ZERTIFIKAT ◆ CERTIFICATE ◆ 認証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

Umwelt Bundesamt

Certificate number: 3684328-ts

TÜV SÜD Industrie Service

Certificate

of product conformity (QAL 1)

Certificate number: 3684328-ts

AMS	MCA 10-HWIR T monitoring CO, NO, SO_2, NO_2, N_2O, HCl, NH_3, CH_4, CO_2, O_2, humidity and TOC
Manufacturer	Dr. Födisch Umweltmesstechnik AG Zwenkauer Straße 159 04420 Markranstädt Germany

Test institute TÜV SÜD Industrie Service GmbH

This is to certify that the AMS has been tested and found to comply with the standards DIN EN 15267-1:2009, DIN EN 15267-2:2009, DIN EN 15267-3:2008 and DIN EN 14181:2015

Certification is awarded in respect of conditions stated in this certificate (the certificate consists of 21 pages).

DIN EN 15267 TÜV SÜD Eignungsprüfung Produktion überwacht Valid until 08/2028

Certificate No: 3684328-ts

Publication in the German Federal Gazette
(BAnz) of 02 August 2023

Umweltbundesamt
Dessau, 01 September 2023

Dr. Marcel Langner
Head of Section II 4

This certificate will expire on:
01 August 2028

TÜV SÜD Industrie Service GmbH
Testing laboratory Emission measurement/ calibration
Munich, 31 August 2023

Hans-Jörg Eisenberger

TÜV®

Test report	3684328_rev1 from 10 February 2023
Initial certification	02 August 2023
Certificate validity until	01 August 2028 (5 years)
Publication	BAnz AT 02.08.2023 B7, chapter I, No. 2.2

Approved application

The tested AMS is suitable for use at plants requiring official approval, plants according to the 27. BImSchV:2013 and plants according to Directive (EU) 2015/2193 (44. BImSchV:2021). The suitability of the AMS for this application was assessed on the basis of a laboratory test and a field test of the MCA 10-HWIR T measuring system lasting over three months at a plant according to Directive 2010/75/EU chapter IV (17. BImSchV:2021). The suitability of the AMS for applications on gas turbine plants according to Directive 2010/75/EU chapter III (13. BImSchV:2021) was assessed on basis of a laboratory test and a field test of the MCA 10-HWIR measuring system lasting over three months and is also valid for MCA 10-HWIR T measuring system. The measuring system is approved for ambient temperatures between +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.

Note:
The legal regulations mentioned do not always have to correspond to the current state of legislation. Each user should ensure, if necessary in consultation with the competent authority, that this AMS fulfils the legal requirements for the intended use. Furthermore, it cannot be ruled out that legal regulations on the use of a measuring system for emission monitoring may change during the term of the certificate.

Certification basis

This certificate is based on:

- TÜV SÜD Industrie Service GmbH test report 3684328_rev1 from 10 February 2023
- Suitability announcement by the German Federal Environment Agency (UBA) as the relevant body
- The ongoing surveillance of the product and the manufacturing process

- Publication in the German Federal Gazette (BAnz AT 02.08.2023 B7, chapter I, No. 2.2, Announcement by UBA from 05 July 2023):

AMS designation: MCA 10-HWIR T monitoring CO, NO, SO_2, NO_2, N_2O, HCl, NH_3, CH_4, CO_2, O_2, humidity and TOC

Manufacturer: Dr. Födisch Umweltmesstechnik AG, Markranstädt

Suitability: For plants requiring authorisation and plants in compliance with the 27. BImSchV and 44. BImSchV

Measurement ranges in the suitability test:

Component	Certification range	Supplementary measurement ranges				Unit
CO	0 - 75	0 - 300	0 - 5000	-	-	mg/m³
CO_2	0 – 25	0 – 50	-	-	-	Vol.-%
NO	0 – 80 and 0 - 200	0 - 400	0 - 3000	-	-	mg/m³
NO_2	0 - 50	0 - 500	-	-	-	mg/m³
N_2O	0 - 50	0 - 3000	-	-	-	mg/m³
NH_3	0 - 10	0 - 50	0 - 500	-	-	mg/m³
SO_2	0 - 75	0 - 300	0 - 2500	-	-	mg/m³
HCl	0 - 15	0 - 90	0 - 5000	-	-	mg/m³
H_2O	0 - 40	-	-	-	-	Vol.-%
CH_4	0 - 50	0 - 500	0 - 3000	-	-	mg/m³
TOC	0 – 15	0 - 30	0 - 150	0 - 500	0 - 3000	mg/m³
O_2	0 – 25	-	-	-	-	Vol.-%

Software versions:

MCA 10:	V 4.03|3.62|3.64	
iFiD Rack:	Testa Display:	3.0
	DGA:	2.0
	I/O:	2.0
	QPC:	2.0

Restrictions:

None

Notes:

1. The AMS determines gas concentrations in moist measuring gas.
2. The analyser shall be operated with the activated thermo-AUTOCAL-function.
3. The AMS shall be equipped with additional heating for temperatures of less than 20 °C at the point of installation.
4. The AMS shall be operated at an interval of 12 h for automatic zero alignment. TOC shall be operated at an interval of 24 h for automatic zero und span point alignment.
5. When HCl, NO_2 or NH_3 are applied, automatic zero point alignment shall be conducted by adding zero gas locally at the injector block.
6. When checking and aligning the span points for NO_2, HCl and NH_3 the sample gas is added locally at the injector block.
7. The maintenance interval is four weeks.
8. The manufacturer's specifications for implementing the air supply to the instruments shall be observed.
9. Starting with the serial numbers with the annual code 18, the measuring system is equipped with a certification range of 0 - 80 mg/ m^3 for the measuring component NO. The annual code is composed of the first two digits of the serial number and is indicated on the nameplate.
10. Supplementary test for measurement system MCA 10-HWIR T (alternative TOC analyser iFiD Rack and supplementary measurement ranges for CH_4 and TOC each 0 – 3000 mg/m^3) to the announcement of the Federal Environmental Agency dated 21 February 2018 (BAnz AT 26.03.2018 B8, chapter I number 3.1) and of 27 February 2019 (BAnz AT 26.03.2019 B7, chapter IV, notification 35).

Test report: TÜV SÜD Industrie Service GmbH, Munich
Report-No.: 3684328_rev1 from 10 February 2023

Certified product

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

The entire tested MCA 10-HWIR T multi component AMS consists of the sample gas extraction probe, heated sample hose and the measurement cabinet with analyser. The measurement cabinet is equipped with an air conditioner and an additional cabinet heating. The basic components of the measurement cabinet are:

- Multi component analyser MCA 10-HWIR
- Total organic carbon analyser iFiD Rack
- Panel-PC P1550 Win7 15“
- PLC control

The MCA 10-HWIR T multi component AMS records emissions of CO, NO, NO_2, N_2O, SO_2, HCl, NH_3, CH_4, Total organic, CO_2 and their reference components O_2 and moisture in flue gas. The sample gas is applied hot to the AMS after filtering using an air jet pump, without prior separation of the flue gas moisture.

The following 4 measurement principles are applied:

Dual frequency measurement procedure
Gas filter correlation
Zirconium dioxide measurement cell
Flame ionization detector

The sample gas extraction is conducted through a stainless-steel extraction probe with a PTFE filter heated to 185 °C. A sample gas line heated to 185 °C and fitted with a PTFE seal (internal diameter 6 mm) is attached to the probe. The line is max. 50 metres long. After the heated line the sample gas flows into the gas distributor block inside the MCA 10-HWIR analyser. The connection for zero air, the exhaust duct and the carrier gas line for the air jet pump and connector for heated gas line (inner diameter 4 mm) to FID with length of 0.7 m are also in the gas distributor block.

The entire system consists of the following components:

Probe

Manufacturer:	M&C TechGroup Germany GmbH, D - 40885 Ratingen
Type:	SP2000-H
Filter	F-T2 150 PTFE filter 2 µm

Heated line

Manufacturer:	Winkler GmbH, D-69126 Heidelberg
Heated temperature:	185 °C, PTFE line (ID: 6 mm), length in the suitability test 50 m
Regulator	integrated into the MCA 10-HWIR

Air conditioning system

Manufacturer:	Rittal GmbH & Co. KG, Herbron
Type:	Wandanbau-Kühlgerät 1500 W/230VAC
Alternative air conditioning	
Manufacturer:	Pentair, Straubenhardt
Type:	Wandanbau-Kühlgerät S101526G031;1500 W/230VAC

Switch cabinet heating

Manufacturer:	Rittal GmbH & Co. KG, Herbron
Type:	SK 3105 / 230VAC / 400 W
Regulator	integrated into the MCA 10-HWIR

Programmable logic control (PLC)

Manufacturer:	Panasonic
Software:	V 3.64

Panel PC with operating software

Software:	MCA10_HID.exe
Version:	V 4.03
System requirements	Operating system Windows XP or higher CPU Pentium II or higher Memory 500 MB ROM 5 GB free storage for data storage Interfaces USB 2.0 Display Mind. 1024*768 Pixel

Analysis system

Manufacturer:	Dr. Födisch Umweltmesstechnik AG
System type:	MCA 10-HWIR T
Software:	V 4.03|3.62|3.64

Measurement principle:	CO, NO, NO_2, N_2O, SO_2, HCl, NH_3, CH_4, CO_2, H_2O: Extractive heat measuring infrared spectroscopy system O_2: Zirconium dioxide cell

Total organic analysis system

Manufacturer:	Testa GmbH / Munich	
System type:	iFiD Rack	
Software:	Testa Display :	3.0
	DGA:	2.0
	I/O:	2.0
	QPC:	2.0
Measurement principle:	flame ionisation detector	

Heated connection FID

Manufacturer:	Winkler GmbH, D-69126 Heidelberg
Heated temperature:	185 °C, PTFE line (ID: 4 mm), length 0,7 m
Regulator	integrated into the TOC analyser

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 required to maintain an approved 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.

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

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

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 expiration is also accessible on the internet at **qal1.de**.

The certification of the multi component measuring system MCA 10-HWIR T is based on the following documents and the regular continuous monitoring of the manufacturer's quality management system:

Initial certification to DIN EN 15267 (MCA 10-HWIR):

Certificate No. 1729865-ts	26 August 2015
Certificate validity until	25 August 2020 (5 years)

Test report: 1729865 from 10 June 2015,
TÜV SÜD Industrie Service GmbH
Publication: BAnz AT 26 August 2015 B4, chapter I no. 2.2
UBA announcement from 22 July 2015

Supplementary testing according to DIN EN 15267 (MCA 10-HWIR):

Certificate No. 2422091-ts	14 March 2016
Certificate validity until	25 August 2020 (5 years)

Test report: 2422091 from 20 October 2015,
TÜV SÜD Industrie Service GmbH
Publication: BAnz AT 14 March 2016 B7, chapter I no. 4.3
UBA announcement from 18 February 2016

Supplementary testing according to DIN EN 15267 (MCA 10-HWIR):

Certificate No. 2600495-ts	24 May 2018
Certificate validity until	25 August 2020 (5 years)

Test report: 2600495 from 29 November 2017,
TÜV SÜD Industrie Service GmbH
Publication: BAnz AT 26 March 2018 B8, chapter I no. 3.1
UBA announcement from 21 February 2018

Notification (MCA 10-HWIR):

Notification of TÜV SÜD Industrie Service GmbH from 26 February 2016
Publication: BAnz AT 1 August 2016 B11, chapter V notification 23
UBA announcement from 14 July 2016 (change software version)

Notification (MCA 10-HWIR)

Notification of TÜV Rheinland Energy GmbH from 05 October 2018
Publication: BAnz AT 26 March 2019 B7, chapter IV, comment 35,
UBA announcement from 27 February 2019 (change software version)

Renewal of the certificate in acc. to DIN EN 15267 (MCA 10-HWIR):

Certificate number 3210534-ts:	26 May 2020
Expiry of the certificate:	25 May 2025 (5 years)

Supplementary testing according to DIN EN 15267 (MCA 10-HWIR T):

Certificate No. 3684328-ts	02 August 2023
Certificate validity until	01 August 2028 (5 years)

Test report: 3684328_rev1 from 10 February 2023,
TÜV SÜD Industrie Service GmbH
Publication: BAnz AT 02.08.2023 B7, chapter I no. 2.2
UBA announcement from 05 July 2023

Calculation of total uncertainty for the measuring system MCA 10-HWIR T for QAL1 testing to DIN EN 14181 and DIN EN 15267-3

Total uncertainty for the measurement component O_2 in the measurement range 0-25 Vol.%

Performance characteristic	*Uncertainty*	*Value standard uncertainty Vol.%*	*Square of standard uncertainty (Vol.%)²*
Lack-of-fit	u_{lof}	0,045	0,00203
Zero drift from field test	$u_{d,z}$	-0,017	0,00029
Span drift from field test	$u_{d,s}$	-0,052	0,0027
Influence of ambient temperature at span	u_t	0,017	0,0003
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	0,081	0,00656
Influence of supply voltage	u_v	0,011	0,00012
Cross-sensitivity (interference)	u_i	0,15	0,0225
Repeatability standard deviation at span	$u_r = s_r$	0,01	ur < ud
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,053	0,00281
Uncertainty of reference material 1 % by 70% of CR	u_{rm}	0,10104	0,01021
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	0,04751
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	0,21797	Vol.%
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	0,42722	Vol.%
Relativ expanded uncertainty	U	**1,7**	% 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

Total uncertainty for the measurement component CO in the measurement range 0-75 mg/m³

Performance characteristic	*Uncertainty*	*Value standard uncertainty mg/m³*	*Square of standard uncertainty (mg/m³)²*
Lack-of-fit	u_{lof}	0,13	0,0169
Zero drift from field test	$u_{d,z}$	-0,299	0,0894
Span drift from field test	$u_{d,s}$	-1,083	1,1729
Influence of ambient temperature at span	u_t	0,565	0,3192
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	0,77	0,5929
Influence of supply voltage	u_v	0,18	0,0324
Cross-sensitivity (interference)	u_i	-0,225	0,0506
Repeatability standard deviation at span	$u_r = s_r$	0,096	ur < ud
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,44	0,1936
Uncertainty of reference material 2 % by 70% of CR	u_{rm}	0,6062	0,3675
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	2,8354
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	1,6839	mg/m³
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	3,3004	mg/m³
Relativ expanded uncertainty	U	**6,6**	% ELV
Permissible uncertainty of EN 15267-3	(of ELV 50 mg/m³)	**7,5**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	(of ELV 50 mg/m³)	**10**	% 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 0-200 mg/m³

Performance characteristic	*Uncertainty*	*Value standard uncertainty mg/m³*	*Square of standard uncertainty (mg/m³)²*
Lack-of-fit	u_{lof}	-0,566	0,3204
Zero drift from field test	$u_{d,z}$	0,219	0,048
Span drift from field test	$u_{d,s}$	-1,801	3,2436
Influence of ambient temperature at span	u_t	1,159	1,3433
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	-1,08	1,1664
Influence of supply voltage	u_v	0,699	0,4886
Cross-sensitivity (interference)	u_i	1,42	2,0164
Repeatability standard deviation at span	$u_r = s_r$	0,174	ur < ud
Standard deviation from paired measurements under field cond.	$u_d = s_d$	2,01	4,0401
Uncertainty of reference material 2 % by 70% of CR	u_{rm}	1,6166	2,6134
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	15,2802
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	3,909	mg/m³
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	7,6616	mg/m³
Relativ expanded uncertainty	U	**5,9**	% ELV
Permissible uncertainty of EN 15267-3	(of ELV 130,4 mg/m³)	**15**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	(of ELV 130,4 mg/m³)	**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 0-80 mg/m³

Performance characteristic	*Uncertainty*	*Value standard uncertainty mg/m³*	*Square of standard uncertainty (mg/m³)²*
Lack-of-fit	u_{lof}	-0,614	0,377
Zero drift from field test	$u_{d,z}$	0,721	0,520
Span drift from field test	$u_{d,s}$	0,693	0,480
Influence of ambient temperature at span	u_t	1,076	1,158
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	-0,830	0,689
Influence of supply voltage	u_v	0,116	0,013
Cross-sensitivity (interference)	u_i	-1,030	1,061
Repeatability standard deviation at span	$u_r = s_r$	0,216	ur < ud
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,634	0,402
Uncertainty of reference material 2 % by 70% of CR	u_{rm}	0,647	0,419
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	5,264
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	2,294	mg/m³
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	4,496	mg/m³
Relativ expanded uncertainty	U	**13,7**	% ELV
Permissible uncertainty of EN 15267-3	(of ELV 32,7 mg/m³)	**15**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	(of ELV 32,7 mg/m³)	**20**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding 13. / 17. BImSchV

Total uncertainty for the measurement component NO_2 in the measurement range 0-50 mg/m³

Performance characteristic	*Uncertainty*	*Value standard uncertainty mg/m³*	*Square of standard uncertainty (mg/m³)²*
Lack-of-fit	u_{lof}	0,378	0,1429
Zero drift from field test	$u_{d,z}$	0,127	0,0161
Span drift from field test	$u_{d,s}$	0,849	0,7208
Influence of ambient temperature at span	u_t	0,445	0,198
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	-0,51	0,2601
Influence of supply voltage	u_v	0,31	0,0961
Cross-sensitivity (interference)	u_i	0,289	0,0835
Repeatability standard deviation at span	$u_r = s_r$	0,05	ur < ud
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,620	0,3844
Uncertainty of reference material 2 % by 70% of CR	u_{rm}	0,4041	0,1633
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	2,0652
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	1,4371	mg/m³
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	2,8167	mg/m³
Relativ expanded uncertainty	U	**5,6**	% ELV
Permissible uncertainty of EN 15267-3	(of ELV 50 mg/m³)	**15**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	(of ELV 50 mg/m³)	**20**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding 13. / 17. BImSchV

Total uncertainty for the measurement component N_2O in the measurement range 0-50 mg/m³

Performance characteristic	*Uncertainty*	*Value standard uncertainty mg/m³*	*Square of standard uncertainty (mg/m³)²*
Lack-of-fit	u_{lof}	-0,193	0,0372
Zero drift from field test	$u_{d,z}$	0,217	0,0471
Span drift from field test	$u_{d,s}$	-0,854	0,7293
Influence of ambient temperature at span	u_t	0,493	0,243
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	-0,410	0,1681
Influence of supply voltage	u_v	0,163	0,0266
Cross-sensitivity (interference)	u_i	0,361	0,1303
Repeatability standard deviation at span	$u_r = s_r$	0,086	ur < ud
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,47	0,2209
Uncertainty of reference material 2 % by 70% of CR	u_{rm}	0,4041	0,1633
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	1,7658
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	1,3288	mg/m³
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	2,6044	mg/m³
Relativ expanded uncertainty	U	**5,2**	% ELV
Permissible uncertainty of EN 15267-3	(of ELV 50 mg/m³)	**15**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	(of ELV 50 mg/m³)	**20**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding 13. / 17. BImSchV

Total uncertainty for the measurement component SO_2 in the measurement range 0-75 mg/m³

Performance characteristic	*Uncertainty*	*Value standard uncertainty mg/m³*	*Square of standard uncertainty (mg/m³)²*
Lack-of-fit	u_{lof}	-0,268	0,0718
Zero drift from field test	$u_{d,z}$	0,16	0,0256
Span drift from field test	$u_{d,s}$	-1,273	1,6205
Influence of ambient temperature at span	u_t	0,748	0,5595
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	-0,424	0,1798
Influence of supply voltage	u_v	0,063	0,004
Cross-sensitivity (interference)	u_i	0,524	0,2746
Repeatability standard deviation at span	$u_r = s_r$	0,102	ur < ud
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,88	0,7744
Uncertainty of reference material 2 % by 70% of CR	u_{rm}	0,6062	0,3675
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	3,8777
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	1,9692	mg/m³
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	3,8596	mg/m³
Relativ expanded uncertainty	U	**7,7**	% ELV
Permissible uncertainty of EN 15267-3	(of ELV 50 mg/m³)	**15**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	(of ELV 50 mg/m³)	**20**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding 13. / 17. BImSchV

Total uncertainty for the measurement component HCl in the measurement range 0-15 mg/m³

Performance characteristic	*Uncertainty*	*Value standard uncertainty mg/m³*	*Square of standard uncertainty (mg/m³)²*
Lack-of-fit	u_{lof}	-0,172	0,0296
Zero drift from field test	$u_{d,z}$	0,146	0,0213
Span drift from field test	$u_{d,s}$	0,251	0,063
Influence of ambient temperature at span	u_t	0,158	0,025
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	0,29	0,0841
Influence of supply voltage	u_v	0,093	0,0086
Cross-sensitivity (interference)	u_i	0,235	0,0552
Repeatability standard deviation at span	$u_r = s_r$	0,055	ur < ud
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,22	0,0484
Uncertainty of reference material 5 % by 70% of CR	u_{rm}	0,3031	0,0919
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	0,4271
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	0,6535	mg/m³
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	1,2809	mg/m³
Relativ expanded uncertainty	U	**12,8**	% ELV
Permissible uncertainty of EN 15267-3	(of ELV 10 mg/m³)	**30**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	(of ELV 10 mg/m³)	**40**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding 13. / 17. BImSchV

Total uncertainty for the measurement component NH_3 in the measurement range 0-10 mg/m³

Performance characteristic	*Uncertainty*	*Value standard uncertainty mg/m³*	*Square of standard uncertainty (mg/m³)²*
Lack-of-fit	u_{lof}	0,114	0,013
Zero drift from field test	$u_{d,z}$	0,137	0,0188
Span drift from field test	$u_{d,s}$	0,171	0,0292
Influence of ambient temperature at span	u_t	0,106	0,0112
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	-0,057	0,0032
Influence of supply voltage	u_v	0,124	0,0154
Cross-sensitivity (interference)	u_i	-0,117	0,0137
Repeatability standard deviation at span	$u_r = s_r$	0,027	ur < ud
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,14	0,0196
Uncertainty of reference material 2 % by 70% of CR	u_{rm}	0,0808	0,0065
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	0,1306
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	0,3614	mg/m³
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	0,7083	mg/m³
Relativ expanded uncertainty	U	**14,2**	% ELV
Permissible uncertainty of EN 15267-3	(of ELV 5 mg/m³)	**30**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	(of ELV 5 mg/m³)	**40**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding 13. / 17. BImSchV

Total uncertainty for the measurement component TOC in the measurement range 0-15 mg/m³

Performance characteristic	*Uncertainty*	*Value standard uncertainty mg/m³*	*Square of standard uncertainty (mg/m³)²*
Lack-of-fit	u_{lof}	-0,045	0,002
Zero drift from field test	$u_{d,z}$	-0,035	0,0012
Span drift from field test	$u_{d,s}$	0,165	0,0272
Influence of ambient temperature at span	u_t	0,047	0,0022
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	0,018	0,0003
Influence of supply voltage	u_v	0,015	0,0002
Cross-sensitivity (interference)	u_i	0,338	0,1142
Repeatability standard deviation at span	$u_r = s_r$	0,046	ur < du
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,061	0,0037
Uncertainty of reference material 2 % by 70% of ZR	u_{rm}	0,1212	0,0147
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}	0,205	0,042
		total	0,2077
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	0,4557	mg/m³
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	0,8932	mg/m³
Relativ expanded uncertainty	U	**8,9**	% ELV
Permissible uncertainty of EN 15267-3	(of ELV 10 mg/m³)	**22,5**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	(of ELV 10 mg/m³)	**30**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding 13. / 17. BImSchV

Total uncertainty for the measurement component CH_4 in the measurement range 0-50 mg/m³

Performance characteristic	*Uncertainty*	*Value standard uncertainty mg/m³*	*Square of standard uncertainty (mg/m³)²*
Lack-of-fit	u_{lof}	-0,28	0,0784
Zero drift from field test	$u_{d,z}$	-0,65	0,4225
Span drift from field test	$u_{d,s}$	-0,866	0,75
Influence of ambient temperature at span	u_t	0,286	0,0818
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	0,13	0,0169
Influence of supply voltage	u_v	0,319	0,1018
Cross-sensitivity (interference)	u_i	0,517	0,2673
Repeatability standard deviation at span	$u_r = s_r$	0,055	ur < ud
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,38	0,1444
Uncertainty of reference material 2 % by 70% of CR	u_{rm}	0,4041	0,1633
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	2,0264
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	1,4235	mg/m³
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	2,7901	mg/m³
Relativ expanded uncertainty	U	**5,6**	% ELV
Permissible uncertainty of EN 15267-3	(of ELV 50 mg/m³)	**22,5**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	(of ELV 50 mg/m³)	**30**	% ELV
Complied with requirements relating to the measurement uncertainty		**yes**	regarding 13. / 17. BImSchV

Total uncertainty for the measurement component CO_2 in the measurement range 0-25 Vol.%

Performance characteristic	*Uncertainty*	*Value standard uncertainty Vol.%*	*Square of standard uncertainty (Vol.%)²*
Lack-of-fit	u_{lof}	0,143	0,02045
Zero drift from field test	$u_{d,z}$	0,045	0,00203
Span drift from field test	$u_{d,s}$	0,172	0,02958
Influence of ambient temperature at span	u_t	0,078	0,00608
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	0,018	0,00032
Influence of supply voltage	u_v	0,009	0,00008
Cross-sensitivity (interference)	u_i	-0,186	0,0346
Repeatability standard deviation at span	$u_r = s_r$	0,014	ur < ud
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,03	0,0009
Uncertainty of reference material 2 % by 70% of CR	u_{rm}	0,20207	0,04083
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	0,13487
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	0,36725	Vol.%
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	0,71981	Vol.%
Relativ expanded uncertainty	U	**2,9**	% 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

Total uncertainty for the measurement component H_2O in the measurement range 0-40 Vol.%

Performance characteristic	*Uncertainty*	*Value standard uncertainty Vol.%*	*Square of standard uncertainty (Vol.%)²*
Lack-of-fit	u_{lof}	-0,157	0,0246
Zero drift from field test	$u_{d,z}$	0,014	0,0002
Span drift from field test	$u_{d,s}$	0,621	0,3856
Influence of ambient temperature at span	u_t	0,19	0,0361
Influence of sample gas pressure	u_p		
Influence of sample gas flow	u_f	0,221	0,0488
Influence of supply voltage	u_v	0,074	0,0055
Cross-sensitivity (interference)	u_i	0	0
Repeatability standard deviation at span	$u_r = s_r$	0,049	ur < ud
Standard deviation from paired measurements under field cond.	$u_d = s_d$	0,08	0,0064
Uncertainty of reference material 2 % by 70% of CR	u_{rm}	0,3233	0,1045
Excursion of measurement beam	u_{mb}		
Converter efficiency for AMS measuring NOx	u_{ce}		
Variation of response factors (TOC)	u_{rf}		
		total	0,6117
Combined standard uncertainty	$u_c = \sqrt{\sum (u_i)^2}$	0,7821	Vol.%
Total expanded uncertainty	$U_{0,95} = 1,96 \times u_c$	1,5329	Vol.%
Relativ expanded uncertainty	U	**3,8**	% CR
Permissible uncertainty of EN 15267-3	(of CR 40 Vol.%)	**7,5**	% CR
Complied with requirements relating to the measurement uncertainty		**yes**	regarding EN 15267-3
Permissible uncertainty 13. / 17. BImSchV	(of CR 40 Vol.%)	**10**	% CR
Complied with requirements relating to the measurement uncertainty		**yes**	regarding 13. / 17. BImSchV