Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No: 0000062068_02

Certified AMS:	MCS200HW for CO, NO, NO_2, N_2O, SO_2, HCl, NH_3, CH_4, H_2O, CO_2, O_2 and TOC
Manufacturer:	SICK AG Rengoldshauser Str. 17 a 88662 Überlingen Deutschland
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 (2014).

Certification is awarded in respect of the conditions stated in this certificate (this certificate contains 21 pages).
The present certificate replaces certificate 0000062068_01 dated 5 November 2019.

TÜVRheinland® CERTIFIED

Suitability Tested
EN 15267
QAL1 Certified
Regular Surveillance

www.tuv.com
ID 0000062068

Publication in the German Federal Gazette (BAnz) of 22 July 2019

This certificate will expire on: 21 July 2029

German Environment Agency
Dessau, 3 July 2024

TÜV Rheinland Energy & Environment GmbH
Cologne, 2 July 2024

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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:	936/21242470/C dated 6 March 2019
Initial certification:	26 March 2019
Expiry date:	21 July 2029
Certificate:	Renewal (of previous certificate 0000062068_01 of 5 November 2019 valid until 21 July 2024)
Publication:	BAnz AT 22.07.2019 B8, chapter I No. 1.4

Approved application

The tested AMS is suitable for use at plants according to Directive 2010/75/EC, chapter III (combustion plants / 13th BImSchV:2017), chapter IV (waste incineration plants / 17th BImSchV:2013), Directive 2015/2193/EC (44th BImSchV:2019), 27th BImSchV:2013 30th BImSchV:2019 and TA Luft:2002. 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 more than twelve month field test at a waste incineration.

The AMS is approved for an ambient temperature range of +5 °C 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 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 936/21242470/C dated 6 March 2019 of TÜV Rheinland Energy 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 22.07.2019 B8, chapter I No. 1.4, Announcement by UBA dated 28 June 2019:

AMS designation:
MCS200HW for CO, NO, NO_2, N_2O, SO_2, HCl, NH_3, CH_4, H_2O, CO_2, O_2 and TOC

Manufacturer:
SICK AG, Überlingen

Field of application:
Modular measuring system for plants requiring official approval and for plants according to the 27th BImSchV

Measuring ranges during the performance test:

Component	Module name	Certification range	supplementary range	Unit	Maintenance interval
CO	"CO"	0 – 75	0 – 10,000	mg/m³	6 months
NO	"NO"	0 – 150	0 – 2,500	mg/m³	6 months
NO_2	„NO_2"	0 – 50	0 – 500	mg/m³	6 months
N_2O	„N_2O"	0 – 100	0 – 2,000	mg/m³	6 months
SO_2	„SO_2"	0 – 75	0 – 2,500	mg/m³	6 months
HCl	"HCl"	0 – 15	0 – 3,000	mg/m³	6 months
NH_3	„NH_3"	0 – 10	0 – 500	mg/m³	6 months
CH_4	„CH_4"	0 – 50	0 – 500	mg/m³	6 months
CO_2	„CO_2"	0 – 25	-	vol.-%	6 months
H_2O	„H_2O"	0 – 40	-	vol.-%	6 months
O_2	„O_2"	0 – 25	-	vol.-%	6 months
TOC	"TOC"	0 – 15	0 – 50 / 150 / 500	mg/m³	3 months

Software versions:
MCS200HW: 1.0.1
GMS811 FIDORi: 4.003

Restrictions:
None

Notes:

1. The maintenance interval is six months. When using the TOC module, the maintenance interval is three months.
2. Wet and dry test gases can be used to test HCl and NH_3.
3. The measuring system performs zero point checks once every day. This requires suitable instrument air or synthetic air.
4. The integrated GMS811 FIDORi FID performs zero point checks once every day. An integrated zero air generator (version “i”) produces the zero air required for this purpose.
5. The measuring system provides a digital Modbus interface (TCP/IP) in accordance with VDI guideline 4201, parts 1 and 3.
6. Maintenance work must be spread over several days in order to comply with the requirements for outage times specified by the 13th BImSchV and 17th BImSchV.
7. When verifying correct installation and functionality of a certain combination of modules, the maintenance interval must be determined for that specific configuration.
8. Supplementary (extension of the maintenance interval and qualification of the components NO_2, N_2O and SO_2) as regards Federal Environment Agency notice of 27 February 2019 (BAnz AT 26.03.2019 B7, chapter I number 2.2).

Test Institute:

TÜV Rheinland Energy GmbH, Cologne

Report No.: 936/21242470/C dated 6 March 2019

Publication in the German Federal Gazette: BAnz AT 05.08.2021 B5, Chap. IV notification 46, Announcement by UBA dated 29 June 2021:

46 Notification as regards Federal Environment Agency (UBA) notice of 28 June 2019 (BAnz AT 22.07.2019 B8, chapter I number 1.4)

The MCS200HW modular measuring system for CO, NO, NO_2, N_2O, SO_2, HCl, NH_3, CH_4, H_2O, CO_2, TOC and O_2 manufactured by SICK AG can be optionally equipped with an A/C unit.

With an integrated A/C unit, the measuring system can be used in an ambient temperature range from 5 °C to 50 °C. Without an integrated A/C unit, the measuring system can be used in an ambient temperature range of 5 °C to 40 °C.

In addition to the basic display, the measuring system can also be equipped with the larger web display on the front panel.
The latest software version of the measuring system is 9264565_1.4.2.1R_13FU.

Statement issued by TÜV Rheinland Energy GmbH dated 08 February 2021

Publication in the German Federal Gazette: BAnz AT 11.04.2022 B10, Chap. VI notification 41, Announcement by UBA dated 9 March 2022:

41 Notification as regards Federal Environment Agency (UBA) notices of 28 June 2019 (BAnz AT 22.07.2019 B8, chapter I number 1.4) and of 29 June 2021 (BAnz AT 05.08.2021 B5, chapter IV notification 46)

The current software versions of the modular measuring device MCS200HW for CO, NO, NO_2, N_2O, SO_2, HCl, NH_3, CH_4, H_2O, CO_2, TOC and O_2 of the company SICK AG are:
MCS200HW: 9265465_1.6.0.2R_19AC
GMS811 FIDORi: 4.003

Statement issued by TÜV Rheinland Energy GmbH dated 14 September 2021

Publication in the German Federal Gazette: BAnz AT 28.07.2022 B4, Chap. III
notification 26, Announcement by UBA dated 28 June 2022:

26 Notification as regards Federal Environment Agency (UBA) notices of 28 June 2019 (BAnz AT 22.07.2019 B8, chapter I number 1.4) and of 9 March 2022 (BAnz AT 11.04.2022 B10, chapter VI notification 41)

The current software versions of the modular measuring device MCS200HW for CO, NO, NO_2, N_2O, SO_2, HCl, NH_3, CH_4, H_2O, CO_2, TOC and O_2 from SICK AG are:
MCS200HW: 9265465_1.6.0.2R_19AC
GMS811 FIDORi: Firmware: 9230690_4.002
BCU: 9150883_4.005

Furthermore, the BCU software version 9150883_4.004 can also be used.

Statement issued by TÜV Rheinland Energy GmbH dated 26 April 2022

Publication in the German Federal Gazette: BAnz AT 20.03.2023 B6, Chap. IV
notification 39, Announcement by UBA dated 21 February 2023:

39 Notification as regards Federal Environment Agency (UBA) notices of 28 June 2019 (BAnz AT 22.07.2019 B8, chapter I number 1.4) and of 28 June 2022 (BAnz AT 28.07.2022 B4, chapter III notification 26)

The current software versions of the MCS200HW modular measuring system for CO, NO, NO_2, N_2O, SO_2, HCl, NH_3, CH_4, H_2O, CO_2, TOC and O_2 from SICK AG are:
MCS200HW: 9264565_1.7.7.4R_1C6E,
GMS811 FIDORi: Firmware: 9230690_4.002,
BCU: 9150883_4.006

The measuring system can also be operated with a revised gas sampling filter (SFU). This can be recognized by the revised housing with protection class IP66.

Statement issued by TÜV Rheinland Energy GmbH dated 16 September 2022

Certified product

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

The modular MCS200HW measuring system is a measurement rack equipped with a single-beam infrared photometer using the bi-frequency and gas filter correlation method. The MCS200HW can measure up to 10 IR components present in the flue gas emitted by industrial combustion plants.

The MCS200HW operates extractively: a sampling probe extracts flue gas from the duct which is then transported to the analyser via a sample line. All gas-carrying components from the sampling probe to the cell are heated above the dew point. An ejector pump transports the sample gas.

A zirconium dioxide sensor is used to measure oxygen alongside the IR components. As an option, a GMS811 FIDORi flame ionisation detector can be integrated to measure total organic carbon. The optional use of internal adjustment cells facilitates span point checks.

The AMS under test comprises the following individual components:

- Sampling probe Sick sampling filter SFU-BF NI GL heated to 200 °C with zero gas and back purge connection,
- Sample gas filter made of metal mesh SilicoNert® covered,
- Heated sample line, inner diameter 6 mm, heated to 200 °C,
- Analyser rack manufactured by Rittal c/w:
  - Modular analyser comprising the heated sample gas cell with single-beam infra-red photometer with bi-frequency and gas filter correlation method as well as a zirconium dioxide to measure oxygen,
  - GMS811 FIDORi FID analyser for the determination of total organic carbon with integrated zero air conditioning at the inner door of the analyser rack with (optional) BCU control unit located underneath,
  - Display unit at the outer wall of the analyser rack, measured value display and operation of the analyser system,
  - active fan unit installed in the rack door and air intake on top of the analyser rack,
  - Pressure reducer to adjust the instrument air,
  - Electronics unit with analogue interfaces for the output of measured signals and status signals,
  - the measuring system provides a digital Modbus interface (TCP/IP) in accordance with VDI guideline 4201, parts 1 and 3 (optional).

The data output is under standard conditions wet and without offsetting waste gas moisture.

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 requests of the 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 MCS200HW 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. 0000062068_00: 12 June 2019
Expiry date of the certificate: 25 March 2024
Test report: 936/21242470/A dated 8 October 2018
TÜV Rheinland Energy GmbH, Cologne
Publication: BAnz AT 26.03.2019 B7, chapter I number 2.2
UBA announcement dated 27 February 2019

Supplementary testing according to EN 15267
Certificate No. 0000062068_01: 5 November 2019
Expiry date of the certificate: 21 July 2024
Test report: 936/21242470/C dated 6 March 2019
TÜV Rheinland Energy GmbH, Cologne
Publication: BAnz AT 22.07.2019 B8, chapter I number 1.4
UBA announcement dated 28 June 2019

Notifications
Statement issued by TÜV Rheinland Energy GmbH dated 8 February 2021
Publication: BAnz AT 05.08.2021 B5, chapter IV notification 46
UBA announcement dated 29 June 2021
(Soft- and hardware changes)

Statement issued by TÜV Rheinland Energy GmbH dated 14 September 2021
Publication: BAnz AT 11.04.2022 B10, chapter VI notification 41
UBA announcement dated 9 March 2022
(Software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 26 April 2022
Publication: BAnz AT 28.07.2022 B4, chapter III notification 26
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 39
UBA announcement dated 21 February 2023
(Soft- and hardware changes)

Renewal of certificates
Certificate No. 0000062068_02: 3 July 2024
Expiry date of the certificate: 21 July 2029

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

Measuring system			
Manufacturer	SICK AG		
AMS designation	MCS200 HW		
Serial number of units under test	17160001 / 17160002		
Measuring principle	bi-frequency and gas filter correlation		
Test report	936/21242470/C		
Test laboratory	TÜV Rheinland		
Date of report	2019-03-06		
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	0.00	mg/m³	
Sum of negative CS at zero point	0.00	mg/m³	
Sum of postive CS at span point	0.40	mg/m³	
Sum of negative CS at span point	0.00	mg/m³	
Maximum sum of cross-sensitivities	0.40	mg/m³	
Uncertainty of cross-sensitivity	u_i 0.229	mg/m³	

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.402	mg/m³	0.162	(mg/m³)²
Lack of fit	u_{lof}	-0.117	mg/m³	0.014	(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	$u_{d,s}$	1.083	mg/m³	1.173	(mg/m³)²
Influence of ambient temperature at span	u_t	0.608	mg/m³	0.370	(mg/m³)²
Influence of supply voltage	u_v	0.070	mg/m³	0.005	(mg/m³)²
Cross-sensitivity (interference)	u_i	0.229	mg/m³	0.052	(mg/m³)²
Influence of sample gas flow	u_p	0.361	mg/m³	0.130	(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 set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max\ j})^2}$	1.55	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	3.03	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 50 mg/m³**	**6.1**
Requirement of 2010/75/EU	**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 AG		
AMS designation	MCS200 HW		
Serial number of units under test	17160001 / 17160002		
Measuring principle	bi-frequency and gas filter correlation		
Test report	936/21242470/C		
Test laboratory	TÜV Rheinland		
Date of report	2019-03-06		
Measured component	NO		
Certification range	0 - 150	mg/m³	

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

Sum of positive CS at zero point	0.92	mg/m³	
Sum of negative CS at zero point	0.00	mg/m³	
Sum of postive CS at span point	1.20	mg/m³	
Sum of negative CS at span point	-3.20	mg/m³	
Maximum sum of cross-sensitivities	-3.20	mg/m³	
Uncertainty of cross-sensitivity	u_i -1.845	mg/m³	

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.621	mg/m³	0.386	(mg/m³)²
Lack of fit	u_{lof}	-0.580	mg/m³	0.336	(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	$u_{d,s}$	2.252	mg/m³	5.072	(mg/m³)²
Influence of ambient temperature at span	u_t	1.514	mg/m³	2.292	(mg/m³)²
Influence of supply voltage	u_v	0.405	mg/m³	0.164	(mg/m³)²
Cross-sensitivity (interference)	u_i	-1.845	mg/m³	3.404	(mg/m³)²
Influence of sample gas flow	u_p	0.356	mg/m³	0.127	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	1.212	mg/m³	1.470	(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)	$u_c = \sqrt{\sum (u_{max\ j})^2}$	3.68	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	7.21	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 98 mg/m³**	**7.4**
Requirement of 2010/75/EU	**U in % of the ELV 98 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 98 mg/m³	15.0

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

Measuring system			
Manufacturer		SICK AG	
AMS designation		MCS200 HW	
Serial number of units under test		17160001 / 17160002	
Measuring principle		bi-frequency and gas filter correlation	
Test report		936/21242470/C	
Test laboratory		TÜV Rheinland	
Date of report		2019-03-06	
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		0.82	mg/m³
Sum of negative CS at zero point		-0.71	mg/m³
Sum of postive CS at span point		1.83	mg/m³
Sum of negative CS at span point		-1.15	mg/m³
Maximum sum of cross-sensitivities		1.83	mg/m³
Uncertainty of cross-sensitivity	u_i	1.057	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Repeatability standard deviation at set point *	u_r	0.090	mg/m³	0.008	(mg/m³)²
Lack of fit	u_{lof}	0.289	mg/m³	0.084	(mg/m³)²
Zero drift from field test	$u_{d.z}$	0.260	mg/m³	0.068	(mg/m³)²
Span drift from field test	$u_{d.s}$	0.693	mg/m³	0.480	(mg/m³)²
Influence of ambient temperature at span	u_t	0.265	mg/m³	0.070	(mg/m³)²
Influence of supply voltage	u_v	0.137	mg/m³	0.019	(mg/m³)²
Cross-sensitivity (interference)	u_i	1.057	mg/m³	1.117	(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}	0.404	mg/m³	0.163	(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)	$u_c = \sqrt{\sum (u_{max\ j})^2}$	1.44	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	2.83	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 33 mg/m³**	**8.6**
Requirement of 2010/75/EU	**U in % of the ELV 33 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 33 mg/m³	15.0

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

Measuring system					
Manufacturer		SICK AG			
AMS designation		MCS200 HW			
Serial number of units under test		17160001 / 17160002			
Measuring principle		bi-frequency and gas filter correlation			
Test report		936/21242470/C			
Test laboratory		TÜV Rheinland			
Date of report		2019-03-06			
Measured component		N_2O			
Certification range		0 - 100	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		-0.46	mg/m³		
Sum of postive CS at span point		0.00	mg/m³		
Sum of negative CS at span point		-3.90	mg/m³		
Maximum sum of cross-sensitivities		-3.90	mg/m³		
Uncertainty of cross-sensitivity	u_i	-2.252	mg/m³		

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.271	mg/m³	0.073	(mg/m³)²
Lack of fit	u_{lof}	-0.064	mg/m³	0.004	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.289	mg/m³	0.084	(mg/m³)²
Span drift from field test	$u_{d,s}$	1.674	mg/m³	2.802	(mg/m³)²
Influence of ambient temperature at span	u_t	0.608	mg/m³	0.370	(mg/m³)²
Influence of supply voltage	u_v	0.404	mg/m³	0.163	(mg/m³)²
Cross-sensitivity (interference)	u_i	-2.252	mg/m³	5.072	(mg/m³)²
Influence of sample gas flow	u_p	-0.313	mg/m³	0.098	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.808	mg/m³	0.653	(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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	3.05	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	5.98	mg/m³

Relative total expanded uncertainty	**U in % of the range 100 mg/m³**	**6.0**
Requirement of 2010/75/EU	**U in % of the range 100 mg/m³**	**20.0 ****
Requirement of EN 15267-3	U in % of the range 100 mg/m³	15.0

** The EU-directive 2010/75/EU on industrial emissions provides no requirements for this component.
A value of 20.0 % was used for this.

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

Measuring system			
Manufacturer		SICK AG	
AMS designation		MCS200 HW	
Serial number of units under test		17160001 / 17160002	
Measuring principle		bi-frequency and gas filter correlation	
Test report		936/21242470/C	
Test laboratory		TÜV Rheinland	
Date of report		2019-03-06	
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		-2.11	mg/m³
Sum of postive CS at span point		0.00	mg/m³
Sum of negative CS at span point		-0.85	mg/m³
Maximum sum of cross-sensitivities		-2.11	mg/m³
Uncertainty of cross-sensitivity	u_i	-1.217	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.337	mg/m³	0.114	(mg/m³)²
Lack of fit	u_{lof}	-0.307	mg/m³	0.094	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.173	mg/m³	0.030	(mg/m³)²
Span drift from field test	$u_{d,s}$	1.212	mg/m³	1.469	(mg/m³)²
Influence of ambient temperature at span	u_t	0.231	mg/m³	0.053	(mg/m³)²
Influence of supply voltage	u_v	0.119	mg/m³	0.014	(mg/m³)²
Cross-sensitivity (interference)	u_i	-1.217	mg/m³	1.481	(mg/m³)²
Influence of sample gas flow	u_p	-0.207	mg/m³	0.043	(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 set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max\ j})^2}$	1.91	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	3.75	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 50 mg/m³**	**7.5**
Requirement of 2010/75/EU	**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 AG	
AMS designation		MCS200 HW	
Serial number of units under test		17160001 / 17160002	
Measuring principle		bi-frequency and gas filter correlation	
Test report		936/21242470/C	
Test laboratory		TÜV Rheinland	
Date of report		2019-03-06	
Measured component		HCl	
Certification range		0 - 15	mg/m³

Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point		0.30	mg/m³
Sum of negative CS at zero point		-0.15	mg/m³
Sum of postive CS at span point		0.48	mg/m³
Sum of negative CS at span point		-0.08	mg/m³
Maximum sum of cross-sensitivities		0.48	mg/m³
Uncertainty of cross-sensitivity	u_i	0.276	mg/m³

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.101	mg/m³	0.010	(mg/m³)²
Lack of fit	u_{lof}	0.069	mg/m³	0.005	(mg/m³)²
Zero drift from field test	$u_{d,z}$	-0.139	mg/m³	0.019	(mg/m³)²
Span drift from field test	$u_{d,s}$	-0.251	mg/m³	0.063	(mg/m³)²
Influence of ambient temperature at span	u_t	0.173	mg/m³	0.030	(mg/m³)²
Influence of supply voltage	u_v	0.055	mg/m³	0.003	(mg/m³)²
Cross-sensitivity (interference)	u_i	0.276	mg/m³	0.076	(mg/m³)²
Influence of sample gas flow	u_b	0.043	mg/m³	0.002	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.121	mg/m³	0.015	(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	$U = u_c * k = u_c * 1.96$	0.93	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 10 mg/m³**	**9.3**
Requirement of 2010/75/EU	**U in % of the ELV 10 mg/m³**	**40.0**
Requirement of EN 15267-3	U in % of the ELV 10 mg/m³	30.0

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

Measuring system			
Manufacturer	SICK AG		
AMS designation	MCS200 HW		
Serial number of units under test	17160001 / 17160002		
Measuring principle	bi-frequency and gas filter correlation		
Test report	936/21242470/C		
Test laboratory	TÜV Rheinland		
Date of report	2019-03-06		
Measured component	NH_3		
Certification range	0 - 10	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	-0.06	mg/m³	
Sum of postive CS at span point	0.09	mg/m³	
Sum of negative CS at span point	-0.20	mg/m³	
Maximum sum of cross-sensitivities	-0.20	mg/m³	
Uncertainty of cross-sensitivity	u_i -0.115	mg/m³	

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.057	mg/m³	0.003	(mg/m³)²
Lack of fit	u_{lof}	0.058	mg/m³	0.003	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.087	mg/m³	0.008	(mg/m³)²
Span drift from field test	$u_{d,s}$	0.167	mg/m³	0.028	(mg/m³)²
Influence of ambient temperature at span	u_t	0.100	mg/m³	0.010	(mg/m³)²
Influence of supply voltage	u_v	0.066	mg/m³	0.004	(mg/m³)²
Cross-sensitivity (interference)	u_i	-0.115	mg/m³	0.013	(mg/m³)²
Influence of sample gas flow	u_p	-0.051	mg/m³	0.003	(mg/m³)²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.081	mg/m³	0.007	(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)	$u_c = \sqrt{\sum (u_{max\ j})^2}$	0.28	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.55	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 10 mg/m³**	**5.5**
Requirement of 2010/75/EU	**U in % of the ELV 10 mg/m³**	**40.0 ****
Requirement of EN 15267-3	U in % of the ELV 10 mg/m³	30.0

** The EU-directive 2010/75/EU on industrial emissions provides no requirements for this component.
A value of 40.0 % was used for this.

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

Measuring system					
Manufacturer		SICK AG			
AMS designation		MCS200 HW			
Serial number of units under test		17160001 / 17160002			
Measuring principle		bi-frequency and gas filter correlation			
Test report		936/21242470/C			
Test laboratory		TÜV Rheinland			
Date of report		2019-03-06			
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		0.00	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		0.00	mg/m³		
Maximum sum of cross-sensitivities		0.00	mg/m³		
Uncertainty of cross-sensitivity	u_i	0.000	mg/m³		

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.058	mg/m³	0.003	(mg/m³)²
Lack of fit	u_{lof}	-0.173	mg/m³	0.030	(mg/m³)²
Zero drift from field test	$u_{d,z}$	0.173	mg/m³	0.030	(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	0.551	mg/m³	0.304	(mg/m³)²
Influence of supply voltage	u_v	0.212	mg/m³	0.045	(mg/m³)²
Cross-sensitivity (interference)	u_i	0.000	mg/m³	0.000	(mg/m³)²
Influence of sample gas flow	u_p	-0.150	mg/m³	0.023	(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 set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.00	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	1.96	mg/m³

Relative total expanded uncertainty	**U in % of the range 50 mg/m³**	**3.9**
Requirement of 2010/75/EU	**U in % of the range 50 mg/m³**	**30.0 ****
Requirement of EN 15267-3	U in % of the range 50 mg/m³	22.5

** The EU-directive 2010/75/EU on industrial emissions provides no requirements for this component.
A value of 30.0 % was used for this.

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

Measuring system					
Manufacturer		SICK AG			
AMS designation		MCS200 HW			
Serial number of units under test		17160001 / 17160002			
Measuring principle		bi-frequency and gas filter correlation			
Test report		936/21242470/C			
Test laboratory		TÜV Rheinland			
Date of report		2019-03-06			
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 span point		0.12	Vol.-%		
Sum of negative CS at span point		0.00	Vol.-%		
Maximum sum of cross-sensitivities		0.12	Vol.-%		
Uncertainty of cross-sensitivity	u_i	0.069	Vol.-%		

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.029	Vol.-%	0.001	(Vol.-%)²
Lack of fit	u_{lof}	-0.115	Vol.-%	0.013	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	0.029	Vol.-%	0.001	(Vol.-%)²
Span drift from field test	$u_{d,s}$	0.072	Vol.-%	0.005	(Vol.-%)²
Influence of ambient temperature at span	u_t	0.058	Vol.-%	0.003	(Vol.-%)²
Influence of supply voltage	u_v	0.015	Vol.-%	0.000	(Vol.-%)²
Cross-sensitivity (interference)	u_i	0.069	Vol.-%	0.005	(Vol.-%)²
Influence of sample gas flow	u_p	0.060	Vol.-%	0.004	(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 set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.27	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.53	Vol.-%

Relative total expanded uncertainty	**U in % of the range 25 Vol.-%**	**2.1**
Requirement of 2010/75/EU	**U in % of the range 25 Vol.-%**	**10.0 ****
Requirement of EN 15267-3	U in % of the range 25 Vol.-%	7.5

** The EU-directive 2010/75/EU on industrial emissions provides no requirements for this component.
A value of 10.0 % was used for this.

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

Measuring system					
Manufacturer		SICK AG			
AMS designation		MCS200 HW			
Serial number of units under test		17160001 / 17160002			
Measuring principle		bi-frequency and gas filter correlation			
Test report		936/21242470/C			
Test laboratory		TÜV Rheinland			
Date of report		2019-03-06			
Measured component		H_2O			
Certification range		0 - 40	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 span point		0.00	Vol.-%		
Sum of negative CS at span point		0.00	Vol.-%		
Maximum sum of cross-sensitivities		0.00	Vol.-%		
Uncertainty of cross-sensitivity	u_i	0.000	Vol.-%		

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Repeatability standard deviation at set point *	u_r	0.160	Vol.-%	0.026	(Vol.-%)²
Lack of fit	u_{lof}	-0.231	Vol.-%	0.053	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	-0.023	Vol.-%	0.001	(Vol.-%)²
Span drift from field test	$u_{d,s}$	0.208	Vol.-%	0.043	(Vol.-%)²
Influence of ambient temperature at span	u_t	0.058	Vol.-%	0.003	(Vol.-%)²
Influence of supply voltage	u_v	0.045	Vol.-%	0.002	(Vol.-%)²
Cross-sensitivity (interference)	u_i	0.000	Vol.-%	0.000	(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}	0.323	Vol.-%	0.105	(Vol.-%)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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.48	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.95	Vol.-%

Relative total expanded uncertainty	**U in % of the range 40 Vol.-%**	**2.4**
Requirement of 2010/75/EU	**U in % of the range 40 Vol.-%**	**10.0 ****
Requirement of EN 15267-3	U in % of the range 40 Vol.-%	7.5

** The EU-directive 2010/75/EU on industrial emissions provides no requirements for this component.
A value of 10.0 % was used for this.

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

Measuring system			
Manufacturer	SICK AG		
AMS designation	MCS200 HW		
Serial number of units under test	17160001 / 17160002		
Measuring principle	zirconium dioxide		
Test report	936/21242470/C		
Test laboratory	TÜV Rheinland		
Date of report	2019-03-06		
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 span point	0.11	Vol.-%	
Sum of negative CS at span point	-0.11	Vol.-%	
Maximum sum of cross-sensitivities	0.11	Vol.-%	
Uncertainty of cross-sensitivity	u_i 0.064	Vol.-%	

Calculation of the combined standard uncertainty

Tested parameter				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.045	Vol.-%	0.002	(Vol.-%)²
Lack of fit	u_{lof}	-0.017	Vol.-%	0.000	(Vol.-%)²
Zero drift from field test	$u_{d,z}$	0.075	Vol.-%	0.006	(Vol.-%)²
Span drift from field test	$u_{d,s}$	-0.098	Vol.-%	0.010	(Vol.-%)²
Influence of ambient temperature at span	u_t	0.115	Vol.-%	0.013	(Vol.-%)²
Influence of supply voltage	u_v	0.006	Vol.-%	0.000	(Vol.-%)²
Cross-sensitivity (interference)	u_i	0.064	Vol.-%	0.004	(Vol.-%)²
Influence of sample gas flow	u_p	0.054	Vol.-%	0.003	(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 set point" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max\,j})^2}$	0.28	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.55	Vol.-%

Relative total expanded uncertainty	**U in % of the range 25 Vol.-%**	**2.2**
Requirement of 2010/75/EU	**U in % of the range 25 Vol.-%**	**10.0 ****
Requirement of EN 15267-3	U in % of the range 25 Vol.-%	7.5

** The EU-directive 2010/75/EU on industrial emissions provides no requirements for this component.
A value of 10.0 % was used for this.

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

Measuring system			
Manufacturer		SICK AG	
AMS designation		MCS200 HW (GMS811 FIDORi)	
Serial number of units under test		00823523, 00823524 / 18290107, 18020076	
Measuring principle		FID	
Test report		936/21242470/C	
Test laboratory		TÜV Rheinland	
Date of report		2019-03-06	
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				u^2	
Standard deviation from paired measurements under field conditions *	u_D	0.033	mg/m³	0.001	(mg/m³)²
Lack of fit	u_{lof}	0.023	mg/m³	0.001	(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	0.100	mg/m³	0.010	(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	0.065	(mg/m³)²
Influence of sample gas flow	u_p	-0.094	mg/m³	0.009	(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)	$u_c = \sqrt{\sum (u_{max\ j})^2}$	0.45	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.89	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 10 mg/m³**	**8.9**
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

Measured values presented in blue are taken from the latest test report on performance testing.
The remaining data originate from the TÜV Rheinland report no. 936/21216085/B
dated 10 October 2011 on the test of the GMS810 FIDOR measuring system.