Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000025930_06

Certified AMS:	PowerCEMS100 for CO, NO, NO_2, N_2O, SO_2, CH_4, TOC, O_2 and CO_2
Manufacturer:	Endress+Hauser SICK GmbH+Co. KG Bergener Ring 27 01458 Ottendorf-Okrilla Germany
Test Institute:	TÜV Rheinland Energy & Environment 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 (2023), EN 15267-3 (2007) as well as EN 14181 (2004).

Certification is awarded in respect of the conditions stated in this certificate (this certificate contains 27 pages).
The present certificate replaces certificate 0000025930_05 dated 10 February 2025.

TÜVRheinland® CERTIFIED

Suitability Tested
EN 15267
QAL1 Certified
Regular Surveillance

www.tuv.com
ID 0000025930

Publication in the German Federal Gazette (BAnz) of 31 October 2025

German Environment Agency

Dessau, 23 March 2026

This certificate will expire on:
22 March 2031

TÜV Rheinland
Energy & Environment GmbH
Cologne, 20 March 2026

Dr. Marcel Langner

i. V. Guido Baum

www.umwelt-tuv.eu
qal1-info@tuv.com
Tel. + 49 221 806-5200

TÜV Rheinland Energy & Environment GmbH
Am Grauen Stein
51105 Köln

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

Test report:	EuL/21264646/A dated 17 February 2025
Initial certification:	12 February 2010
Expiry date:	22 March 2031
Publication:	BAnz AT 31.10.2025 B5, chapter I No. 3.2

Approved application
The tested AMS is suitable for use at plants according to Directive 2010/75/EC, chapter III (combustion plants / 13th BImSchV:2021), chapter IV (waste incineration plants / 17th BImSchV:2021), Directive 2015/2193/EC (44th BImSchV:2022), TA Luft:2021, 30th BImSchV:2022 and 27th BImSchV:2013. 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 six to twenty-four month field test at a combined heat and power plant. In addition, field testing of the GMS811-FIDOR measurement module was carried out over a period of more than six months at a waste-to-energy plant (see 936/21216085/B dated 10 October 2011, TÜV Rheinland Energie und Umwelt GmbH).

The AMS is approved for an ambient temperature range of +5 °C to +40 °C and with air conditioning up to +50 °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 emission limit values and oxygen concentration relevant to the application.

Any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for the installation at which it will be installed.

Note
The legal regulations mentioned correspond to the current state of legislation during certification. Each user should, if necessary, in consultation with the competent authority, ensure that this AMS meets the legal requirements for the intended use. In addition, it cannot be ruled out that legal regulations governing the use of a measuring device for emission monitoring may change during the lifetime of the certificate.

Basis of the certification
This certification is based on:

- Test report EuL/21264646/A dated 17 February 2025 of TÜV Rheinland Energy & Environment 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 AT 31.10.2025 B5, chapter I No. 3.2, Announcement by UBA dated 27 August 2025:

AMS designation:
PowerCEMS100 for CO, NO, NO_2, SO_2, CH_4, N_2O, CO_2, O_2 and TOC

Manufacturer:
Endress+Hauser SICK GmbH+Co. KG, Ottendorf-Okrilla, Germany

Field of application:
For measurements at plants requiring official approval to 13th BImSchV, 17th BImSchV, 30th BImSchV, TA-Luft as well as plants according to 27th BImSchV and 44th BImSchV

Measuring ranges during the performance test:

Component	Module	Certification range	Supplementary measuring ranges		Unit
	MAC GMS800				
CO	UNOR	0 - 75	0 - 750	0 - 3,000	mg/m³
	MULTOR	0 - 200	0 - 2,000	-	mg/m³
NO	UNOR	0 - 100	0 - 1,000	0 - 2,000	mg/m³
	MULTOR	0 - 250	0 – 2,500	-	mg/m³
	DEFOR	0 - 50	0 - 1,000	0 - 2,000	mg/m³
NO_2	DEFOR	0 - 50	0 - 500	-	mg/m³
NO_x	UNOR	0 - 100	0 - 1,000	0 - 2,000	mg/m³
	MULTOR	0 - 250	0 - 2,500	-	mg/m³
SO_2	UNOR	0 - 75	0 - 287	0 - 2,000	mg/m³
	MULTOR	0 - 250	0 - 2,000	-	mg/m³
	DEFOR	0 - 75	0 - 287	0 - 2,000	mg/m³
CH_4	UNOR	0 - 50	0 - 500	-	mg/m³
	MULTOR	0 - 286	0 - 500	-	mg/m³
N_2O	UNOR	0 - 50	0 - 500	-	mg/m³
CO_2	UNOR	0 - 25	-	-	Vol.-%
	MULTOR	0 - 25	-	-	Vol.-%
O_2	OXOR-P	0 - 25	-	-	Vol.-%
	OXOR-E	0 - 25	-	-	Vol.-%
TOC	GMS811-FIDOR	0 - 15	0 - 50 / 0 - 150 / 0 - 500		mg/m³

Software versions:

PowerCEMS100

BCU:	9150883_4.006
UNOR/MULTOR:	9137995_4.002
DEFOR:	9139736_4.004
OXOR:	9138052_4.001
Gasmodul:	9134803_4.003
GMS811-FIDORi:	9230690_4.003
PC-Software:	Sopas ET 2024.3 Build 5.4.0.6478

Restrictions:

1. Functionality of the respective combination of modules shall be verified during the checks for proper installation.
2. The maintenance interval shall be determined during the check for proper installation.

Notes:

1. Automatic calibration of zero points shall be carried out with humidified ambient air for all components except for O_2 (OXOR-P and OXOR-E) once a week.
2. Automatic span point calibration for the OXOR-P and OXOR-E (O_2) sensors shall be carried out once a week with humidified ambient air.
3. With the help of external air conditioning the AMS also fulfils the requirements at an ambient air temperature of 50 °C.
4. If the "GMS811-FIDOR for TOC" module is installed, the measuring system can only be operated with a fan unit up to an ambient temperature of 40 °C.
5. The measuring system may be operated with cooler type MAK10-2 manufactured by AGT Thermotechnik as well as with type CSS-V2SK manufactured by M&C.
6. If a weekly adjustments is carried out using the relevant internal adjustment check or edge filter, the maintenance interval for the modules can be extended as follows:
   one year for the modules CO (UNOR), CH_4 (UNOR and MULTOR)
   half a year for the modules CO (MULTOR), NO (MULTOR), SO_2 (DEFOR)
   three months for the modules NO (UNOR) and NO_2 (DEFOR)
7. The measuring system can also be equipped with the SCU-P100 display unit.
8. The 19" slide-in housing with integrated BCU (GMS810) and without integrated BCU (GMS811) is used for the standard application in the PowerCEMS100.
9. In the modular PowerCEMS100 system, the entire measuring system is controlled via a central BCU and a downstream central signalling unit. The individual measurement modules are now not connected to the SCU/BCU as before, but individually to the signal I/O unit. The BCU is still connected to the measurement and I/O modules via CAN bus.
10. The BCU of the measuring system now has the digital Modbus interface (RTU and TCP/IP) in accordance with VDI 4201 Part 1 and Part 3. The results of the tests are described in report 936/21236082/A dated 10 October 2016 (PowerCEMS100) and in report 936/21236082/B dated 10 October 2016 (GMS811-FIDOR) from TÜV Rheinland Energy GmbH.
11. In future, the measuring system can be equipped with a housing purge using inert gas or clean air for the GMS800 DEFOR measuring module when installed in areas with contaminated ambient air. This purging can be carried out either for the entire 19" housing or for the filter wheel housing. Appropriate design modifications have been made to the housings to connect the purge air.

12. In future, the DEFOR module can also be equipped with alternative interference filters for NO_2 measurement with the article numbers 5347371 and 5347372.
13. The "GMS811-FIDOR for TOC" module can alternatively be operated with the 6027504 catalytic converter for air treatment.
14. The "GMS811-FIDOR for TOC" module performs a daily zero point adjustment.
15. The measuring systems are also suitable for use in installations subject to the 44th BImSchV.
16. Supplementary testing (integration of the GMS811-FIDORi into the PowerCEMS100 modular system) as regards Federal Environment Agency notices
    of 23 February 2012 (BAnz. 2 March 2012, No. 36, p. 920, chap. I No. 5.1) and
    of 2 April 2025 (BAnz AT 19,05.2025 B3, chap. IV notification 10).

Test Report:

TÜV Rheinland Energy & Environment GmbH, Cologne
Report No.: EuL/21264646/A dated 17 February 2025

Certified product

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

The multi-component measuring system PowerCEMS100 is a modular sensor system. The essential part is the instrument cabinet including the interface modules, measuring gas pump, test gas supply unit, electronic unit and SCU/BCU control unit. It is possible to place up to three different measurement modules in this instrument cabinet. All gas sensors are able to work independently from other sensors.

Thus, the modular measuring system can be equipped according to different requirements, each with appropriate measurement modules.

The following gas sensor modules have been certified so far: UNOR, MULTOR, DEFOR, OXOR.

All gas sensor modules are connected by a BUS-system. The BUS system continuously outputs the measured values determined. It also allows to activate control functions of the sensor modules or read and, where necessary, change sensor parameters.

The following components are part of the complete system:

- Heated probe (M&C SP 2000) with heated filter, test gas supply function and back purging
- Heated sample gas line (a heated line with a length of 10 m was used during the laboratory test, during the field test a heated line with a length of 50 m was used)
- Instrument cabinet with interface modules, measuring gas pump, sample gas cooler, test gas supply unit, sensor modules with gas sensors, electronic unit and SCU/BCU control unit.

General notes

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 manufacture of 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 & Environment 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 certification mark may be applied to the product or used in advertising materials for the certified product.

This document as well as the certification mark remains property of TÜV Rheinland Energy & Environment GmbH. With revocation of the publication the certificate loses its validity. After the expiration of the certificate and on request of TÜV Rheinland Energy & Environment GmbH this document shall be returned and the certificate mark must not be employed anymore.

The relevant version of this certificate and its expiration is also accessible on the internet: **qal1.de**.

History of documents
Certification of PowerCEMS100 is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

Initial certification according to EN 15267
Certificate No. 0000025930_00: 12 February 2010
Expiry date of the certificate: 11 February 2015
Test report: 936/21211670/A dated 29 October 2009
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH
Publication: BAnz. 12 February 2010, No. 24, p. 553, chapter I number 1.2
UBA announcement dated 25 January 2010

Supplementary testing according to EN 15267
Certificate No. 0000025930_01: 2 August 2010
Expiry date of the certificate: 11 February 2015
Test report: 936/21211670/B dated 26 March 2010
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH
Publication: BAnz. 28 July 2010, No. 111, p. 2597, chapter I number 2.1
UBA announcement dated 12 July 2010

Notifications
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 24 September 2010
Publication: BAnz. 26 January 2011, No. 14, p. 294, chapter IV notification 2
UBA announcement dated 10 January 2011
(Changing system name and extension of components)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 8 November 2010
Publication: BAnz. 26 January 2011, No. 14, p. 294, chapter IV notification 30
UBA announcement dated 10 January 2011
(Software changes)

Supplementary testing according to EN 15267
Certificate No. 0000025930_02: 16 March 2012
Expiry date of the certificate: 26 March 2010
Test report: 936/21217568/A dated 18 October 2011
TÜV Rheinland Energie und Umwelt GmbH
Publication: BAnz. 02 March 2012, No. 36, p. 920, chapter I number 5.1
UBA announcement dated 23 February 2012

Notifications
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 25 March 2013
Publication: BAnz AT 23.07.2013 B4, chapter V notification 12
UBA announcement dated 3 July 2013
(New manufacturer name)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 25 March 2013
Publication: BAnz AT 23.07.2013 B4, chapter V notification 13
UBA announcement dated 3 July 2013
(Software changes)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 2 April 2014
Publication: BAnz AT 05.08.2014 B11, chapter V notification 13
UBA announcement dated 17 July 2014
(Software and hardware changes)

Renewal of certificates
Certificate No. 0000025930_03: 2 February 2015
Expiry date of the certificate: 11 February 2020

Notifications
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 9 October 2015
Publication: BAnz AT 14.03.2016 B7, chapter V notification 34
UBA announcement dated 18 February 2016
(Hardware changes and new system name)

Statement issued by TÜV Rheinland Energy GmbH dated 10 October 2016
Publication: BAnz AT 15.03.2017 B6, chapter V notification 25
UBA announcement dated 22 February 2017
(Software changes and extension for digital data comunication - Modbus RTU and TCP/IP)

Statement issued by TÜV Rheinland Energy GmbH dated 2 October 2017
Publication: BAnz AT 26.03.2018 B8, chapter V notification 47
UBA announcement dated 21 February 2018
(Software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 2 October 2018
Publication: BAnz AT 26.03.2019 B7, chapter IV notification 59
UBA announcement dated 27 February 2019
(Software changes)

Renewal of certificates
Certificate No. 0000025930_04: 12 February 2020
Expiry date of the certificate: 11 February 2025

Notifications
Statement issued by TÜV Rheinland Energy GmbH dated 19 September 2019
Publication: BAnz AT 24.03.2020 B7, chapter IV notification 61
UBA announcement dated 24 February 2020
(Software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 18 September 2020
Publication: BAnz AT 03.05.2021 B9, chapter III notification 56
UBA announcement dated 31 March 2021
(Hardware changes)

Statement issued by TÜV Rheinland Energy GmbH dated 3 May 2021
Publication: BAnz AT 05.08.2021 B5, chapter IV notification 47
UBA announcement dated 29 June 2021
(Software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 14 February 2022
Publication: BAnz AT 28.07.2022 B4, chapter III notification 28
UBA announcement dated 28 June 2022
(Software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 16 September 2022
Publication: BAnz AT 20.03.2023 B6, chapter IV notification 44
UBA announcement dated 21 February 2023
(Software changes)

Statement issued by TÜV Rheinland Energy & Environment GmbH dated 4 March 2024
Publication: BAnz AT 31.10.2024 B9, chapter IV notification 40
UBA announcement dated 21 August 2024
(Software and hardware changes)

Renewal of certificates
Certificate No. 0000025930_05: 10 February 2025
Expiry date of the certificate: 11 February 2030

Notifications
Statement issued by TÜV Rheinland Energy & Environment GmbH dated 20 December 2024
Publication: BAnz AT 19.05.2025 B3, chapter IV notification 10
UBA announcement dated 2 April 2025
(Compliance with 44th BImSchV and new manufacturer name)

Supplementary testing according to EN 15267
Certificate No. 0000025930_06: 23 March 2026
Expiry date of the certificate: 22 March 2031
Test report: EuL/21264646/A dated 17 February 2025
TÜV Rheinland Energy & Environment GmbH
Publication: BAnz AT 31.10.2025 B5, chapter I number 3.2
UBA announcement dated 27 August 2025

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Sick Maihak GmbH	
Name of measuring system		MAC GMS800 UNOR for CO	
Serial number of the candidates		TÜV 1 / TÜV 3	
Measuring principle		NDIR	
Test report		936/21217568/A	
Test laboratory		TÜV Rheinland	
Date of report		2011-10-18	
Measured component		CO	
Certification range		0 - 75	mg/m³

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point		1.80	mg/m³
Sum of negative CS at zero point		-1.30	mg/m³
Sum of postive CS at reference point		1.07	mg/m³
Sum of negative CS at reference point		0.00	mg/m³
Maximum sum of cross sensitivities		1.80	mg/m³
Uncertainty of cross sensitivity		1.039	mg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Standard deviation from paired measurements under field conditions *	u_D	0.747	mg/m³	0.558	(mg/m³)²
Lack of fit	u_{lof}	0.289	mg/m³	0.084	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.346	mg/m³	0.120	(mg/m³)²
Span drift from field test	$u_{d,s}$	0.866	mg/m³	0.750	(mg/m³)²
Influence of ambient temperature at span	u_t	0.751	mg/m³	0.564	(mg/m³)²
Influence of supply voltage	u_v	0.115	mg/m³	0.013	(mg/m³)²
Cross sensitivity (interference)	u_i	1.039	mg/m³	1.080	(mg/m³)²
Influence of sample gas flow	u_b	-0.029	mg/m³	0.001	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.606	mg/m³	0.368	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.88	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	3.69	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 50 mg/m³**	**7.4**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 50 mg/m³**	**10.0**
Requirement of EN 15267-3	U in % of the ELV 50 mg/m³	7.5

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system					
Manufacturer			Sick Maihak GmbH		
Name of measuring system			MAC GMS800 MULTOR for CO		
Serial number of the candidates			TÜV 1 / TÜV 3		
Measuring principle			NDIR		
Test report			936/21217568/A		
Test laboratory			TÜV Rheinland		
Date of report			2011-10-18		
Measured component			CO		
Certification range			0 - 200	mg/m³	
Evaluation of the cross sensitivity (CS)					
(system with largest CS)					
Sum of positive CS at zero point			0.00	mg/m³	
Sum of negative CS at zero point			0.00	mg/m³	
Sum of postive CS at reference point			6.76	mg/m³	
Sum of negative CS at reference point			0.00	mg/m³	
Maximum sum of cross sensitivities			6.76	mg/m³	
Uncertainty of cross sensitivity			3.903	mg/m³	

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Standard deviation from paired measurements under field conditions *	u_D	1.588	mg/m³	2.522	(mg/m³)²
Lack of fit	u_{lof}	1.155	mg/m³	1.334	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.924	mg/m³	0.854	(mg/m³)²
Span drift from field test	$u_{d,s}$	-3.002	mg/m³	9.012	(mg/m³)²
Influence of ambient temperature at span	u_t	2.406	mg/m³	5.789	(mg/m³)²
Influence of supply voltage	u_v	0.157	mg/m³	0.025	(mg/m³)²
Cross sensitivity (interference)	u_i	3.903	mg/m³	15.233	(mg/m³)²
Influence of sample gas flow	u_b	0.127	mg/m³	0.016	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	1.617	mg/m³	2.613	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	6.12	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	11.99	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 160 mg/m³**	**7.5**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 160 mg/m³**	**10.0**
Requirement of EN 15267-3	U in % of the ELV 160 mg/m³	7.5

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Sick Maihak GmbH	
Name of measuring system		MAC GMS800 UNOR for NO	
Serial number of the candidates		TÜV 1 / TÜV 3	
Measuring principle		NDIR	
Test report		936/21217568/A	
Test laboratory		TÜV Rheinland	
Date of report		2011-10-18	
Measured component		NO	
Certification range		0 - 100	mg/m³

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point		1.56	mg/m³
Sum of negative CS at zero point		0.00	mg/m³
Sum of postive CS at reference point		2.46	mg/m³
Sum of negative CS at reference point		-0.73	mg/m³
Maximum sum of cross sensitivities		2.46	mg/m³
Uncertainty of cross sensitivity		1.420	mg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u^2	
Standard deviation from paired measurements under field conditions *	u_D	1.191	mg/m³	1.418	$(mg/m^3)^2$
Lack of fit	u_{lof}	0.231	mg/m³	0.053	$(mg/m^3)^2$
Zero drift from field test	$u_{d,z}$	-1.212	mg/m³	1.469	$(mg/m^3)^2$
Span drift from field test	$u_{d,s}$	1.732	mg/m³	3.000	$(mg/m^3)^2$
Influence of ambient temperature at span	u_t	0.529	mg/m³	0.280	$(mg/m^3)^2$
Influence of supply voltage	u_v	0.142	mg/m³	0.020	$(mg/m^3)^2$
Cross sensitivity (interference)	u_i	1.420	mg/m³	2.017	$(mg/m^3)^2$
Influence of sample gas flow	u_b	-0.104	mg/m³	0.011	$(mg/m^3)^2$
Uncertainty of reference material at 70% of certification range	u_{rm}	0.808	mg/m³	0.653	$(mg/m^3)^2$

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	2.99	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	5.85	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 50 mg/m³**	**11.7**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 50 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 50 mg/m³	15.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system					
Manufacturer		Sick Maihak GmbH			
Name of measuring system		MAC GMS800 MULTOR for NO			
Serial number of the candidates		TÜV 1 / TÜV 3			
Measuring principle		NDIR			
Test report		936/21217568/A			
Test laboratory		TÜV Rheinland			
Date of report		2011-10-18			
Measured component		NO			
Certification range		0 - 250	mg/m³		
Evaluation of the cross sensitivity (CS)					
(system with largest CS)					
Sum of positive CS at zero point		8.95	mg/m³		
Sum of negative CS at zero point		-4.43	mg/m³		
Sum of postive CS at reference point		3.45	mg/m³		
Sum of negative CS at reference point		-3.65	mg/m³		
Maximum sum of cross sensitivities		8.95	mg/m³		
Uncertainty of cross sensitivity		5.167	mg/m³		

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Standard deviation from paired measurements under field conditions *	u_D	2.241	mg/m³	5.022	(mg/m³)²
Lack of fit	u_{lof}	-1.155	mg/m³	1.334	(mg/m³)²
Zero drift from field test	$u_{d,z}$	2.742	mg/m³	7.519	(mg/m³)²
Span drift from field test	$u_{d,s}$	4.186	mg/m³	17.523	(mg/m³)²
Influence of ambient temperature at span	u_t	0.950	mg/m³	0.903	(mg/m³)²
Influence of supply voltage	u_v	0.737	mg/m³	0.543	(mg/m³)²
Cross sensitivity (interference)	u_i	5.167	mg/m³	26.701	(mg/m³)²
Influence of sample gas flow	u_b	0.277	mg/m³	0.077	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	2.021	mg/m³	4.083	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	7.98	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	15.64	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 131 mg/m³**	**11.9**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 131 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 131 mg/m³	15.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer		Sick Maihak GmbH	
Name of measuring system		MAC GMS800 DEFOR for NO	
Serial number of the candidates		TÜV 2 / TÜV 4	
Measuring principle		UVRAS	
Test report		936/21217568/A	
Test laboratory		TÜV Rheinland	
Date of report		2011-10-18	
Measured component		NO	
Certification range		0 - 50	mg/m³

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point	1.86	mg/m³
Sum of negative CS at zero point	0.00	mg/m³
Sum of postive CS at reference point	1.06	mg/m³
Sum of negative CS at reference point	-0.94	mg/m³
Maximum sum of cross sensitivities	1.86	mg/m³
Uncertainty of cross sensitivity	1.074	mg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Standard deviation from paired measurements under field conditions *	u_D	0.751	mg/m³	0.564	(mg/m³)²
Lack of fit	u_{lof}	-0.115	mg/m³	0.013	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.375	mg/m³	0.141	(mg/m³)²
Span drift from field test	$u_{d,s}$	0.866	mg/m³	0.750	(mg/m³)²
Influence of ambient temperature at span	u_t	0.153	mg/m³	0.023	(mg/m³)²
Influence of supply voltage	u_v	0.233	mg/m³	0.054	(mg/m³)²
Cross sensitivity (interference)	u_i	1.074	mg/m³	1.153	(mg/m³)²
Influence of sample gas flow	u_b	0.052	mg/m³	0.003	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.404	mg/m³	0.163	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.69	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	3.32	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 30 mg/m³**	**11.1**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 30 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 30 mg/m³	15.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system	
Manufacturer	Sick Maihak GmbH
Name of measuring system	MAC GMS800 DEFOR for NO_2
Serial number of the candidates	TÜV 2 / TÜV 4
Measuring principle	UVRAS
Test report	936/21217568/A
Test laboratory	TÜV Rheinland
Date of report	2011-10-18
Measured component	NO_2
Certification range	0 - 50 mg/m³

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point	1.72	mg/m³
Sum of negative CS at zero point	0.00	mg/m³
Sum of postive CS at reference point	1.93	mg/m³
Sum of negative CS at reference point	-0.26	mg/m³
Maximum sum of cross sensitivities	1.93	mg/m³
Uncertainty of cross sensitivity	1.114	mg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u^2	
Repeatability standard deviation at set point *	u_r	0.520	mg/m³	0.270	$(mg/m^3)^2$
Lack of fit	u_{lof}	-0.231	mg/m³	0.053	$(mg/m^3)^2$
Zero drift from field test	$u_{d,z}$	-0.693	mg/m³	0.480	$(mg/m^3)^2$
Span drift from field test	$u_{d,s}$	0.866	mg/m³	0.750	$(mg/m^3)^2$
Influence of ambient temperature at span	u_t	0.458	mg/m³	0.210	$(mg/m^3)^2$
Influence of supply voltage	u_v	0.110	mg/m³	0.012	$(mg/m^3)^2$
Cross sensitivity (interference)	u_i	1.114	mg/m³	1.242	$(mg/m^3)^2$
Influence of sample gas flow	u_b	0.030	mg/m³	0.001	$(mg/m^3)^2$
Uncertainty of reference material at 70% of certification range	u_{rm}	0.404	mg/m³	0.163	$(mg/m^3)^2$

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.78	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	3.50	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 50 mg/m³**	**7.0**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 50 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 50 mg/m³	15.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer	Sick Maihak GmbH		
Name of measuring system	MAC GMS800 UNOR for SO_2		
Serial number of the candidates	TÜV 2 / TÜV 4		
Measuring principle	NDIR		
Test report	936/21217568/A		
Test laboratory	TÜV Rheinland		
Date of report	2011-10-18		
Measured component	SO_2		
Certification range	0 - 75	mg/m³	

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point	2.75	mg/m³
Sum of negative CS at zero point	-1.75	mg/m³
Sum of postive CS at reference point	2.30	mg/m³
Sum of negative CS at reference point	-1.82	mg/m³
Maximum sum of cross sensitivities	2.75	mg/m³
Uncertainty of cross sensitivity	1.585	mg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u^2	
Standard deviation from paired measurements under field conditions *	u_D	1.228	mg/m³	1.508	$(mg/m^3)^2$
Lack of fit	u_{lof}	0.410	mg/m³	0.168	$(mg/m^3)^2$
Zero drift from field test	$u_{d,z}$	-1.212	mg/m³	1.469	$(mg/m^3)^2$
Span drift from field test	$u_{d,s}$	1.299	mg/m³	1.687	$(mg/m^3)^2$
Influence of ambient temperature at span	u_t	0.929	mg/m³	0.863	$(mg/m^3)^2$
Influence of supply voltage	u_v	0.227	mg/m³	0.052	$(mg/m^3)^2$
Cross sensitivity (interference)	u_i	1.585	mg/m³	2.512	$(mg/m^3)^2$
Influence of sample gas flow	u_b	0.057	mg/m³	0.003	$(mg/m^3)^2$
Uncertainty of reference material at 70% of certification range	u_{rm}	0.606	mg/m³	0.368	$(mg/m^3)^2$

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	2.94	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	5.76	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 50 mg/m³**	**11.5**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 50 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 50 mg/m³	15.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system	
Manufacturer	Sick Maihak GmbH
Name of measuring system	MAC GMS800 MULTOR for SO_2
Serial number of the candidates	TÜV 1 / TÜV 3
Measuring principle	NDIR
Test report	936/21217568/A
Test laboratory	TÜV Rheinland
Date of report	2011-10-18
Measured component	SO_2
Certification range	0 - 250 mg/m³

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point	9.63	mg/m³
Sum of negative CS at zero point	-2.65	mg/m³
Sum of postive CS at reference point	5.93	mg/m³
Sum of negative CS at reference point	-1.20	mg/m³
Maximum sum of cross sensitivities	9.63	mg/m³
Uncertainty of cross sensitivity	5.557	mg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u^2	
Standard deviation from paired measurements under field conditions *	u_D	1.546	mg/m³	2.390	$(mg/m^3)^2$
Lack of fit	u_{lof}	-2.714	mg/m³	7.366	$(mg/m^3)^2$
Zero drift from field test	$u_{d,z}$	2.115	mg/m³	4.473	$(mg/m^3)^2$
Span drift from field test	$u_{d,s}$	-3.002	mg/m³	9.012	$(mg/m^3)^2$
Influence of ambient temperature at span	u_t	2.901	mg/m³	8.416	$(mg/m^3)^2$
Influence of supply voltage	u_v	0.839	mg/m³	0.704	$(mg/m^3)^2$
Cross sensitivity (interference)	u_i	5.557	mg/m³	30.880	$(mg/m^3)^2$
Influence of sample gas flow	u_b	-0.410	mg/m³	0.168	$(mg/m^3)^2$
Uncertainty of reference material at 70% of certification range	u_{rm}	2.021	mg/m³	4.083	$(mg/m^3)^2$

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	8.22	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	16.10	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 150 mg/m³**	**10.7**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 150 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 150 mg/m³	15.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system			
Manufacturer	Sick Maihak GmbH		
Name of measuring system	MAC GMS800 DEFOR for SO_2		
Serial number of the candidates	TÜV 2 / TÜV 4		
Measuring principle	UVRAS		
Test report	936/21217568/A		
Test laboratory	TÜV Rheinland		
Date of report	2011-10-18		
Measured component	SO_2		
Certification range	0 - 75	mg/m³	

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point	0.00	mg/m³
Sum of negative CS at zero point	-0.81	mg/m³
Sum of postive CS at reference point	0.35	mg/m³
Sum of negative CS at reference point	-2.91	mg/m³
Maximum sum of cross sensitivities	-2.91	mg/m³
Uncertainty of cross sensitivity	-1.680	mg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u^2	
Standard deviation from paired measurements under field conditions *	u_D	1.206	mg/m³	1.454	$(mg/m^3)^2$
Lack of fit	u_{lof}	-0.404	mg/m³	0.163	$(mg/m^3)^2$
Zero drift from field test	$u_{d,z}$	-0.606	mg/m³	0.367	$(mg/m^3)^2$
Span drift from field test	$u_{d,s}$	1.299	mg/m³	1.687	$(mg/m^3)^2$
Influence of ambient temperature at span	u_t	0.964	mg/m³	0.929	$(mg/m^3)^2$
Influence of supply voltage	u_v	0.067	mg/m³	0.004	$(mg/m^3)^2$
Cross sensitivity (interference)	u_i	-1.680	mg/m³	2.823	$(mg/m^3)^2$
Uncertainty of reference material at 70% of certification range	u_{rm}	0.606	mg/m³	0.368	$(mg/m^3)^2$

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	2.79	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	5.47	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 50 mg/m³**	**10.9**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 50 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 50 mg/m³	15.0

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system	
Manufacturer	Sick Maihak GmbH
Name of measuring system	MAC GMS800 UNOR for CH_4
Serial number of the candidates	TÜV 2 / TÜV 4
Measuring principle	NDIR
Test report	936/21217568/A
Test laboratory	TÜV Rheinland
Date of report	2011-10-18
Measured component	CH_4
Certification range	0 - 50 mg/m³

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point	0.48 mg/m³
Sum of negative CS at zero point	-1.77 mg/m³
Sum of postive CS at reference point	0.00 mg/m³
Sum of negative CS at reference point	-0.63 mg/m³
Maximum sum of cross sensitivities	-1.77 mg/m³
Uncertainty of cross sensitivity	-1.022 mg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u^2	
Repeatability standard deviation at set point *	u_r	0.630	mg/m³	0.397	(mg/m³)²
Lack of fit	u_{lof}	0.231	mg/m³	0.053	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.520	mg/m³	0.270	(mg/m³)²
Span drift from field test	$u_{d,s}$	0.635	mg/m³	0.403	(mg/m³)²
Influence of ambient temperature at span	u_t	0.416	mg/m³	0.173	(mg/m³)²
Influence of supply voltage	u_v	0.306	mg/m³	0.094	(mg/m³)²
Cross sensitivity (interference)	u_i	-1.022	mg/m³	1.044	(mg/m³)²
Influence of sample gas flow	u_b	-0.035	mg/m³	0.001	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.404	mg/m³	0.163	(mg/m³)²

* The larger value is used:
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max\,j})^2}$	1.61	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	3.16	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 20 mg/m³**	**15.8**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 20 mg/m³**	**30.0** **
Requirement of EN 15267-3	U in % of the ELV 20 mg/m³	22.5

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
A value of 30 % was used for this.

Umwelt Bundesamt

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Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system					
Manufacturer			Sick Maihak		
Name of measuring system			MAC GMS800 MULTOR for CH_4		
Serial number of the candidates			TÜV 2 / TÜV 4		
Measuring principle			NDIR		
Test report			936/21217568/A		
Test laboratory			TÜV Rheinland		
Date of report			2011-10-18		
Measured component			CH_4		
Certification range			0 - 286 mg/m³		
Evaluation of the cross sensitivity (CS)					
(system with largest CS)					
Sum of positive CS at zero point			0.00 mg/m³		
Sum of negative CS at zero point			0.00 mg/m³		
Sum of postive CS at reference point			1.06 mg/m³		
Sum of negative CS at reference point			-1.49 mg/m³		
Maximum sum of cross sensitivities			-1.49 mg/m³		
Uncertainty of cross sensitivity			-0.859 mg/m³		

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Repeatability standard deviation at set point *	u_r	0.620	mg/m³	0.384	(mg/m³)²
Lack of fit	u_{lof}	-1.501	mg/m³	2.253	(mg/m³)²
Zero drift from field test	u_{dz}	1.156	mg/m³	1.336	(mg/m³)²
Span drift from field test	u_{ds}	-2.972	mg/m³	8.833	(mg/m³)²
Influence of ambient temperature at span	u_t	2.843	mg/m³	8.083	(mg/m³)²
Influence of supply voltage	u_v	0.532	mg/m³	0.283	(mg/m³)²
Cross sensitivity (interference)	u_i	-0.859	mg/m³	0.737	(mg/m³)²
Influence of sample gas flow	u_n	0.370	mg/m³	0.137	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	2.312	mg/m³	5.344	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	5.23	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	10.26	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 100 mg/m³**	**10.3**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 100 mg/m³**	**30.0** **
Requirement of EN 15267-3	U in % of the ELV 100 mg/m³	22.5

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
A value of 30 % was used for this.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system	
Manufacturer	Sick Maihak GmbH
Name of measuring system	MAC GMS800 UNOR for N_2O
Serial number of the candidates	TÜV 2 / TÜV 4
Measuring principle	NDIR
Test report	936/21217568/A
Test laboratory	TÜV Rheinland
Date of report	2011-10-18
Measured component	N_2O
Certification range	0 - 50 mg/m³

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point	0.93 mg/m³
Sum of negative CS at zero point	-1.41 mg/m³
Sum of postive CS at reference point	0.00 mg/m³
Sum of negative CS at reference point	-0.65 mg/m³
Maximum sum of cross sensitivities	-1.41 mg/m³
Uncertainty of cross sensitivity	-0.814 mg/m³

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Standard deviation from paired measurements under field conditions *	u_D	0.410	mg/m³	0.168	(mg/m³)²
Lack of fit	u_{lof}	0.231	mg/m³	0.053	(mg/m³)²
Zero drift from field test	$u_{d,z}$	-0.318	mg/m³	0.101	(mg/m³)²
Span drift from field test	$u_{d,s}$	0.866	mg/m³	0.750	(mg/m³)²
Influence of ambient temperature at span	u_t	0.436	mg/m³	0.190	(mg/m³)²
Influence of supply voltage	u_v	0.172	mg/m³	0.030	(mg/m³)²
Cross sensitivity (interference)	u_i	-0.814	mg/m³	0.663	(mg/m³)²
Influence of sample gas flow	u_p	0.052	mg/m³	0.003	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.404	mg/m³	0.163	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.46	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	2.85	mg/m³

Relative total expanded uncertainty	**U in % of the range 50 mg/m³**	**5.7**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the range 50 mg/m³**	**20.0** **
Requirement of EN 15267-3	U in % of the range 50 mg/m³	15.0

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
A value of 20 % was used for this.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system	
Manufacturer	Sick Maihak GmbH
Name of measuring system	MAC GMS800 UNOR for CO_2
Serial number of the candidates	TÜV 1 / TÜV 3
Measuring principle	NDIR
Test report	936/21217568/A
Test laboratory	TÜV Rheinland
Date of report	2011-10-18
Measured component	CO_2
Certification range	0 - 25 Vol.-%

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point	0.00 Vol.-%
Sum of negative CS at zero point	-0.47 Vol.-%
Sum of postive CS at reference point	0.00 Vol.-%
Sum of negative CS at reference point	0.00 Vol.-%
Maximum sum of cross sensitivities	-0.47 Vol.-%
Uncertainty of cross sensitivity	-0.271 Vol.-%

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Standard deviation from paired measurements under field conditions *	u_D	0.156	Vol.-%	0.024	(Vol.-%)²
Lack of fit	u_{lof}	-0.144	Vol.-%	0.021	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	-0.188	Vol.-%	0.035	(Vol.-%)²
Span drift from field test	$u_{d,s}$	0.346	Vol.-%	0.120	(Vol.-%)²
Influence of ambient temperature at span	u_t	0.300	Vol.-%	0.090	(Vol.-%)²
Influence of supply voltage	u_v	0.049	Vol.-%	0.002	(Vol.-%)²
Cross sensitivity (interference)	u_i	-0.271	Vol.-%	0.074	(Vol.-%)²
Influence of sample gas flow	u_p	0.017	Vol.-%	0.000	(Vol.-%)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.202	Vol.-%	0.041	(Vol.-%)²

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.64	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	1.25	Vol.-%

Relative total expanded uncertainty	**U in % of the ELV 25 Vol.-%**	**5.0**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 25 Vol.-%**	**10.0** **
Requirement of EN 15267-3	U in % of the ELV 25 Vol.-%	7.5

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
A value of 10 % was used for this.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system	
Manufacturer	Sick Maihak
Name of measuring system	MAC GMS800 MULTOR for CO_2
Serial number of the candidates	TÜV 2 / TÜV 4
Measuring principle	NDIR
Test report	936/21217568/A
Test laboratory	TÜV Rheinland
Date of report	2011-10-18
Measured component	CO_2
Certification range	0 - 25 Vol.-%

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point	0.00	Vol.-%
Sum of negative CS at zero point	0.00	Vol.-%
Sum of postive CS at reference point	0.10	Vol.-%
Sum of negative CS at reference point	-0.09	Vol.-%
Maximum sum of cross sensitivities	0.10	Vol.-%
Uncertainty of cross sensitivity	0.058	Vol.-%

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Standard deviation from paired measurements under field conditions *	u_D	0.165	Vol.-%	0.027	(Vol.-%)²
Lack of fit	u_{lof}	-0.237	Vol.-%	0.056	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	-0.188	Vol.-%	0.035	(Vol.-%)²
Span drift from field test	$u_{d,s}$	0.433	Vol.-%	0.187	(Vol.-%)²
Influence of ambient temperature at span	u_t	0.115	Vol.-%	0.013	(Vol.-%)²
Influence of supply voltage	u_v	0.015	Vol.-%	0.000	(Vol.-%)²
Cross sensitivity (interference)	u_i	0.058	Vol.-%	0.003	(Vol.-%)²
Influence of sample gas flow	u_p	0.029	Vol.-%	0.001	(Vol.-%)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.202	Vol.-%	0.041	(Vol.-%)²

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.60	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	1.18	Vol.-%

Relative total expanded uncertainty	**U in % of the ELV 25 Vol.-%**	**4.7**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 25 Vol.-%**	**10.0**
Requirement of EN 15267-3	U in % of the ELV 25 Vol.-%	7.5

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
The chosen value is recommended by the certification body.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system	
Manufacturer	Sick Maihak GmbH
Name of measuring system	MAC GMS800 OXOR-P for O_2
Serial number of the candidates	TÜV 1 / TÜV 3
Measuring principle	paramagnetic
Test report	936/21217568/A
Test laboratory	TÜV Rheinland
Date of report	2011-10-18
Measured component	O_2
Certification range	0 - 25 Vol.-%

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point	0.00	Vol.-%
Sum of negative CS at zero point	0.00	Vol.-%
Sum of postive CS at reference point	0.00	Vol.-%
Sum of negative CS at reference point	0.00	Vol.-%
Maximum sum of cross sensitivities	0.00	Vol.-%
Uncertainty of cross sensitivity	0.000	Vol.-%

Calculation of the combined standard uncertainty

Tested parameter		u		u²	
Standard deviation from paired measurements under field conditions *	u_D	0.084	Vol.-%	0.007	(Vol.-%)²
Lack of fit	u_{lof}	-0.040	Vol.-%	0.002	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	0.120	Vol.-%	0.014	(Vol.-%)²
Span drift from field test	$u_{d,s}$	0.120	Vol.-%	0.014	(Vol.-%)²
Influence of ambient temperature at span	u_t	0.110	Vol.-%	0.012	(Vol.-%)²
Influence of supply voltage	u_v	0.003	Vol.-%	0.000	(Vol.-%)²
Cross sensitivity (interference)	u_i	0.000	Vol.-%	0.000	(Vol.-%)²
Influence of sample gas flow	u_p	-0.023	Vol.-%	0.001	(Vol.-%)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.202	Vol.-%	0.041	(Vol.-%)²

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.30	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.59	Vol.-%

Relative total expanded uncertainty	**U in % of the range 25 Vol.-%**	**2.4**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the range 25 Vol.-%**	**10.0** **
Requirement of EN 15267-3	U in % of the range 25 Vol.-%	7.5

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
A value of 10 % was used for this.

Umwelt Bundesamt

Certificate:
0000025930_06 / 23 March 2026

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Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system					
Manufacturer		Sick Maihak GmbH			
Name of measuring system		MAC GMS800 OXOR-E for O_2			
Serial number of the candidates		TÜV 2 / TÜV 4			
Measuring principle		electrochemical cell			
Test report		936/21217568/A			
Test laboratory		TÜV Rheinland			
Date of report		2011-10-18			
Measured component		O_2			
Certification range		0 - 25 Vol.-%			

Evaluation of the cross sensitivity (CS)
(system with largest CS)

Sum of positive CS at zero point	0.00	Vol.-%
Sum of negative CS at zero point	0.00	Vol.-%
Sum of postive CS at reference point	0.33	Vol.-%
Sum of negative CS at reference point	0.00	Vol.-%
Maximum sum of cross sensitivities	0.33	Vol.-%
Uncertainty of cross sensitivity	0.191	Vol.-%

Calculation of the combined standard uncertainty

Tested parameter		u		u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.108	Vol.-%	0.012	(Vol.-%)²
Lack of fit	u_{lof}	0.058	Vol.-%	0.003	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	0.120	Vol.-%	0.014	(Vol.-%)²
Span drift from field test	$u_{d,s}$	0.120	Vol.-%	0.014	(Vol.-%)²
Influence of ambient temperature at span	u_t	0.127	Vol.-%	0.016	(Vol.-%)²
Influence of supply voltage	u_v	0.030	Vol.-%	0.001	(Vol.-%)²
Cross sensitivity (interference)	u_i	0.191	Vol.-%	0.036	(Vol.-%)²
Influence of sample gas flow	u_p	0.029	Vol.-%	0.001	(Vol.-%)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.202	Vol.-%	0.041	(Vol.-%)²

* The larger value is used :
"Repeatability standard deviation at span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.37	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.73	Vol.-%

Relative total expanded uncertainty	**U in % of the range 25 Vol.-%**	**2.9**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the range 25 Vol.-%**	**10.0** **
Requirement of EN 15267-3	U in % of the range 25 Vol.-%	7.5

** For this component no requirements in the EC-directives 2001/80/EG und 2000/76/EG are given.
A value of 10 % was used for this.

Calculation of overall uncertainty according to EN 14181 and EN 15267-3

Measuring system					
Manufacturer			Endress+Hauser SICK GmbH+Co.KG		
AMS designation			PowerCEMS100		
Serial number of units under test			2433 1704/2434 0062		
Measuring principle			Flammenionisationsdetektion		
Test report			EuL/21264646/A		
Test laboratory			TÜV Rheinland		
Measured component			TOC		
Certification range			0 - 15	mg/m³	
Evaluation of the cross-sensitivity (CS)					
(system with largest CS)					
Sum of positive CS at zero point			0,17	mg/m³	
Sum of negative CS at zero point			0,00	mg/m³	
Sum of postive CS at span point			0,00	mg/m³	
Sum of negative CS at span point			-0,44	mg/m³	
Maximum sum of cross-sensitivities			-0,44	mg/m³	
Uncertainty of cross-sensitivity		u_i	-0,254	mg/m³	

Calculation of the combined standard uncertainty

Tested parameter				u²	
Standard deviation from paired measurements under field conditions *	uD	0,033	mg/m³	0,001	(mg/m³)²
Lack of fit	u_{lof}	0,075	mg/m³	0,006	(mg/m³)²
Zero drift from field test	$u_{d,z}$	-0,190	mg/m³	0,036	(mg/m³)²
Span drift from field test	$u_{d,s}$	-0,249	mg/m³	0,062	(mg/m³)²
Influence of ambient temperature at span	u_t	0,153	mg/m³	0,023	(mg/m³)²
Influence of supply voltage	u_v	0,083	mg/m³	0,007	(mg/m³)²
Cross-sensitivity (interference)	u_i	-0,254	mg/m³	0,064	(mg/m³)²
Influence of sample gas flow	u_p	0,087	mg/m³	0,008	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0,121	mg/m³	0,015	(mg/m³)²
Variation of response factors (TOC)	u_{rf}	0,000	mg/m³	0,000	(mg/m³)²

* The larger value is used :
"Repeatability standard deviation at set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0,47	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0,92	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 10 mg/m³**	**9,2**
Requirement of 2010/75/EU	**U in % of the ELV 10 mg/m³**	**30,0**
Requirement of EN 15267-3	U in % of the ELV 10 mg/m³	22,5