

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000059872_02

AMS designation: EasyLine EL3000 for CO, NO, N₂O, SO₂, O₂ und CO₂

Manufacturer: ABB Automation GmbH
Stierstädter Str. 5
60488 Frankfurt/Main
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 19 pages).

The present certificate replaces certificate 2664463ts of 20 January 2017.



Suitability Tested
EN 15267
QAL1 Certified
Regular
Surveillance

www.tuv.com
ID 0000059872

Publication in the German Federal Gazette
(BAnz) of 02 March 2012

German Federal Environment Agency
Dessau, 16 February 2022

This certificate will expire on:
01 March 2027

TÜV Rheinland Energy GmbH
Cologne, 15 February 2022

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

Test report:	1669640 of 30 September 2011
Initial certification:	02 March 2012
Expiry date:	01 March 2027
Certificate	Renewal (of previous certificate 2664463ts of 20 January 2017 valid until 01 March 2022)
Publication:	BAnz. 02 March 2012, no. 36, p. 920, chapter I number 4.4

Approved application

The tested AMS is suitable for use at combustion plants according to Directive 2010/75/EU, chapter III (13th BImSchV), chapter IV (17th BImSchV), 30th BImSchV, plants in compliance with TA Luft, plants according to the 27th BImSchV and other plants requiring official approval. 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 three-month field test at a municipal waste incinerator.

The AMS is approved for an ambient temperature range of +5° 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 1669640 of 30 September 2011 by TÜV Süd Industrie Service 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. 02 March 2012, no. 36, p. 920, chapter I number 4.4, UBA announcement dated 23 February 2012:

AMS designation:

EasyLine EL3000 for CO, NO, SO₂, N₂O, CO₂ und O₂

Manufacturer:

ABB Automation GmbH, Frankfurt/Main

Field of application:

For plants requiring official approval and for plants according to the 27th BImSchV

Measuring ranges during performance testing:

Component	Certification range	Supplementary measuring ranges		Unit
CO	0 - 75	0 - 300	0 - 4000	mg/m ³
NO	0 - 200	0 - 1000	0 - 5000	mg/m ³
NO Version (L)	0 - 100	0 - 200	-	mg/m ³
SO ₂	0 - 75	0 - 300	0 - 8000	mg/m ³
N ₂ O	0 - 100	0 - 6700	-	mg/m ³
CO ₂	0 - 20	-	-	Vol.-%
O ₂	0 - 25	0 - 10	-	Vol.-%

Software versions:

Analyser module: 3.3.0

Restrictions:

1. For the N₂O measurement in the certification range 0 100 mg/m³, the sum of the positive influences of interfering components (cross-sensitivity) exceeds 4% of the certification range for CO concentrations above 210 mg/m³. An internal correction using an additional CO measurement channel is possible, as necessary.
2. At N₂O concentrations above 75 mg/m³, the sum of the positive influences of interfering components in the measuring range 0 - 150 mg/m³ exceeds the permissible amount of 4% of this measuring range at the CO measuring channel of the system variant without filter cuvette. Use of the filter cuvette or an internal correction by means of an additional N₂O measuring channel is possible, as necessary.
3. The total uncertainty in the certification range at an emission limit value of 50 mg/m³ for the component CO cannot be fulfilled.
4. The total uncertainty in the certification range at an emission limit value of 50 mg/m³ NO₂ for the component NO cannot be fulfilled.

Notes:

1. The measuring systems of the EasyLine EL3000 series are equipped with the Uras26 infrared measuring cell. They can be equipped with a paramagnetic oxygen measuring cell Magnos206 without an oxygen measuring cell or alternatively with an electrochemical oxygen measuring cell (sensor).

2. Modules with the measuring range NO(L) must always be equipped with an oxygen measurement cell.
3. Modules with a measurement range for SO₂ of 0 - 75 mg/m³ must always be equipped with an oxygen measurement cell.
4. If the analysers are operated with calibration cuvettes, their concentrations should be checked with test gases during the annual functional test.
5. The zero points for the oxygen measurement equipment should be tested in the annual function test with nitrogen.
6. Systems with the suffix (K) are equipped with a filter cuvette.
7. The maintenance interval is three months.
8. The performance test includes the following system variations:

Device Version	URAS 26 - Identifier	Component 1	Component 2	Component 3	Component 4
EL3020/3040	CEM1000	CO			
EL3020/3040	CEM2000	NO			
EL3020/3040	CEM2000L	NO(L)			
EL3020/3040	CEM4000	N2O			
EL3020/3040	CEM1200	CO	NO		
EL3020/3040	CEM1200L	CO	NO(L)		
EL3020/3040	CEM1500	CO	CO2		
EL3020/3040	CEM1400	CO	N2O		
EL3020/3040	CEM2300	NO	SO2		
EL3020/3040	CEM2400	NO	N2O		
EL3020/3040	CEM2500	NO	CO2		
EL3020/3040	CEM2500L	NO(L)	CO2		
EL3020/3040	CEM4500	N2O	CO2		
EL3020/3040	CEM1250	CO	NO	CO2	
EL3020/3040	CEM1250L	CO	NO(L)	CO2	
EL3020/3040	CEM1230	CO	SO2	NO	
EL3020/3040	CEM1230K	CO(K)	SO2(K)	NO	
EL3020/3040	CEM1230L	CO	SO2	NO(L)	
EL3020/3040	CEM1230KL	CO(K)	SO2(K)	NO(L)	
EL3020/3040	CEM1450	CO	N2O	CO2	
EL3020/3040	CEM2350	NO	SO2	CO2	
EL3020/3040	CEM2450	NO	N2O	CO2	
EL3020/3040	CEM1235	CO	SO2	NO	CO2
EL3020/3040	CEM1235K	CO(K)	SO2(K)	NO	CO2

An additional statement is provided as to whether an oxygen cell Magnos206 or an electrochemical sensor has been installed.

9. Supplementary test for transferring into the system of EN 15267 as regards notices of the Federal Environment Agency (UBA) of 12 September 2006 (BAnz. p. 6715, chapter I number 2.2) and of 10 January 2011 (BAnz. p. 294, Chapter IV, 28th notification).

Test Report:

TÜV Süd Industrie Service GmbH, Munich
Report no.: 1710933 of 30 September 2011

Publication in the German Federal Gazette: BAnz AT 20.07.2012 B11, chapter IV
27th notification, UBA announcement dated 06 July 2012:

**27 Notification as regards Federal Environment Agency (UBA) notice
of 23 February 2012 (BAnz. p. 920, chapter I number 4.4)**

The current software version of the analyser module for the measuring systems of
the EasyLine EL3000 series manufactured by ABB Automation GmbH, Frankfurt,
is 3.3.2.

Statement issued by TÜV Süd Industrie Service GmbH dated 16 March 2012

Publication in the German Federal Gazette: BAnz AT 01.04.2014 B12, chapter VI
3rd notification, UBA announcement dated 27 February 2014:

**3 Notification as regards Federal Environment Agency (UBA) notices
of 23 February 2012 (BAnz. p. 920, chapter I number 4.4) and
of 06 July 2012 (BAnz AT 20.07.2012 B11, chapter IV, 27th notification)**

The current software version of the analyser module for the measuring systems of
the EL3000 series manufactured by ABB Automation GmbH, Frankfurt, is 3.4.2.

Statement issued by TÜV Süd Industrie Service GmbH dated 30 September 2013

Publication in the German Federal Gazette: BAnz AT 02.04.2015 B5, chapter IV
39th notification, UBA announcement dated 25 February 2015:

**39 Notification as regards Federal Environment Agency (UBA) notices
of 23 February 2012 (BAnz. p. 920, chapter I number 4.4) and
of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter VI 3rd notification)**

The current software version of the analyser modules for the measuring systems
of the EL3000 series manufactured by ABB Automation GmbH, Frankfurt, is
3.4.4.

Statement issued by TÜV Süd Industrie Service GmbH dated 18 September 2014

Publication in the German Federal Gazette: BAnz AT 01.08.2016 B11, chapter V
21st notification, UBA announcement dated 14 July 2016:

**21 Notification as regards Federal Environment Agency (UBA) notices
of 23 February 2012 (BAnz. p. 920, chapter I number 4.4) and
of 25 February 2015 (BAnz AT 02.04.2015 B5, chapter VI 39th notification)**

The current software version of the analyser modules (AMC) for the measuring systems of the EL3000 series manufactured by ABB Automation GmbH, Frankfurt, is 3.4.8.

Statement issued by TÜV Süd Industrie Service GmbH dated 26 February 2016

Publication in the German Federal Gazette: BAnz AT 15.03.2017 B6, chapter V
19th notification, UBA announcement dated 22 February 2017:

**19 Notification as regards Federal Environment Agency (UBA) notices
of 23 February 2012 (BAnz. p. 920, chapter I number 4.4) and
of 14 July 2016 (BAnz AT 01.08.2016 B11, chapter V 21st notification)**

The EasyLine EL3000 series of measuring systems for the determination of CO, NO, SO₂, N₂O, CO₂ and O₂ manufactured by ABB Automation GmbH now has the digital interface Modbus (EIA485 and TCP/IP) according to VDI 4201 part 1 and part 3. The results of the tests are described in test report 936/21234720/B dated 4 October 2016 by TÜV Rheinland Energy GmbH.

The current software version is: 3.4.10.

The software version 3.4.9 can also be used.

Statement issued by TÜV Rheinland Energy GmbH dated 10 October 2016

Publication in the German Federal Gazette: BAnz AT 31.07.2017 B12, chapter II
8th notification, UBA announcement dated 13 July 2017:

**8 Notification as regards Federal Environment Agency (UBA) notices
of 23 February 2012 (BAnz. p. 920, chapter I number 4.4) and
of 22 February 2017 (BAnz AT 15.03.2017 B6, chapter V 19th notification)**

The current software version of the EasyLine EL3000 series measuring systems for CO, NO, SO₂, N₂O, CO₂ and O₂ manufactured by ABB Automation GmbH is:
AMC board: 3.8.0

The Impotron power supply type PSU-0261-12-14 may be used as 24V power supply.

Statement issued by TÜV Rheinland Energy GmbH dated 7 March 2017

Publication in the German Federal Gazette: BAnz AT 17.07.2018 B9, chapter III
10th notification, UBA announcement dated 3 July 2018:

10 Notification as regards Federal Environment Agency (UBA) notices of 23 February 2012 (BAnz. p. 920, chapter I number 4.4) and of 13 July 2017 (BAnz AT 31.07.2017 B12, chapter II 8th notification)

The current software version of the EasyLine EL3000 series measuring systems for CO, NO, SO₂, N₂O, CO₂ and O₂ manufactured by ABB Automation GmbH is:
AMC board: 3.8.6

The software versions 3.8.2 and 3.8.4 for the AMC board are included.

Statement issued by TÜV Rheinland Energy GmbH dated 8 March 2018

Publication in the German Federal Gazette: BAnz AT 24.03.2020 B7, chapter IV
6th notification, UBA announcement dated 24 February 2020:

6 Notification as regards Federal Environment Agency (UBA) notices of 23 February 2012 (BAnz. p. 920, chapter I number 4.4) and of 03 July 2018 (BAnz AT 17.07.2018 B9, chapter III 10th notification)

The latest software version of the EasyLine EL3000 series for CO, NO, SO₂, N₂O, CO₂, and O₂ manufactured by ABB Automation GmbH is:
AMC board: 3.9.0

Statement issued by TÜV Rheinland Energy GmbH dated 13 September 2019

Publication in the German Federal Gazette: BAnz AT 05.08.2021 B5, chapter IV
24th notification, UBA announcement dated 29 June 2021:

24 Notification as regards Federal Environment Agency (UBA) notices of 23 February 2012 (BAnz. p. 920, chapter I number 4.4) and of 24 February 2020 (BAnz AT 24.03.2020 B7, chapter IV 6th notification)

The latest software version of the EasyLine EL3000 series of measuring systems for CO, NO, SO₂, N₂O, CO₂ and O₂ manufactured by ABB Automation GmbH is:
AMC board: 3.9.2

Statement issued by TÜV Rheinland Energy GmbH dated 19 February 2021

Certified product

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

The entire tested measuring system of the EasyLine EL3000 series consists of a sample gas probe, the heated sample gas line, the sample gas cooler, the sample gas delivery unit and the multi-component analyser with up to four measurement channels.

For the measurement of CO, NO, SO₂, CO₂ and N₂O, the AMS works according to the principle of non-dispersive infrared absorption (NDIR method). To measure O₂, either an electrochemical sensor or a magneto mechanical oxygen measuring cell (Magnos206) is used.

The sample gas extraction consists of a stainless steel sampling pipe with a heated ceramic filter. A heated sample gas line equipped with a PTFE core (inner diameter 6 mm) is connected to the probe. After the heated line, the sample gas enters a compressor cooler via a solenoid valve (3-way valve). The sample gas delivery unit, with integrated rotameter with flow sensor for adjusting the sample gas flows and a fine filter is downstream of the cooler. After the gas delivery unit, the sample gas enters the analyser. The solenoid valve is used to connect zero and sample gases. The solenoid valve is used to readjust the zero points for the components CO, NO, SO₂, CO₂ and N₂O as well as the span point for O₂ using ambient air. This auto-calibration is controlled by the analyser.

The entire system consists of the following components:

Probe

Manufacturer: ABB Automation GmbH, 60488 Frankfurt
Type: PFE 2 with ceramic filter, heated

Heated sample hose / line

Manufacturer: ABB Automation GmbH, 60488 Frankfurt
Heated temperature: 180 °C
Length: 25 m in the field test during performance testing
Diameter: PTFE line with 6 mm Ø (inside)
Controller
Manufacturer: Jumo GmbH & CO. KG

Compressor cooler

Manufacturer: ABB Automation GmbH, 60488 Frankfurt
Type: Advance SCC-C (2 gas channels)

Sample gas delivery unit

Manufacturer: ABB Automation GmbH, 60488 Frankfurt
Type: Advance SCC-F (2 gas channels)

Analysers

Manufacturer: ABB Automation GmbH, 60488 Frankfurt
System type: EasyLine EL3000 in the versions EL3020 or EL3040
Software: 3.4.8

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.

Document history

Certification of the EasyLine EL3000 measuring system is based on the documents listed below and the regular, continuous surveillance of the manufacturer's quality management system:

Basic testing

Test report: 691317 of 30 June 2006
TÜV Süd Industrie Service GmbH
Publication: Banz. 14 October 2006, no. 194, p. 6715, chapter I number 2.2
UBA announcement dated 12 September 2006

Notifications

Statement issued by TÜV Süd Industrie Service GmbH dated 12 December 2006
Publication: Banz. 20 April 2007, no. 75, p. 4139, chapter IV notification 3
UBA announcement dated 12 April 2007
(Software updates)

Statement issued by TÜV Süd Industrie Service GmbH dated 06 November 2007
Publication: BAnz. 07 March 2008, no. 38, p. 901, chapter IV notification 3
UBA announcement dated 14 February 2008
(Software updates)

Statement issued by TÜV Süd Industrie Service GmbH dated 29 February 2008
Publication: Banz. 03 September 2008, no. 133, p. 3243, chapter IV notification 16
UBA announcement dated 12 August 2008
(Software updates)

Statement issued by TÜV Süd Industrie Service GmbH dated 20 October 2008
Publication: BAnz. 11 March 2009, no. 38, p. 899, chapter IV number 14
UBA announcement dated 19 February 2009
(Software updates)

Statement issued by TÜV Süd Industrie Service GmbH dated 31 March 2009
Publication: BAnz. 25 August 2009, no. 125, p. 2929, chapter III notification 23
UBA announcement dated 03 August 2009
(Software updates)

Statement issued by TÜV Süd Industrie Service GmbH dated 26 October 2009
Publication: BAnz. 12 February 2010, no. 24, p. 553, chapter IV notification 19
UBA announcement dated 25 January 2010
(Software updates)

Statement issued by TÜV Süd Industrie Service GmbH dated 28 September 2010
Publication: BAnz. 26 January 2011, no. 14, p. 294, chapter IV notification 28
UBA announcement dated 10 January 2011:
(Design changes)

Initial certification according to EN 15267

Certificate no. 1669640ts: 02 March 2012
Expiry date of the certificate: 01 March 2017
Test report: 1669640 of 30 September 2011
TÜV Süd Industrie Service GmbH
Publication: BAnz. 02 March 2012, no. 36, p. 920, chapter I number 4.4
UBA announcement dated 23 February 2012

Notifications

Statement issued by TÜV Süd Industrie Service GmbH dated 16 March 2012
Publication: BAnz AT 20.07.2012 B11, chapter IV notification 27
UBA announcement dated 06 July 2012
(Software updates)

Statement issued by TÜV Süd Industrie Service GmbH dated 30 September 2013
Publication: BAnz AT 01.04.2014 B12, chapter VI notification 3
UBA announcement dated 27 February 2014
(Software updates)

Statement issued by TÜV Süd Industrie Service GmbH dated 18 September 2014
Publication: BAnz AT 02.04.2015 B5, chapter IV notification 39
UBA announcement dated 25 February 2015
(Software updates)

Statement issued by TÜV Süd Industrie Service GmbH dated 26 February 2016
Publication: BAnz AT 01.08.2016 B11, chapter V notification 21
UBA announcement dated 14 July 2016
(Software updates)

Renewal of the certificate

Certificate no. 2664463ts: 20 January 2017
Expiry date of the certificate: 01 March 2022

Notifications

Statement issued by TÜV Rheinland Energy GmbH dated 10 October 2016
Publication: BAnz AT 15.03.2017 B6, chapter V notification 19
UBA announcement dated 22 February 2017
(Software modification and extension with digital interface - Modbus EIA485 and TCP/IP)

Statement issued by TÜV Rheinland Energy GmbH dated 07 March 2017
Publication: BAnz AT 31.07.2017 B12, chapter II notification 8
UBA announcement dated 13 July 2017
(Design and software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 08 March 2018
Publication: BAnz AT 17.07.2018 B9, chapter III notification 10
UBA announcement dated 03 July 2018
(Software updates)

Statement issued by TÜV Rheinland Energy GmbH dated 13 September 2019
Publication: BAnz AT 24.03.2020 B7, chapter IV notification 6
UBA announcement dated 24 February 2020
(Software updates)

Notifications

Statement issued by TÜV Rheinland Energy GmbH dated 19 February 2021
Publication: BAnz AT 05.08.2021 B5, chapter IV notification 24
UBA announcement dated 29 June 2021
(Software updates)

Renewal of the certificate

Certificate no. 0000059872_02: 16 February 2022
Expiry date of the certificate: 01 March 2027

Total Uncertainty for the measurement component CO in the measuring range 0 – 75 mg/m³

Performance Characteristic	Uncertainty	Value standard uncertainty (mg/m ³)	Square of standard uncertainty (mg/m ³)
Lack-of-fit	u_{lof}	-0,074	0,0055
Zero drift from field test	u_{dz}	0,520	0,2704
Span drift from field test	u_{ds}	-0,866	0,75
Influence of ambient temperature at span	u_t	1,164	1,3549
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	0,281	0,079
Influence of supply voltage	u_v	0,027	0,0007
Cross-sensitivity (interference)	u_i	-1,039	1,0795
Repeatability standard deviation at span point	$u_r = s_r$	0,013	$u_r < u_d$
Standard deviation from paired measurements under field conditions	$u_d = s_d$	0,309	0,0955
Uncertainty of reference material 2 % at 70% of certification range	u_{rm}	1,050	1,1025
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	4,738
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	2,1767	mg/m ³
Total expanded uncertainty	$u_{0,95} = 1,96 \cdot u_c$	4,2663	mg/m ³
Relative total expanded uncertainty	U	8,5	% ELV
Required measurement uncertainty according to EN 15267	(of ELV 50 mg/m ³)	7,5	% ELV
Complied with requirement relating to the measurement uncertainty		No	regarding EN 15256-3
Required measurement uncertainty according to 13./17. BImSchV	(of ELV 50 mg/m ³)	10	% ELV
Complied with requirement relating to the measurement uncertainty		Yes	regarding 13. / 17. BImSchV

Total uncertainty for the measurement component NO in the measuring range 0 – 100 mg/m³

Performance Characteristic	Uncertainty	Value standard uncertainty (mg/m ³)	Square of standard uncertainty (mg/m ³)
Lack-of-fit	u_{lof}	0,133	0,0177
Zero drift from field test	$u_{d,z}$	-0,299	0,0894
Span drift from field test	$u_{d,s}$	1,155	1,334
Influence of ambient temperature at span	u_t	0,599	0,3588
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	0,294	0,0864
Influence of supply voltage	u_v	0,072	0,0052
Cross-sensitivity (interference)	u_i	-1,963	3,8534
Repeatability standard deviation at span point	$u_r = s_r$	0,035	$u_r < u_d$
Standard deviation from paired measurements under field conditions	$u_d = s_d$	0,944	0,8911
Uncertainty of reference material 2 % at 70% of certification range	u_{rm}	1,400	1,96
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	8,596
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	2,9319	mg/m ³
Total expanded uncertainty	$u_{0,95} = 1,96 \cdot u_c$	5,7465	mg/m ³
Relative total expanded uncertainty	U	17,6	% ELV
Required measurement uncertainty according to EN 15267	(of ELV 32,6 mg/m ³)	15	% ELV
Complied with requirement relating to the measurement uncertainty		no	regarding EN 15256-3
Required measurement uncertainty according to 13./17. BImSchV	(of ELV 32,6 mg/m ³)	20	% ELV
Complied with requirement relating to the measurement uncertainty		yes	regarding 13. / 17. BImSchV

Total uncertainty for the measurement component SO₂ in the measuring range 0 – 75 mg/m³

Performance Characteristic	Uncertainty	Value standard uncertainty (mg/m ³)	Square of standard uncertainty (mg/m ³)
Lack-of-fit	u_{lof}	-0,087	0,0076
Zero drift from field test	$u_{d,z}$	0,260	0,0676
Span drift from field test	$u_{d,s}$	-1,169	1,3666
Influence of ambient temperature at span	u_t	0,786	0,6178
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	0,697	0,4858
Influence of supply voltage	u_v	0,135	0,0182
Cross-sensitivity (interference)	u_i	1,689	2,8527
Repeatability standard deviation at span point	$u_r = s_r$	0,097	$u_r < u_d$
Standard deviation from paired measurements under field conditions	$u_d = s_d$	0,525	0,2756
Uncertainty of reference material 2 % at 70% of certification range	u_{rm}	1,050	1,1025
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	6,7944
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	2,6066	mg/m ³
Total expanded uncertainty	$u_{0,95} = 1,96 \cdot u_c$	5,1089	mg/m ³
Relative total expanded uncertainty	U	10,2	% ELV
Required measurement uncertainty according to EN 15267	(of ELV 50 mg/m ³)	15	% ELV
Complied with requirement relating to the measurement uncertainty		yes	regarding EN 15256-3
Required measurement uncertainty according to 13./17. BImSchV	(of ELV 50 mg/m ³)	20	% ELV
Complied with requirement relating to the measurement uncertainty		yes	regarding 13. / 17. BImSchV

Total uncertainty for the measurement component O₂ in the measuring range 0 – 25 Vol.-% (version with electrochemical cell)

Performance Characteristic	Uncertainty	Value standard uncertainty (Vol.-%)	Square of standard uncertainty (Vol.-%)
Lack-of-fit	u_{lof}	0,017	0,0003
Zero drift from field test	$u_{d,z}$	-0,060	0,0036
Span drift from field test	$u_{d,s}$	0,050	0,0025
Influence of ambient temperature at span	u_t	0,226	0,0511
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	0,035	0,0012
Influence of supply voltage	u_v	0,016	0,0003
Cross-sensitivity (interference)	u_i	0,058	0,0034
Repeatability standard deviation at span point	$u_r = s_r$	0,010	$u_r < u_d$
Standard deviation from paired measurements under field conditions	$u_d = s_d$	0,031	0,001
Uncertainty of reference material 2 % at 70% of certification range	u_{rm}	0,175	0,0306
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	0,094
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	0,3066	Vol.-%
Total expanded uncertainty	$u_{0,95} = 1,96 \cdot u_c$	0,6009	Vol.-%
Relative total expanded uncertainty	U	2,4	% CR
Required measurement uncertainty according to EN 15267	(of CR 25 Vol.-%)	7,5	% CR
Complied with requirement relating to the measurement uncertainty		yes	regarding EN 15256-3
Required measurement uncertainty according to 13./17. BImSchV	(of CR 25 Vol.-%)	10	% CR
Complied with requirement relating to the measurement uncertainty		yes	regarding 13. / 17. BImSchV

Total uncertainty for the measurement component CO₂ in the measuring range 0 – 20 Vol.-%

Performance Characteristic	Uncertainty	Value standard uncertainty (Vol.-%)	Square of standard uncertainty (Vol.-%)
Lack-of-fit	u_{lof}	0,040	0,0016
Zero drift from field test	$u_{d,z}$	0,010	0,0001
Span drift from field test	$u_{d,s}$	-0,210	0,0441
Influence of ambient temperature at span	u_t	0,202	0,0408
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	-0,197	0,0388
Influence of supply voltage	u_v	0,000	0,0000
Cross-sensitivity (interference)	u_i	-0,090	0,0081
Repeatability standard deviation at span point	$u_r = s_r$	0,010	$u_r < u_d$
Standard deviation from paired measurements under field conditions	$u_d = s_d$	0,031	0,001
Uncertainty of reference material 2 % at 70% of certification range	u_{rm}	0,140	0,0196
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	0,1541
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	0,3926	Vol.-%
Total expanded uncertainty	$u_{0,95} = 1,96 \cdot u_c$	0,7695	Vol.-%
Relative total expanded uncertainty	U	3,8	% CR
Required measurement uncertainty according to EN 15267	(of CR 25 Vol.-%)	7,5	% CR
Complied with requirement relating to the measurement uncertainty		yes	regarding EN 15256-3
Required measurement uncertainty according to 13./17. BImSchV	(of CR 25 Vol.-%)	10	% CR
Complied with requirement relating to the measurement uncertainty		yes	regarding 13. / 17. BImSchV

Total uncertainty for the measurement component NO in the measuring range 0 – 200 mg/m³

Performance Characteristic	Uncertainty	Value standard uncertainty (mg/m ³)	Square of standard uncertainty (mg/m ³)
Lack-of-fit	u_{lof}	0,831	0,6906
Zero drift from field test	$u_{d,z}$	0,346	0,1197
Span drift from field test	$u_{d,s}$	2,887	8,3348
Influence of ambient temperature at span	u_t	1,315	1,7292
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	1,316	1,7319
Influence of supply voltage	u_v	0,577	0,3329
Cross-sensitivity (interference)	u_i	-2,310	5,3361
Repeatability standard deviation at span point	$u_r = s_r$	0,147	$u_r < u_d$
Standard deviation from paired measurements under field conditions	$u_d = s_d$	1,325	1,7556
Uncertainty of reference material 2 % at 70% of certification range	u_{rm}	2,800	7,84
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	27,8708
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	5,2793	mg/m ³
Total expanded uncertainty	$u_{0,95} = 1,96 \cdot u_c$	10,3474	mg/m ³
Relative total expanded uncertainty	U	7,9	% ELV
Required measurement uncertainty according to EN 15267	(of ELV 130,4 mg/m ³)	15	% ELV
Complied with requirement relating to the measurement uncertainty		yes	regarding EN 15256-3
Required measurement uncertainty according to 13./17. BImSchV	(of ELV 130,4 mg/m ³)	20	% ELV
Complied with requirement relating to the measurement uncertainty		yes	regarding 13. / 17. BImSchV

Total uncertainty for the measurement component N₂O in the measuring range 0 – 100 mg/m³

Performance Characteristic	Uncertainty	Value standard uncertainty (mg/m ³)	Square of standard uncertainty (mg/m ³)
Lack-of-fit	u_{lof}	0,064	0,0041
Zero drift from field test	$u_{d,z}$	-0,231	0,0534
Span drift from field test	$u_{d,s}$	1,328	1,7636
Influence of ambient temperature at span	u_t	0,566	0,3204
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	0,508	0,2581
Influence of supply voltage	u_v	0,217	0,0471
Cross-sensitivity (interference)	u_i	2,078	4,3181
Repeatability standard deviation at span point	$u_r = s_r$	0,083	$u_r < u_d$
Standard deviation from paired measurements under field conditions	$u_d = s_d$	0,650	0,4225
Uncertainty of reference material 2 % at 70% of certification range	u_{rm}	0,700	0,49
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NO _x	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	7,6773
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	2,7708	mg/m ³
Total expanded uncertainty	$u_{0,95} = 1,96 \cdot u_c$	5,4308	mg/m ³
Relative total expanded uncertainty	U	5,4	% ELV
Required measurement uncertainty according to EN 15267	(of ELV 100 mg/m ³)	15	% ELV
Complied with requirement relating to the measurement uncertainty		yes	regarding EN 15256-3
Required measurement uncertainty according to 13./17. BImSchV	(of ELV 100 mg/m ³)	20	% ELV
Complied with requirement relating to the measurement uncertainty		yes	regarding 13. / 17. BImSchV

Total uncertainty for the measurement component O₂ in the measuring range 0 – 25 Vol.-% (version with magneto mechanical oxygen cell)

Performance Characteristic	Uncertainty	Value standard uncertainty (Vol.-%)	Square of standard uncertainty (Vol.-%)
Lack-of-fit	u_{lof}	0,017	0,0003
Zero drift from field test	u_{dz}	-0,010	0,0001
Span drift from field test	u_{ds}	0,030	0,0009
Influence of ambient temperature at span	u_t	0,055	0,0030
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	0,081	0,0066
Influence of supply voltage	u_v	0,000	0,0000
Cross-sensitivity (interference)	u_i	-0,060	0,0036
Repeatability standard deviation at span point	$u_r = s_r$	0,001	$u_r < u_d$
Standard deviation from paired measurements under field conditions	$u_d = s_d$	0,044	0,0019
Uncertainty of reference material 2 % at 70% of certification range	u_{rm}	0,175	0,0306
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	0,047
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	0,2168	Vol.-%
Total expanded uncertainty	$u_{0,95} = 1,96 \cdot u_c$	0,4249	Vol.-%
Relative total expanded uncertainty	U	1,7	% CR
Required measurement uncertainty according to EN 15267	(of CR 25 Vol.-%)	7,5	% CR
Complied with requirement relating to the measurement uncertainty		yes	regarding EN 15256-3
Required measurement uncertainty according to 13./17. BImSchV	(of CR 25 Vol.-%)	10	% CR
Complied with requirement relating to the measurement uncertainty		yes	regarding 13. / 17. BImSchV