Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000053810_09

AMS designation:	Set CEM CERT 7MB1957 for CO, NO, SO_2, CO_2, NO_2, NO_X and O_2
Manufacturer:	Siemens AG Östliche Rheinbrückenstraße 50 76187 Karlsruhe Germany
Test Laboratory:	TÜV Rheinland Energy GmbH

This is to certify that the AMS has been tested and certified according to the standards
EN 15267-1 (2009), EN 15267-2 (2009), EN 15267-3 (2008) and EN 14181 (2004).

Certification is awarded in respect of the conditions stated in this certificate (this certificate contains 34 pages).
The present certificate replaces certificate 0000053810_08 of 25 April 2017.

TÜVRheinland®
ZERTIFIZIERT

Performance tested
EN 15267
QAL1 certified
Continuous surveillance

www.tuv.com
ID 0000053810

Publication in the Federal Gazette (BAnz) of 31 July 2017

German Federal Environment Agency
Dessau, 08 September 2017

Dr. Marcel Langner
Head of Section II 4.1

This certificate will expire on:
04 March 2018

TÜV Rheinland Energy GmbH
Cologne, 07 September 2017

ppa. Dr. Peter Wilbring

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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 the certificate D-PL-11120-02-00.

Test Report:	936/21230405/C dated 22 December 2016
Initial certification:	05 March 2013
Expiry date:	04 March 2018
Publication:	BAnz AT 31.07.2017 B12, chapter I number 3.1

Tested 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 SIRPROCESS 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. The measured ranges have been selected so as to cater for 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 incinerators.

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 performance 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 installation at which it will be installed.

Basis of the certification
This certification is based on:

- Test report 936/21230405/C dated 22 December 2016 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 31.07.2017 B12, chapter I number 3.1
UBA announcement dated 13 July 2017:

AMS designation:

Set CEM CERT 7MB1957 for CO, NO, SO_2, CO_2, NO_2, NO_x and O_2

Manufacturer:

Siemens AG, Karlsruhe

Field of application:

Modular measuring system for plants according to the 13th and 27th BImSchV and for plants according to the TI Air

Measuring ranges during performance testing and maintenance interval determined:

Component	Module version:	Certification range	Supplementary ranges		Unit	Maintenance interval
CO	Ultramat 23-7MB2355 - Z - T13 / T23 / T33	0 - 200	0 - 1250	-	mg/m³	12 months
	Ultramat 23-7MB2357 - Z - T13 /T23 / T33	0 - 200	0 - 1250	-	mg/m³	12 months
	Ultramat 23-7MB2358 - Z - T13 / T23	0 - 250	0 - 1250	-	mg/m³	6 months
	Ultramat 23-7MB2355 - Z - T14 / T24 / T34	0 - 1250	0 - 6000	-	mg/m³	12 months
	Ultramat 23-7MB2357 - Z - T14 / T24 / T34	0 - 1250	0 - 6000	-	mg/m³	12 months
	Ultramat 6 LR - Z + Y27	0 - 75	0 - 1250	0 - 3000	mg/m³	6 months
	Ultramat 6-2K LR - Z + Y27 + Y 28	0 - 75	0 - 1250	0 - 3000	mg/m³	6 months
	Ultramat/Oxymat 6 LR - Z + Y27 + Y28	0 - 75	0 - 1250	0 - 3000	mg/m³	6 months
	Ultramat 6 HR - Z + Y27	0 - 1000	0 - 10000	-	mg/m³	6 months
	Ultramat 6-2K HR- Z + Y27 + Y 28	0 - 1000	0 - 10000	-	mg/m³	6 months
	Ultramat/Oxymat 6 HR - Z + Y27 + Y28	0 - 1000	0 - 10000	-	mg/m³	6 months
	Ultramat 6-2K LR - HR - Z - Y27 + Y28	0 - 75 [3] 0 - 1000 [4]	0 - 1250 [3] 0 - 10000 [4]	-	mg/m³	6 months
NO_x	Ultramat 23-7MB2355 - 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 months
	Ultramat 23-7MB2357 - 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 months
	Ultramat 23-7MB2358 - Z - T13 / T23	0 - 400 [1] 0 - 613 [2]	0 - 2000 [1] 0 - 3067 [2]	-	mg/m³	6 months

Component	Module version	Certification range	Supplementary ranges		Unit	Maintenance interval
NO	SIPROCESS UV600-7MB2621 - Z - Y17	0 - 50	0 - 200	0 - 2000	mg/m³	2 weeks
	Ultramat 23-7MB2355 - Z - T14 / T24 / T34	0 - 600	0 - 3000	-	mg/m³	12 months
	Ultramat 23-7MB2357 - Z - T14 / T24 / T34	0 - 600	0 - 3000	-	mg/m³	12 months
	Ultramat 6 LR - Z + Y27	0 - 100	0 - 2000	-	mg/m³	6 months
	Ultramat 6-2K LR - Z + Y27 + Y 28	0 - 100	0 - 2000	-	mg/m³	6 months
	Ultramat/Oxymat 6 LR - Z + Y27 + Y28	0 - 100	0 - 2000	-	mg/m³	6 months
	Ultramat 6 HR - Z + Y27	0 - 1000	0 - 10000	-	mg/m³	6 months
	Ultramat 6-2K HR- Z + Y27 + Y 28	0 - 1000	0 - 10000	-	mg/m³	6 months
	Ultramat/Oxymat 6 HR - Z + Y27 + Y28	0 - 1000	0 - 10000	-	mg/m³	6 months
	Ultramat 6-2K LR - HR - Z - Y27 + Y28	0 - 100 [3] 0 - 1000 [4]	0 - 2000 [3] 0 - 10000 [4]	-	mg/m³	6 months
NO_2	SIPROCESS UV600-7MB2621 - Z - Y17	0 - 50	0 - 500	-	mg/m³	3 months provided that an adjustment with a calibration cell takes place weekly, else 2 weeks
SO_2	Ultramat 23-7MB2355 - Z - T13 / T23 / T33	0 - 400	0 - 2000	0 - 7000	mg/m³	12 months
	Ultramat 23-7MB2357 - Z - T13 / T23 / T33	0 - 400	0 - 2000	0 - 7000	mg/m³	12 months
	Ultramat 23-7MB2358 - Z - T13 / T23	0 - 400	0 - 2000	0 - 7000	mg/m³	6 months
	SIPROCESS UV600-7MB2621 - Z - Y17	0 - 75	0 - 130	0 - 2000	mg/m³	6 months provided that an adjustment with a calibration cell takes place weekly, else 2 weeks
	Ultramat 6 LR - Z + Y27	0 - 75	0 - 1500	-	mg/m³	6 months
	Ultramat 6-2K LR - Z + Y27 + Y 28	0 - 75	0 - 1500	-	mg/m³	6 months
	Ultramat/Oxymat 6 LR - Z + Y27 + Y28	0 - 75	0 - 1500	-	mg/m³	6 months

Component	Module version	Certification range	Supplementary ranges		Unit	Maintenance interval
CO_2	Ultramat 23-7MB2355 - Z - T13 / T23 / T33	0 - 25	-	-	Vol.-%	12 months
	Ultramat 23-7MB2357 - Z - T13 / T23 / T33	0 - 25	-	-	Vol.-%	12 months
O_2,paramag-netic	Ultramat 23-7MB2355 - Z - T13 / T14	0 - 25	-	-	Vol.-%	12 months
	Ultramat 23-7MB2357 - Z - T13 / T14	0 - 25	-	-	Vol.-%	12 months
	Ultramat 23-7MB2358 - Z - T13 / T14	0 - 25	-	-	Vol.-%	6 months
	Oxymat 6 - Z + Y27	0 - 25	0 - 5	-	Vol.-%	6 months
	Ultramat / Oxymat 6 - Z + Y27 + Y28	0 - 25	0 - 5	-	Vol.-%	6 months
O_2, electro-chemical	Ultramat 23-7MB2355 - Z - T23 / T24	0 - 25	0 - 5	-	Vol.-%	12 months
	Ultramat 23-7MB2357 - Z - T23 / T24	0 - 25	0 - 5	-	Vol.-%	12 months
	Ultramat 23-7MB2358 - Z - T23 / T24	0 - 25	0 - 5	-	Vol.-%	6 months

[1] expressed as NO
[2] expressed as NO_2
[3] low measuring range
[4] large measuring range

Software versions:

Ultramat 23-7MB2355	3.00.07
Ultramat 23-7MB2357	3.00.07
Ultramat 23-7MB2358	3.00.07
Ultramat 6	4.8.5
Ultramat 6-2K	4.8.5
Oxymat 6	4.8.5
Ultramat / Oxymat 6	4.8.5
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

Restrictions:

1. For the component CO, the Ultramat 23-7MB2358 measuring system does not meet the requirements for measurement uncertainty stipulated in EN 15267.
2. For use with the Ultramat 23-7MB2355, Ultramat 23-7MB2357 and Ultramat 23-7MB2358, the system cabinet needs to be equipped with an air conditioning unit.

Notes:

1. The modular Set CEM CERT 7MB1957 measuring system monitors components NO, NO_2 and SO_2 when equipped with the SIPROCESS UV600-7MB2621 or the components CO, NO and SO_2 at plants in the scope 17th BImSchV when equipped with the Ultramat 6, Ultramat 6-2K, Ultramat/Oxymat 6 module.
2. Modules of the Ultramat 23 series need to be operated with a 24 h interval for automatic zero point adjustments. Modules of the Ultramat 6 series need to be operated with a one-week interval for automatic zero and span point adjustments.
3. For improved cross-sensitivity to CO_2 at the CO measurement channel, the Ultramat 23-7MB2355, Ultramat 23-7MB2357 and Ultramat 23-7MB2358 modules of the Set CEM CERT 7MB1957 series have been sold with a modified CO receiver since April 2014 which is clearly marked by serial number E4 and onwards in the middle section.
4. The Ultramat 23-7MB2355, Ultramat 23-7MB2357 and Ultramat 23-7MB2358 need to be operated with the Thermo-AUTOCAL feature activated.
5. The modular Set CEM CERT 7MB1957 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 CEM CERT 7MB1957 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. The modular Set CEM CERT 7MB1957 measuring system for determining NO_x is equipped with an NO_x type gas converter CG-2 manufactured by M&C Tech Group Germany GmbH.
8. When adding additional modules to the Set CEM CERT 7MB1957 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. The Set CEM CERT 7MB1957 comes with a measuring cabinet with a degree of protection of IP40. The system cabinet can be equipped with an air conditioning unit or a ventilator unit.
11. Supplementary test (for the purpose the extension of the maintenance interval) as regards Federal Environment Agency notice dated 22 February 2017 (BAnz AT 15.03.2017 B6, chapter I number 4.1).

Test Report:

TÜV Rheinland Energy GmbH, Cologne
Report no.: 936/21230405/C dated 22 December 2016

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

The complete modular Set CEM CERT 7MB1957 measuring system tested comprises a heated sampling probe, a heated sampling line, a two-stage sample gas cooler, the sample gas pump and a maximum of three measurement component analysers from the Ultramat 6, Ultramat 6 2-K, Oxymat 6, Ultramat/Oxymat 6, Ultramat 23-7MB2355, Ultramat 23-7MB2357, Ultramat 23-7MB2358 or SIPROCESS UV600-7MB2621.
The Set CEM CERT 7MB1957 comes with a measuring cabinet with a degree of protection of IP40. The system cabinet can be equipped with an air conditioning unit or a ventilator unit. For measuring CO, NO and SO_2 in the Ultramat 23 analysers, the modular measuring system uses the principle of non-dispersive infrared absorption (NDIR method). For measuring O_2, an electrochemical or a paramagnetic oxygen measuring cell may be used. The modular system for NO in the SIPROCESS UV600 uses the principle of gas filter correlation (GFC) and interference filter correlation (IFC) for NO_2 and SO_2 respectively.

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

The modular measuring system comprises the following components:

Measuring cabinet	Set CEM CERT 7MB1957 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 100cm), heated to 180 °C
Heated sample gas line	Manufacturer	Winkler GmbH
	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	P 2.3
NO_X converter	Manufacturer	M&C TechGroup Germany GmbH
	Type	gas converter CG-2
Analyser module	Manufacturer	Siemens AG
	Type	Ultramat 6 Ultramat 6 2-K Oxymat 6 Ultramat / Oxymat 6 Ultramat 23-7MB2355 Ultramat 23-7MB2357 Ultramat 23-7MB2358 SIPROCESS UV600

The current software versions are:

Ultramat 23-7MB2355	3.00.07
Ultramat 23-7MB2357	3.00.07
Ultramat 23-7MB2358	3.00.07
Ultramat 6	4.8.5
Ultramat 6-2K	4.8.5
Oxymat 6	4.8.5
Ultramat / Oxymat 6	4.8.5
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

The current versions of the operation manuals are:

Ultramat 23:	Version 01/2015
Ultramat 6/Oxymat 6:	Version 11/2005
SiprocessUV600:	Version 10/2013

System description Set CEM CERT 7MB1957: Version of 06/07/2017 Rev. 7

General remarks

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

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

A certification mark with an ID-Number that is specific to the certified product is presented on page 1 of this certificate.

This document as well as the certification mark remains property of TÜV Rheinland Energy GmbH. Upon revocation of the publication the certificate loses its validity. After the expiration of the certificate and on request of TÜV Rheinland Energy GmbH this document shall be returned and the certificate mark must no longer be used.

The relevant version of this certificate and its expiration date are also accessible on the internet at **qal1.de**.

Certification of the Set CEM CERT 7MB1957 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. 1630664-ts: 05 March 2013
Expiry date of the certificate: 04 March 2018
Test report 1630664 dated 15 September 2012,
TÜV SÜD Industrie Service GmbH
Publication: BAnz AT 05.03.2013 B10, chapter I no. 6.1
UBA announcement dated 12 February 2013

Supplementary testing according to EN 15267

Certificate No. 1630664.2-ts: 23 July 2013
Expiry date of the certificate: 04 March 2018
Test report 1630664-2 dated 15 March 2013
TÜV SÜD Industrie Service GmbH
Publication: BAnz AT 23.07.2013 B4, chapter I no. 4.1
UBA announcement dated 3 July 2013

Certificate No. 1630664.3-ts 01 April 2014
Expiry date of the certificate 04 March 2018
Test report 1630664-3 dated 18 December 2013,
TÜV SÜD Industrie Service GmbH
Publication: BAnz AT 01.04.2014 B12, chapter I no. 4.2
UBA announcement dated 27 February 2014

Certificate No. 1630664.4a-ts 05 August 2014
Expiry date of the certificate 04 March 2018
Test report 1630664-4a dated 28 February 2014,
TÜV SÜD Industrie Service GmbH
Publication: BAnz AT 05.08.2014 B11, chapter I no. 5.3
UBA announcement dated 17 July 2014

Certificate No. 1630664.4b-ts 05 August 2014
Expiry date of the certificate 04 March 2018
Test report 1630664-4b dated 28 February 2014,
TÜV SÜD Industrie Service GmbH
Publication: BAnz AT 05.08.2014 B11, chapter I no. 5.4
UBA announcement dated 17 July 2014

Certificate No. 1797266-ts 15 April 2015
Expiry date of the certificate 04 March 2018
Test report 1797266 dated 18 September 2014,
TÜV SÜD Industrie Service GmbH
Publication: BAnz AT 02.04.2015 B5, chapter I no. 4.1
UBA announcement dated 25 February 2015

Certificate No. 2219424-ts 08 September 2015
Expiry date of the certificate 04 March 2018
Test report 2219424 dated 20 March 2015,
TÜV SÜD Industrie Service GmbH
Publication: BAnz AT 26.08.2015 B4, chapter I no. 3.2
UBA announcement dated 22 July 2015

Certificate No. 2435071-ts 26 April 2016
Expiry date of the certificate 04 March 2018
Test report 2435071 dated 30 September 2015,
TÜV SÜD Industrie Service GmbH
Publication: BAnz AT 14.03.2016 B7, chapter I no. 5.1
UBA announcement dated 18 February 2016

Certificate No. 0000053810_08 25 April 2017
Expiry date of the certificate 04 March 2018
Test report: 936/21230405/C dated 22 December 2016
TÜV Rheinland Energy GmbH, Cologne
Publication: BAnz AT 15.03.2017 B6, chapter I no. 4.1
UBA announcement dated 22 February 2017

Certificate No. 0000053810_09 08 September 2017
Expiry date of the certificate 04 March 2018
Test report: 936/21230405/C dated 22 December 2016
TÜV Rheinland Energy GmbH, Cologne
Publication: BAnz AT 31.07.2017 B12, chapter I number 3.1
UBA announcement dated 13 July 2017

Notifications

Statement of TÜV Süd Industrie Service GmbH of 17 March 2013
Publication in the German Federal Gazette: BAnz AT 23.07.2013 B4, chapter V notification 26
Announcement by UBA of 03 July 2013
(software changes)

Statement of TÜV Süd Industrie Service GmbH of 19 March 2014
Publication in the German Federal Gazette: BAnz AT 05.08.2014 B11, chapter V notification 3
Announcement by UBA of 17 July 2014
(software changes)

Statement of TÜV Süd Industrie Service GmbH of 18 September 2015
Publication in the German Federal Gazette: BAnz AT 02.04.2015 B5, chapter IV notification 43
Announcement by UBA of 25 February 2015
(software changes)

Statement of TÜV Süd Industrie Service GmbH of 29 February 2016
Publication in the German Federal Gazette: BAnz AT 01.08.2016 B11, chapter V notification 29
Announcement by UBA of 14 July 2016
(software changes)

Corrections

Correction of the Umweltbundesamt of 22 July 2015
Publication in the German Federal Gazette: BAnz AT 26.08.2015 B4, chapter IV correction 1 (missing second additional measurement range for NO_X for the Ultramat 23-7MB2357-Z-T13 module)
Announcement by UBA of 22 July 2015

Statement of TÜV Süd Industrie Service GmbH of 15 October 2015
Publication in the German Federal Gazette: BAnz AT 14.03.2016 B7, chapter IV correction 1 (second additional measurement range for CO for the Ultramat 23-7MB2357-Z-T13 module deleted)
Announcement by UBA of 18 February 2016

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

Measuring system					
Manufacturer			Siemens AG		
AMS designation			Set CEM CERT 7MB1957 Ultramat 6		
Serial number of units under test			System 1 / System 3 / System 2 / System 4		
Measuring principle			NDIR		
Test report			936/21230405/A		
Test laboratory			TÜV Rheinland		
Date of report			2016-08-31		
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_p	-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

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

Measuring system			
Manufacturer		Siemens AG	
AMS designation		Set CEM CERT 7MB1957 Ultramat 6	
Serial number of units under test		System 1 / System 3 / System 2 / System 4	
Measuring principle		NDIR	
Test report		936/21230405/A	
Test laboratory		TÜV Rheinland	
Date of report		2016-08-31	
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_p	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

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

Measuring system			
Manufacturer	Siemens AG		
AMS designation	Set CEM CERT 7MB1957 Ultramat 23		
Serial number of units under test	System 1 / System 3 / System 2 / System 4		
Measuring principle	NDIR		
Test report	936/21230405/A		
Test laboratory	TÜV Rheinland		
Date of report	2016-08-31		
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

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

Measuring system			
Manufacturer		Siemens AG	
AMS designation		Set CEM CERT 7MB1957 Ultramat 6	
Serial number of units under test		System 1 / System 3 / System 2 / System 4	
Measuring principle		NDIR	
Test report		936/21230405/A	
Test laboratory		TÜV Rheinland	
Date of report		2016-08-31	
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_p	-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

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

Measuring system			
Manufacturer		Siemens AG	
AMS designation		Set CEM CERT 7MB1957 Ultramat 6	
Serial number of units under test		System 1 / System 3 / System2 / System 4	
Measuring principle		NDIR	
Test report		936/21230405/A	
Test laboratory		TÜV Rheinland	
Date of report		2016-08-31	
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_b	-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

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

Measuring system					
Manufacturer			Siemens AG		
AMS designation			Set CEM CERT 7MB1957 Ultramat 23		
Serial number of units under test			System 1 / System 3 / System 2 / System 4		
Measuring principle			NDIR		
Test report			936/21230405/C		
Test laboratory			TÜV Rheinland		
Date of report			2016-12-22		
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				u²	
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_p	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

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

Measuring system					
Manufacturer			Siemens AG		
AMS designation			Set CEM CERT 7MB1957 Ultramat 6		
Serial number of units under test			System 1 / System 3 / System 2 / System 4		
Measuring principle			NDIR		
Test report			936/21230405/C		
Test laboratory			TÜV Rheinland		
Date of report			2016-12-22		
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_p	-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

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

Measuring system					
Manufacturer			Siemens AG		
AMS designation			Set CEM CERT 7MB1957 Ultramat 23		
Serial number of units under test			System1 / System 3 / System 2 / System 4		
Measuring principle			NDIR		
Test report			936/21230405/C		
Test laboratory			TÜV Rheinland		
Date of report			2016-12-22		
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_p	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

** The EU-directive 2010/75/EU on industrial emissions provides no requirements for this component.
A value of 10.0 % was used for this.

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

Measuring system					
Manufacturer			Siemens AG		
AMS designation			Set CEM CERT 7MB1957 Oxymat 6		
Serial number of units under test			System 1 / System 3 / System 2 / System 4		
Measuring principle			paramagnetic		
Test report			936/21230405/C		
Test laboratory			TÜV Rheinland		
Date of report			2016-12-22		
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_p	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

** The EU-directive 2010/75/EU on industrial emissions provides no requirements for this component.
A value of 10.0 % was used for this.

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

Measuring system					
Manufacturer			Siemens AG		
AMS designation			Set CEM CERT Ultramat 23		
Serial number of units under test			System 1 / System 3 / System 2 / System 4		
Measuring principle			electrochemic		
Test report			936/21230405/C		
Test laboratory			TÜV Rheinland		
Date of report			2016-12-22		
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_p	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
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.-%

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

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

** The EU-directive 2010/75/EU on industrial emissions provides no requirements for this component.
A value of 10.0 % was used for this.

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

Measuring system					
Manufacturer			Siemens AG		
AMS designation			Set CEM CERT 7MB1957 Ultramat 23		
Serial number of units under test			System1 / System 3 / System 2 / System 4		
Measuring principle			NDIR		
Test report			936/21230405/C		
Test laboratory			TÜV Rheinland		
Date of report			2016-12-22		
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_p	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

** The EU-directive 2010/75/EU on industrial emissions provides no requirements for this component.
A value of 10.0 % was used for this.

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

Measuring system			
Manufacturer	Siemens AG		
AMS designation	Set CEM CERT 7MB 1957		
Serial number of units under test	TÜV 1 / TÜV 2		
Measuring principle	NDIR		
Test report	936/21230405/B		
Test laboratory	TÜV Rheinland		
Date of report	2016-09-12		
Measured component	CO		
Certification range	0 - 200	mg/m³	
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
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_p	-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

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		Siemens AG	
AMS designation		Set CEM CERT 7MB 1957	
Serial number of units under test		TÜV 1 / TÜV 2	
Measuring principle		NDIR	
Test report		936/21230405/B	
Test laboratory		TÜV Rheinland	
Date of report		2016-09-12	
Measured component		CO	
Certification range		0 - 250 mg/m³	
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
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

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

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

Measuring system					
Manufacturer			Siemens AG		
AMS designation			Set CEM CERT 7MB 1957		
Serial number of units under test			TÜV 1 / TÜV 2		
Measuring principle			NDIR		
Test report			936/21230405/B		
Test laboratory			TÜV Rheinland		
Date of report			2016-09-12		
Measured component			CO		
Certification range			0 - 250 mg/m³		
Evaluation of the cross-sensitivity (CS)					
(system with largest CS)					
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

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

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

Measuring system			
Manufacturer		Siemens AG	
AMS designation		Set CEM CERT 7MB 1957	
Serial number of units under test		TÜV 1 / TÜV 2	
Measuring principle		NDIR	
Test report		936/21230405/B	
Test laboratory		TÜV Rheinland	
Date of report		2016-09-12	
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_p	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

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

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

Measuring system			
Manufacturer	Siemens AG		
AMS designation	Set CEM CERT 7MB 1957		
Serial number of units under test	TÜV 1 / TÜV 2		
Measuring principle	NDIR		
Test report	936/21230405/B		
Test laboratory	TÜV Rheinland		
Date of report	2016-09-12		
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	2.177	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_p	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

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

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

Measuring system			
Manufacturer		Siemens AG	
AMS designation		Set CEM CERT 7MB 1957	
Serial number of units under test		TÜV 1 / TÜV 2	
Measuring principle		NDIR	
Test report		936/21230405/B	
Test laboratory		TÜV Rheinland	
Date of report		2016-09-12	
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_p	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

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		Siemens AG	
AMS designation		Set CEM CERT 7MB 1957	
Serial number of units under test		TÜV 1 / TÜV 2	
Measuring principle		NDIR	
Test report		936/21230405/B	
Test laboratory		TÜV Rheinland	
Date of report		2016-09-12	
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

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	Siemens AG		
AMS designation	Set CEM CERT 7MB 1957		
Serial number of units under test	TÜV 1 / TÜV 2		
Measuring principle	NDIR		
Test report	936/21230405/B		
Test laboratory	TÜV Rheinland		
Date of report	2016-09-12		
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	2.217	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_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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	12.71	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

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			Siemens AG		
AMS designation			Set CEM CERT 7MB 1957		
Serial number of units under test			TÜV 3 / TÜV 4		
Measuring principle			NDIR		
Test report			936/21230405/B		
Test laboratory			TÜV Rheinland		
Date of report			2016-09-12		
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

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		Siemens AG	
AMS designation		Set CEM CERT 7MB1957 Ultramat 6	
Serial number of units under test		System 1 / System 3 / System 2 / System 4	
Measuring principle		NDIR	
Test report		936/21230405/C	
Test laboratory		TÜV Rheinland	
Date of report		2016-12-22	
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_p	-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

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

Measuring system					
Manufacturer			Siemens AG		
AMS designation			Set CEM CERT 7MB 1957		
Serial number of units under test			TÜV 1 / TÜV 2		
Measuring principle			NDIR		
Test report			936/21230405/B		
Test laboratory			TÜV Rheinland		
Date of report			2016-09-12		
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_p	-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

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		Siemens AG	
AMS designation		Set CEM CERT 7MB 1957	
Serial number of units under test		TÜV 1 / TÜV 2	
Measuring principle		NDIR	
Test report		936/21230405/B	
Test laboratory		TÜV Rheinland	
Date of report		2016-09-12	
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	0.167	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	0.072	Vol.-%	0.005	(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_p	-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	$U = u_c * k = u_c * 1.96$	0.68	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

** The EU-directive 2010/75/EU on industrial emissions provides no requirements for this component.
A value of 25.0 % was used for this.