

# CERTIFICATE

## of Product Conformity (QAL1)

Certificate No.: 0000053810\_12

**AMS designation:** Set CEM CERT 7MB1957 for CO, NO, NO<sub>2</sub>, NO<sub>x</sub>, SO<sub>2</sub>, O<sub>2</sub> and CO<sub>2</sub>

**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 37 pages).

The present certificate replaces certificate 0000053810\_11 of 05 November 2019.



Suitability Tested  
EN 15267  
QAL1 Certified  
Regular  
Surveillance

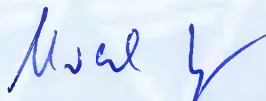
www.tuv.com  
ID 0000053810

Publication in the German Federal Gazette  
(BAnz) of 05 August 2021

This certificate will expire on:  
04 August 2026

German Federal Environment Agency  
Dessau, 03 September 2021

TÜV Rheinland Energy GmbH  
Cologne, 02 September 2021



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

<b>Test Report:</b>	936/21242490/B of 03 May 2021
<b>Initial certification:</b>	05 March 2013
<b>Expiry date:</b>	04 August 2026
<b>Publication:</b>	BAnz AT 05.08.2021 B5, chap. I No. 4.2

### Approved application

The tested AMS is suitable for use at combustion plants according to Directive 2010/75/EU, chapter III (13<sup>th</sup> BImSchV), plants in compliance with TA Luft and plants according to the 27<sup>th</sup> 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 (17<sup>th</sup> BImSchV) for monitoring the components NO, NO<sub>2</sub> and SO<sub>2</sub>. 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 (17<sup>th</sup> BImSchV) for monitoring components CO, NO and SO<sub>2</sub>. 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 test at various waste incineration plants.

The AMS is approved for an ambient temperature range of +5 °C to 40 °C.

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

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

### Basis of the certification

This certification is based on:

- Test report 936/21242490/B of 03 May 2021 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 05.08.2021 B5, chap. I No. 4.2 ,  
UBA announcement dated 29 June 2021 :

**AMS designation:**

Set CEM CERT 7MB1957 for CO, NO, NO<sub>2</sub>, NO<sub>x</sub>, SO<sub>2</sub>, CO<sub>2</sub> and O<sub>2</sub>

**Manufacturer:**

SIEMENS AG, Karlsruhe

**Field of application:**

Modular measuring system for plants requiring official approval and for plants accord-  
ing to the 27<sup>th</sup> BImSchV

**Measuring ranges during performance testing:**

Component	Modul Typ	Certification range	Additional ranges		Unit	Maintenace intervall
CO	Ultramat 23-7MB2355 - Z - T13 / T23 / T33 Ultramat 23-7MB2357 - Z - T13 / T23 / T33	0 - 200	0 - 1250	-	mg/m <sup>3</sup>	12 Months
	Ultramat 23-7MB2358 - Z - T13 / T23	0 - 375	0 - 1250	-	mg/m <sup>3</sup>	6 Months
	Ultramat 23-7MB2355 - Z - T14 / T24 / T34 Ultramat 23-7MB2357 - Z - T14 / T24 / T34	0 - 1250	0 - 6000	-	mg/m <sup>3</sup>	12 Months
	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/m <sup>3</sup>	6 Months
	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/m <sup>3</sup>	6 Months
	Ultramat 6-2K LR - HR - Z - Y27 + Y28	0 - 75 <sup>3)</sup> 0 - 1000 <sup>4)</sup>	0 - 1250 <sup>3)</sup> 0 - 10000 <sup>4)</sup>	-	mg/m <sup>3</sup>	6 Months
NO <sub>x</sub>	Ultramat 23-7MB2355 - Z - T13 / T23 / T33 Ultramat 23-7MB2357 - Z - T13 / T23 / T33	0 - 150 <sup>1)</sup> 0 - 230 <sup>2)</sup>	0 - 750 <sup>1)</sup> 0 - 1150 <sup>2)</sup>	0 - 2000 <sup>1)</sup> 0 - 3067 <sup>2)</sup>	mg/m <sup>3</sup>	12 Months
	Ultramat 23-7MB2358 - Z - T13 / T23	0 - 400 <sup>1)</sup> 0 - 613 <sup>2)</sup>	0 - 2000 <sup>1)</sup> 0 - 3067 <sup>2)</sup>	-	mg/m <sup>3</sup>	6 Months

Component	Modul Typ	Certification range	Additional ranges		Unit	Maintenace intervall
NO	SIPROCESS UV600-7MB2621 - Z - Y17	0 - 50	0 - 200	0 - 2000	mg/m <sup>3</sup>	2 Weeks
	Ultramat 23-7MB2355 - Z - T14 / T24 / T34 Ultramat 23-7MB2357 - Z - T14 / T24 / T34	0 - 600	0 - 3000	-	mg/m <sup>3</sup>	12 Months
	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/m <sup>3</sup>	6 Months
	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/m <sup>3</sup>	6 Months
	Ultramat 6-2K LR - HR - Z - Y27 + Y28	0 - 100 <sup>3)</sup> 0 - 1000 <sup>4)</sup>	0 - 2000 <sup>3)</sup> 0 - 10000 <sup>4)</sup>	-	mg/m <sup>3</sup>	6 Months
NO <sub>2</sub>	SIPROCESS UV600-7MB2621 - Z - Y17	0 - 50	0 - 500	-	mg/m <sup>3</sup>	3 Months with a weekly adjustment with internal calibration cell, 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/m <sup>3</sup>	4 Weeks
SO <sub>2</sub>	Ultramat 23-7MB2355 - Z - T13 / T23 / T33 Ultramat 23-7MB2357 - Z - T13 / T23 / T33	0 - 400	0 - 2000	0 - 7000	mg/m <sup>3</sup>	12 Months
	Ultramat 23-7MB2358 - Z - T13 / T23	0 - 400	0 - 2000	0 - 7000	mg/m <sup>3</sup>	6 Months
	SIPROCESS UV600-7MB2621 - Z - Y17	0 - 75	0 - 130	0 - 2000	mg/m <sup>3</sup>	6 Months with a weekly adjustment with internal calibration cell, 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/m <sup>3</sup>	6 Months
	Ultramat 23-7MB2355 - Z - T25 / T35 Ultramat 23-7MB2357 - Z - T25 / T35 Ultramat 23-7MB2358 - Z - T35	0 - 70	0 - 75	0 - 1250	mg/m <sup>3</sup>	4 Weeks

Component	Modul Typ	Certification range	Additional ranges		Unit	Maintenace intervall
CO <sub>2</sub>	Ultramat 23-7MB2355 - Z - T13 / T23 / T33 Ultramat 23-7MB2357 - Z - T13 / T23 / T33	0 - 25	-	-	Vol.-%	12 Months
	SIPROCESS GA700 Ultramat 7	0 - 25	-	-	Vol.-%	12 Months
O <sub>2</sub> (paramagnetisch)	Ultramat 23-7MB2355 - Z - T13/T14 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
	SIPROCESS GA700 Oxymat 7	0 - 25	0 - 5	-	Vol.-%	12 Months
O <sub>2</sub> (elektrochemisch)	Ultramat 23-7MB2355 - Z - T23/T24/T25 Ultramat 23-7MB2357 - Z - T23/T24/T25	0 - 25	0 - 5	-	Vol.-%	12 Months
	Ultramat 23-7MB2358 - Z - T23/T24/T25	0 - 25	0 - 5	-	Vol.-%	6 Months

1 state as NO  
3 small range

2 state as NO<sub>2</sub>  
4 great range

**Software versions:**

ULTRAMAT 23-7MB2355	4.02.08
ULTRAMAT 23-7MB2357	4.02.08
ULTRAMAT 23-7MB2358	4.02.08
ULTRAMAT 6	4.8.8
ULTRAMAT 6-2K	4.8.8
OXYMAT 6	4.8.8
ULTRAMAT / OXYMAT 6	4.8.8

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
SIPROCESS GA700 ULTRAMAT 7	CALC 1.70.00 / ADU 1.40.02
SIPROCESS GA700 OXYMAT 7	CALC 1.40.08 / ADU 1.30.00

**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:**

- When equipped with the SIPROCESS UV600-7MB2621 module for monitoring NO, NO<sub>2</sub> and SO<sub>2</sub> or with the ULTRAMAT 6, ULTRAMAT 6-2K and ULTRAMAT / OXYMAT 6 module for monitoring CO, NO and SO<sub>2</sub> 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<sub>2</sub>, the modular Set CEM CERT 7MB1957 measuring system may also be used for applications according to IED, chapter IV (17<sup>th</sup> BImSchV).



2. For automatic zero adjustments, the modules of the ULTRAMAT 23 series must be operated at a 24h interval. The modules of the ULTRAMAT 6 series must be operated at a one-week interval for automatic span point adjustments.
3. For improved cross-sensitivity to CO<sub>2</sub> 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-AUTO CAL feature activated.
5. The modular Set CEM CERT 7MB1957 measuring system may alternatively be equipped with a sampling probe (SP2000H) 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<sub>x</sub> is equipped with an NO<sub>x</sub> 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 13<sup>th</sup> BImSchV and 17<sup>th</sup> 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<sub>3</sub> 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 maintenance interval extension of the measuring modules SIPROCESS GA700 ULTRAMAT 7 for CO<sub>2</sub> and SIPROCESS GA700 OXYMAT 7 for O<sub>2</sub>) as regards the notices of the Federal Environment Agency (UBA) of 28 June 2019 (BANz. AT 22.07.2019, B8, chapter I, 1.5) and of 31 March 2021 (BANz AT 03.05.2021, B9, chapter III, notification 58).

**Test Report:**

TÜV Rheinland Energy GmbH, Cologne  
Report no.: 936/21242490/B of 03 May 2021

### Certified product

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

The complete tested modular Set CEM CERT-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.

<u>Measuring cabinet</u>	Set CEM CERT 7MB1957 system cabinet	
<u>Probe</u>	Manufacturer	Bühler Technologies GmbH
	Type	Gas 222.20-Cal-twin incl. ceramic filter
<u>Alternative probe</u>	Manufacturer	M&C TechGroup Germany GmbH
	Type	SP2000-H incl. ceramic filter (length 100 cm), heated to 180 °C
<u>Heated sample gas line</u>	Temperature	180 °C
	Length:	50 m in the field, 10 m in the lab
	Diameter	(inner):4 mm
	Material	PTFE
<u>Compressor cooler</u>	Manufacturer	M&C TechGroup Germany GmbH
	Type	CSS V1-S
<u>Alternative cooler</u>	Manufacturer	Bühler Technologies GmbH
	Type	EGK 2-19, 2 stage, dew point 3 °C
<u>Sample gas pump</u>	Manufacturer	Bühler Technologies GmbH
	Type	P2.3:
<u>NO<sub>x</sub> converter</u>	Manufacturer	M&C TechGroup Germany GmbH
	Type	Gas Konverter CG-2
<u>Analyser modules</u>	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 housing protection class 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 Ultra-mat 23 measuring modules, a (heated) converter is placed upstream of the condensate filter for measuring NO<sub>x</sub>. 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.

#### 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](http://qal1.de).



### **Document 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 of 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 of 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**

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 of 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 of the certificate: 04 March 2018  
Test Report: 1630664-4a of 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**

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 of the certificate: 04 March 2018  
Test Report: 1630664-4b of 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 of the certificate: 04 March 2018  
Test Report: 1797266 of 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**

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 supplementary measuring range for NO<sub>x</sub> for the Ultramat module 23-7MB2357-Z-T13)

#### **Supplementary testing according to EN 15267**

Certificate no. 2219424-ts 08 September 2015  
Expiry date of the certificate: 04 March 2018  
Test Report: 2219424 of 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**

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 module Ultramat 23-7MB2357-Z-T13)

#### **Supplementary testing according to EN 15267**

Certificate no. 2435071ts 26 April 2016  
Expiry date of the certificate: 04 March 2018  
Test Report: 2435071 of 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**

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 of the certificate: 04 March 2018  
Test Report: 936/21230405/A of 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 of the certificate: 04 March 2018  
Test Report: 936/21230405/C of 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

Certificate no. 0000053810\_10: 05 March 2018  
Expiry date of the certificate: 04 March 2023

#### Notifications

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  
(Software and hardware change)

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  
(Software updates)

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  
(Design and software changes)

#### Supplementary testing according to EN 15267

Certificate no. 0000053810\_11: 05 November 2019  
Expiry date of the certificate: 21 July 2024  
Test Report: 936/21242490/A of 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

#### Notifications

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 17 December 2019  
Publication: BAnz AT 07.05.2020 B8, chapter III notification 5  
UBA announcement dated 31 March 2020  
(Design and software changes)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 11. September 2020.  
Publication: BAnz AT 03.05.2021 B9, chapter III notification 58  
UBA announcement dated 31 March 2021  
(Design and software changes)

#### Supplementary testing according to EN 15267

Certificate no. 0000053810\_12: 03 September 2021  
Expiry date of the certificate: 04 August 2026  
Test Report: 936/21242490/B of 03 May 2021  
TÜV Rheinland Energy GmbH, Cologne  
Publication: BAnz AT 05.08.2021 B5, chap. I No. 4.2  
UBA announcement dated 29 June 2021 :

**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**

Test laboratory	936/21230405/C
Date of report	TÜV Rheinland
	2016-12-22

**Measured component**

Certification range	CO	0 - 75 mg/m <sup>3</sup>
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**Evaluation of the cross-sensitivity (CS)**

(system with largest CS)

Sum of positive CS at zero point	0.32 mg/m <sup>3</sup>
Sum of negative CS at zero point	-0.33 mg/m <sup>3</sup>
Sum of positive CS at span point	1.00 mg/m <sup>3</sup>
Sum of negative CS at span point	-0.40 mg/m <sup>3</sup>
Maximum sum of cross-sensitivities	1.00 mg/m <sup>3</sup>
Uncertainty of cross-sensitivity	$u_i$ 0.576 mg/m <sup>3</sup>

**Calculation of the combined standard uncertainty**

**Tested parameter**

			$u^2$
Standard deviation from paired measurements under field conditions *	$u_D$	0.614 mg/m <sup>3</sup>	0.377 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$	0.229 mg/m <sup>3</sup>	0.052 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	-0.650 mg/m <sup>3</sup>	0.423 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$	0.606 mg/m <sup>3</sup>	0.367 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	0.924 mg/m <sup>3</sup>	0.854 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$	0.082 mg/m <sup>3</sup>	0.007 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	0.576 mg/m <sup>3</sup>	0.332 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	$u_p$	-0.079 mg/m <sup>3</sup>	0.006 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	0.606 mg/m <sup>3</sup>	0.368 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty ( $u_c$ )

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 1.67 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 3.27 \text{ mg/m}^3$$

**Relative total expanded uncertainty**

**U in % of the ELV 50 mg/m<sup>3</sup> 6.5**

**Requirement of 2010/75/EU**

**U in % of the ELV 50 mg/m<sup>3</sup> 10.0**

**Requirement of EN 15267-3**

**U in % of the ELV 50 mg/m<sup>3</sup> 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

Test laboratory	936/21230405/C
Date of report	TÜV Rheinland
	2016-12-22

#### Measured component

Certification range	CO	0 - 1000 mg/m <sup>3</sup>
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#### Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m <sup>3</sup>
Sum of negative CS at zero point	0.00 mg/m <sup>3</sup>
Sum of positive CS at span point	8.60 mg/m <sup>3</sup>
Sum of negative CS at span point	-4.20 mg/m <sup>3</sup>
Maximum sum of cross-sensitivities	8.60 mg/m <sup>3</sup>
Uncertainty of cross-sensitivity	$u_i$ 4.965 mg/m <sup>3</sup>

#### Calculation of the combined standard uncertainty

##### Tested parameter

			$u^2$
Standard deviation from paired measurements under field conditions *	$u_D$	2.042 mg/m <sup>3</sup>	4.170 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$	-1.732 mg/m <sup>3</sup>	3.000 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	3.464 mg/m <sup>3</sup>	11.999 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$	-13.279 mg/m <sup>3</sup>	176.332 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	5.700 mg/m <sup>3</sup>	32.490 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$	3.549 mg/m <sup>3</sup>	12.595 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	4.965 mg/m <sup>3</sup>	24.651 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	$u_p$	0.842 mg/m <sup>3</sup>	0.709 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	8.083 mg/m <sup>3</sup>	65.333 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty ( $u_c$ )

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 18.20 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 35.67 \text{ mg/m}^3$$

#### Relative total expanded uncertainty

**U in % of the ELV 500 mg/m<sup>3</sup> 7.1**

#### Requirement of 2010/75/EU

**U in % of the ELV 500 mg/m<sup>3</sup> 10.0**

#### Requirement of EN 15267-3

**U in % of the ELV 500 mg/m<sup>3</sup> 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**

Test laboratory	936/21230405/C
Date of report	TÜV Rheinland
	2016-12-22

**Measured component**

Certification range	CO	0 - 1250 mg/m <sup>3</sup>
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**Evaluation of the cross-sensitivity (CS)**

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m <sup>3</sup>
Sum of negative CS at zero point	0.00 mg/m <sup>3</sup>
Sum of positive CS at span point	7.75 mg/m <sup>3</sup>
Sum of negative CS at span point	-23.38 mg/m <sup>3</sup>
Maximum sum of cross-sensitivities	-23.38 mg/m <sup>3</sup>
Uncertainty of cross-sensitivity	$u_i$ -13.496 mg/m <sup>3</sup>

**Calculation of the combined standard uncertainty**

**Tested parameter**

			$u^2$
Standard deviation from paired measurements under field conditions *	$u_D$	2.228 mg/m <sup>3</sup>	4.964 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$	3.464 mg/m <sup>3</sup>	11.999 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	3.608 mg/m <sup>3</sup>	13.018 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$	7.939 mg/m <sup>3</sup>	63.028 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	8.609 mg/m <sup>3</sup>	74.115 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$	0.688 mg/m <sup>3</sup>	0.473 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	-13.496 mg/m <sup>3</sup>	182.142 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	$u_p$	0.000 mg/m <sup>3</sup>	0.000 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	10.104 mg/m <sup>3</sup>	102.083 (mg/m <sup>3</sup> ) <sup>2</sup>

\* 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/m <sup>3</sup>
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	41.66 mg/m <sup>3</sup>

**Relative total expanded uncertainty**

Requirement of 2010/75/EU	<b>U in % of the ELV 600 mg/m<sup>3</sup></b>	<b>6.9</b>
Requirement of EN 15267-3	<b>U in % of the ELV 600 mg/m<sup>3</sup></b>	<b>10.0</b>
	<b>U in % of the ELV 600 mg/m<sup>3</sup></b>	<b>7.5</b>



### 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

Test laboratory	936/21230405/C
Date of report	TÜV Rheinland
	2016-12-22

#### Measured component

Certification range	NO	0 - 100 mg/m <sup>3</sup>
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#### Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	3.06 mg/m <sup>3</sup>
Sum of negative CS at zero point	0.00 mg/m <sup>3</sup>
Sum of positive CS at span point	3.20 mg/m <sup>3</sup>
Sum of negative CS at span point	-0.50 mg/m <sup>3</sup>
Maximum sum of cross-sensitivities	3.20 mg/m <sup>3</sup>
Uncertainty of cross-sensitivity	$u_i$ 1.848 mg/m <sup>3</sup>

#### Calculation of the combined standard uncertainty

##### Tested parameter

			$u^2$
Standard deviation from paired measurements under field conditions *	$u_D$	0.628 mg/m <sup>3</sup>	0.394 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$	-0.924 mg/m <sup>3</sup>	0.854 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	1.386 mg/m <sup>3</sup>	1.921 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$	0.751 mg/m <sup>3</sup>	0.564 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	0.896 mg/m <sup>3</sup>	0.803 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$	0.582 mg/m <sup>3</sup>	0.339 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	1.848 mg/m <sup>3</sup>	3.415 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	$u_p$	-0.120 mg/m <sup>3</sup>	0.014 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	0.808 mg/m <sup>3</sup>	0.653 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty ( $u_c$ )

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 2.99 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 5.87 \text{ mg/m}^3$$

#### Relative total expanded uncertainty

**U in % of the ELV 40 mg/m<sup>3</sup> 14.7**

#### Requirement of 2010/75/EU

**U in % of the ELV 40 mg/m<sup>3</sup> 20.0**

#### Requirement of EN 15267-3

**U in % of the ELV 40 mg/m<sup>3</sup> 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**

Test laboratory	936/21230405/C TÜV Rheinland
Date of report	2016-12-22

**Measured component**

Certification range	NO 0 - 1000 mg/m <sup>3</sup>
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**Evaluation of the cross-sensitivity (CS)**

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m <sup>3</sup>
Sum of negative CS at zero point	0.00 mg/m <sup>3</sup>
Sum of positive CS at span point	0.00 mg/m <sup>3</sup>
Sum of negative CS at span point	-33.10 mg/m <sup>3</sup>
Maximum sum of cross-sensitivities	-33.10 mg/m <sup>3</sup>
Uncertainty of cross-sensitivity	$u_i$ -19.110 mg/m <sup>3</sup>

**Calculation of the combined standard uncertainty**

**Tested parameter**

			$u^2$	
Standard deviation from paired measurements under field conditions *	$u_D$	5.941 mg/m <sup>3</sup>	35.295	(mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$	4.041 mg/m <sup>3</sup>	16.330	(mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	5.774 mg/m <sup>3</sup>	33.339	(mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$	10.970 mg/m <sup>3</sup>	120.341	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	6.275 mg/m <sup>3</sup>	39.376	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$	1.851 mg/m <sup>3</sup>	3.426	(mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	-19.110 mg/m <sup>3</sup>	365.192	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	$u_p$	-0.722 mg/m <sup>3</sup>	0.521	(mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	8.083 mg/m <sup>3</sup>	65.333	(mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty ( $u_c$ )

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 26.06 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 51.08 \text{ mg/m}^3$$

**Relative total expanded uncertainty**

**U in % of the ELV 500 mg/m<sup>3</sup> 10.2**

**Requirement of 2010/75/EU**

**U in % of the ELV 500 mg/m<sup>3</sup> 20.0**

Requirement of EN 15267-3

U in % of the ELV 500 mg/m<sup>3</sup> 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

Test laboratory	936/21230405/C
Date of report	TÜV Rheinland
	2016-12-22

#### Measured component

Certification range	NO	0 - 600 mg/m <sup>3</sup>
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#### Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m <sup>3</sup>
Sum of negative CS at zero point	0.00 mg/m <sup>3</sup>
Sum of positive CS at span point	0.00 mg/m <sup>3</sup>
Sum of negative CS at span point	-17.04 mg/m <sup>3</sup>
Maximum sum of cross-sensitivities	-17.04 mg/m <sup>3</sup>
Uncertainty of cross-sensitivity	$u_i$ -9.838 mg/m <sup>3</sup>

#### Calculation of the combined standard uncertainty

##### Tested parameter

			$u^2$
Standard deviation from paired measurements under field conditions *	$u_D$	2.338 mg/m <sup>3</sup>	5.466 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$	1.732 mg/m <sup>3</sup>	3.000 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	4.850 mg/m <sup>3</sup>	23.523 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$	6.582 mg/m <sup>3</sup>	43.323 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	3.005 mg/m <sup>3</sup>	9.030 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$	1.787 mg/m <sup>3</sup>	3.193 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	-9.838 mg/m <sup>3</sup>	96.786 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	$u_p$	0.577 mg/m <sup>3</sup>	0.333 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	4.850 mg/m <sup>3</sup>	23.520 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty ( $u_c$ )

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 14.43 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 28.28 \text{ mg/m}^3$$

#### Relative total expanded uncertainty

**U in % of the ELV 200 mg/m<sup>3</sup> 14.1**

#### Requirement of 2010/75/EU

**U in % of the ELV 200 mg/m<sup>3</sup> 20.0**

#### Requirement of EN 15267-3

**U in % of the ELV 200 mg/m<sup>3</sup> 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

Test laboratory	936/21230405/C
Date of report	TÜV Rheinland
	2016-12-22

#### Measured component

	SO <sub>2</sub>
Certification range	0 - 75 mg/m <sup>3</sup>

#### Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	1.99 mg/m <sup>3</sup>
Sum of negative CS at zero point	-0.84 mg/m <sup>3</sup>
Sum of positive CS at span point	1.10 mg/m <sup>3</sup>
Sum of negative CS at span point	-2.80 mg/m <sup>3</sup>
Maximum sum of cross-sensitivities	-2.80 mg/m <sup>3</sup>
Uncertainty of cross-sensitivity	u <sub>i</sub> -1.615 mg/m <sup>3</sup>

#### Calculation of the combined standard uncertainty

##### Tested parameter

			u <sup>2</sup>
Standard deviation from paired measurements under field conditions *	U <sub>D</sub>	1.066 mg/m <sup>3</sup>	1.136 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	U <sub>lof</sub>	-0.637 mg/m <sup>3</sup>	0.406 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	U <sub>d,z</sub>	0.953 mg/m <sup>3</sup>	0.908 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	U <sub>d,s</sub>	0.996 mg/m <sup>3</sup>	0.992 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	U <sub>t</sub>	1.277 mg/m <sup>3</sup>	1.631 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	U <sub>v</sub>	0.448 mg/m <sup>3</sup>	0.201 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	u <sub>i</sub>	-1.615 mg/m <sup>3</sup>	2.608 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	U <sub>p</sub>	-0.135 mg/m <sup>3</sup>	0.018 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	U <sub>rm</sub>	0.606 mg/m <sup>3</sup>	0.368 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u<sub>c</sub>)

$$u_c = \sqrt{\sum (u_{\max, j})^2} \quad 2.88 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 5.64 \text{ mg/m}^3$$

#### Relative total expanded uncertainty

U in % of the ELV 50 mg/m<sup>3</sup> **11.3**

#### Requirement of 2010/75/EU

U in % of the ELV 50 mg/m<sup>3</sup> **20.0**

#### Requirement of EN 15267-3

U in % of the ELV 50 mg/m<sup>3</sup> **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

Test laboratory	936/21230405/C
Date of report	TÜV Rheinland
	2016-12-22

#### Measured component

	CO <sub>2</sub>
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 positive 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.-%) <sup>2</sup>
Lack of fit	$u_{lof}$	0.058 Vol.-%	0.003 (Vol.-%) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	-0.289 Vol.-%	0.084 (Vol.-%) <sup>2</sup>
Span drift from field test	$u_{d,s}$	-0.260 Vol.-%	0.068 (Vol.-%) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	0.289 Vol.-%	0.084 (Vol.-%) <sup>2</sup>
Influence of supply voltage	$u_v$	0.062 Vol.-%	0.004 (Vol.-%) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	-0.173 Vol.-%	0.030 (Vol.-%) <sup>2</sup>
Influence of sample gas flow	$u_p$	0.000 Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	0.202 Vol.-%	0.041 (Vol.-%) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty ( $u_c$ )

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 0.93 \text{ Vol.-%}$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 1.82 \text{ Vol.-%}$$

#### 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**

Test laboratory	936/21230405/C
Date of report	TÜV Rheinland
	2016-12-22

**Measured component**

Certification range	O <sub>2</sub>	0 - 25 Vol.-%
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**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 positive 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 <sub>i</sub>	0.000 Vol.-%

**Calculation of the combined standard uncertainty**

**Tested parameter**

				u <sup>2</sup>
Standard deviation from paired measurements under field conditions *	u <sub>D</sub>	0.083	Vol.-%	0.007 (Vol.-%) <sup>2</sup>
Lack of fit	u <sub>lof</sub>	-0.012	Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Zero drift from field test	u <sub>d,z</sub>	-0.035	Vol.-%	0.001 (Vol.-%) <sup>2</sup>
Span drift from field test	u <sub>d,s</sub>	-0.069	Vol.-%	0.005 (Vol.-%) <sup>2</sup>
Influence of ambient temperature at span	u <sub>t</sub>	0.081	Vol.-%	0.007 (Vol.-%) <sup>2</sup>
Influence of supply voltage	u <sub>v</sub>	0.055	Vol.-%	0.003 (Vol.-%) <sup>2</sup>
Cross-sensitivity (interference)	u <sub>i</sub>	0.000	Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Influence of sample gas flow	u <sub>p</sub>	0.006	Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	u <sub>rm</sub>	0.202	Vol.-%	0.041 (Vol.-%) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u<sub>c</sub>)

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 0.25 \text{ Vol.-%}$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 0.49 \text{ Vol.-%}$$

**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 GEM CERT 7MB 1957
Serial number of units under test	TÜV 1 / TÜV 2
Measuring principle	electrochemical

**Test report**

Test laboratory	936/21230405/B
Date of report	TÜV Rheinland
	2016-09-12

**Measured component**

Certification range	O <sub>2</sub>	0 - 25 Vol.-%
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**Evaluation of the cross-sensitivity (CS)**

(system with largest CS)

Uncertainty of cross-sensitivity	$u_i$	0.167 Vol.-%
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**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.-%) <sup>2</sup>
Lack of fit	$u_{lof}$	0.058 Vol.-%	0.003 (Vol.-%) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	0.167 Vol.-%	0.028 (Vol.-%) <sup>2</sup>
Span drift from field test	$u_{d,s}$	0.098 Vol.-%	0.010 (Vol.-%) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	0.040 Vol.-%	0.002 (Vol.-%) <sup>2</sup>
Influence of supply voltage	$u_v$	0.009 Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	0.167 Vol.-%	0.028 (Vol.-%) <sup>2</sup>
Influence of sample gas flow	$u_p$	-0.029 Vol.-%	0.001 (Vol.-%) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	0.202 Vol.-%	0.041 (Vol.-%) <sup>2</sup>

\* 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 GEM CERT 7MB 1957 SIPROCESS UV 600
Serial number of units under test	TÜV 1 / TÜV 2
Measuring principle	UV-RAS

#### Test report

Test laboratory	936/21230405/B
Date of report	TÜV Rheinland
	2016-09-12

#### Measured component

Certification range	SO <sub>2</sub>	0 - 75 mg/m <sup>3</sup>
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#### Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Uncertainty of cross-sensitivity	u <sub>i</sub>	1.589 mg/m <sup>3</sup>
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#### Calculation of the combined standard uncertainty

##### Tested parameter

			u <sup>2</sup>
Standard deviation from paired measurements under field conditions *	u <sub>D</sub>	0.586 mg/m <sup>3</sup>	0.343 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	u <sub>lof</sub>	0.403 mg/m <sup>3</sup>	0.162 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	u <sub>d,z</sub>	-1.212 mg/m <sup>3</sup>	1.469 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	u <sub>d,s</sub>	-1.256 mg/m <sup>3</sup>	1.578 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	u <sub>t</sub>	0.872 mg/m <sup>3</sup>	0.760 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	u <sub>v</sub>	0.179 mg/m <sup>3</sup>	0.032 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	u <sub>i</sub>	1.589 mg/m <sup>3</sup>	2.525 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	u <sub>b</sub>	-0.264 mg/m <sup>3</sup>	0.070 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	u <sub>rm</sub>	0.606 mg/m <sup>3</sup>	0.368 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u<sub>c</sub>)

$$u_c = \sqrt{\sum (u_{\max, j})^2} \quad 2.70 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 5.30 \text{ mg/m}^3$$

#### Relative total expanded uncertainty

**U in % of the ELV 50 mg/m<sup>3</sup> 10.6**

#### Requirement of 2010/75/EU

**U in % of the ELV 50 mg/m<sup>3</sup> 20.0**

#### Requirement of EN 15267-3

**U in % of the ELV 50 mg/m<sup>3</sup> 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 GEM CERT 7MB 1957 Ultramat 23
Serial number of units under test	TÜV 1 / TÜV 2
Measuring principle	NDIR

#### Test report

Test laboratory	936/21242490/A
Date of report	TÜV Rheinland
	2019-02-27

#### Measured component

Certification range	CO	0 - 375 mg/m <sup>3</sup>
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#### Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Uncertainty of cross-sensitivity	$u_i$	2.165 mg/m <sup>3</sup>
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#### Calculation of the combined standard uncertainty

##### Tested parameter

			$u^2$	
Standard deviation from paired measurements under field conditions *	$u_D$	1.656 mg/m <sup>3</sup>	2.742	(mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$	-1.155 mg/m <sup>3</sup>	1.334	(mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	1.443 mg/m <sup>3</sup>	2.082	(mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$	1.443 mg/m <sup>3</sup>	2.082	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	1.277 mg/m <sup>3</sup>	1.631	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$	1.392 mg/m <sup>3</sup>	1.938	(mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	2.165 mg/m <sup>3</sup>	4.687	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	$u_b$	-0.217 mg/m <sup>3</sup>	0.047	(mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	3.031 mg/m <sup>3</sup>	9.188	(mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty ( $u_c$ )

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 5.07 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 9.94 \text{ mg/m}^3$$

#### Relative total expanded uncertainty

**U in % of the ELV 150 mg/m<sup>3</sup> 6.6**

#### Requirement of 2010/75/EU

**U in % of the ELV 150 mg/m<sup>3</sup> 10.0**

#### Requirement of EN 15267-3

**U in % of the ELV 150 mg/m<sup>3</sup> 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 GEM CERT 7MB 1957 Ultramat 23
Serial number of units under test	TÜV 3 / TÜV 4
Measuring principle	NDIR

#### Test report

Test laboratory	936/21242490/A
Date of report	TÜV Rheinland
	2019-02-27

#### Measured component

Certification range	CO	0 - 375 mg/m <sup>3</sup>
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#### Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Uncertainty of cross-sensitivity	$u_i$	2.165 mg/m <sup>3</sup>
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#### Calculation of the combined standard uncertainty

##### Tested parameter

			$u^2$	
Standard deviation from paired measurements under field conditions *	$u_D$	1.656 mg/m <sup>3</sup>	2.742	(mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$	-1.155 mg/m <sup>3</sup>	1.334	(mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	1.443 mg/m <sup>3</sup>	2.082	(mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$	1.443 mg/m <sup>3</sup>	2.082	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	1.277 mg/m <sup>3</sup>	1.631	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$	1.568 mg/m <sup>3</sup>	2.459	(mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	2.165 mg/m <sup>3</sup>	4.687	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	$u_b$	-0.303 mg/m <sup>3</sup>	0.092	(mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	3.031 mg/m <sup>3</sup>	9.188	(mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty ( $u_c$ )

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 5.13 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 10.05 \text{ mg/m}^3$$

#### Relative total expanded uncertainty

**U in % of the ELV 150 mg/m<sup>3</sup> 6.7**

#### Requirement of 2010/75/EU

**U in % of the ELV 150 mg/m<sup>3</sup> 10.0**

#### Requirement of EN 15267-3

**U in % of the ELV 150 mg/m<sup>3</sup> 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 GEM CERT 7MB 1957 Ultramat 23
Serial number of units under test	TÜV 1 / TÜV 2
Measuring principle	NDIR

#### Test report

Test laboratory	936/21230405/B
Date of report	TÜV Rheinland
	2016-09-12

#### Measured component

Certification range	NO	0 - 150 mg/m <sup>3</sup>
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#### Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Uncertainty of cross-sensitivity	$u_i$	-3.464 mg/m <sup>3</sup>
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#### Calculation of the combined standard uncertainty

##### Tested parameter

			$u^2$	
Standard deviation from paired measurements under field conditions *	$u_D$	0.619 mg/m <sup>3</sup>	0.383	(mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$	0.753 mg/m <sup>3</sup>	0.567	(mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	-1.212 mg/m <sup>3</sup>	1.469	(mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$	2.252 mg/m <sup>3</sup>	5.072	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	0.833 mg/m <sup>3</sup>	0.694	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$	1.108 mg/m <sup>3</sup>	1.228	(mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	-3.464 mg/m <sup>3</sup>	11.999	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	$u_b$	0.381 mg/m <sup>3</sup>	0.145	(mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	1.212 mg/m <sup>3</sup>	1.470	(mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty ( $u_c$ )

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 4.80 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 9.41 \text{ mg/m}^3$$

#### Relative total expanded uncertainty

**U in % of the ELV 65.2 mg/m<sup>3</sup> 14.4**

#### Requirement of 2010/75/EU

**U in % of the ELV 65.2 mg/m<sup>3</sup> 20.0**

#### Requirement of EN 15267-3

**U in % of the ELV 65.2 mg/m<sup>3</sup> 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 GEM CERT 7MB 1957 Ultramat 23
Serial number of units under test	TÜV 1 / TÜV 2
Measuring principle	NDIR

**Test report**

Test laboratory	936/21230405/B
Date of report	TÜV Rheinland
	2016-09-12

**Measured component**

Certification range	NO	0 - 400 mg/m³
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**Evaluation of the cross-sensitivity (CS)**

(system with largest CS)

Uncertainty of cross-sensitivity	$u_i$	-6.928 mg/m³
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**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	$u_b$	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 ( $u_c$ )

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 9.73 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 19.07 \text{ mg/m}^3$$

**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

Test laboratory	936/21230405/B
Date of report	TÜV Rheinland
	2016-09-12

#### Measured component

Certification range	NO	0 - 400 mg/m <sup>3</sup>
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#### Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Uncertainty of cross-sensitivity	$u_i$	-6.928 mg/m <sup>3</sup>
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#### Calculation of the combined standard uncertainty

##### Tested parameter

			$u^2$	
Standard deviation from paired measurements under field conditions *	$u_D$	1.750 mg/m <sup>3</sup>	3.063	(mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$	-1.155 mg/m <sup>3</sup>	1.334	(mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	3.233 mg/m <sup>3</sup>	10.452	(mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$	3.695 mg/m <sup>3</sup>	13.653	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	2.117 mg/m <sup>3</sup>	4.482	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$	2.824 mg/m <sup>3</sup>	7.975	(mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	-6.928 mg/m <sup>3</sup>	47.997	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	$u_b$	0.531 mg/m <sup>3</sup>	0.282	(mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	3.233 mg/m <sup>3</sup>	10.453	(mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty ( $u_c$ )

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 9.98 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 19.57 \text{ mg/m}^3$$

#### Relative total expanded uncertainty

**U in % of the ELV 130.4 mg/m<sup>3</sup> 15.0**

#### Requirement of 2010/75/EU

**U in % of the ELV 130.4 mg/m<sup>3</sup> 20.0**

#### Requirement of EN 15267-3

**U in % of the ELV 130.4 mg/m<sup>3</sup> 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 GEM CERT 7MB 1957 SIPROCESS UV 600
Serial number of units under test	TÜV 1 / TÜV 2
Measuring principle	UV-RAS

#### Test report

Test laboratory	936/21230405/B
Date of report	TÜV Rheinland
	2016-09-12

#### Measured component

Certification range	NO	0 - 50 mg/m <sup>3</sup>
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#### Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Uncertainty of cross-sensitivity	$u_i$	0.967 mg/m <sup>3</sup>
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#### Calculation of the combined standard uncertainty

##### Tested parameter

			$u^2$	
Standard deviation from paired measurements under field conditions *	$u_D$	0.350 mg/m <sup>3</sup>	0.123	(mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$	-0.289 mg/m <sup>3</sup>	0.084	(mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	0.866 mg/m <sup>3</sup>	0.750	(mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$	-0.693 mg/m <sup>3</sup>	0.480	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	0.624 mg/m <sup>3</sup>	0.389	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$	0.096 mg/m <sup>3</sup>	0.009	(mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	0.967 mg/m <sup>3</sup>	0.935	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	$u_b$	-0.136 mg/m <sup>3</sup>	0.018	(mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	0.404 mg/m <sup>3</sup>	0.163	(mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty ( $u_c$ )

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 1.72 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 3.37 \text{ mg/m}^3$$

#### Relative total expanded uncertainty

**U in % of the ELV 32.6 mg/m<sup>3</sup> 10.3**

#### Requirement of 2010/75/EU

**U in % of the ELV 32.6 mg/m<sup>3</sup> 20.0**

#### Requirement of EN 15267-3

**U in % of the ELV 32.6 mg/m<sup>3</sup> 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 GEM CERT 7MB 1957 Ultramat 23
Serial number of units under test	TÜV 1 / TÜV 2
Measuring principle	NDIR

**Test report**

Test laboratory	936/21230405/B
Date of report	TÜV Rheinland
	2016-09-12

**Measured component**

Certification range	SO <sub>2</sub>	0 - 400 mg/m <sup>3</sup>
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**Evaluation of the cross-sensitivity (CS)**

(system with largest CS)

Uncertainty of cross-sensitivity	u <sub>i</sub>	-6.928 mg/m <sup>3</sup>
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**Calculation of the combined standard uncertainty**

**Tested parameter**

			u <sup>2</sup>
Standard deviation from paired measurements under field conditions *	u <sub>D</sub>	2.475 mg/m <sup>3</sup>	6.126 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	u <sub>lof</sub>	-2.309 mg/m <sup>3</sup>	5.331 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	u <sub>d,z</sub>	6.235 mg/m <sup>3</sup>	38.875 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	u <sub>d,s</sub>	4.850 mg/m <sup>3</sup>	23.523 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	u <sub>t</sub>	4.414 mg/m <sup>3</sup>	19.483 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	u <sub>v</sub>	2.217 mg/m <sup>3</sup>	4.915 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	u <sub>i</sub>	-6.928 mg/m <sup>3</sup>	47.997 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	u <sub>b</sub>	-2.215 mg/m <sup>3</sup>	4.906 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	u <sub>rm</sub>	3.233 mg/m <sup>3</sup>	10.453 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u<sub>c</sub>)

$$u_c = \sqrt{\sum (u_{\max, j})^2} \quad 12.71 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 24.92 \text{ mg/m}^3$$

**Relative total expanded uncertainty**

**U in % of the ELV 200 mg/m<sup>3</sup> 12.5**

**Requirement of 2010/75/EU**

**U in % of the ELV 200 mg/m<sup>3</sup> 20.0**

**Requirement of EN 15267-3**

**U in % of the ELV 200 mg/m<sup>3</sup> 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

Test laboratory	936/21230405/B
Date of report	TÜV Rheinland
	2016-09-12

#### Measured component

Certification range	SO <sub>2</sub>	0 - 400 mg/m <sup>3</sup>
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#### Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Uncertainty of cross-sensitivity	u <sub>i</sub>	-6.928 mg/m <sup>3</sup>
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#### Calculation of the combined standard uncertainty

##### Tested parameter

			u <sup>2</sup>
Standard deviation from paired measurements under field conditions *	u <sub>D</sub>	2.475 mg/m <sup>3</sup>	6.126 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	u <sub>lof</sub>	-2.309 mg/m <sup>3</sup>	5.331 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	u <sub>d,z</sub>	6.235 mg/m <sup>3</sup>	38.875 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	u <sub>d,s</sub>	4.850 mg/m <sup>3</sup>	23.523 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	u <sub>t</sub>	4.414 mg/m <sup>3</sup>	19.483 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	u <sub>v</sub>	2.564 mg/m <sup>3</sup>	6.574 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	u <sub>i</sub>	-6.928 mg/m <sup>3</sup>	47.997 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	u <sub>b</sub>	-2.215 mg/m <sup>3</sup>	4.906 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	u <sub>rm</sub>	3.233 mg/m <sup>3</sup>	10.453 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u<sub>c</sub>)

$$u_c = \sqrt{\sum (u_{\max, j})^2} \quad 12.78 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 25.04 \text{ mg/m}^3$$

#### Relative total expanded uncertainty

U in % of the ELV 200 mg/m<sup>3</sup> **12.5**

#### Requirement of 2010/75/EU

U in % of the ELV 200 mg/m<sup>3</sup> **20.0**

#### Requirement of EN 15267-3

U in % of the ELV 200 mg/m<sup>3</sup> **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.



**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**

Test laboratory	TÜV Rheinland
Date of report	2016-09-12

**Measured component**

Certification range	CO 0 - 200 mg/m <sup>3</sup>
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**Evaluation of the cross-sensitivity (CS)**

(system with largest CS)

Uncertainty of cross-sensitivity	$u_i$ 1.998 mg/m <sup>3</sup>
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**Calculation of the combined standard uncertainty**

**Tested parameter**

		$u^2$	
Standard deviation from paired measurements under field conditions *	$u_D$ 0.588 mg/m <sup>3</sup>	0.346	(mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$ -0.924 mg/m <sup>3</sup>	0.854	(mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$ 1.848 mg/m <sup>3</sup>	3.415	(mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$ -1.732 mg/m <sup>3</sup>	3.000	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$ 0.493 mg/m <sup>3</sup>	0.243	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$ 0.484 mg/m <sup>3</sup>	0.234	(mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$ 1.998 mg/m <sup>3</sup>	3.992	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	$u_p$ -0.107 mg/m <sup>3</sup>	0.011	(mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$ 1.617 mg/m <sup>3</sup>	2.613	(mg/m <sup>3</sup> ) <sup>2</sup>

\* 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/m <sup>3</sup>
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	7.52 mg/m <sup>3</sup>

**Relative total expanded uncertainty**

**Requirement of 2010/75/EU**

Requirement of EN 15267-3

<b>U in % of the ELV 100 mg/m<sup>3</sup></b>	<b>7.5</b>
<b>U in % of the ELV 100 mg/m<sup>3</sup></b>	<b>10.0</b>
U in % of the ELV 100 mg/m <sup>3</sup>	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 GEM CERT 7MB 1957 SIPROCESS UV 600
Serial number of units under test	TÜV 1 / TÜV 2
Measuring principle	UV-RAS

#### Test report

Test laboratory	936/21230405/B
Date of report	TÜV Rheinland
	2016-09-12

#### Measured component

Certification range	NO <sub>2</sub>	0 - 50 mg/m <sup>3</sup>
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#### Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Uncertainty of cross-sensitivity	u <sub>i</sub>	1.065 mg/m <sup>3</sup>
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#### Calculation of the combined standard uncertainty

##### Tested parameter

			u <sup>2</sup>	
Standard deviation from paired measurements under field conditions *	u <sub>D</sub>	0.372 mg/m <sup>3</sup>	0.138	(mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	u <sub>lof</sub>	0.231 mg/m <sup>3</sup>	0.053	(mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	u <sub>d,z</sub>	0.606 mg/m <sup>3</sup>	0.367	(mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	u <sub>d,s</sub>	-0.808 mg/m <sup>3</sup>	0.653	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	u <sub>t</sub>	0.643 mg/m <sup>3</sup>	0.413	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	u <sub>v</sub>	0.200 mg/m <sup>3</sup>	0.040	(mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	u <sub>i</sub>	1.065 mg/m <sup>3</sup>	1.134	(mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	u <sub>b</sub>	-0.075 mg/m <sup>3</sup>	0.006	(mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	u <sub>rm</sub>	0.404 mg/m <sup>3</sup>	0.163	(mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u<sub>c</sub>)

$$u_c = \sqrt{\sum (u_{\max, j})^2} \quad 1.72 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 3.38 \text{ mg/m}^3$$

#### Relative total expanded uncertainty

**U in % of the ELV 50 mg/m<sup>3</sup> 6.8**

#### Requirement of 2010/75/EU

**U in % of the ELV 50 mg/m<sup>3</sup> 20.0**

#### Requirement of EN 15267-3

**U in % of the ELV 50 mg/m<sup>3</sup> 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

Test laboratory	936/21230405/C
Date of report	TÜV Rheinland
	2016-12-22

#### Measured component

	O <sub>2</sub>
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 positive 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 <sub>i</sub>	0.000 Vol.-%

#### Calculation of the combined standard uncertainty

##### Tested parameter

				u <sup>2</sup>
Repeatability standard deviation at set point *	u <sub>r</sub>	0.050	Vol.-%	0.003 (Vol.-%) <sup>2</sup>
Lack of fit	u <sub>lof</sub>	0.058	Vol.-%	0.003 (Vol.-%) <sup>2</sup>
Zero drift from field test	u <sub>d,z</sub>	-0.052	Vol.-%	0.003 (Vol.-%) <sup>2</sup>
Span drift from field test	u <sub>d,s</sub>	0.081	Vol.-%	0.007 (Vol.-%) <sup>2</sup>
Influence of ambient temperature at span	u <sub>t</sub>	0.116	Vol.-%	0.013 (Vol.-%) <sup>2</sup>
Influence of supply voltage	u <sub>v</sub>	0.055	Vol.-%	0.003 (Vol.-%) <sup>2</sup>
Cross-sensitivity (interference)	u <sub>i</sub>	0.000	Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Influence of sample gas flow	u <sub>p</sub>	0.006	Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	u <sub>rm</sub>	0.202	Vol.-%	0.041 (Vol.-%) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u<sub>c</sub>)

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 0.27 \text{ Vol.-%}$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 0.53 \text{ Vol.-%}$$

#### 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 % 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**

Test laboratory	936/21242490/A	936/21242490/B
Date of report	TÜV Rheinland	TÜV Rheinland
	2019-02-27	2021-05-03

**Measured component**

Certification range	O <sub>2</sub>	0 - 25 Vol.-%
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**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 positive 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 <sub>i</sub>	0.000 Vol.-%

**Calculation of the combined standard uncertainty**

**Tested parameter**

				u <sup>2</sup>
Standard deviation from paired measurements under field conditions *	u <sub>D</sub>	0.086	Vol.-%	0.007 (Vol.-%) <sup>2</sup>
Lack of fit	u <sub>lof</sub>	0.058	Vol.-%	0.003 (Vol.-%) <sup>2</sup>
Zero drift from field test	u <sub>d,z</sub>	0.098	Vol.-%	0.010 (Vol.-%) <sup>2</sup>
Span drift from field test	u <sub>d,s</sub>	0.110	Vol.-%	0.012 (Vol.-%) <sup>2</sup>
Influence of ambient temperature at span	u <sub>t</sub>	0.122	Vol.-%	0.015 (Vol.-%) <sup>2</sup>
Influence of supply voltage	u <sub>v</sub>	0.021	Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Cross-sensitivity (interference)	u <sub>i</sub>	0.000	Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Influence of sample gas flow	u <sub>p</sub>	0.021	Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	u <sub>rm</sub>	0.202	Vol.-%	0.041 (Vol.-%) <sup>2</sup>

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

Combined standard uncertainty (u <sub>c</sub> )	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.30	Vol.-%
Total expanded uncertainty	U = u <sub>c</sub> * k = u <sub>c</sub> * 1.96	0.58	Vol.-%

**Relative total expanded uncertainty**

<b>Requirement of 2010/75/EU</b>	<b>U in % of the range 25 Vol.-%</b>	<b>2.3</b>
<b>Requirement of EN 15267-3</b>	<b>U in % of the range 25 Vol.-%</b>	<b>10.0 **</b>
		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 7)
Serial number of units under test	N1K1100191 / N1JN100185
Measuring principle	NDIR

**Test report**

Test laboratory	TÜV Rheinland
Date of report	2019-02-27

**Measured component**

Certification range	CO <sub>2</sub>	0 - 30 Vol.-%
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**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 positive 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 <sub>i</sub>	0.232 Vol.-%

**Calculation of the combined standard uncertainty**

**Tested parameter**

				u <sup>2</sup>
Standard deviation from paired measurements under field conditions *	u <sub>D</sub>	0.047	Vol.-%	0.002 (Vol.-%) <sup>2</sup>
Lack of fit	u <sub>lof</sub>	0.289	Vol.-%	0.084 (Vol.-%) <sup>2</sup>
Zero drift from field test	u <sub>d,z</sub>	0.017	Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Span drift from field test	u <sub>d,s</sub>	0.087	Vol.-%	0.008 (Vol.-%) <sup>2</sup>
Influence of ambient temperature at span	u <sub>t</sub>	0.173	Vol.-%	0.030 (Vol.-%) <sup>2</sup>
Influence of supply voltage	u <sub>v</sub>	0.012	Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Cross-sensitivity (interference)	u <sub>i</sub>	0.232	Vol.-%	0.054 (Vol.-%) <sup>2</sup>
Influence of sample gas flow	u <sub>p</sub>	0.004	Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	u <sub>rm</sub>	0.242	Vol.-%	0.059 (Vol.-%) <sup>2</sup>

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

Combined standard uncertainty (u <sub>c</sub> )	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.49	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.95	Vol.-%

**Relative total expanded uncertainty**

<b>Requirement of 2010/75/EU</b>	<b>U in % of the range 30 Vol.-%</b>	<b>3.2</b>
<b>Requirement of EN 15267-3</b>	<b>U in % of the range 30 Vol.-%</b>	<b>10.0 **</b>
	<b>U in % of the range 30 Vol.-%</b>	<b>7.5</b>

\*\* 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**

Test laboratory	936/21242490/A
Date of report	TÜV Rheinland
	2019-02-27

**Measured component**

	NO <sub>2</sub>
Certification range	0 - 50 mg/m <sup>3</sup>

**Evaluation of the cross-sensitivity (CS)**

(system with largest CS)

Sum of positive CS at zero point	1.61 mg/m <sup>3</sup>
Sum of negative CS at zero point	0.00 mg/m <sup>3</sup>
Sum of positive CS at span point	0.30 mg/m <sup>3</sup>
Sum of negative CS at span point	-0.70 mg/m <sup>3</sup>
Maximum sum of cross-sensitivities	1.61 mg/m <sup>3</sup>
Uncertainty of cross-sensitivity	u <sub>i</sub> 0.930 mg/m <sup>3</sup>

**Calculation of the combined standard uncertainty**

**Tested parameter**

			u <sup>2</sup>
Standard deviation from paired measurements under field conditions *	U <sub>D</sub>	0.096 mg/m <sup>3</sup>	0.009 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	U <sub>lof</sub>	0.346 mg/m <sup>3</sup>	0.120 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	U <sub>d,z</sub>	0.173 mg/m <sup>3</sup>	0.030 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	U <sub>d,s</sub>	-0.751 mg/m <sup>3</sup>	0.564 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	U <sub>t</sub>	0.473 mg/m <sup>3</sup>	0.224 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	U <sub>v</sub>	0.031 mg/m <sup>3</sup>	0.001 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	u <sub>i</sub>	0.930 mg/m <sup>3</sup>	0.865 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	U <sub>p</sub>	0.030 mg/m <sup>3</sup>	0.001 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	U <sub>rm</sub>	0.404 mg/m <sup>3</sup>	0.163 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u<sub>c</sub>)

$$u_c = \sqrt{\sum (u_{\max, j})^2} \quad 1.41 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 2.76 \text{ mg/m}^3$$

**Relative total expanded uncertainty**

**U in % of the ELV 33.3 mg/m<sup>3</sup> 8.3**

**Requirement of 2010/75/EU**

**U in % of the ELV 33.3 mg/m<sup>3</sup> 20.0**

**Requirement of EN 15267-3**

**U in % of the ELV 33.3 mg/m<sup>3</sup> 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**

Test laboratory	936/21242490/A TÜV Rheinland
Date of report	2019-02-27

**Measured component**

Certification range	SO <sub>2</sub> 0 - 70 mg/m <sup>3</sup>
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**Evaluation of the cross-sensitivity (CS)**

(system with largest CS)

Sum of positive CS at zero point	2.29 mg/m <sup>3</sup>
Sum of negative CS at zero point	0.00 mg/m <sup>3</sup>
Sum of positive CS at span point	0.60 mg/m <sup>3</sup>
Sum of negative CS at span point	-1.90 mg/m <sup>3</sup>
Maximum sum of cross-sensitivities	2.29 mg/m <sup>3</sup>
Uncertainty of cross-sensitivity	u <sub>i</sub> 1.322 mg/m <sup>3</sup>

**Calculation of the combined standard uncertainty**

**Tested parameter**

		u <sup>2</sup>
Standard deviation from paired measurements under field conditions *	U <sub>D</sub> 0.286 mg/m <sup>3</sup>	0.082 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	U <sub>lof</sub> 0.230 mg/m <sup>3</sup>	0.053 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	U <sub>d,z</sub> 0.323 mg/m <sup>3</sup>	0.104 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	U <sub>d,s</sub> -1.091 mg/m <sup>3</sup>	1.190 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	U <sub>t</sub> 0.656 mg/m <sup>3</sup>	0.430 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	U <sub>v</sub> 0.162 mg/m <sup>3</sup>	0.026 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	U <sub>i</sub> 1.322 mg/m <sup>3</sup>	1.748 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	U <sub>p</sub> 0.051 mg/m <sup>3</sup>	0.003 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	U <sub>rm</sub> 0.566 mg/m <sup>3</sup>	0.320 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u<sub>c</sub>)

$$u_c = \sqrt{\sum (u_{\max, j})^2} \quad 1.99 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c * k = u_c * 1.96 \quad 3.90 \text{ mg/m}^3$$

**Relative total expanded uncertainty**

**U in % of the ELV 50 mg/m<sup>3</sup> 7.8**

**Requirement of 2010/75/EU**

**U in % of the ELV 50 mg/m<sup>3</sup> 20.0**

Requirement of EN 15267-3

U in % of the ELV 50 mg/m<sup>3</sup> 15.0