CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000081150_02

Certified AMS:	Set CEM CERT II 7MB1957 for CO, NO, NO_2, NO_x, SO_2, O_2 and CO_2
Manufacturer:	Siemens Östliche Rheinbrückenstr. 50 76187 Karlsruhe Germany
Test Institute:	TÜV Rheinland Energy & Environment 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 (2023), EN 15267-3 (2007) as well as EN 14181 (2014).

Certification is awarded in respect of the conditions stated in this certificate (this certificate contains 14 pages).
The present certificate replaces certificate 0000081150_01 dated 5 September 2023.

TÜVRheinland® CERTIFIED

Suitability Tested
EN 15267
QAL1 Certified
Regular Surveillance

www.tuv.com
ID 0000081150

Publication in the German Federal Gazette (BAnz) of 10 May 2024

German Environment Agency

Dessau, 12 June 2024

This certificate will expire on:
9 May 2029

TÜV Rheinland Energy & Environment GmbH
Cologne, 11 June 2024

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51105 Köln

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

Test report:	EuL/21258935/A dated 29 September 2023
Initial certification:	20 March 2023
Expiry date:	9 May 2029
Publication:	BAnz AT 10.05.2024 B7, chapter I No. 5.2

Approved application

The tested AMS is suitable for use at plants according to Directive 2010/75/EC, chapter III (combustion plants / 13th BImSchV:2021), chapter IV (waste incineration plants / 17th BImSchV:2021), Directive 2015/2193/EC (44th BImSchV:2022), TA Luft:2021, 30th BImSchV:2019 and 27th BImSchV:2013. 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 a twelve month field test at a waste incineration.

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 emission limit values and oxygen concentration 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.

Note

The legal regulations mentioned correspond to the current state of legislation during certification. Each user should, if necessary, in consultation with the competent authority, ensure that this AMS meets the legal requirements for the intended use. In addition, it cannot be ruled out that legal regulations governing the use of a measuring device for emission monitoring may change during the lifetime of the certificate.

Basis of the certification

This certification is based on:

- Test report EuL/21258935/A dated 29 September 2023 of 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 10.05.2024 B7, chapter I No. 5.2, Announcement by UBA dated 19 March 2024:

AMS designation:
SET CEM CERT II 7MB1957 for CO, NO, NO_2, NO_x, SO_2, CO_2 and O_2

Manufacturer:
Siemens AG, Karlsruhe, Germany

Field of application:
Modular measuring system for plants requiring official approval and for plants according to the 27th BImSchV

Measuring ranges during the performance test:

Component	Module	Certification range	Supplementary measuring ranges		Unit
	Ultramat23-7MB235a-0bcd6-3efg				
CO	a=5; bc=(AG,AJ)[1]	0 - 50	0 - 1250	0 - 3000	mg/m³
	a=7; (bc=(AG,AJ)[1] or ef=AA,(AG,AJ)[1])				
	a=8; bc=BM,(AK,AS)[1]				
NOx	a=7; (bc=PA,(PF,PG,PH,PU,PV,PW)[1] or ef=(PF,PG,PH,PU,PV,PW)[1])	0 - 50	0 - 2000	-	mg/m³
	a=8; bc=AS[1)]				
NO	a=5; bc=PA,(PF,PG,PH,PU,PV,PW)[1]	0 - 50	0 - 1000	-	mg/m³
	a=7; (bc=PA,(PF,PG,PH,PU,PV,PW)[1] or ef=(PF,PG,PH,PU,PV,PW)[1])				
	a=8; bc=(AK,AS)[1]				
NO_2	a=5; bc=NS	0 - 50	0 - 1000	-	mg/m³
	a=7,8; ef=NS				
SO_2	a=5; bc=NS,(NF,NG,NH,NW)[1]	0 - 70	0 - 1250	-	mg/m³
	a=7; (bc=(NF,NG,NH,NW)[1] or ef=NS,(NF,NG,NH,NW)[1])				
	a=8; ef=NS,(NF,NG,NH,NW)[1]				
CO_2	a=5; bc=CP	0 - 25	-	-	Vol.-%
	a=7; (bc=CP oder ef=CP)				
	a=8; bc=BM				
O_2 electrochemical	a=5,7,8; d=1	0 - 25	-	-	Vol.-%

[1] supplementary measuring ranges

Software version:

ULTRAMAT 23-7MB2355 4.02.13
ULTRAMAT 23-7MB2357 4.02.13
ULTRAMAT 23-7MB2358 4.02.13
SIEMENS SIMATIC Set CEM CERT 7MB1957 Rev. 3.0.5

Restrictions:

none

Notes:

1. The modules of the ULTRAMAT 23 series must be operated with an interval of 24 h for automatic zero point adjustment.
2. The maintenance interval is six months.
3. The modular measuring system set CEM CERT II 7MB1957 includes a system cabinet with housing protection class IP40. The system cabinet can be equipped with a climate control unit or a fan unit.
4. The measuring system has a digital interface for data transmission in accordance with the VDI 4201 standard part 1 (General requirements), part 3 (Modbus TCP/IP) and part 4 (OPC).
5. The measuring system can be operated with the following sample gas cooler models: RC1.2+ and EGK 2-19 (+) from Bühler Technologies GmbH and MAK20-2 from AGT-PSG GmbH.
6. Supplementary test (approval of further sample gas coolers) with regard to the announcement of the Federal Environment Agency of 5 July 2023 (BAnz AT 02.08.2023 B7, Chapter I Number 3.3).

Test institute:

TÜV Rheinland Energy GmbH, Cologne
Report No.: EuL/21258935/A dated 29 September 2023

Certified product

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

The entire tested modular measuring equipment Set CEM CERT II 7MB1957 is composed of a heated sample gas sampling probe, the heated sample gas line, the two-stage sample gas cooler, the sample gas feed pump and a maximum of three multi-component analyzers from the possible analyzers Ultramat 23-7MB2355, Ultramat 23-7MB2357 or Ultramat 23-7MB2358.

Measuring cabinet Set CEM CERT II 7MB1957 System cabinet

Probe in test
Manufacturer: Bühler Technologies GmbH
Type: GAS 222.20-Cal-twin incl. ceramic filter (length 100 cm), heated 180 °C

Heated sample gas line
Temperature: 180 °C
Length: 50 m in the field, 10 m in the laboratory,
Diameter (inside): 4 mm
Material: PTFE

Compressor cooler in testing
Manufacturer: Bühler Technologies GmbH
Type: RC1.2+, 2 cooling stages, dew point at 4 °C

Alternative cooler models
Manufacturer: Bühler Technologies GmbH
Type: EGK 2-19 (+), 2 cooling stages, dew point at 5 °C
Manufacturer: AGT-PSG GmbH
Type: MAK20-2, 2 cooling stages, dew point at 4 °C

Sample gas pump
Manufacturer Bühler Technologies GmbH
Type: P 2.3

Analytical modules
Manufacturer Siemens AG
Type Ultramat 23-7MB2355
Ultramat 23-7MB2357
Ultramat 23-7MB2358

The modular measuring system Set CEM CERT II 7MB1957 includes a system cabinet with housing protection class IP40. The system cabinet can be equipped with an air-conditioning unit or with a fan unit.

The sample gas pump with integrated gas recirculation for adjusting the sample gas flows is located between the first and second cooler stages. A fine filter for fine dust separation is also integrated into the cooler housing. Downstream of the sample gas cooler, the gas path splits into either two or three sections and supplies the analyzer modules arranged in parallel with sample gas. The excess gas flows off via a bypass, if necessary. Immediately upstream of each analyzer module is another condensate filter which closes the gas path in the event

of moisture breakthrough in order to protect the analyzers. To connect zero gas for automatic zero point setting (AutoCal), a three-way valve is installed upstream of the pump, which is switched by the SIMATIC.

For the connection of zero/test gases, a further three-way valve is installed downstream of the pump which, if necessary, can offer corresponding gases for the automatic adjustment of zero and reference point - switched time-controlled by the SIMATIC. Alternatively, the test gases can also be supplied manually via a third three-way valve.

General notes

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

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

A certification mark with an ID-Number that is specific to the certified product is presented on page 1 of this certificate. This certification mark may be applied to the product or used in advertising materials for the certified product.

This document as well as the certification mark remains property of TÜV Rheinland Energy & Environment GmbH. With revocation of the publication the certificate loses its validity. After the expiration of the certificate and on requests of the TÜV Rheinland Energy & Environment GmbH this document shall be returned and the certificate mark must not be employed anymore.

The relevant version of this certificate and its expiration is also accessible on the internet: **qal1.de**.

History of documents
Certification of Set CEM CERT II 7MB1957 is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

Initial certification according to EN 15267
Certificate No. 0000081150_00: 25 April 2023
Expiry date of the certificate: 19 March 2028
Test report: 936/21253799/A dated 5 August 2022
TÜV Rheinland Energy GmbH
Publication: BAnz AT 20.03.2023 B6, chapter I number 3.3
UBA announcement dated 21 February 2023

Supplementary testing according to EN 15267
Certificate No. 0000081150_01: 5 September 2023
Expiry date of the certificate: 1 August 2028
Test report: 936/21253799/B dated 3 February 2023
TÜV Rheinland Energy GmbH
Publication: BAnz AT 02.08.2023 B7, chapter I number 3.3
UBA announcement dated 5 July 2023

Supplementary testing according to EN 15267
Certificate No. 0000081150_02: 12 June 2024
Expiry date of the certificate: 9 May 2029
Test report: EuL/21258935/A dated 29 September 2023
TÜV Rheinland Energy GmbH
Publication: BAnz AT 10.05.2024 B7, chapter I number 5.2
UBA announcement dated 19 March 2024

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

Measuring system			
Manufacturer	SIEMENS AG		
AMS designation	Set CEM CERT II 7MB1957		
Serial number of units under test	TÜV 1/TÜV 2		
Measuring principle	NDIR		
Test report	EuL/21253799/B		
Test laboratory	TÜV Rheinland		
Measured component	CO		
Certification range	0 - 50	mg/m³	
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point	0.23	mg/m³	
Sum of negative CS at zero point	0.00	mg/m³	
Sum of postive CS at span point	0.00	mg/m³	
Sum of negative CS at span point	-0.30	mg/m³	
Maximum sum of cross-sensitivities	-0.30	mg/m³	
Uncertainty of cross-sensitivity	u_i -0.173	mg/m³	

Calculation of the combined standard uncertainty

Tested parameter			u^2	
	u_D 0.309	mg/m³	0.095	(mg/m³)²
Lack of fit	u_{lof} -0.231	mg/m³	0.053	(mg/m³)²
Zero drift from field test	$u_{d,z}$ 0.115	mg/m³	0.013	(mg/m³)²
Span drift from field test	$u_{d,s}$ 0.462	mg/m³	0.213	(mg/m³)²
Influence of ambient temperature at span	u_t 0.379	mg/m³	0.144	(mg/m³)²
Influence of supply voltage	u_v 0.107	mg/m³	0.011	(mg/m³)²
Cross-sensitivity (interference)	u_i -0.173	mg/m³	0.030	(mg/m³)²
Influence of sample gas flow	u_n 0.196	mg/m³	0.038	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.87	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	1.71	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 33.3 mg/m³**	**5.1**
Requirement of 2010/75/EU	**U in % of the ELV 33.3 mg/m³**	**10.0**
Requirement of EN 15267-3	U in % of the ELV 33.3 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 II 7MB1957		
Serial number of units under test			TÜV 1/TÜV 2		
Measuring principle			NDIR		
Test report			EuL/21253799/B		
Test laboratory			TÜV Rheinland		
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			0.00	Vol.-%	
Sum of negative CS at span point			-0.10	Vol.-%	
Maximum sum of cross-sensitivities			0.10	Vol.-%	
Uncertainty of cross-sensitivity	u_i		0.058	Vol.-%	

Calculation of the combined standard uncertainty

Tested parameter				u^2	
	u_D	0.105	Vol.-%	0.011	(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	$u_{d,s}$	0.130	Vol.-%	0.017	(Vol.-%)²
Influence of ambient temperature at span	u_t	0.115	Vol.-%	0.013	(Vol.-%)²
Influence of supply voltage	u_v	0.000	Vol.-%	0.000	(Vol.-%)²
Cross-sensitivity (interference)	u_i	0.058	Vol.-%	0.003	(Vol.-%)²
Influence of sample gas flow	u_n	0.058	Vol.-%	0.003	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.30	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.60	Vol.-%

Relative total expanded uncertainty	**U in % of the range 25 Vol.-%**	**2.4**
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.

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

Measuring system				
Manufacturer		SIEMENS AG		
AMS designation		Set CEM CERT II 7MB1957		
Serial number of units under test		TÜV 1/TÜV 2		
Measuring principle		NDIR		
Test report		EuL/21253799/B		
Test laboratory		TÜV Rheinland		
Measured component		NO		
Certification range		0 - 50 mg/m³		
Evaluation of the cross-sensitivity (CS)				
(system with largest CS)				
Sum of positive CS at zero point		1.19 mg/m³		
Sum of negative CS at zero point		-0.97 mg/m³		
Sum of postive CS at span point		1.10 mg/m³		
Sum of negative CS at span point		-0.70 mg/m³		
Maximum sum of cross-sensitivities		1.19 mg/m³		
Uncertainty of cross-sensitivity	u_i	0.687 mg/m³		

Calculation of the combined standard uncertainty

Tested parameter			u^2	
	u_D	0.643 mg/m³	0.413	(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	$u_{d,s}$	0.635 mg/m³	0.403	(mg/m³)²
Influence of ambient temperature at span	u_t	0.346 mg/m³	0.120	(mg/m³)²
Influence of supply voltage	u_v	0.156 mg/m³	0.024	(mg/m³)²
Cross-sensitivity (interference)	u_i	0.687 mg/m³	0.472	(mg/m³)²
Influence of sample gas flow	u_n	0.115 mg/m³	0.013	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.33	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	2.60	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 33.3 mg/m³**	**7.8**
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 II 7MB1957		
Serial number of units under test		TÜV 1/TÜV 2		
Measuring principle		UV Absorption		
Test report		EuL/21253799/B		
Test laboratory		TÜV Rheinland		
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		0.68 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		-0.80 mg/m³		
Maximum sum of cross-sensitivities		-0.80 mg/m³		
Uncertainty of cross-sensitivity	u_i	-0.462 mg/m³		
Calculation of the combined standard uncertainty				
Tested parameter			u^2	
	u_D	0.468 mg/m³	0.219	(mg/m³)²
Lack of fit	u_{lof}	0.173 mg/m³	0.030	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.144 mg/m³	0.021	(mg/m³)²
Span drift from field test	$u_{d,s}$	0.508 mg/m³	0.258	(mg/m³)²
Influence of ambient temperature at span	u_t	0.321 mg/m³	0.103	(mg/m³)²
Influence of supply voltage	u_v	0.313 mg/m³	0.098	(mg/m³)²
Cross-sensitivity (interference)	u_i	-0.462 mg/m³	0.213	(mg/m³)²
Influence of sample gas flow	u_n	0.115 mg/m³	0.013	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.06	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	2.07	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 33.3 mg/m³**	**6.2**
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 II 7MB1957		
Serial number of units under test		TÜV 1/TÜV 2		
Measuring principle		calculated		
Test report		EuL/21253799/B		
Test laboratory		TÜV Rheinland		
Measured component		NOx		
Certification range		0 - 50 mg/m³		
Evaluation of the cross-sensitivity (CS)				
(system with largest CS)				
Sum of positive CS at zero point		1.65 mg/m³		
Sum of negative CS at zero point		-0.86 mg/m³		
Sum of postive CS at span point		0.00 mg/m³		
Sum of negative CS at span point		-0.70 mg/m³		
Maximum sum of cross-sensitivities		1.65 mg/m³		
Uncertainty of cross-sensitivity	u_i	0.953 mg/m³		

Calculation of the combined standard uncertainty

Tested parameter			u^2	
	u_D	1.035 mg/m³	1.071	(mg/m³)²
Lack of fit	u_{lof}	0.173 mg/m³	0.030	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.177 mg/m³	0.031	(mg/m³)²
Span drift from field test	$u_{d,s}$	0.574 mg/m³	0.329	(mg/m³)²
Influence of ambient temperature at span	u_t	0.586 mg/m³	0.343	(mg/m³)²
Influence of supply voltage	u_v	0.313 mg/m³	0.098	(mg/m³)²
Cross-sensitivity (interference)	u_i	0.953 mg/m³	0.908	(mg/m³)²
Influence of sample gas flow	u_p	-0.214 mg/m³	0.046	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.74	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	3.41	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 33.3 mg/m³**	**10.2**
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 II 7MB1957		
Serial number of units under test	TÜV 1/TÜV 2		
Measuring principle	eletrochemical		
Test report	EuL/21253799/B		
Test laboratory	TÜV Rheinland		
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	-0.10	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	-0.10	Vol.-%	
Uncertainty of cross-sensitivity	u_i -0.058	Vol.-%	

Calculation of the combined standard uncertainty

Tested parameter			u^2	
	u_D 0.038	Vol.-%	0.001	(Vol.-%)²
Lack of fit	u_{lof} -0.058	Vol.-%	0.003	(Vol.-%)²
Zero drift from field test	$u_{d,z}$ 0.058	Vol.-%	0.003	(Vol.-%)²
Span drift from field test	$u_{d,s}$ 0.104	Vol.-%	0.011	(Vol.-%)²
Influence of ambient temperature at span	u_t 0.064	Vol.-%	0.004	(Vol.-%)²
Influence of supply voltage	u_v 0.021	Vol.-%	0.000	(Vol.-%)²
Cross-sensitivity (interference)	u_i -0.058	Vol.-%	0.003	(Vol.-%)²
Influence of sample gas flow	u_n 0.006	Vol.-%	0.000	(Vol.-%)²
Uncertainty of reference material at 70% of certification range	u_{rm} 0.202	Vol.-%	0.041	(Vol.-%)²

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

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.26	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.51	Vol.-%

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

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

Umwelt Bundesamt

Certificate:
0000081150_02 / 12 June 2024

TÜVRheinland®
Precisely Right.

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

Measuring system				
Manufacturer		SIEMENS AG		
AMS designation		Set CEM CERT II 7MB1957		
Serial number of units under test		TÜV 1/TÜV 2		
Measuring principle		UV Absorption		
Test report		EuL/21253799/B		
Test laboratory		TÜV Rheinland		
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		0.54 mg/m³		
Sum of negative CS at zero point		-0.61 mg/m³		
Sum of postive CS at span point		2.20 mg/m³		
Sum of negative CS at span point		-1.20 mg/m³		
Maximum sum of cross-sensitivities		2.20 mg/m³		
Uncertainty of cross-sensitivity	u_i	1.269 mg/m³		

Calculation of the combined standard uncertainty

Tested parameter			u^2	
	u_D	0.203 mg/m³	0.041	(mg/m³)²
Lack of fit	u_{lof}	-0.287 mg/m³	0.082	(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	$u_{d,s}$	0.970 mg/m³	0.941	(mg/m³)²
Influence of ambient temperature at span	u_t	0.608 mg/m³	0.370	(mg/m³)²
Influence of supply voltage	u_v	0.176 mg/m³	0.031	(mg/m³)²
Cross-sensitivity (interference)	u_i	1.269 mg/m³	1.610	(mg/m³)²
Influence of sample gas flow	u_p	0.289 mg/m³	0.084	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.89	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	3.71	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 46.6 mg/m³**	**8.0**
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