



Certificate number: 1630664.4b-ts



# CERTIFICATE

of product conformity (QAL 1)

Certificate number: 1630664.4b-ts

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

**Manufacturer** Siemens AG  
 Östliche Rheinbrückenstraße 50  
 76187 Karlsruhe  
 Germany

**Test institute** TÜV SÜD Industrie Service GmbH

**This is to certify that the AMS fulfils the requirements of the  
 DIN EN 15267-1: 2009, DIN EN 15267-2: 2009, DIN EN 15267-3: 2008 and DIN EN 14181: 2004  
 standards.**

This certificate replaces the certificate 1630664.3-ts dated 1<sup>st</sup> April 2014



Certificate No: 1630664.4b-ts

**Publication in the German Federal Gazette**  
 dated 5<sup>th</sup> August 2014

**Certificate validity**  
 until 4<sup>th</sup> March 2018

Umweltbundesamt  
 Dessau, 29<sup>th</sup> August 2014

TÜV SÜD Industrie Service GmbH  
 Testing laboratory Emission measurement/ calibration  
 Munich, 1<sup>st</sup> September 2014

p.p. Dr. Marcel Langner

Dr. Michael Wäber

**Certification applies to the conditions listed in this certificate**

<b>Test report</b>	1630664-4b from 28 <sup>th</sup> February 2014
<b>Initial certification</b>	5 <sup>th</sup> March 2013
<b>Certificate validity until</b>	4 <sup>th</sup> March 2018 (5 years)
<b>Publication</b>	BAnz AT 05.08.2014 B11, chapter I, No. 5.4

**Approved application**

The AMS tested is suitable for plants in compliance with the 13<sup>th</sup> and 27<sup>th</sup> BImSchV and plants in compliance with TA Luft. The suitability of the AMS for this application was assessed on the basis of a laboratory test and a field test of the modular measuring system Set CEM CERT 7MB1957 lasting over three months at a plant in compliance with the 17<sup>th</sup> BImSchV. The modular measuring system is authorized for the ambient temperature range from +5 °C to +40 °C.

The operator should consult the manufacturer to ensure that the AMS is suitable for the plant where it is being installed.

**Certification basis**

This certificate is based on:

- TÜV SÜD Industrie Service GmbH test report 1630664-4b from 28<sup>th</sup> February 2014
- Suitability publication by the Umweltbundesamt as responsible body
- Monitoring of the product and the manufacturing process
- Publication in the German Federal Gazette (BAnz AT 5<sup>th</sup> August 2014 B11, chapter I, No. 5.4, UBA publication from 17<sup>th</sup> July 2014).

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

**Manufacturer:** Siemens AG, Karlsruhe

**Suitability:** Modular measuring system for plants in compliance with the 13<sup>th</sup> and 27<sup>th</sup> BImSchV and plants in compliance with TA Luft

**Measurement ranges in the suitability test:**

Component	Certification range	Additional measurement range		Unit
CO	0 – 250	0 – 1250	-	mg/m <sup>3</sup>
NO <sub>x</sub>	0 – 400 <sup>1</sup>	0 – 2000 <sup>1</sup>	-	mg/m <sup>3</sup>
	0 – 613 <sup>2</sup>	0 – 3067 <sup>2</sup>	-	mg/m <sup>3</sup>
SO <sub>2</sub>	0 – 400	0 – 2000	0 – 7000	mg/m <sup>3</sup>
O <sub>2</sub> paramagnetic	0 – 25	-	-	Vol.-%
O <sub>2</sub> electrochemical	0 – 25	-	-	Vol.-%

<sup>1</sup> stated as NO  
<sup>2</sup> stated as NO<sub>2</sub>

**Measurement ranges for the modular system Set CEM CERT 7MB1957, Ultramat 23-7MB2358 module in the suitability test:**

Component	Module variation	Certification range	Additional measurement range		Unit
CO	Ultramat 23-7MB2358 – Z – T13	0 – 250	0 – 1250	-	mg/m <sup>3</sup>
	Ultramat 23-7MB2358 – Z – T23	0 – 250	0 – 1250	-	mg/m <sup>3</sup>
NO <sub>x</sub>	Ultramat 23-7MB2358 – Z – T13	0 – 400 <sup>1</sup>	0 – 2000 <sup>1</sup>	-	mg/m <sup>3</sup>
		0 – 613 <sup>2</sup>	0 – 3067 <sup>2</sup>	-	mg/m <sup>3</sup>
	Ultramat 23-7MB2358 – Z – T23	0 – 400 <sup>1</sup>	0 – 2000 <sup>1</sup>	-	mg/m <sup>3</sup>
		0 – 613 <sup>2</sup>	0 – 3067 <sup>2</sup>	-	mg/m <sup>3</sup>
SO <sub>2</sub>	Ultramat 23-7MB2358 – Z – T13	0 – 400	0 – 2000	0 – 7000	mg/m <sup>3</sup>
	Ultramat 23-7MB2358 – Z – T23	0 – 400	0 – 2000	0 – 7000	mg/m <sup>3</sup>
O <sub>2</sub> paramagnetic	Ultramat 23-7MB2358 – Z – T13	0 – 25	-	-	Vol.-%
O <sub>2</sub> electrochemical	Ultramat 23-7MB2358 – Z – T23	0 – 25	-	-	Vol.-%

<sup>1</sup> stated as NO  
<sup>2</sup> stated as NO<sub>2</sub>

The suitability test of the system Set CEM CERT 7MB1957, Ultramat 23-7MB2358 module, covers two module variations that are equipped to measure the following components respectively:

Module variation	Component 1	Component 2	Component 3	Component 4
Ultramat 23-7MB2358 – Z – T13	CO	NO	SO <sub>2</sub>	O <sub>2</sub> paramagnetic
Ultramat 23-7MB2358 – Z – T23	CO	NO	SO <sub>2</sub>	O <sub>2</sub> electrochemical

<b>Software versions:</b>	Ultramat 23-7MB2358:	2.14.07
	SPS:	Set CEM CERT Rev. 1.0
<b>Restrictions:</b>		
1. The requirement for total uncertainty in the suitability test according to DIN EN 15267-3 was not fulfilled for the component CO and only partly fulfilled for the component SO <sub>2</sub> .		
2. The protection provided by enclosure class is only IP 20. If the operating conditions require a higher class the analysis module shall be incorporated into an analysis cabinet with the relevant protection class.		
<b>Notes:</b>		
1. The AMS should be operated at an interval of 24 h for automatic alignment.		
2. To optimise the cross-sensitivity at the measurement channel CO with CO <sub>2</sub> , the Ultramat 23-7MB2358 module from the AMS Set CEM CERT 7MB1957 will be operated with a modified CO receiver from the production month April 2014, identified with the series number from E4 onwards in the central block.		
3. The analyser should be operated with the activated thermo-AUTOCAL-function.		



4. The modular measurement system Set CEM CERT 7MB1957 can alternatively be fitted with a measurement gas sampling probe (SP2000-H) from M&C TechGroup Germany GmbH and a measurement gas cooler (EGK 2-19) from Bühler Technologies GmbH.
5. The modular measurement system Set CEM CERT 7MB1957 is fitted with a NO<sub>x</sub> converter from M&C TechGroup Germany GmbH, type gas converter CG-2, for detecting NO<sub>x</sub>.
6. The maintenance interval for the Ultramat 23-7MB2358 module is three months. In the case of an extension of the Set CEM CERT 7MB1957 by adding additional modules the functionality of the respective compilation of the modules should be tested within the framework of the test for proper installation and the maintenance interval should be set.
7. Supplementary test (approval of a NO<sub>x</sub> converter) to the publication by the Umweltbundesamt dated 27<sup>th</sup> February 2014 (BAnz AT 01.04.2014 B12, chapter I number 4.2) and dated 3<sup>rd</sup> July 2013 (BAnz AT 23.07.2013 B4, chapter V 26<sup>th</sup> note).

**Test report:**

TÜV SÜD Industrie Service GmbH, Munich  
Report-No.: 1630664-4b dated 28<sup>th</sup> February 2014

**Certified product**

The certificate applies to AMS that comply with the following description:

The entire tested modular AMS consists of the sample gas extraction probe, heated sample hose, a dual-level measurement gas cooler, a measurement gas feeder pump and the multi-component analyser Ultramat 23-7MB2358. The modular AMS measures CO, NO, SO<sub>2</sub> and O<sub>2</sub> according to the principle of non-dispersive-infrared-absorption (NDIR procedure). Either an electrochemical or paramagnetic oxygen measurement cell can be used to measure O<sub>2</sub>.

To regulate measurement gas flow there is a measurement gas pipe with integrated gas recirculation between the first and second cooler level. In the cooler casing there is another fine filter for separating fine dust. After the measurement gas cooler the gas path separates into two pipe sections, each supplying one analyser module with measurement gas. In each of these pipe section currents there is a condensation filter directly before the analyser module, which closes the gas path on penetration of any humidity, to protect the analyser. The converter is switched on before the condensation filter to measure NO<sub>x</sub>. To regulate zero/sample gas there is a three way valve between the first and second cooler level, which can be switched on to automatically align the analyser or can be time controlled using programmable logic controller (PLC).

The entire system is made up of the following components:

**Probe**

Manufacturer: Bühler Technologies GmbH, D - 40880 Ratingen  
Type: GAS 222.20-Cal-twin with ceramic filter, length 100 cm, heated to 180 °C

**Alternative Probe**

Manufacturer: M&C TechGroup Germany GmbH, D - 40885 Ratingen  
Type: SP2000-H with ceramic filter, length 100 cm, heated to 180 °C  
Controller: M&C TechGroup Germany GmbH, D - 40885 Ratingen



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Heated sampling hose

Manufacturer: Winkler GmbH, D-69126 Heidelberg  
Heated temperature: 180 °C, 2 PTFE connections (ID: 4 mm), heated to 180 °C, length in the suitability test 35 m

Controller

Manufacturer: Siemens AG  
Type: SIRIUS, PT 100

Compressor cooler

Manufacturer: M&C TechGroup Germany GmbH, D - 40885 Ratingen  
Type: CSS V1-S, dew point at 3°C (2 gas paths)

Alternative compressor cooler

Manufacturer: Bühler Technologies GmbH, D-40880 Ratingen  
Type: EGK 2-19, dew point at 4°C (2 gas paths)

Measurement gas feeder pump

Manufacturer: Bühler Technologies GmbH, D-40880 Ratingen  
Type: P 2.3  
Flow: 1-2 l/min

NO<sub>x</sub> converter

Manufacturer: M&C TechGroup Germany GmbH, D - 40885 Ratingen  
Type: Gas converter CG-2, heated to 350 °C

Analyser

Ultramat 23-7MB2358  
Software version 2.14.07  
Software version SPS Set CEM CERT Rev. 1.0

### General comments

This certificate is based on the analyser tested. The manufacturer is responsible for the continuous compliance of the production to the DIN EN 15267 requirements. The manufacturer is obliged to maintain a tested quality management system to control the manufacture of the certified product. Regular monitoring must be conducted on both the product and the quality management systems.

Should the product from the current production series no longer comply with the certified product, the Environmental Service Department of TÜV SÜD Industrie Service GmbH should be informed (Address see footnote).

The certification mark, which appears on the certified product or is used in advertising materials, is presented on page 1 of this certificate.

This document and the certification mark shall remain the property of TÜV SÜD Industrie Service GmbH.

Should the publication be revoked, this certificate will become invalid. This document must be returned when the period of validity has elapsed and at the request of TÜV SÜD Industrie Service GmbH and the certification mark may no longer be used.

The current version of the certificate and its validity can also be viewed on the internet page: **qal1.de**.

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The certification of the modular measuring system Set CEM CERT 7MB1957 is based on the following documents and the regular continuous monitoring of the manufacturer's quality management system:

**Initial certification to DIN EN 15267:**

Certificate No. 1630664-ts 5<sup>th</sup> March 2013  
Certificate validity until 4<sup>th</sup> March 2018 (5 years)

Test report: 1630664 from 15<sup>th</sup> September 2012,  
TÜV SÜD Industrie Service GmbH  
Publication: BAnz AT 05.03.2013 B10, chapter I No. 6.1  
UBA publication from 12<sup>th</sup> February 2013

**Supplementary test to DIN EN 15267:**

Certificate No. 1630664.2-ts 23<sup>rd</sup> July 2013  
Certificate validity until 4<sup>th</sup> March 2018 (5 years)

Test report: 1630664-2 from 15<sup>th</sup> March 2013,  
TÜV SÜD Industrie Service GmbH  
Publication: BAnz AT 23.07.2013 B4, chapter I, No. 4.1  
UBA publication from 3<sup>rd</sup> July 2013

**Supplementary test to DIN EN 15267:**

Certificate No. 1630664.3-ts 1<sup>st</sup> April 2014  
Certificate validity until 4<sup>th</sup> March 2018 (5 years)

Test report: 1630664-3 from 18<sup>th</sup> December 2013,  
TÜV SÜD Industrie Service GmbH  
Publication: BAnz AT 01.04.2014 B12, chapter I, No. 4.2  
UBA publication from 27<sup>th</sup> February 2014

**Supplementary test to DIN EN 15267:**

Certificate No. 1630664.4b-ts 5<sup>th</sup> August 2014  
Certificate validity until 4<sup>th</sup> March 2018 (5 years)

Test report: 1630664-4b from 28<sup>th</sup> February 2014,  
TÜV SÜD Industrie Service GmbH  
Publication: BAnz AT 05.08.2014 B11, chapter I, No. 5.4  
UBA publication from 17<sup>th</sup> July 2014

**Notifications:**

Publication: BAnz AT 23.07.2013 B4, chapter V, note 26 (new software)  
UBA publication from 3<sup>rd</sup> July 2013

Publication: BAnz AT 05.08.2014 B11, Chapter V, note 3 (new software)  
UBA publication from 17<sup>th</sup> July 2014

**Calculation of total uncertainty for QAL1 testing to DIN EN 14181 and DIN EN 15267-3**

**Total uncertainty for the measurement component CO in the measurement range 0-250 mg/m<sup>3</sup> for modules 1/ 2**

<i>Performance characteristic</i>	<i>Uncertainty</i>	<i>Value of standard uncertainty in mg/m<sup>3</sup></i>	<i>Square sum of standard uncertainty in (mg/m<sup>3</sup>)<sup>2</sup></i>
Lack-of-fit	ulof	0,678	0,5
Zero point drift	ud,z	1,443	2,1
Span point drift	ud,s	1,443	2,1
Influence of ambient temperature at span point	ut	0,781	0,6
Influence of sample gas pressure	up	-	-
Influence of sample gas flow	uf	-0,217	0,0
Influence of voltage	uv	1,392	1,9
Cross-sensitivity	ui	2,165	4,7
Standard deviation from paired measurements or repeat standard deviation at span point *)	ud = sd	1,656	2,7
Uncertainty of test gas (2% at 70% CR)	utg	2,021	4,1
Sum		-	18,7
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	4,3	mg/m <sup>3</sup>
Expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	8,5	mg/m <sup>3</sup>
Relative expanded uncertainty	U	8,5	%ELV
Demanded uncertainty (ELV 100 mg/m <sup>3</sup> )		7,5	%ELV
Requirement concerning uncertainty to 15267 fulfilled		no	
Requirement concerning uncertainty to 13th BImSchV fulfilled		yes	

\*) here: Standard deviation from paired measurements



**Total uncertainty for the measurement component NO in the measurement range 0-400 mg/m<sup>3</sup> for modules 1/ 2**

<i>Performance characteristic</i>	<i>Uncertainty</i>	<i>Value of standard uncertainty in mg/m<sup>3</sup></i>	<i>Square sum of standard uncertainty in (mg/m<sup>3</sup>)<sup>2</sup></i>
Lack-of-fit	ulof	-0,393	0,2
Zero point drift	ud,z	3,233	10,5
Span point drift	ud,s	3,695	13,7
Influence of ambient temperature at span point	ut	2,177	4,7
Influence of sample gas pressure	up	-	-
Influence of sample gas flow	uf	0,277	0,1
Influence of voltage	uv	1,688	2,8
Cross-sensitivity	ui	-6,928	48,0
Standard deviation from paired measurements or repeat standard deviation at span point *)	ud = sd	1,750	3,1
Uncertainty of test gas (2% at 70% CR)	utg	3,236	10,5
Sum		-	97,0
Combined standard uncertainty	$u_c = \sqrt{\sum(u_i)^2}$	9,8	mg/m <sup>3</sup>
Expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	19,3	mg/m <sup>3</sup>
Relative expanded uncertainty	U	14,8	%ELV
Demanded uncertainty (ELV 130,4 mg/m <sup>3</sup> )		15,0	%ELV
Requirement concerning uncertainty to 15267 fulfilled		Yes	
Requirement concerning uncertainty to 13th BImSchV fulfilled		Yes	

\*) here: Standard deviation from paired measurements

**Total uncertainty for the measurement component SO<sub>2</sub> in the measurement range 0-400 mg/m<sup>3</sup> for modules 1/ 2**

<i>Performance characteristic</i>	<i>Uncertainty</i>	<i>Value of standard uncertainty in mg/m<sup>3</sup></i>	<i>Square sum of standard uncertainty in (mg/m<sup>3</sup>)<sup>2</sup></i>
Lack-of-fit	ulof	2,102	4,4
Zero point drift	ud,z	6,235	38,9
Span point drift	ud,s	4,85	23,5
Influence of ambient temperature at span point	ut	6,498	42,2
Influence of sample gas pressure	up	-	-
Influence of sample gas flow	uf	-2,215	4,9
Influence of voltage	uv	2,217	4,9
Cross-sensitivity	ui	-6,928	48,0
Standard deviation from paired measurements or repeat standard deviation at span point *)	ur	2,475	6,1
Uncertainty of test gas	utg	3,236	10,5
Sum		-	183,5
Combined standard uncertainty	$u_c = \sqrt{\sum(u_i)^2}$	13,5	mg/m <sup>3</sup>
Expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	26,5	mg/m <sup>3</sup>
Relative expanded uncertainty	$U$	13,3	%ELV
Demanded uncertainty (ELV 200 mg/m <sup>3</sup> to DIN EN 15267-3)		15,0	%ELV
Requirement concerning uncertainty to 15267 fulfilled		yes	
Requirement concerning uncertainty to 13th BImSchV fulfilled		yes	

\*) here: Standard deviation from paired measurements

**Total uncertainty for the measurement component O<sub>2</sub> in the measurement range 0-25 Vol.-% (in the version with paramagnetic oxygen measurement) for modules 1 / 2**

<i>Performance characteristic</i>	<i>Uncertainty</i>	<i>Value of standard uncertainty in Vol.-%</i>	<i>Square sum of standard uncertainty in (Vol.-%)<sup>2</sup></i>
Lack-of-fit	ulof	0,017	0,00
Zero point drift	ud,z	-0,092	0,01
Span point drift	ud,s	-0,081	0,01
Influence of ambient temperature at span point	ut	0,044	0,00
Influence of sample gas pressure	up	-	-
Influence of sample gas flow	uf	-0,017	0,00
Influence of voltage	uv	0,051	0,00
Cross-sensitivity	ui	0,162	0,03
Standard deviation from paired measurements or repeat standard deviation at span point *)	ur	0,081	0,01
Uncertainty of test gas	utg	0,230	0,05
Sum		-	0,11
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	0,33	Vol.-%
Expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	0,64	Vol.-%
Relative expanded uncertainty	$U$	2,6	%
Demanded uncertainty (% from CR)		7,5	% from CR
Requirement concerning measurement uncertainty fulfilled		yes	

\*) here: Standard deviation from paired measurements



**Total uncertainty for the measurement component CO in the measurement range 0-250 mg/m<sup>3</sup> for modules 3/ 4**

<i>Performance characteristic</i>	<i>Uncertainty</i>	<i>Value of standard uncertainty in mg/m<sup>3</sup></i>	<i>Square sum of standard uncertainty in (mg/m<sup>3</sup>)<sup>2</sup></i>
Lack-of-fit	ulof	0,678	0,5
Zero point drift	ud,z	1,443	2,1
Span point drift	ud,s	1,443	2,1
Influence of ambient temperature at span point	ut	1,285	1,7
Influence of sample gas pressure	up	-	-
Influence of sample gas flow	uf	-0,303	0,1
Influence of voltage	uv	1,568	2,5
Cross-sensitivity	ui	2,165	4,7
Standard deviation from paired measurements or repeat standard deviation at span point *)	ud = sd	1,656	2,7
Uncertainty of test gas (2% at 70% CR)	utg	2,021	4,1
Sum		-	20,3
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	4,5	mg/m <sup>3</sup>
Expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	8,8	mg/m <sup>3</sup>
Relative expanded uncertainty	U	8,8	%ELV
Demanded uncertainty (ELV 100 mg/m <sup>3</sup> )		7,5	%ELV
Requirement concerning uncertainty to 15267 fulfilled		no	
Requirement concerning uncertainty to 13th BImSchV fulfilled		yes	

\*) here: Standard deviation from paired measurements

**Total uncertainty for the measurement component NO in the measurement range 0-400 mg/m<sup>3</sup> for modules 3/ 4**

<i>Performance characteristic</i>	<i>Uncertainty</i>	<i>Value of standard uncertainty in mg/m<sup>3</sup></i>	<i>Square sum of standard uncertainty in (mg/m<sup>3</sup>)<sup>2</sup></i>
Lack-of-fit	ulof	-0,393	0,2
Zero point drift	ud,z	3,233	10,5
Span point drift	ud,s	3,695	13,7
Influence of ambient temperature at span point	ut	2,177	4,7
Influence of sample gas pressure	up	-	-
Influence of sample gas flow	uf	0,277	0,1
Influence of voltage	uv	1,688	2,8
Cross-sensitivity	ui	-6,928	48,0
Standard deviation from paired measurements or repeat standard deviation at span point *)	ur	1,750	3,1
Uncertainty of test gas	utg	3,236	10,5
Sum		-	93,5
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	9,7	mg/m <sup>3</sup>
Expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	18,9	mg/m <sup>3</sup>
Relative expanded uncertainty	$U$	14,5	%ELV
Demanded uncertainty (ELV 130,4 mg/m <sup>3</sup> to DIN EN 15267-3)		15,0	%ELV
Requirement concerning uncertainty to 15267 fulfilled		Yes	
Requirement concerning uncertainty to 13th BImSchV fulfilled		yes	

\*) here: Standard deviation from paired measurements

**Total uncertainty for the measurement component SO<sub>2</sub> in the measurement range 0-400 mg/m<sup>3</sup> for modules 3/ 4**

<i>Performance characteristic</i>	<i>Uncertainty</i>	<i>Value of standard uncertainty in mg/m<sup>3</sup></i>	<i>Square sum of standard uncertainty in (mg/m<sup>3</sup>)<sup>2</sup></i>
Lack-of-fit	ulof	2,102	4,4
Zero point drift	ud,z	6,235	38,9
Span point drift	ud,s	4,85	23,5
Influence of ambient temperature at span point	ut	9,96	99,2
Influence of sample gas pressure	up	-	-
Influence of sample gas flow	uf	-2,125	4,5
Influence of voltage	uv	2,564	6,6
Cross-sensitivity	ui	-6,928	48,0
Standard deviation from paired measurements or repeat standard deviation at span point *)	ur	2,475	6,1
Uncertainty of test gas	utg	3,236	10,5
Sum		-	241,7
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	15,5	mg/m <sup>3</sup>
Expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	30,5	mg/m <sup>3</sup>
Relative expanded uncertainty	$U$	15,2	%ELV
Demanded uncertainty (ELV 200 mg/m <sup>3</sup> ) to DIN EN 15267-3		15,0	%ELV
Requirement concerning uncertainty to 15267 fulfilled		no	
Requirement concerning uncertainty to 13th BImSchV fulfilled		yes	

\*) here: Standard deviation from paired measurements



**Total uncertainty for the measurement component O<sub>2</sub> in the measurement range 0-25 Vol.-% (in the version with electrochemical oxygen measurement) for modules 3/ 4**

<i>Performance characteristic</i>	<i>Uncertainty</i>	<i>Value of standard uncertainty in Vol.-%</i>	<i>Square sum of standard uncertainty in (Vol.-%)<sup>2</sup></i>
Lack-of-fit	ulof	0,035	0,00
Zero point drift	ud,z	0,167	0,03
Span point drift	ud,s	0,098	0,01
Influence of ambient temperature at span point	ut	0,021	0,00
Influence of sample gas pressure	up	-	-
Influence of sample gas flow	uf	-0,029	0,00
Influence of voltage	uv	0,009	0,00
Cross-sensitivity	ui	0,167	0,03
Standard deviation from paired measurements or repeat standard deviation at span point *)	ur	0,056	0,00
Uncertainty of test gas	utg	0,230	0,05
Sum		-	0,12
Combined standard uncertainty	$u_c = \sqrt{\sum(u_i)^2}$	0,35	Vol.-%
Expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	0,69	Vol.-%
Relative Expanded uncertainty	$U$	2,8	%
Demanded uncertainty (% from CR)		7,5	% from CR
Requirement concerning measurement uncertainty fulfilled		yes	

\*) here: Standard deviation from paired measurements