
Test report		936/2127820/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-09-24	
Measured component		CO	
Certification range		0 - 75	mg/m³
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point		0.32	mg/m³
Sum of negative CS at zero point		-0.33	mg/m³
Sum of postive CS at span point		1.00	mg/m³
Sum of negative CS at span point		-0.40	mg/m³
Maximum sum of cross-sensitivities		1.00	mg/m³
Uncertainty of cross-sensitivity	u_i	0.576	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.614	mg/m³	0.377	(mg/m³)²
Lack of fit	u_{lof}	0.229	mg/m³	0.052	(mg/m³)²
Zero drift from field test	$u_{d,z}$	-0.650	mg/m³	0.423	(mg/m³)²
Span drift from field test	$u_{d,s}$	0.606	mg/m³	0.367	(mg/m³)²
Influence of ambient temperature at span	u_t	0.924	mg/m³	0.854	(mg/m³)²
Influence of supply voltage	u_v	0.082	mg/m³	0.007	(mg/m³)²
Cross-sensitivity (interference)	u_i	0.576	mg/m³	0.332	(mg/m³)²
Influence of sample gas flow	u_n	-0.079	mg/m³	0.006	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.606	mg/m³	0.368	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.67	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	3.27	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 50 mg/m³**	**6.5**
Requirement of 2010/75/EU	**U in % of the ELV 50 mg/m³**	**10.0**
Requirement of EN 15267-3	U in % of the ELV 50 mg/m³	7.5

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Bühler Technologies GmbH	
AMS designation		CEMSelect OEM Ultramat 6	
Serial number of units under test		System 1 / System 3 / System 2 / System 4	
Measuring principle		NDIR	
Test report		936/21247820/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-09-24	
Measured component		CO	
Certification range		0 - 1000	mg/m³
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point		0.00	mg/m³
Sum of negative CS at zero point		0.00	mg/m³
Sum of postive CS at span point		8.60	mg/m³
Sum of negative CS at span point		-4.20	mg/m³
Maximum sum of cross-sensitivities		8.60	mg/m³
Uncertainty of cross-sensitivity	u_i	4.965	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	2.042	mg/m³	4.170	(mg/m³)²
Lack of fit	u_{lof}	-1.732	mg/m³	3.000	(mg/m³)²
Zero drift from field test	$u_{d,z}$	3.464	mg/m³	11.999	(mg/m³)²
Span drift from field test	$u_{d,s}$	-13.279	mg/m³	176.332	(mg/m³)²
Influence of ambient temperature at span	u_t	5.700	mg/m³	32.490	(mg/m³)²
Influence of supply voltage	u_v	3.549	mg/m³	12.595	(mg/m³)²
Cross-sensitivity (interference)	u_i	4.965	mg/m³	24.651	(mg/m³)²
Influence of sample gas flow	u_n	0.842	mg/m³	0.709	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	8.083	mg/m³	65.333	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	18.20	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	35.67	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 500 mg/m³**	**7.1**
Requirement of 2010/75/EU	**U in % of the ELV 500 mg/m³**	**10.0**
Requirement of EN 15267-3	U in % of the ELV 500 mg/m³	7.5

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Bühler Technologies GmbH	
AMS designation		CEMSelect OEM Ultramat 23	
Serial number of units under test		System 1 / System 3 / System 2 / System 4	
Measuring principle		NDIR	
Test report		936/2127820/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-09-24	
Measured component		CO	
Certification range		0 - 1250	mg/m³
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point		0.00	mg/m³
Sum of negative CS at zero point		0.00	mg/m³
Sum of postive CS at span point		7.75	mg/m³
Sum of negative CS at span point		-23.38	mg/m³
Maximum sum of cross-sensitivities		-23.38	mg/m³
Uncertainty of cross-sensitivity	u_i	-13.496	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	2.228	mg/m³	4.964	(mg/m³)²
Lack of fit	u_{lof}	3.464	mg/m³	11.999	(mg/m³)²
Zero drift from field test	$u_{d,z}$	3.608	mg/m³	13.018	(mg/m³)²
Span drift from field test	$u_{d,s}$	7.939	mg/m³	63.028	(mg/m³)²
Influence of ambient temperature at span	u_t	8.609	mg/m³	74.115	(mg/m³)²
Influence of supply voltage	u_v	0.688	mg/m³	0.473	(mg/m³)²
Cross-sensitivity (interference)	u_i	-13.496	mg/m³	182.142	(mg/m³)²
Influence of sample gas flow	u_p	0.000	mg/m³	0.000	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	10.104	mg/m³	102.083	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	21.26	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	41.66	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 600 mg/m³**	**6.9**
Requirement of 2010/75/EU	**U in % of the ELV 600 mg/m³**	**10.0**
Requirement of EN 15267-3	U in % of the ELV 600 mg/m³	7.5

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Bühler Technologies GmbH	
AMS designation		CEMSelect OEM Ultramat 6	
Serial number of units under test		System 1 / System 3 / System 2 / System 4	
Measuring principle		NDIR	
Test report		936/2127820/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-09-24	
Measured component		NO	
Certification range		0 - 100	mg/m³
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point		3.06	mg/m³
Sum of negative CS at zero point		0.00	mg/m³
Sum of postive CS at span point		3.20	mg/m³
Sum of negative CS at span point		-0.50	mg/m³
Maximum sum of cross-sensitivities		3.20	mg/m³
Uncertainty of cross-sensitivity	u_i	1.848	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.628	mg/m³	0.394	(mg/m³)²
Lack of fit	u_{lof}	-0.924	mg/m³	0.854	(mg/m³)²
Zero drift from field test	$u_{d,z}$	1.386	mg/m³	1.921	(mg/m³)²
Span drift from field test	$u_{d,s}$	0.751	mg/m³	0.564	(mg/m³)²
Influence of ambient temperature at span	u_t	0.896	mg/m³	0.803	(mg/m³)²
Influence of supply voltage	u_v	0.582	mg/m³	0.339	(mg/m³)²
Cross-sensitivity (interference)	u_i	1.848	mg/m³	3.415	(mg/m³)²
Influence of sample gas flow	u_n	-0.120	mg/m³	0.014	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.808	mg/m³	0.653	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	2.99	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	5.87	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 40 mg/m³**	**14.7**
Requirement of 2010/75/EU	**U in % of the ELV 40 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 40 mg/m³	15.0

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Bühler Technologies GmbH	
AMS designation		CEMSelect OEM Ultramat 6	
Serial number of units under test		System 1 / System 3 / System2 / System 4	
Measuring principle		NDIR	
Test report		936/2127820/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-09-24	
Measured component		NO	
Certification range		0 - 1000	mg/m³
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point		0.00	mg/m³
Sum of negative CS at zero point		0.00	mg/m³
Sum of postive CS at span point		0.00	mg/m³
Sum of negative CS at span point		-33.10	mg/m³
Maximum sum of cross-sensitivities		-33.10	mg/m³
Uncertainty of cross-sensitivity	u_i	-19.110	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	5.941	mg/m³	35.295	(mg/m³)²
Lack of fit	u_{lof}	4.041	mg/m³	16.330	(mg/m³)²
Zero drift from field test	$u_{d,z}$	5.774	mg/m³	33.339	(mg/m³)²
Span drift from field test	$u_{d,s}$	10.970	mg/m³	120.341	(mg/m³)²
Influence of ambient temperature at span	u_t	6.275	mg/m³	39.376	(mg/m³)²
Influence of supply voltage	u_v	1.851	mg/m³	3.426	(mg/m³)²
Cross-sensitivity (interference)	u_i	-19.110	mg/m³	365.192	(mg/m³)²
Influence of sample gas flow	u_n	-0.722	mg/m³	0.521	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	8.083	mg/m³	65.333	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	26.06	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	51.08	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 500 mg/m³**	**10.2**
Requirement of 2010/75/EU	**U in % of the ELV 500 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 500 mg/m³	15.0

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Bühler Technologies GmbH	
AMS designation		CEMSelect OEM Ultramat 23	
Serial number of units under test		System 1 / System 3 / System 2 / System 4	
Measuring principle		NDIR	
Test report		936/2127820/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-09-24	
Measured component		NO	
Certification range		0 - 600	mg/m³
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point		0.00	mg/m³
Sum of negative CS at zero point		0.00	mg/m³
Sum of postive CS at span point		0.00	mg/m³
Sum of negative CS at span point		-17.04	mg/m³
Maximum sum of cross-sensitivities		-17.04	mg/m³
Uncertainty of cross-sensitivity	u_i	-9.838	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	2.338	mg/m³	5.466	(mg/m³)²
Lack of fit	u_{lof}	1.732	mg/m³	3.000	(mg/m³)²
Zero drift from field test	$u_{d,z}$	4.850	mg/m³	23.523	(mg/m³)²
Span drift from field test	$u_{d,s}$	6.582	mg/m³	43.323	(mg/m³)²
Influence of ambient temperature at span	u_t	3.005	mg/m³	9.030	(mg/m³)²
Influence of supply voltage	u_v	1.787	mg/m³	3.193	(mg/m³)²
Cross-sensitivity (interference)	u_i	-9.838	mg/m³	96.786	(mg/m³)²
Influence of sample gas flow	u_n	0.577	mg/m³	0.333	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	4.850	mg/m³	23.520	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	14.43	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	28.28	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 200 mg/m³**	**14.1**
Requirement of 2010/75/EU	**U in % of the ELV 200 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 200 mg/m³	15.0

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Bühler Technologies GmbH	
AMS designation		CEMSelect OEM Ultramat 6	
Serial number of units under test		System 1 / System 3 / System 2 / System 4	
Measuring principle		NDIR	
Test report		936/2127820/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-09-24	
Measured component		SO_2	
Certification range		0 - 75	mg/m³
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point		1.99	mg/m³
Sum of negative CS at zero point		-0.84	mg/m³
Sum of postive CS at span point		1.10	mg/m³
Sum of negative CS at span point		-2.80	mg/m³
Maximum sum of cross-sensitivities		-2.80	mg/m³
Uncertainty of cross-sensitivity	u_i	-1.615	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	1.066	mg/m³	1.136	(mg/m³)²
Lack of fit	u_{lof}	-0.637	mg/m³	0.406	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.953	mg/m³	0.908	(mg/m³)²
Span drift from field test	$u_{d,s}$	0.996	mg/m³	0.992	(mg/m³)²
Influence of ambient temperature at span	u_t	1.277	mg/m³	1.631	(mg/m³)²
Influence of supply voltage	u_v	0.448	mg/m³	0.201	(mg/m³)²
Cross-sensitivity (interference)	u_i	-1.615	mg/m³	2.608	(mg/m³)²
Influence of sample gas flow	u_n	-0.135	mg/m³	0.018	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.606	mg/m³	0.368	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	2.88	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	5.64	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 50 mg/m³**	**11.3**
Requirement of 2010/75/EU	**U in % of the ELV 50 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 50 mg/m³	15.0

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Bühler Technologies GmbH	
AMS designation		CEMSelcet OEM Ultramat 23	
Serial number of units under test		System1 / System 3 / System 2 / System 4	
Measuring principle		NDIR	
Test report		936/2127820/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-09-24	
Measured component		CO_2	
Certification range		0 - 25	Vol.-%
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point		0.00	Vol.-%
Sum of negative CS at zero point		0.00	Vol.-%
Sum of postive CS at span point		0.10	Vol.-%
Sum of negative CS at span point		-0.30	Vol.-%
Maximum sum of cross-sensitivities		-0.30	Vol.-%
Uncertainty of cross-sensitivity	u_i	-0.173	Vol.-%

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.740	Vol.-%	0.548	(Vol.-%)²
Lack of fit	u_{lof}	0.058	Vol.-%	0.003	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	-0.289	Vol.-%	0.084	(Vol.-%)²
Span drift from field test	$u_{d,s}$	-0.260	Vol.-%	0.068	(Vol.-%)²
Influence of ambient temperature at span	u_t	0.289	Vol.-%	0.084	(Vol.-%)²
Influence of supply voltage	u_v	0.062	Vol.-%	0.004	(Vol.-%)²
Cross-sensitivity (interference)	u_i	-0.173	Vol.-%	0.030	(Vol.-%)²
Influence of sample gas flow	u_n	0.000	Vol.-%	0.000	(Vol.-%)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.202	Vol.-%	0.041	(Vol.-%)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.93	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	1.82	Vol.-%

Relative total expanded uncertainty	**U in % of the range 25 Vol.-%**	**7.3**
Requirement of 2010/75/EU	**U in % of the range 25 Vol.-%**	**10.0 ****
Requirement of EN 15267-3	U in % of the range 25 Vol.-%	7.5

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

** EU Directive 2010/75/EU on industrial emissions does not define requirements for this component.
A value of 10.0 % was used instead.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Bühler Technologies GmbH	
AMS designation		CEMSelcet OEM Oxymat 6	
Serial number of units under test		System 1 / System 3 / System 2 / System 4	
Measuring principle		paramagnetic	
Test report		936/2127820/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-09-24	
Measured component		O_2	
Certification range		0 - 25	Vol.-%
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point		0.00	Vol.-%
Sum of negative CS at zero point		0.00	Vol.-%
Sum of postive CS at span point		0.00	Vol.-%
Sum of negative CS at span point		0.00	Vol.-%
Maximum sum of cross-sensitivities		0.00	Vol.-%
Uncertainty of cross-sensitivity	u_i	0.000	Vol.-%

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.083	Vol.-%	0.007	(Vol.-%)²
Lack of fit	u_{lof}	-0.012	Vol.-%	0.000	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	-0.035	Vol.-%	0.001	(Vol.-%)²
Span drift from field test	$u_{d,s}$	-0.069	Vol.-%	0.005	(Vol.-%)²
Influence of ambient temperature at span	u_t	0.081	Vol.-%	0.007	(Vol.-%)²
Influence of supply voltage	u_v	0.055	Vol.-%	0.003	(Vol.-%)²
Cross-sensitivity (interference)	u_i	0.000	Vol.-%	0.000	(Vol.-%)²
Influence of sample gas flow	u_n	0.006	Vol.-%	0.000	(Vol.-%)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.202	Vol.-%	0.041	(Vol.-%)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.25	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.49	Vol.-%

Relative total expanded uncertainty	**U in % of the range 25 Vol.-%**	**2.0**
Requirement of 2010/75/EU	**U in % of the range 25 Vol.-%**	**10.0 ****
Requirement of EN 15267-3	U in % of the range 25 Vol.-%	7.5

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

** EU Directive 2010/75/EU on industrial emissions does not define requirements for this component.
A value of 10.0 % was used instead.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Bühler Technologies GmbH	
AMS designation		CEMSelect OEM Ultramat 23	
Serial number of units under test		System 1 / System 3 / System 2 / System 4	
Measuring principle		electrochemical	
Test report		936/2127820/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-09-24	
Measured component		O_2	
Certification range		0 - 25	Vol.-%
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point		0.00	Vol.-%
Sum of negative CS at zero point		0.00	Vol.-%
Sum of postive CS at span point		0.00	Vol.-%
Sum of negative CS at span point		0.00	Vol.-%
Maximum sum of cross-sensitivities		0.00	Vol.-%
Uncertainty of cross-sensitivity	u_i	0.000	Vol.-%

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Repeatability standard deviation at set point *	u_r	0.050	Vol.-%	0.003	(Vol.-%)²
Lack of fit	u_{lof}	0.058	Vol.-%	0.003	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	-0.052	Vol.-%	0.003	(Vol.-%)²
Span drift from field test	$u_{d,s}$	0.081	Vol.-%	0.007	(Vol.-%)²
Influence of ambient temperature at span	u_t	0.116	Vol.-%	0.013	(Vol.-%)²
Influence of supply voltage	u_v	0.055	Vol.-%	0.003	(Vol.-%)²
Cross-sensitivity (interference)	u_i	0.000	Vol.-%	0.000	(Vol.-%)²
Influence of sample gas flow	u_n	0.006	Vol.-%	0.000	(Vol.-%)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.202	Vol.-%	0.041	(Vol.-%)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.27	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.53	Vol.-%

Relative total expanded uncertainty	**U in % of the range 25 Vol.-%**	**2.1**
Requirement of 2010/75/EU	**U in % of the range 25 Vol.-%**	**10.0 ****
Requirement of EN 15267-3	U in % of the range 25 Vol.-%	7.5

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

** EU Directive 2010/75/EU on industrial emissions does not define requirements for this component.
A value of 10.0 % was used instead.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Bühler Technologies GmbH	
AMS designation		CEMSelcet OEM	
Serial number of units under test		TÜV 1 / TÜV 2	
Measuring principle		NDIR	
Test report		936/2127820/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-09-24	
Measured component		CO	
Certification range		0 - 200	mg/m³
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point		0.00	mg/m³
Sum of negative CS at zero point		0.00	mg/m³
Sum of postive CS at span point		0.00	mg/m³
Sum of negative CS at span point		0.00	mg/m³
Maximum sum of cross-sensitivities		0.00	mg/m³
Uncertainty of cross-sensitivity	u_i	1.998	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.588	mg/m³	0.346	(mg/m³)²
Lack of fit	u_{lof}	-0.924	mg/m³	0.854	(mg/m³)²
Zero drift from field test	$u_{d,z}$	1.848	mg/m³	3.415	(mg/m³)²
Span drift from field test	$u_{d,s}$	-1.732	mg/m³	3.000	(mg/m³)²
Influence of ambient temperature at span	u_t	0.493	mg/m³	0.243	(mg/m³)²
Influence of supply voltage	u_v	0.484	mg/m³	0.234	(mg/m³)²
Cross-sensitivity (interference)	u_i	1.998	mg/m³	3.992	(mg/m³)²
Influence of sample gas flow	u_n	-0.107	mg/m³	0.011	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	1.617	mg/m³	2.613	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	3.84	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	7.52	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 100 mg/m³**	**7.5**
Requirement of 2010/75/EU	**U in % of the ELV 100 mg/m³**	**10.0**
Requirement of EN 15267-3	U in % of the ELV 100 mg/m³	7.5

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Test results from the test performed by TÜV Rheinland Energy GmbH and TÜV Süd Industrie Service GmbH account for the data of the uncertainty calculation.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Bühler Technologies GmbH	
AMS designation		CEMSelect OEM Ultramat 23	
Serial number of units under test		TÜV 1 / TÜV 2	
Measuring principle		NDIR	
Test report		936/2127820/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-09-24	
Measured component		CO	
Certification range		0 - 250	mg/m³
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point		0.00	mg/m³
Sum of negative CS at zero point		0.00	mg/m³
Sum of postive CS at span point		0.00	mg/m³
Sum of negative CS at span point		0.00	mg/m³
Maximum sum of cross-sensitivities		0.00	mg/m³
Uncertainty of cross-sensitivity	u_i	2.165	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	1.656	mg/m³	2.742	(mg/m³)²
Lack of fit	u_{lof}	-1.155	mg/m³	1.334	(mg/m³)²
Zero drift from field test	$u_{d,z}$	1.443	mg/m³	2.082	(mg/m³)²
Span drift from field test	$u_{d,s}$	1.443	mg/m³	2.082	(mg/m³)²
Influence of ambient temperature at span	u_t	1.277	mg/m³	1.631	(mg/m³)²
Influence of supply voltage	u_v	1.392	mg/m³	1.938	(mg/m³)²
Cross-sensitivity (interference)	u_i	2.165	mg/m³	4.687	(mg/m³)²
Influence of sample gas flow	u_p	-0.217	mg/m³	0.047	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	2.021	mg/m³	4.083	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	4.54	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	8.90	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 100 mg/m³**	**8.9**
Requirement of 2010/75/EU	**U in % of the ELV 100 mg/m³**	**10.0**
Requirement of EN 15267-3	U in % of the ELV 100 mg/m³	7.5

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Test results from the test performed by TÜV Rheinland Energy GmbH and TÜV Süd Industrie Service GmbH account for the data of the uncertainty calculation.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Bühler Technologies GmbH	
AMS designation		CEMSelcet OEM Ultramat 23	
Serial number of units under test		TÜV 3 / TÜV 4	
Measuring principle		NDIR	
Test report		936/2127820/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-09-24	
Measured component		CO	
Certification range		0 - 250	mg/m³
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point		0.00	mg/m³
Sum of negative CS at zero point		0.00	mg/m³
Sum of postive CS at span point		0.00	mg/m³
Sum of negative CS at span point		0.00	mg/m³
Maximum sum of cross-sensitivities		0.00	mg/m³
Uncertainty of cross-sensitivity	u_i	2.165	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	1.656	mg/m³	2.742	(mg/m³)²
Lack of fit	u_{lof}	-1.155	mg/m³	1.334	(mg/m³)²
Zero drift from field test	$u_{d,z}$	1.443	mg/m³	2.082	(mg/m³)²
Span drift from field test	$u_{d,s}$	1.443	mg/m³	2.082	(mg/m³)²
Influence of ambient temperature at span	u_t	1.277	mg/m³	1.631	(mg/m³)²
Influence of supply voltage	u_v	1.568	mg/m³	2.459	(mg/m³)²
Cross-sensitivity (interference)	u_i	2.165	mg/m³	4.687	(mg/m³)²
Influence of sample gas flow	u_p	-0.303	mg/m³	0.092	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	2.021	mg/m³	4.083	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	4.60	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	9.02	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 100 mg/m³**	**9.0**
Requirement of 2010/75/EU	**U in % of the ELV 100 mg/m³**	**10.0**
Requirement of EN 15267-3	U in % of the ELV 100 mg/m³	7.5

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Test results from the test performed by TÜV Rheinland Energy GmbH and TÜV Süd Industrie Service GmbH account for the data of the uncertainty calculation.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Bühler Technologies GmbH	
AMS designation		CEMSelcet OEM Ultramat 23	
Serial number of units under test		TÜV 1 / TÜV 2	
Measuring principle		NDIR	
Test report		936/2127820/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-09-24	
Measured component		NO	
Certification range		0 - 150	mg/m³
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Uncertainty of cross-sensitivity	u_i	-3.464	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.619	mg/m³	0.383	(mg/m³)²
Lack of fit	u_{lof}	0.753	mg/m³	0.567	(mg/m³)²
Zero drift from field test	$u_{d,z}$	-1.212	mg/m³	1.469	(mg/m³)²
Span drift from field test	$u_{d,s}$	2.252	mg/m³	5.072	(mg/m³)²
Influence of ambient temperature at span	u_t	0.833	mg/m³	0.694	(mg/m³)²
Influence of supply voltage	u_v	1.108	mg/m³	1.228	(mg/m³)²
Cross-sensitivity (interference)	u_i	-3.464	mg/m³	11.999	(mg/m³)²
Influence of sample gas flow	u_n	0.381	mg/m³	0.145	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	1.212	mg/m³	1.470	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	4.80	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	9.41	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 65.2 mg/m³**	**14.4**
Requirement of 2010/75/EU	**U in % of the ELV 65.2 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 65.2 mg/m³	15.0

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Test results from the test performed by TÜV Rheinland Energy GmbH and TÜV Süd Industrie Service GmbH account for the data of the uncertainty calculation.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system					
Manufacturer			Bühler Technologies GmbH		
AMS designation			CEMSelect OEM Ultramat 23		
Serial number of units under test			TÜV 1 / TÜV 2		
Measuring principle			NDIR		
Test report			936/2127820/A		
Test laboratory			TÜV Rheinland		
Date of report			2019-09-24		
Measured component			NO		
Certification range			0 - 400	mg/m³	
Evaluation of the cross-sensitivity (CS)					
(system with largest CS)					
Uncertainty of cross-sensitivity	u_i		-6.928	mg/m³	

Calculation of the combined standard uncertainty

Tested parameter				u²	
Standard deviation from paired measurements under field conditions *	u_D	1.750	mg/m³	3.063	(mg/m³)²
Lack of fit	u_{lof}	-1.155	mg/m³	1.334	(mg/m³)²
Zero drift from field test	$u_{d,z}$	3.233	mg/m³	10.452	(mg/m³)²
Span drift from field test	$u_{d,s}$	3.695	mg/m³	13.653	(mg/m³)²
Influence of ambient temperature at span	u_t	2.177	mg/m³	4.739	(mg/m³)²
Influence of supply voltage	u_v	1.688	mg/m³	2.849	(mg/m³)²
Cross-sensitivity (interference)	u_i	-6.928	mg/m³	47.997	(mg/m³)²
Influence of sample gas flow	u_n	0.277	mg/m³	0.077	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	3.233	mg/m³	10.453	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	9.73	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	19.07	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 130.4 mg/m³**	**14.6**
Requirement of 2010/75/EU	**U in % of the ELV 130.4 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 130.4 mg/m³	15.0

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Test results from the test performed by TÜV Rheinland Energy GmbH and TÜV Süd Industrie Service GmbH account for the data of the uncertainty calculation.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Bühler Technologies GmbH	
AMS designation		CEMSelect OEM Ultramat 23	
Serial number of units under test		TÜV 1 / TÜV 2	
Measuring principle		NDIR	
Test report		936/2127820/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-09-24	
Measured component		NO	
Certification range		0 - 400	mg/m³
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Uncertainty of cross-sensitivity	u_i	-6.928	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	1.750	mg/m³	3.063	(mg/m³)²
Lack of fit	u_{lof}	-1.155	mg/m³	1.334	(mg/m³)²
Zero drift from field test	$u_{d,z}$	3.233	mg/m³	10.452	(mg/m³)²
Span drift from field test	$u_{d,s}$	3.695	mg/m³	13.653	(mg/m³)²
Influence of ambient temperature at span	u_t	2.117	mg/m³	4.482	(mg/m³)²
Influence of supply voltage	u_v	2.824	mg/m³	7.975	(mg/m³)²
Cross-sensitivity (interference)	u_i	-6.928	mg/m³	47.997	(mg/m³)²
Influence of sample gas flow	u_n	0.531	mg/m³	0.282	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	3.233	mg/m³	10.453	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	9.98	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	19.57	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 130.4 mg/m³**	**15.0**
Requirement of 2010/75/EU	**U in % of the ELV 130.4 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 130.4 mg/m³	15.0

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Test results from the test performed by TÜV Rheinland Energy GmbH and TÜV Süd Industrie Service GmbH account for the data of the uncertainty calculation.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system					
Manufacturer			Bühler Technologies GmbH		
AMS designation			CEMSelcet OEM SIPROCESS UV 600		
Serial number of units under test			TÜV 1 / TÜV 2		
Measuring principle			UV-RAS		
Test report			936/2127820/A		
Test laboratory			TÜV Rheinland		
Date of report			2019-09-24		
Measured component			NO		
Certification range			0 - 50	mg/m³	
Evaluation of the cross-sensitivity (CS)					
(system with largest CS)					
Uncertainty of cross-sensitivity	u_i		0.967	mg/m³	

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.350	mg/m³	0.123	(mg/m³)²
Lack of fit	u_{lof}	-0.289	mg/m³	0.084	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.866	mg/m³	0.750	(mg/m³)²
Span drift from field test	$u_{d,s}$	-0.693	mg/m³	0.480	(mg/m³)²
Influence of ambient temperature at span	u_t	0.624	mg/m³	0.389	(mg/m³)²
Influence of supply voltage	u_v	0.096	mg/m³	0.009	(mg/m³)²
Cross-sensitivity (interference)	u_i	0.967	mg/m³	0.935	(mg/m³)²
Influence of sample gas flow	u_p	-0.136	mg/m³	0.018	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.404	mg/m³	0.163	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.72	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	3.37	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 32.6 mg/m³**	**10.3**
Requirement of 2010/75/EU	**U in % of the ELV 32.6 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 32.6 mg/m³	15.0

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Test results from the test performed by TÜV Rheinland Energy GmbH and TÜV Süd Industrie Service GmbH account for the data of the uncertainty calculation.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system					
Manufacturer			Bühler Technologies GmbH		
AMS designation			CEMSelect OEM Ultramat 23		
Serial number of units under test			TÜV 1 / TÜV 2		
Measuring principle			NDIR		
Test report			936/2127820/A		
Test laboratory			TÜV Rheinland		
Date of report			2019-09-24		
Measured component			SO_2		
Certification range			0 - 400	mg/m³	
Evaluation of the cross-sensitivity (CS)					
(system with largest CS)					
Uncertainty of cross-sensitivity	u_i		-6.928	mg/m³	

Calculation of the combined standard uncertainty

Tested parameter				u²	
Standard deviation from paired measurements under field conditions *	u_D	2.475	mg/m³	6.126	(mg/m³)²
Lack of fit	u_{lof}	-2.309	mg/m³	5.331	(mg/m³)²
Zero drift from field test	$u_{d,z}$	6.235	mg/m³	38.875	(mg/m³)²
Span drift from field test	$u_{d,s}$	4.850	mg/m³	23.523	(mg/m³)²
Influence of ambient temperature at span	u_t	4.414	mg/m³	19.483	(mg/m³)²
Influence of supply voltage	u_v	2.217	mg/m³	4.915	(mg/m³)²
Cross-sensitivity (interference)	u_i	-6.928	mg/m³	47.997	(mg/m³)²
Influence of sample gas flow	u_n	-2.215	mg/m³	4.906	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	3.233	mg/m³	10.453	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	12.71	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	24.92	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 200 mg/m³**	**12.5**
Requirement of 2010/75/EU	**U in % of the ELV 200 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 200 mg/m³	15.0

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Test results from the test performed by TÜV Rheinland Energy GmbH and TÜV Süd Industrie Service GmbH account for the data of the uncertainty calculation.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system					
Manufacturer			Bühler Technologies GmbH		
AMS designation			CEMSelect OEM Ultramat 23		
Serial number of units under test			TÜV 3 / TÜV 4		
Measuring principle			NDIR		
Test report			936/2127820/A		
Test laboratory			TÜV Rheinland		
Date of report			2019-09-24		
Measured component			SO_2		
Certification range			0 - 400	mg/m³	
Evaluation of the cross-sensitivity (CS)					
(system with largest CS)					
Uncertainty of cross-sensitivity	u_i		-6.928	mg/m³	

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	2.475	mg/m³	6.126	(mg/m³)²
Lack of fit	u_{lof}	-2.309	mg/m³	5.331	(mg/m³)²
Zero drift from field test	$u_{d,z}$	6.235	mg/m³	38.875	(mg/m³)²
Span drift from field test	$u_{d,s}$	4.850	mg/m³	23.523	(mg/m³)²
Influence of ambient temperature at span	u_t	4.414	mg/m³	19.483	(mg/m³)²
Influence of supply voltage	u_v	2.564	mg/m³	6.574	(mg/m³)²
Cross-sensitivity (interference)	u_i	-6.928	mg/m³	47.997	(mg/m³)²
Influence of sample gas flow	u_p	-2.215	mg/m³	4.906	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	3.233	mg/m³	10.453	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	12.78	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	25.04	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 200 mg/m³**	**12.5**
Requirement of 2010/75/EU	**U in % of the ELV 200 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 200 mg/m³	15.0

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Test results from the test performed by TÜV Rheinland Energy GmbH and TÜV Süd Industrie Service GmbH account for the data of the uncertainty calculation.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system					
Manufacturer			Bühler Technologies GmbH		
AMS designation			CEMSelect OEM SIPROCESS UV 600		
Serial number of units under test			TÜV 1 / TÜV 2		
Measuring principle			UV-RAS		
Test report			936/2127820/A		
Test laboratory			TÜV Rheinland		
Date of report			2019-09-24		
Measured component			SO_2		
Certification range			0 - 75	mg/m³	
Evaluation of the cross-sensitivity (CS)					
(system with largest CS)					
Uncertainty of cross-sensitivity	u_i		1.589	mg/m³	

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.586	mg/m³	0.343	(mg/m³)²
Lack of fit	u_{lof}	0.403	mg/m³	0.162	(mg/m³)²
Zero drift from field test	$u_{d,z}$	-1.212	mg/m³	1.469	(mg/m³)²
Span drift from field test	$u_{d,s}$	-1.256	mg/m³	1.578	(mg/m³)²
Influence of ambient temperature at span	u_t	0.872	mg/m³	0.760	(mg/m³)²
Influence of supply voltage	u_v	0.179	mg/m³	0.032	(mg/m³)²
Cross-sensitivity (interference)	u_i	1.589	mg/m³	2.525	(mg/m³)²
Influence of sample gas flow	u_p	-0.264	mg/m³	0.070	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.606	mg/m³	0.368	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	2.70	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	5.30	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 50 mg/m³**	**10.6**
Requirement of 2010/75/EU	**U in % of the ELV 50 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 50 mg/m³	15.0

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Test results from the test performed by TÜV Rheinland Energy GmbH and TÜV Süd Industrie Service GmbH account for the data of the uncertainty calculation.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system					
Manufacturer			Bühler Technologies GmbH		
AMS designation			CEMSelect OEM SIPROCESS UV 600		
Serial number of units under test			TÜV 1 / TÜV 2		
Measuring principle			UV-RAS		
Test report			936/2127820/A		
Test laboratory			TÜV Rheinland		
Date of report			2019-09-24		
Measured component			NO_2		
Certification range			0 - 50	mg/m³	
Evaluation of the cross-sensitivity (CS)					
(system with largest CS)					
Uncertainty of cross-sensitivity	u_i		1,065	mg/m³	

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0,372	mg/m³	0,138	(mg/m³)²
Lack of fit	u_{lof}	0,231	mg/m³	0,053	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0,606	mg/m³	0,367	(mg/m³)²
Span drift from field test	$u_{d,s}$	-0,808	mg/m³	0,653	(mg/m³)²
Influence of ambient temperature at span	u_t	0,643	mg/m³	0,413	(mg/m³)²
Influence of supply voltage	u_v	0,200	mg/m³	0,040	(mg/m³)²
Cross-sensitivity (interference)	u_i	1,065	mg/m³	1,134	(mg/m³)²
Influence of sample gas flow	u_n	-0,075	mg/m³	0,006	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0,404	mg/m³	0,163	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1,72	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	3,38	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 50 mg/m³**	**6,8**
Requirement of 2010/75/EU	**U in % of the ELV 50 mg/m³**	**20,0**
Requirement of EN 15267-3	U in % of the ELV 50 mg/m³	15,0

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

Test results from the test performed by TÜV Rheinland Energy GmbH and TÜV Süd Industrie Service GmbH account for the data of the uncertainty calculation.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Bühler Technologies GmbH	
AMS designation		CEMSelect OEM	
Serial number of units under test		TÜV 1 / TÜV 2	
Measuring principle		electrochemical	
Test report		936/2127820/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-09-24	
Measured component		O_2	
Certification range		0 - 25	Vol.-%
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Uncertainty of cross-sensitivity	u_i	0.167	Vol.-%

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.056	Vol.-%	0.003	(Vol.-%)²
Lack of fit	u_{lof}	0.058	Vol.-%	0.003	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	0.167	Vol.-%	0.028	(Vol.-%)²
Span drift from field test	$u_{d,s}$	0.098	Vol.-%	0.010	(Vol.-%)²
Influence of ambient temperature at span	u_t	0.040	Vol.-%	0.002	(Vol.-%)²
Influence of supply voltage	u_v	0.009	Vol.-%	0.000	(Vol.-%)²
Cross-sensitivity (interference)	u_i	0.167	Vol.-%	0.028	(Vol.-%)²
Influence of sample gas flow	u_n	-0.029	Vol.-%	0.001	(Vol.-%)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.202	Vol.-%	0.041	(Vol.-%)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.34	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.67	Vol.-%

Relative total expanded uncertainty	**U in % of the range 25 Vol.-%**	**2.7**
Requirement of 2010/75/EU	**U in % of the range 25 Vol.-%**	**25.0 ****
Requirement of EN 15267-3	U in % of the range 25 Vol.-%	7.5

During performance testing, the tests were carried out with the Siemens Set CEM CERT 7MB1957 measuring system.

** The EU-directive 2010/75/EU on industrial emissions provides no requirements for this component.
A value of 25.0 % was used for this.
Test results from the test performed by TÜV Rheinland Energy GmbH and TÜV Süd Industrie Service GmbH account for the data of the uncertainty calculation.