

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証証書 ◆ CERTIFICADO ◆ CERTIFICAT



Certificate number: 2694203-ts



Industrie Service

# CERTIFICATE

of product conformity (QAL 1)

Certificate number: 2694203-ts

<b>Certified AMS</b>	AO2000-Limas21 UV for NO, NO <sub>2</sub> , SO <sub>2</sub> and O <sub>2</sub>
<b>Manufacturer</b>	ABB Automation GmbH Stierstädter Straße 5 60488 Frankfurt Germany

**Test institute** TÜV SÜD Industrie Service GmbH

This is to certify that the AMS was tested and certified subject to DIN EN 15267-1 (2009), DIN EN 15267-2 (2009), DIN EN 15267-3 (2008) and DIN EN 14181 (2015) standards.

Certification applies to the conditions listed in this certificate (the certificate consists of 14 pages).

This certificate replaces the certificate 2231669.1-ts dated 14<sup>th</sup> March 2016.



Certificate No.: 2694203-ts

**Publication in the German Federal Gazette**  
dated 26<sup>th</sup> April 2017

**Certificate validity**  
until 13<sup>th</sup> March 2021

Umweltbundesamt  
Dessau, 09<sup>th</sup> June 2017

TÜV SÜD Industrie Service GmbH  
Testing laboratory emission measurement/  
calibration  
Munich, 08<sup>th</sup> June 2017

Dr. Marcel Langner  
Head of Section II 4.1

Dr. Michael Waeber

Certificate number: 2694203-ts

<b>Test report</b>	2694203 from 01 <sup>st</sup> March 2017
<b>Initial certification</b>	14 <sup>th</sup> March 2016
<b>Certificate validity until</b>	13 <sup>th</sup> March 2021 (5 years)
<b>Publication</b>	BAnz AT 26 <sup>th</sup> April 2017 B9, chapter I, No. 1.1

**Approved application**

The AMS tested is suitable for use at plants according to Directive 2010/75/EU, chapter III (13<sup>th</sup> BImSchV), at waste incineration plants according to Directive 2010/75/EU, chapter IV (17<sup>th</sup> BImSchV) and other plants requiring official approval. The AMS in the Limas21-version CEM200Q is suitable for plants authorised to the 13<sup>th</sup> BImSchV, which fulfil the requirements of paragraph 20 section 4 and for plants authorised to the 17<sup>th</sup> BImSchV, which fulfil the requirements of paragraph 16 section 3. The suitability of the AMS for this application was assessed on the basis of a laboratory test and a field test over more than three months at a plant in compliance with the 17<sup>th</sup> BImSchV. The measuring system is authorized for the ambient temperature range from +5 °C to +40 °C.

The AMS publication, the suitability test and the performance of the uncertainty calculations were conducted based on the provisions valid at the time of testing. Due to possible amendments to legal foundations, every user should ensure before use of the AMS that it is suitable for monitoring the applicable limit values.

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 2694203 from 01<sup>st</sup> March 2017
- Suitability publication by the Umweltbundesamt as responsible body
- Monitoring of the product and the manufacturing process
- Publication in the German Federal Gazette (BAnz AT 26<sup>th</sup> April 2017 B9, chapter I, No. 1.1, UBA publication from 18<sup>th</sup> April 2017):

**AMS:** AO2000-Limas21 UV for NO, NO<sub>2</sub>, SO<sub>2</sub> and O<sub>2</sub>

**Manufacturer:** ABB Automation GmbH, Frankfurt am Main

**Suitability:** Measuring system with Limas21-version CEM200Q for plants according to 13<sup>th</sup> BImSchV, which meet the requirements of § 20 section 4 and plants according to 17<sup>th</sup> BImSchV, which meet the requirements of § 16 section 3.

Measuring system with Limas21-versions CEM236Q and CEM260Q for plants requiring authorisation.

**Measurement ranges in the suitability test:**

Limas21-identification <sup>1)</sup>	Component	Certification range	Supplementary measurement range	Unit
CEM236Q	NO	0 - 25	0 - 200	mg/m <sup>3</sup>
	NO <sub>2</sub>	0 - 50	0 - 500	mg/m <sup>3</sup>
	SO <sub>2</sub>	0 - 75	0 - 300	mg/m <sup>3</sup>
-	O <sub>2</sub> , electro chemical	0 - 25	-	Vol.-%
CEM260Q	NO	0 - 25	0 - 200	mg/m <sup>3</sup>
	NO <sub>2</sub>	0 - 50	0 - 500	mg/m <sup>3</sup>
-	O <sub>2</sub> , electro chemical	0 - 25	-	Vol.-%
CEM200Q	NO	0 - 25	0 - 200	mg/m <sup>3</sup>
	O <sub>2</sub> , electro chemical	0 - 25	-	Vol.-%

<sup>1)</sup> Limas21-identification relates to the UV photometer.

**Software versions:** Central unit: 5.1.4  
Analyser module: 3.7.0

- Restrictions:**
- The minimum requirement for cross-sensitivity for the component NO was not fulfilled in the CEM200Q Limas21 version in the suitability test according to DIN EN 15267-3 in the certification range at NO<sub>2</sub> concentrations > 8 mg/m<sup>3</sup>. In the supplementary measurement range, the NO<sub>2</sub> concentration shall not exceed 64 mg/m<sup>3</sup>.
  - The AMS can only be used in the Limas21 CEM200Q version in plants in compliance with the 13<sup>th</sup> and 17<sup>th</sup> BImSchV, for which the responsible authorities waive the continuous measurement of nitrogen dioxide and have authorized the determination through calculation, as due to the input substances (13<sup>th</sup> BImSchV) or the waste or materials used according to paragraph 1 section 1 of the 17<sup>th</sup> BImSchV, the design, the mode of operation or due to the individual measurements the result is a nitrogen dioxide share in the nitrogen oxide emissions that is under 5 % (13<sup>th</sup> BImSchV) or under 10 % (17<sup>th</sup> BImSchV).

**Notes:**

1. The maintenance interval is four weeks.
2. The AMS should be operated at an interval of 24 hours for automatic alignment. The zero points for components NO, NO<sub>2</sub> and SO<sub>2</sub> and the reference point for O<sub>2</sub> shall be realigned with prepared ambient air.
3. The analyser can be used in the AO2020 and AO2040 versions.
4. The AMS can also be equipped with analysers with the Limas21 identification CEM200Q and CEM260Q.
5. The measuring system AO2000-Limas21 UV is not suitable for use in coal-fired plants without desulfurization in the Limas21 versions CEM200Q and CEM260Q.
6. Supplementary suitability test (approval of a further Limas21 analyser (CEM200Q)) to the publication of the Umweltbundesamt dated from 22<sup>nd</sup> February 2017 (BAnz AT 15.03.2017 B6, chapter I number 3.4).

**Test report:**

TÜV SÜD Industrie Service GmbH, Munich  
Report No.: 2694203 from 01<sup>st</sup> March 2017

- Publication in the German Federal Gazette (BAnz AT 15<sup>th</sup> March 2017 B6, chapter V, notification 31, UBA publication from 22<sup>nd</sup> February 2017):

**31 Notification to the publication by the Umweltbundesamt from 18<sup>th</sup> February 2016 (BAnz AT 14<sup>th</sup> March 2016 B7, chapter I number 4.1)**

The current software version for the analyser module (AMC) of the measuring system AO2000-Limas21 UV for NO, NO<sub>2</sub>, SO<sub>2</sub> and O<sub>2</sub> from ABB Automation GmbH, Frankfurt am Main, is 3.7.0.

The current software version for the central unit Syscon III of the measuring system AO2000-Limas21 UV for NO, NO<sub>2</sub>, SO<sub>2</sub> and O<sub>2</sub> from ABB Automation GmbH, Frankfurt am Main, is 5.1.10. The versions 5.1.6, 5.1.7 und 5.1.8 are included.

Statement from TÜV Süd Industrie Service GmbH from 27<sup>th</sup> September 2016.

**Certified product**

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

The entire tested AO2000-Limas21 UV AMS consisted of a heated sampling probe, the heated measurement gas line, the magnetic valve (3 way valve), sample gas cooler, sample gas feed unit and the analyser from the AO2000-Limas21 UV product series with up to three UV measurement channels and oxygen. To measure NO the analyser works according to the gas filter correlation principle (GFC), to measure NO<sub>2</sub> and SO<sub>2</sub> according to the interference filter correlation principle (IFC). The component O<sub>2</sub> is determined using an electro chemical oxygen measurement cell.

The sample gas extraction consists of a stainless steel extraction probe with a heated ceramic filter. A heated sample gas pipe, fitted with a PTFE-seal (interior diameter 6 mm), is attached to the probe. After the heated pipe, the sample gas flows through the magnetic valve (3 way valve) into a compressor cooler. The sample gas feed unit with integrated rotameter and flow sensor for setting measurement gas flow and a fine filter can be found after the cooler. After the gas feed unit the measured gas flows into the analyser. The magnetic valve activates the flow of zero and test gases. The zero points for the components NO, NO<sub>2</sub> and SO<sub>2</sub> and the span point for O<sub>2</sub> are re-aligned via the magnetic valve with ambient air. This auto-alignment is triggered at an interval of 24 hours by the analyser. Alternatively, zero gas/ test gas can be applied manually via the second gas connection on the probe. The analyser is equipped with a measurement gas cuvette made of quartz glass. The analyser is available in the versions AO2020 (19" rack cabinet) and AO2040 (cabinet for wall mounting).

The AMS consists of the following components:

<b>Probe</b>	
Manufacturer:	ABB Automation GmbH, D – 60488 Frankfurt
Type:	40 or 42 (heated), with ceramic filter, PFE 3 of the modular system of PFE series, heated to 180 °C
Regulator:	PSG
<b>Heated sampling hose</b>	
Manufacturer:	ABB Automation GmbH, D – 60488 Frankfurt
Heated temperatures:	180 °C
Length:	30 m in the field test
Diameter:	6 mm ID
Controller	
Manufacturer:	Jumo GmbH & Co. KG
Sensor:	PT 100
<b>Compressor cooler</b>	
Manufacturer:	ABB Automation GmbH, D – 60488 Frankfurt
Type:	Advance SCC-C
<b>Sample gas feed unit</b>	
Manufacturer:	ABB Automation GmbH, D – 60488 Frankfurt
Type:	Advance SCC-F
<b>Magnetic valve</b>	
Manufacturer:	Bürkert GmbH & Co. KG
Type:	0124

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Analysers  
Manufacturer: ABB Automation GmbH, D – 60488 Frankfurt  
Types : AO2020- or AO2040-Limas21 UV  
(Limas-identification: CEM200Q, CEM260Q, CEM236Q)  
Software: Central unit: 5.1.10  
Analyser module: 3.7.0  
Manuals: 42/24 10 DE Rev. 11 (analyser)  
42/23-24 DE Rev. 5 (heated line)  
42/23-39 DE Rev. 7 (probe)  
42/23-51 DE Rev. 3 (sample gas feed unit)  
42/23-55 DE Rev. 2 (sample gas cooler)

### General notes

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](http://qal1.de).

The certification of the measuring system AO2000-Limas21 UV is based on the following documents and the regular continuous monitoring of the manufacturer's quality management system:



**Calculation of total uncertainty for QAL1 testing to DIN EN 14181 and DIN EN 15267-3**
**Total uncertainty for the measurement component NO in the measuring range 0-25 mg/m<sup>3</sup>, Limas21 CEM236Q**

<i>Performance characteristic</i>	<i>Uncertainty</i>	<i>Value standard uncertainty mg/m<sup>3</sup></i>	<i>Square of standard uncertainty (mg/m<sup>3</sup>)<sup>2</sup></i>
Lack-of-fit	$u_{lof}$	-0,058	0,0033
Zero drift from field test	$u_{d,z}$	0,332	0,1102
Span drift from field test	$u_{d,s}$	0,245	0,06
Influence of ambient temperature at span	$u_t$	0,176	0,031
Influence of sample gas pressure	$u_p$		
Influence of sample gas flow	$u_f$	-0,033	0,0011
Influence of supply voltage	$u_v$	0,065	0,0042
Cross-sensitivity (interference)	$u_i$	0,391	0,153
Repeatability standard deviation at span	$u_r = s_r$	0,068	$u_r < du$
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,400	0,16
Uncertainty of reference material 2 % by 70% of ZR	$u_{rm}$	0,202	0,0408
Excursion of measurement beam	$u_{mb}$		
Converter efficiency for AMS measuring NOx	$u_{ce}$		
Variation of response factors (TOC)	$u_{rf}$		
		total	0,5636
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	0,7507	mg/m <sup>3</sup>
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	1,4714	mg/m <sup>3</sup>
Relativ expanded uncertainty	$U$	4,5	% ELV
Permissible uncertainty of EN 15267-3	( of ELV 32,6 mg/m <sup>3</sup> )	15	% ELV
Complied with requirements relating to the measurement uncertainty		yes	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	( of ELV 32,6 mg/m <sup>3</sup> )	20	% ELV
Complied with requirements relating to the measurement uncertainty		yes	regarding 13. / 17. BImSchV



**Total uncertainty for the measurement component NO<sub>2</sub> in the measurement range 0-50 mg/m<sup>3</sup>, Limas21 CEM236Q**

<i>Performance characteristic</i>	<i>Uncertainty</i>	<i>Value standard uncertainty mg/m<sup>3</sup></i>	<i>Square of standard uncertainty (mg/m<sup>3</sup>)<sup>2</sup></i>
Lack-of-fit	$u_{lof}$	0,268	0,0721
Zero drift from field test	$u_{d,z}$	-0,491	0,2411
Span drift from field test	$u_{d,s}$	-0,491	0,2411
Influence of ambient temperature at span	$u_t$	0,791	0,6257
Influence of sample gas pressure	$u_p$		
Influence of sample gas flow	$u_f$	-0,192	0,0369
Influence of supply voltage	$u_v$	0,152	0,0231
Cross-sensitivity (interference)	$u_i$	1,149	1,32
Repeatability standard deviation at span	$u_r = s_r$	0,057	$u_r < du$
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,263	0,0692
Uncertainty of reference material 2 % by 70% of ZR	$u_{rm}$	0,404	0,1633
Excursion of measurement beam	$u_{mb}$		
Converter efficiency for AMS measuring NOx	$u_{ce}$		
Variation of response factors (TOC)	$u_{rf}$		
		total	2,7925
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	1,6711	mg/m <sup>3</sup>
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	3,2754	mg/m <sup>3</sup>
Relativ expanded uncertainty	U	6,6	% ELV
Permissible uncertainty of EN 15267-3	( of ELV 50 mg/m <sup>3</sup> )	15	% ELV
Complied with requirements relating to the measurement uncertainty		yes	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	( of ELV 50 mg/m <sup>3</sup> )	20	% ELV
Complied with requirements relating to the measurement uncertainty		yes	regarding 13. / 17. BImSchV

**Total uncertainty for the measurement component SO<sub>2</sub> in the measurement range 0-75 mg/m<sup>3</sup>, Limas21 CEM236Q**

<i>Performance characteristic</i>	<i>Uncertainty</i>	<i>Value standard uncertainty mg/m<sup>3</sup></i>	<i>Square of standard uncertainty (mg/m<sup>3</sup>)<sup>2</sup></i>
Lack-of-fit	$u_{lof}$	0,372	0,1387
Zero drift from field test	$u_{d,z}$	-1,256	1,5775
Span drift from field test	$u_{d,s}$	1,299	1,6874
Influence of ambient temperature at span	$u_t$	0,485	0,2352
Influence of sample gas pressure	$u_p$		
Influence of sample gas flow	$u_f$	-0,126	0,0158
Influence of supply voltage	$u_v$	0,287	0,0824
Cross-sensitivity (interference)	$u_i$	1,256	1,5769
Repeatability standard deviation at span	$u_r = s_r$	0,209	$u_r < du$
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,530	0,2809
Uncertainty of reference material 2 % by 70% of ZR	$u_{rm}$	0,606	0,3675
Excursion of measurement beam	$u_{mb}$		
Converter efficiency for AMS measuring NOx	$u_{ce}$		
Variation of response factors (TOC)	$u_{rf}$		
		total	5,9623
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	2,4418	mg/m <sup>3</sup>
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	4,7859	mg/m <sup>3</sup>
Relativ expanded uncertainty	$U$	9,6	% ELV
Permissible uncertainty of EN 15267-3	( of ELV 50 mg/m <sup>3</sup> )	15	% ELV
Complied with requirements relating to the measurement uncertainty		yes	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	( of ELV 50 mg/m <sup>3</sup> )	20	% ELV
Complied with requirements relating to the measurement uncertainty		yes	regarding 13. / 17. BImSchV

**Total uncertainty for the measurement component O<sub>2</sub> in the measurement range  
0-25 Vol.-%**

<i>Performance characteristic</i>	<i>Uncertainty</i>	<i>Value standard uncertaintyVol.%</i>	<i>Square of standard uncertaintyVol.%<sup>2</sup></i>
Lack-of-fit	$u_{lof}$	-0,092	0,0085
Zero drift from field test	$u_{d,z}$	-0,110	0,0121
Span drift from field test	$u_{d,s}$	0,035	0,0012
Influence of ambient temperature at span	$u_t$	0,240	0,0576
Influence of sample gas pressure	$u_p$		
Influence of sample gas flow	$u_f$	-0,021	0,0004
Influence of supply voltage	$u_v$	0,004	0,00000
Cross-sensitivity (interference)	$u_i$	0,196	0,0385
Repeatability standard deviation at span	$u_r = s_r$	0,032	0,001
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,028	$u_d < u_r$
Uncertainty of reference material 1 % by 70% of ZR	$u_{rm}$	0,101	0,0102
Excursion of measurement beam	$u_{mb}$		
Converter efficiency for AMS measuring NOx	$u_{ce}$		
Variation of response factors (TOC)	$u_{rf}$		
		<b>total</b>	<b>0,1295</b>
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	0,3599	Vol. %
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	0,7054	Vol. %
Relativ expanded uncertainty	<b>U</b>	<b>2,8</b>	<b>% CR</b>
Permissible uncertainty of EN 15267-3	( of CR 25 Vol. % )	<b>7,5</b>	<b>% CR</b>
Complied with requirements relating to the measurement uncertainty		<b>yes</b>	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	( of CR 25 Vol. % )	<b>10</b>	<b>% CR</b>
Complied with requirements relating to the measurement uncertainty		<b>yes</b>	regarding 13. / 17. BImSchV

**Total uncertainty for the measurement component NO in the measurement range 0-25 mg/m<sup>3</sup>, Limas21 CEM200Q**

<i>Performance characteristic</i>	<i>Uncertainty</i>	<i>Value standard uncertainty mg/m<sup>3</sup></i>	<i>Square of standard uncertainty (mg/m<sup>3</sup>)<sup>2</sup></i>
Lack-of-fit	$u_{lof}$	-0,058	0,0033
Zero drift from field test	$u_{d,z}$	0,332	0,1102
Span drift from field test	$u_{d,s}$	0,245	0,06
Influence of ambient temperature at span	$u_t$	0,176	0,031
Influence of sample gas pressure	$u_p$		
Influence of sample gas flow	$u_f$	-0,033	0,0011
Influence of supply voltage	$u_v$	0,065	0,0042
Cross-sensitivity (interference)	$u_i$	0,556	0,3091
Repeatability standard deviation at span	$u_r = s_r$	0,068	$u_r < du$
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,400	0,16
Uncertainty of reference material 2 % by 70% of ZR	$u_{rm}$	0,202	0,0408
Excursion of measurement beam	$u_{mb}$		
Converter efficiency for AMS measuring NOx	$u_{ce}$		
Variation of response factors (TOC)	$u_{rf}$		
		total	0,7197
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	0,8484	mg/m <sup>3</sup>
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	1,6629	mg/m <sup>3</sup>
Relativ expanded uncertainty	U	10,0	% ELV
Permissible uncertainty of EN 15267-3	( of ELV 16,7 mg/m <sup>3</sup> )	15	% ELV
Complied with requirements relating to the measurement uncertainty		yes	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	( of ELV 16,7 mg/m <sup>3</sup> )	20	% ELV
Complied with requirements relating to the measurement uncertainty		yes	regarding 13. / 17. BImSchV

**Total uncertainty for the measurement component NO in the measurement range 0-25 mg/m<sup>3</sup>, Limas21 CEM260Q**

<i>Performance characteristic</i>	<i>Uncertainty</i>	<i>Value standard uncertainty mg/m<sup>3</sup></i>	<i>Square of standard uncertainty (mg/m<sup>3</sup>)<sup>2</sup></i>
Lack-of-fit	$u_{lof}$	-0,058	0,0033
Zero drift from field test	$u_{d,z}$	0,332	0,1102
Span drift from field test	$u_{d,s}$	0,245	0,06
Influence of ambient temperature at span	$u_t$	0,176	0,031
Influence of sample gas pressure	$u_p$		
Influence of sample gas flow	$u_f$	-0,033	0,0011
Influence of supply voltage	$u_v$	0,065	0,0042
Cross-sensitivity (interference)	$u_i$	-0,261	0,0681
Repeatability standard deviation at span	$u_r = s_r$	0,068	$u_r < du$
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,400	0,16
Uncertainty of reference material 2 % by 70% of ZR	$u_{rm}$	0,202	0,0408
Excursion of measurement beam	$u_{mb}$		
Converter efficiency for AMS measuring NOx	$u_{ce}$		
Variation of response factors (TOC)	$u_{rf}$		
		total	0,4787
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	0,6919	mg/m <sup>3</sup>
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	1,3561	mg/m <sup>3</sup>
Relativ expanded uncertainty	U	8,1	% ELV
Permissible uncertainty of EN 15267-3	( of ELV 16,7 mg/m <sup>3</sup> )	15	% ELV
Complied with requirements relating to the measurement uncertainty		yes	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	( of ELV 16,7 mg/m <sup>3</sup> )	20	% ELV
Complied with requirements relating to the measurement uncertainty		yes	regarding 13. / 17. BImSchV

**Total uncertainty for the measurement component NO<sub>2</sub> in the measurement range 0-50 mg/m<sup>3</sup>, Limas21 CEM260Q**

<i>Performance characteristic</i>	<i>Uncertainty</i>	<i>Value standard uncertainty/mg/m<sup>3</sup></i>	<i>Square of standard uncertainty (mg/m<sup>3</sup>)<sup>2</sup></i>
Lack-of-fit	$u_{lof}$	0,268	0,0721
Zero drift from field test	$u_{d,z}$	-0,491	0,2411
Span drift from field test	$u_{d,s}$	-0,491	0,2411
Influence of ambient temperature at span	$u_t$	0,791	0,6257
Influence of sample gas pressure	$u_p$		
Influence of sample gas flow	$u_f$	-0,192	0,0369
Influence of supply voltage	$u_v$	0,152	0,0231
Cross-sensitivity (interference)	$u_i$	-0,927	0,8593
Repeatability standard deviation at span	$u_r = s_r$	0,057	$u_r < du$
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,263	0,0692
Uncertainty of reference material 2 % by 70% of ZR	$u_{rm}$	0,404	0,1633
Excursion of measurement beam	$u_{mb}$		
Converter efficiency for AMS measuring NOx	$u_{ce}$		
Variation of response factors (TOC)	$u_{rf}$		
		total	2,3318
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	1,527	mg/m <sup>3</sup>
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	2,9929	mg/m <sup>3</sup>
Relativ expanded uncertainty	U	9,0	% ELV
Permissible uncertainty of EN 15267-3	( of ELV 33,3 mg/m <sup>3</sup> )	15	% ELV
Complied with requirements relating to the measurement uncertainty		yes	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	( of ELV 33,3 mg/m <sup>3</sup> )	20	% ELV
Complied with requirements relating to the measurement uncertainty		yes	regarding 13. / 17. BImSchV