Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000053810_11

AMS designation:	Set CEM CERT 7MB1957 for CO, NO, SO_2, CO_2, NO_2, NO_X und 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 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 36 pages).
The present certificate replaces certificate 0000053810_10 dated 05 March 2018.

TÜVRheinland® CERTIFIED

Suitability Tested
EN 15267
QAL1 Certified
Regular Surveillance

www.tuv.com
ID 0000053810

Publication in the German Federal Gazette (BAnz) of 22 July 2019

Expiry date:
21 July 2024

Federal Environment Agency
Dessau, 05 November 2019

TÜV Rheinland Energy GmbH
Cologne, 04 November 2019

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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:	936/21242490/A dated 27 February 2019
Initial certification:	05 March 2013
Expiry date:	21 July 2024
Publication:	BAnz AT 22.07.2019 B8, chapter I number 1.5

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/Oxymant 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 installation at which it will be installed.

Basis of the certification

This certification is based on:

- Test report no. 936/21242490/A dated 27 February 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 22.07.2019 B8, chapter I number 1.5
UBA announcement dated 28 June 2019:

AMS designation:

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

Manufacturer:

SIEMENS AG, Karlsruhe

Field of application:

Modular measuring system for measurements at plants according to the 13th, 17th, and 27th BImSchV as well as plants under the TA Luft

Measuring ranges during performance testing:

Component	Modul Type	Certification range	Additional ranges		Unit	Maintenance interval
CO	Ultramat 23-7MB2355 - Z - T13 / T23 / T33 Ultramat 23-7MB2357 - Z - T13 /T23 / T33	0 - 200	0 - 1250	-	mg/m³	12 month
	Ultramat 23-7MB2358 - Z - T13 / T23	0 - 375	0 - 1250	-	mg/m³	6 month
	Ultramat 23-7MB2355 - Z - T14 / T24 / T34 Ultramat 23-7MB2357 - Z - T14 / T24 / T34	0 - 1250	0 - 6000	-	mg/m³	12 month
	Ultramat 6 LR - Z + Y27 Ultramat 6-2K LR - Z + Y27 + Y 28 Ultramat/Oxymat 6 LR - Z + Y27 + Y28	0 - 75	0 - 1250	0 - 3000	mg/m³	6 month
	Ultramat 6 HR - Z + Y27 Ultramat 6-2K HR - Z + Y27 + Y 28 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 23-7MB2355 - Z - T13 / T23 / T33 Ultramat 23-7MB2357 - 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 23-7MB2358 - 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 23-7MB2355 - Z - T14 / T24 / T34 Ultramat 23-7MB2357 - Z - T14 / T24 / T34	0 - 600	0 - 3000	-	mg/m³	12 month
	Ultramat 6 LR - Z + Y27 Ultramat 6-2K LR - Z + Y27 + Y 28 Ultramat/Oxymat 6 LR - Z + Y27 + Y28	0 - 100	0 - 2000	-	mg/m³	6 month
	Ultramat 6 HR - Z + Y27 Ultramat 6-2K HR - Z + Y27 + Y 28 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

Component	Modul Type	Certification range	Additional ranges		Unit	Maintenance interval
NO_2	SIPROCESS UV600-7MB2621 - Z - Y17	0 - 50	0 - 500	-	mg/m³	3 month with weekly calibration with the internal calibration cuvette, otherwise 2 weeks
	Ultramat 23-7MB2355 - Z - T25 / T35 Ultramat 23-7MB2357 - Z - T25 / T35 Ultramat 23-7MB2358 - Z - T35	0 - 50	0 - 1000	-	mg/m³	4 weeks
SO_2	Ultramat 23-7MB2355 - Z - T13 / T23 / T33 Ultramat 23-7MB2357 - Z - T13 / T23 / T33	0 - 400	0 - 2000	0 - 7000	mg/m³	12 month
	Ultramat 23-7MB2358 - 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	6 month with weekly calibration with the internal calibration cuvette, otherwise 2 weeks
	Ultramat 6 LR - Z + Y27 Ultramat 6-2K LR - Z + Y27 + Y 28 Ultramat/Oxymat 6 LR - Z + Y27 + Y28	0 - 75	0 - 1500	-	mg/m³	6 month
	Ultramat 23-7MB2355 - Z - T25 / T35 Ultramat 23-7MB2357 - Z - T25 / T35 Ultramat 23-7MB2358 - Z - T35	0 - 70	0 - 75	0 - 1250	mg/m³	4 weeks
CO_2	Ultramat 23-7MB2355 - Z - T13 / T23 / T33 Ultramat 23-7MB2357 - Z - T13 / T23 / T33	0 - 25	-	-	Vol.-%	12 month
	SIPROCESS GA700 Ultramat 7	0 - 25	-	-	Vol.-%	4 weeks
O_2 (paramagnetic)	Ultramat 23-7MB2355 - Z - T13/T14 Ultramat 23-7MB2357 - Z - T13/T14	0 - 25	-	-	Vol.-%	12 month
	Ultramat 23-7MB2358 - 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	-	Vol.-%	6 month
	SIPROCESS GA700 Oxymat 7	0 - 25	0 - 5	-	Vol.-%	4 weeks
O_2 (electrochemic)	Ultramat 23-7MB2355 - Z - T23/T24/T25 Ultramat 23-7MB2357 - Z - T23/T24/T25	0 - 25	0 - 5	-	Vol.-%	12 month
	Ultramat 23-7MB2358 - Z - T23/T24/T25	0 - 25	0 - 5	-	Vol.-%	6 month

Software versions:

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
Gasmodul: 9137582_3.002
UV-Module: 9139736_3.005

SIPROCESS GA700 Ultramat 7 CALC 1.40.03 / ADU 1.33.00
SIPROCESS GA700 Oxymat 7 CALC 1.40.05 / ADU 1.20.

Restriction:
When using the Ultramat 23-7MB2355, Ultramat 23-7MB2357 or Ultramat 23-7MB2358 modules, the system cabinet must be equipped with an A/C unit.

Notes:

1. When equipped with the SIPROCESS UV600-7MB2621 module for monitoring NO, NO_2 and SO_2 or with the Ultramat 6, Ultramat 6-2K and Ultramat / Oxymat 6 module for monitoring CO, NO and SO_2 as well as the Ultramat 23-7MB2355-Z-T25/T35, Ultramat 23-7MB2357-Z-T25/T35 and Ultramat 23-7MB2358-Z-T25/T35 module for SO_2, the modular Set CEM CERT 7MB1957 measuring system may also be used for applications according to IED, chapter IV (17th BImSchV).
2. For automatic zero adjustments, the modules of the Ultramat 23 series must be operated at a 24-hour interval. The modules of the Ultramat 6 series must be operated at a one-week interval for automatic 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 modules 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. Maintenance work must be spread over several days in order to comply with the requirements for outage times specified by the 13th and 17th BImSchV.
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. It is possible to integrate the central unit of the QAL1 certified LDS 6 7MB6121 NH_3 and LDS 6 7MB6121 HCl measuring systems as a single module into the system cabinet of the Set CEM CERT 7MB1957 measuring system.
12. Supplementary test (for the purpose of approving additional measuring modules and integrating the LDS6 7MB6121) as regards Federal Environment Agency notices of 13 July 2017 (BAnz AT 31.07.2017 B12, chapter I number 3.1) and of 3 July 2018 (BAnz AT 17.07.2018 B9, chapter III 23rd notification).

Test Report:

TÜV Rheinland Energy GmbH, Cologne
Report no. 936/21242490/A dated 27 February 2019

Certified product

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

The complete tested modular SIPROCESS UV600-7MB2621 measuring system comprises a heated sampling probe, a heated sample gas line, a two-stage test 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, SIPROCESS GA700-Ultramat 7, SIPROCESS GA700-Oxymat 7 or SIPROCESS UV600-7MB2621.

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 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 converter CG-2
Analyser modules	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 SIPROCESS GA700 Ultramat 7/ Oxymat 7

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.

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 current software versions are:

Ultramat 23-7MB2355	V4.02.04
Ultramat 23-7MB2357	V4.02.04
Ultramat 23-7MB2358	V4.02.04
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 modules:	9139736_3.005

SIPROCESS GA700 Ultramat 7	CALC 1.40.03 / ADU 1.33.00
SIPROCESS GA700 Oxymat 7	CALC 1.40.05 / ADU 1.20.05

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 system 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**.

Documentation history

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 number 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 number 4.1
UBA announcement dated 03 July 2013

Notifications in accordance with EN 15267

Statement issued by TÜV Süd Industrie Service GmbH dated 17 March 2013
Publication: BAnz AT 23.07.2013 B4, chapter V notification 26
UBA announcement dated 03 July 2013
(New software version)

Supplementary testing according to EN 15267

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 number 4.2
UBA announcement dated 27 February 2014

Certificate no. 1630664.4a-ts 05 August 2014
Expiry date: 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 number 5.3
UBA announcement dated 17 July 2014

Notifications in accordance with EN 15267

Statement issued by TÜV Süd Industrie Service GmbH dated 19 March 2014
Publication: BAnz AT 05.08.2014 B11, chapter V notification 3
UBA announcement dated 17 July 2014
(New software version)

Supplementary testing according to EN 15267

Certificate no. 1630664.4b-ts 05 August 2014
Expiry date: 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 number 5.4
UBA announcement dated 17 July 2014

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

Notifications in accordance with EN 15267

Statement issued by TÜV Süd Industrie Service GmbH dated 18 September 2015
Publication: BAnz AT 02.04.2015 B5, chapter IV notification 43
UBA announcement dated 25 February 2015
(New software version)

Correction issued by the Federal Environment Agency on 22 July 2015
Publication: BAnz AT 26.08.2015 B4, chapter IV correction 1
UBA announcement dated 22 July 2015
(missing second additional measuring range for NO_x
for the Ultramat 23-7MB2357-Z-T13 module)

Supplementary testing according to EN 15267

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

Notifications in accordance with EN 15267

Statement issued by TÜV Süd Industrie Service GmbH dated 15 October 2015
Publication: BAnz AT 14.03.2016 B7, chapter IV correction 1
UBA announcement dated 18 February 2016
(additional second measuring range for CO
for the Ultramat 23-7MB2357-Z-T13 module removed)

Supplementary testing according to EN 15267

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

Notifications in accordance with EN 15267

Statement issued by TÜV Süd Industrie Service GmbH dated 29 February 2016
Publication: BAnz AT 01.08.2016 B11, chapter V notification 29
UBA announcement dated 14 July 2016
(New software version)

Supplementary testing according to EN 15267

Certificate no. 0000053810_08: 25 April 2017
Expiry date: 04 March 2018
Test report: 936/21230405/A dated 31 August 2016
TÜV Rheinland Energy GmbH, Cologne
Publication: BAnz AT 15.03.2017 B6, chapter I number 4.1
UBA announcement dated 22 February 2017

Certificate no. 0000053810_09: 08 September 2017
Expiry date: 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

Renewal of the certificate in accordance with EN 15267

Certificate no. 0000053810_10: 05 March 2018
Expiry date of the certificate: 21 July 2024

Notifications in accordance with EN 15267

Statement issued by TÜV Rheinland Energy GmbH dated 08 December 2017
Publication: BAnz AT 26.03.2018 B8, chapter V notification 48
UBA announcement dated 21 February 2018
(Hardware and software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 02 May 2018
Publication: BAnz AT 17.07.2018 B9, chapter III notification 23
UBA announcement dated 03 July 2018
(New software version)

Statement issued by TÜV Rheinland Energy GmbH dated 09 October 2018
Publication: BAnz AT 26.03.2019 B7, chapter IV notification 63
UBA announcement dated 27 February 2019
(Hardware and software changes)

Supplementary testing according to EN 15267

Certificate no. 0000053810_11: 05 November 2019
Expiry date: 21 July 2024
Test report: 936/21242490/A dated 27 February 2019
TÜV Rheinland Energy GmbH, Cologne
Publication: BAnz AT 22.07.2019 B8, chapter I number 1.5
UBA announcement dated 28 June 2019

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		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/C		
Test laboratory		TÜV Rheinland		
Date of report		2016-12-22		
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/C	
Test laboratory		TÜV Rheinland	
Date of report		2016-12-22	
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/C	
Test laboratory		TÜV Rheinland	
Date of report		2016-12-22	
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/C	
Test laboratory		TÜV Rheinland	
Date of report		2016-12-22	
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				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_b	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

** 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			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

** 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		Siemens AG	
AMS designation		Set CEM CERT 7MB 1957	
Serial number of units under test		TÜV 1 / TÜV 2	
Measuring principle		electrochemical	
Test report		936/21230405/B	
Test laboratory		TÜV Rheinland	
Date of report		2016-09-12	
Measured component		O2	
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_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	$U = u_c * k = u_c * 1.96$	0.67	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

** 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.

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

Measuring system					
Manufacturer			Siemens AG		
AMS designation			Set CEM CERT 7MB 1957 SIPROCESS UV 600		
Serial number of units under test			TÜV 1 / TÜV 2		
Measuring principle			UV-RAS		
Test report			936/21230405/B		
Test laboratory			TÜV Rheinland		
Date of report			2016-09-12		
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

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 Ultramat 23		
Serial number of units under test			TÜV 1 / TÜV 2		
Measuring principle			NDIR		
Test report			936/21242490/A		
Test laboratory			TÜV Rheinland		
Date of report			2019-02-27		
Measured component			CO		
Certification range			0 - 375	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				u²	
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_b	-0.217	mg/m³	0.047	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	3.031	mg/m³	9.188	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	5.07	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	9.94	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 150 mg/m³**	**6.6**
Requirement of 2010/75/EU	**U in % of the ELV 150 mg/m³**	**10.0**
Requirement of EN 15267-3	U in % of the ELV 150 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 Ultramat 23	
Serial number of units under test		TÜV 3 / TÜV 4	
Measuring principle		NDIR	
Test report		936/21242490/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-02-27	
Measured component		CO	
Certification range		0 - 375	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}	3.031	mg/m³	9.188	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	5.13	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	10.05	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 150 mg/m³**	**6.7**
Requirement of 2010/75/EU	**U in % of the ELV 150 mg/m³**	**10.0**
Requirement of EN 15267-3	U in % of the ELV 150 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 Ultramat 23		
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 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 Ultramat 23		
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 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 Ultramat 23	
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 SIPROCESS UV 600		
Serial number of units under test			TÜV 1 / TÜV 2		
Measuring principle			UV-RAS		
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 Ultramat 23		
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 Ultramat 23		
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.

Certificate:
0000053810_11 / 05 November 2019

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				u²	
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 SIPROCESS UV 600		
Serial number of units under test			TÜV 1 / TÜV 2		
Measuring principle			UV-RAS		
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 Ultramat 23		
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	
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

* 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

** 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		Siemens AG			
AMS designation		Set CEM CERT 7MB1957 (Oxymat 7)			
Serial number of units under test		N1K1200172 / N1JN200171			
Measuring principle		paramagnetic			
Test report		936/21242490/A			
Test laboratory		TÜV Rheinland			
Date of report		2019-02-27			
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	0.086	Vol.-%	0.007	(Vol.-%)²
Lack of fit	u_{lof}	0.058	Vol.-%	0.003	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	-0.029	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	0.122	Vol.-%	0.015	(Vol.-%)²
Influence of supply voltage	u_v	0.021	Vol.-%	0.000	(Vol.-%)²
Cross-sensitivity (interference)	u_i	0.000	Vol.-%	0.000	(Vol.-%)²
Influence of sample gas flow	u_p	0.021	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

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

Umwelt Bundesamt

Certificate:
0000053810_11 / 05 November 2019

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

Measuring system					
Manufacturer			Siemens AG		
AMS designation			Set CEM CERT 7MB1957 (Ultramat 7)		
Serial number of units under test			N1K1100191 / N1JN100185		
Measuring principle			NDIR		
Test report			936/21242490/A		
Test laboratory			TÜV Rheinland		
Date of report			2019-02-27		
Measured component			CO_2		
Certification range			0 - 30	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			0.40	Vol.-%	
Sum of negative CS at span point			-0.20	Vol.-%	
Maximum sum of cross-sensitivities			0.40	Vol.-%	
Uncertainty of cross-sensitivity	u_i		0.232	Vol.-%	

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.047	Vol.-%	0.002	(Vol.-%)²
Lack of fit	u_{lof}	0.289	Vol.-%	0.084	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	0.017	Vol.-%	0.000	(Vol.-%)²
Span drift from field test	$u_{d,s}$	0.087	Vol.-%	0.008	(Vol.-%)²
Influence of ambient temperature at span	u_t	0.173	Vol.-%	0.030	(Vol.-%)²
Influence of supply voltage	u_v	0.012	Vol.-%	0.000	(Vol.-%)²
Cross-sensitivity (interference)	u_i	0.232	Vol.-%	0.054	(Vol.-%)²
Influence of sample gas flow	u_p	0.004	Vol.-%	0.000	(Vol.-%)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.242	Vol.-%	0.059	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.49	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.95	Vol.-%

Relative total expanded uncertainty	**U in % of the range 30 Vol.-%**	**3.2**
Requirement of 2010/75/EU	**U in % of the range 30 Vol.-%**	**10.0 ****
Requirement of EN 15267-3	U in % of the range 30 Vol.-%	7.5

** The EU-directive 2010/75/EC 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		Siemens AG	
AMS designation		Set CEM CERT 7MB1957 (Ultramat 23)	
Serial number of units under test		JN-820 / JN-821	
Measuring principle		UV Absorption	
Test report		936/21242490/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-02-27	
Measured component		NO_2	
Certification range		0 - 50	mg/m³

Evaluation of the cross-sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point		1.61	mg/m³
Sum of negative CS at zero point		0.00	mg/m³
Sum of postive CS at span point		0.30	mg/m³
Sum of negative CS at span point		-0.70	mg/m³
Maximum sum of cross-sensitivities		1.61	mg/m³
Uncertainty of cross-sensitivity	u_i	0.930	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.096	mg/m³	0.009	(mg/m³)²
Lack of fit	u_{lof}	0.346	mg/m³	0.120	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.173	mg/m³	0.030	(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	0.473	mg/m³	0.224	(mg/m³)²
Influence of supply voltage	u_v	0.031	mg/m³	0.001	(mg/m³)²
Cross-sensitivity (interference)	u_i	0.930	mg/m³	0.865	(mg/m³)²
Influence of sample gas flow	u_p	0.030	mg/m³	0.001	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.41	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	2.76	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 33.3 mg/m³**	**8.3**
Requirement of 2010/75/EU	**U in % of the ELV 33.3 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 33.3 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		JN-820 / JN-821	
Measuring principle		UV Absorption	
Test report		936/21242490/A	
Test laboratory		TÜV Rheinland	
Date of report		2019-02-27	
Measured component		SO_2	
Certification range		0 - 70	mg/m³
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point		2.29	mg/m³
Sum of negative CS at zero point		0.00	mg/m³
Sum of postive CS at span point		0.60	mg/m³
Sum of negative CS at span point		-1.90	mg/m³
Maximum sum of cross-sensitivities		2.29	mg/m³
Uncertainty of cross-sensitivity	u_i	1.322	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.286	mg/m³	0.082	(mg/m³)²
Lack of fit	u_{lof}	0.230	mg/m³	0.053	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.323	mg/m³	0.104	(mg/m³)²
Span drift from field test	$u_{d,s}$	-1.091	mg/m³	1.190	(mg/m³)²
Influence of ambient temperature at span	u_t	0.656	mg/m³	0.430	(mg/m³)²
Influence of supply voltage	u_v	0.162	mg/m³	0.026	(mg/m³)²
Cross-sensitivity (interference)	u_i	1.322	mg/m³	1.748	(mg/m³)²
Influence of sample gas flow	u_p	0.051	mg/m³	0.003	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.566	mg/m³	0.320	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.99	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	3.90	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 46,6 mg/m³**	**8.4**
Requirement of 2010/75/EU	**U in % of the ELV 46,6 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 46,6 mg/m³	15.0