



Certificate number: 2231669.1-ts



Industrie Service

# CERTIFICATE

of product conformity (QAL 1)

Certificate number: 2231669.1-ts

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

**Manufacturer** 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 (2004) standards.

Certification applies to the conditions listed in this certificate  
 (the certificate consists of 9 pages).



Certificate No.: 2231669.1-ts

**Publication in the German Federal Gazette**  
 dated 14<sup>th</sup> March 2016

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

Umweltbundesamt  
 Dessau, 26<sup>th</sup> April 2016

TÜV SÜD Industrie Service GmbH  
 Testing laboratory Emission measurement/  
 calibration  
 Munich, 25<sup>th</sup> April 2016

Dr. Marcel Langner  
 Head of Section II 4.1

Dr. Michael Waeber

<b>Test report</b>	2231669.1 from 1 <sup>st</sup> September 2015
<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 14.03.2016 B7, chapter I, No. 4.1

### Approved application

The AMS tested is suitable for monitoring the components NO, NO<sub>2</sub> and SO<sub>2</sub> and for measuring the connected component O<sub>2</sub> in 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 suitability of the AMS for this application was assessed on the basis of a laboratory test and a field test lasting over 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 publication of the AMS, the suitability test and the performance of the uncertainty calculations were made on the basis of provisions at the time of the test. Due to possible amendments to legal provisions, each operator should ensure before use of the system that the AMS is suitable for monitoring the relevant 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 2231669.1 from 1<sup>st</sup> September 2015
- Suitability publication by the Umweltbundesamt as responsible body
- Monitoring of the product and the manufacturing process
- Publication in the German Federal Gazette (BAnz AT 14.03.2016 B7, chapter I, No. 4.1, UBA publication from 18<sup>th</sup> February 2016):

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

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

**Suitability:** Measuring system for plants in compliance with the 13<sup>th</sup> and 17<sup>th</sup> BImSchV and plants in compliance with TA Luft

**Measurement ranges in the suitability test:**

Component	Certification range	Additional measurement range	Unit
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> , electrochemical	0 – 25	-	Vol.-%

**Software versions:** Syscon board: 5.1.4  
Limas21 module: 3.4.5

**Restrictions:**

None

**Notes:**

1. The maintenance interval is four weeks.
2. The AMS should be operated at an interval of 24 h for automatic alignment. 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 realigned with ambient air.
3. The analyser can be used in the cabinet version AO2020 (19" rack cabinet) and AO2040 (cabinet for mounting on wall).

**Test report:** TÜV SÜD Industrie Service GmbH, Munich  
Report No.: 2231669.1 from 1<sup>st</sup> September 2015

### Certified product

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

The entire tested AMS AO2000-Limas21 UV consists of a heated sample gas extraction probe, heated sample gas hose, a magnetic valve, a measurement gas cooler, a measurement gas feeder pump and the multi-component analyser from the product series AO2000-Limas21 UV. The analyser measures NO according to the principle of gas filter correlation (GFC), NO<sub>2</sub> and SO<sub>2</sub> according to the principle of interference filter correlation (IFC). An electrochemical oxygen measurement cell is used to determine the component O<sub>2</sub>.

The sample gas extraction system consists of a stainless steel extraction pipe with a heated ceramic filter. A sample gas hose, equipped with a PTFE core (inner diameter 6 mm) is connected to the probe. After the heated hose the sample gas passes to a compressor cooler by means of a magnetic valve (3 directional control valve). The sample gas feeder pump, with integrated rotameter with flow sensor for setting the sample gas flow and a fine filter is situated after the cooler. After the gas feeder pump the sample gas passes into the analyser. The magnetic valve is used to connect zero and test gases. Zero points for the components NO, NO<sub>2</sub> and SO<sub>2</sub> and span point for O<sub>2</sub> are realigned with ambient air via the magnetic valve. This auto alignment is controlled by the analyser and triggered at an interval of 24 h. Alternatively zero gas/ test gas can be applied manually to the probe via the second gas connection. The analyser is equipped with a sample gas cuvette of quartz glass. The analyser types can vary between casing versions AO2020 (19" rack cabinet) and AO2040 (cabinet for mounting on wall).

The entire system is made up of the following components:

#### Probe

Manufacturer: ABB Automation GmbH, D – 60488 Frankfurt  
Type: 40 or 42 (heated), with ceramic filter, PFE 3 from the modular system of the PFE series  
Regulator: PSG

#### Heated sampling hose

Manufacturer: ABB Automation GmbH, D – 60488 Frankfurt  
Heated temperature: 180 °C  
Length: 30 m in the field test  
Diameter: 6 mm ID  
Regulator  
Manufacturer: Jumo GmbH & Co. KG  
Sensor: PT 100Regulator

#### Compressor cooler

Manufacturer: ABB Automation GmbH, D – 60488 Frankfurt  
Type: Advance SCC-C

#### Sample gas feeder pump

Manufacturer: ABB Automation GmbH, D – 60488 Frankfurt  
Type: Advance SCC-F

#### Magnetic valve

Manufacturer: Bürkert GmbH & Co. KG  
Type: 0124

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Analyser  
Manufacturer: ABB Automation GmbH, D – 60488 Frankfurt  
System type: AO2020 or AO2040 Limas21 UV (Limas version: CEM236Q)  
Software: Syscon Board: 5.1.4  
Limas21 module: 3.4.5

### 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: **qa11.de**.

The certification of the modular measuring system AO2000-Limas21 UV 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. 2231669.1-ts	14 <sup>th</sup> March 2016
Certificate validity until	13 <sup>th</sup> March 2021 (5 years)

Test report: 2231669.1 from 1<sup>st</sup> September 2015,  
TÜV SÜD Industrie Service GmbH  
Publication: BAnz AT 14.03.2016 B7, chapter I No. 4.1  
UBA publication from 18<sup>th</sup> February 2016

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

<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>**

<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>**

Performance characteristic	Uncertainty	Value standard uncertainty mg/m <sup>3</sup>	Square of standard uncertainty (mg/m <sup>3</sup> ) <sup>2</sup>
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 uncertainty Vol.%</i>	<i>Square of standard uncertainty Vol.%<sup>2</sup></i>
Lack-of-fit	$u_{lof}$	-0,046	0,0021
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)	$u_{rf}$		
		total	0,1231
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	0,3509	Vol.%
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	0,6878	Vol.%
Relativ expanded uncertainty	U	2,8	% CR
Permissible uncertainty of EN 15267-3	( of CR 25 Vol.% )	7,5	% CR
Complied with requirements relating to the measurement uncertainty		yes	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	( of CR 25 Vol.% )	10	% CR
Complied with requirements relating to the measurement uncertainty		yes	regarding 13. / 17. BImSchV