Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No: 0000037052_02

Certified AMS:	GM32 GMP for NO and SO_2
Manufacturer:	SICK AG Gisela Sick Straße 1 79276 Reute Germany
Test Institute:	TÜV Rheinland Energy GmbH

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

Certification is awarded in respect of the conditions stated in this certificate (this certificate contains 16 pages).
The present certificate replaces certificate 0000037052_01 dated 18 July 2017.

TÜVRheinland® CERTIFIED

Suitability Tested
EN 15267
QAL1 Certified
Regular Surveillance

www.tuv.com
ID 0000037052

Publication in the German Federal Gazette (BAnz) of 20 July 2012

This certificate will expire on:
19 July 2027

German Environment Agency
Dessau, 20 July 2022

TÜV Rheinland Energy GmbH
Cologne, 19 July 2022

Dr. Marcel Langner
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TÜV Rheinland Energy 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:	936/21209185/B dated 06 March 2009
Initial certification:	20 August 2012
Expiry date:	19 July 2027
Certificate:	Renewal (of previous certificate 0000037052_01 of 18. Juli 2017 valid until 19 July 2022)
Publication:	BAnz AT 20.07.2012 B11, Chap. IV No. 22

Approved application
The tested AMS is suitable for use at plants according to directive 2001/80/EC (13th BImSchV:2009), 2000/76/EC (17th BImSchV:2009), 30th BImSchV:2001 Directive 2015/2193/EC (44th BImSchV:2021), TA Luft:2002 and at plants according to the 27th BImSchV:1997. 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 seven months field test at fluidised bed combustion main material mineral coal.

The AMS is approved for an ambient temperature range of -20° 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 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 do not correspond to the current state of legislation in every case. 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 936/21209185/B dated 06 March 2009
  of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH
- Suitability announced by the German Environment Agency (UBA)
  as the relevant body
- The ongoing surveillance of the product and the manufacturing process

Publication in the German Federal Gazette: BAnz. 25 August 2009, No. 125, p. 2929, chapter I no. 3.3, Announcement by UBA from 03 August 2009:

AMS designation:
GM32 In-Situ-Gas analysator model GMP for NO and SO_2

Manufacturer:
SICK MAIHAK GmbH, Reute

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

Measuring ranges during the performance test:

Component	CR1	CR2	Unit
NO	0 - 70*	0 - 700*	mg/m³
SO_2	0 - 75*	0 – 1,000*	mg/m³

CR = certification range
* with an active measuring path length of 1.25 m

or.

Component	CR1	CR2	Unit
NO	0 – 87.5*	0 - 875*	mg/m³
SO_2	0 – 93.8*	0 – 1,250*	mg/m³

CR = certification range
* with an active measuring path length of 1.00 m

Software versions:
GM32: 9125967 SL36
SOPAS ET: 02.20

Notes:

1. A three-month period has been specified as maintenance interval.

2. The device variant “Comfort” has been tested. In terms of hardware and software, the device variant “Pro” is completely identical to the configuration tested. However, it contains only 1 instead of 2 separately calibrated measuring ranges per component. In accordance with the type coding, variant “Comfort” is identified by “C”, and variant “Pro” by “P”.

3. Within the context of the manufacturer's quality assurance according to QAL 3 of Directive DIN EN 14181, the signals of the internal check cycle can be used for regular checks of the zero and span points. If any values exceed specified limits, the measuring system is then checked – similarly to the annual surveillance test (AST) – by means of a filter box and a zero point measurement in an environment free of test gas (ambient air).

4. Performance testing includes the following device variants (measured components):

Device designation according to type code	NO	SO_2
C1 or P1		x
C2 Or P2	x	x
C4 or P4	x	

"C" = device variant "Comfort"
"P" = device variant "Pro"

Test report:
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne
Report No.: 936/21209185/B dated 06 March 2009

Publication in the German Federal Gazette: BAnz. 12. Februar 2010, No. 24, p. 553, Chap. IV notification 8, Announcement by UBA dated 25 January 2010:

8 Notification as regards Federal Environment Agency (UBA) notice of 03 August 2009 (BAnz. p. 2931)

The current software version implemented in the emission measuring system GM 32 in-situ gas analyser by the company SICK MAIHAK GmbH, in its cross-duct and measuring probe versions is:
GM32: 9125967 T473

Statement of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH of 9 October 2009

Publication in the German Federal Gazette: BAnz. 26. Januar 2011, No. 14, p. 294, chapter IV notification 1, Announcement by UBA dated 10 January 2011:

1 Notification as regards Federal Environment Agency (UBA) notices of 3 August 2009 (BAnz. p. 2929, chapter I no. 3.2 and 3.3) and of 25 January 2010 (BAnz. p. 552, chapter IV notification 8)

The current software version of the GM 32 In-situ Analysator in its Cross Duct and probe GMP versions manufactured by SICK Maihak GmbH is:
GM32: 9125967 U727

Effective immediately, the GMP probe version's cladding tube of the probe is extended to 45mm. The reflector in its clamp is repositioned by the same distance in relation to the measurement slit.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 4 October 2010

Publication in the German Federal Gazette: BAnz. 26. Januar 2011, No. 14, p. 294, chapter IV notification 30, Announcement by UBA dated 10 January 2011:

30 Notification as regards Federal Environmental Agency notices referring to suitability-tested AMS manufactured by SICK Engineering GmbH and SICK MAIHAK GmbH (Extract)

No.	AMS manufacturer	Notice	Notification	Statement of the test institute
…	…	…	…	…
8	GM 32 In-Situ Analysator in its Cross Duct version and in Its GMP probe version/ SICK MAIHAK GmbH	as regards notification 1 of this notice	The current software version of the SOPAS ET platform, which controls the AMS is, SOPAS ET 2.32	TÜV Rheinland Energie und Umwelt GmbH of 08 November 2010
…	…	…	…	…

Publication in the German Federal Gazette: BAnz. 29. Juli 2011, Nr. 113, S. 2725, chapter III notification 16, Announcement by UBA dated 15 July 2011:

16 Notification as regards Federal Environment Agency (UBA) notices of 3 August 2009 (BAnz. p. 2929, chapter I no. 3.2 and 3.3) and of 10 January 2011 (BAnz. p. 294, chapter IV notification 1 and 30)

The tracking mirror which has so far been used for the GM 32 In-Situ Gas analyser, in its Cross Duct and GMP probe version for NO and SO_2 manufactured by SICK MAIHAK GmbH may be replaced by an alternative tracking module.
The current software version is:
GM32: 9125967 V113

Statement of TÜV Rheinland Energie und Umwelt GmbH of 24 March 2011

Publication in the German Federal Gazette: BAnz AT 20.07.2012 B11, chapter IV notification 22, Announcement by UBA from 06 July 2012:

22 Notification as regards Federal Environmental Agency notices of 3. August 2009 (BAnz. S. 2929, chapter I no. 3.2 and 3.3) and of 15 July 2011 (BAnz. p. 2725, chapter III notification 16)

The GM 32 In-Situ Gas analyser in its GMP probe and Cross Duct versions for NO and SO_2 manufactured by SICK MAIHAK GmbH and the production process and the quality management system for this measuring system meet the requirements of EN 15267.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 20 March 2012

Publication in the German Federal Gazette: BAnz AT 05.03.2013 B10, chapter V notification 18, Announcement by UBA dated 12 February 2013:

18 Notification as regards Federal Environment Agency (UBA) notices of 3 August 2009 (BAnz. p. 2929, chapter I no. 3.3) and of 6 July 2012 (BAnz AT 20.07.2012 B11, chapter IV notification 22)

The GM 32 in-situ gas analyser for measuring NO and SO_2 emissions in its GMP probe version manufactured by SICK MAIHAK GmbH is also available as flame-proof type for installation at hazardous areas of the classification Zone 1 (category 2G) and Zone 2 (category 3G).

The GM 32 in-situ gas analyser for measuring NO and SO_2 emissions in its GMP probe version manufactured by SICK MAIHAK GmbH can also be equipped with the new TX25 processor.

The current software version of the GM 32 in-situ gas analyser for measuring NO and SO_2 emissions in its GMP probe version manufactured by SICK MAIHAK GmbH is:

GM32: 9125967 W051 (former processor)
or
GM32: 9171698 0000 (new processor)

The current software version of the purge air attachment and the GMP probe of the GM 32 in-situ gas analyser for measuring NO and SO_2 emissions in its GMP probe version manufactured by SICK MAIHAK GmbH is:
9091948 WJ24

Statement stated by TÜV Rheinland Energie und Umwelt GmbH of 2 October 2012

Publication in the German Federal Gazette: BAnz AT 23.07.2013 B4, chapter V notification 12, Announcement by UBA dated 03 July 2013:

12 Notification as regards Federal Environmental Agency notices regarding performance tested AMS manufactured by SICK MAIHAK GmbH (Extract)

No.	AMS manufacturer	Notice	Notification	Statement of the test institute
…	…	…	…	…
7	GM 32 In-Situ Analysator in its Cross Duct version and in Its GMP probe version/ SICK AG	of 3 August 2009 (BAnz. p. 2929, chap. II No. 3.2 and 3.3) and 12 February 2013 (BAnz AT 05.03.2013 B10, chap. V Note 17 and 18)	SICK MAIHAK GmbH merged with its parent company SICK AG as of 1 January 2013. The manufacturer is now registered as SICK AG.	TÜV Rheinland Energie und Umwelt GmbH of 25 March 2013
…	…	…	…	…

Publication in the German Federal Gazette: BAnz AT 23.07.2013 B4, chapter V notification 13,
Announcement by UBA dated 03 July 2013:

13 Notification as regards Federal Environmental Agency notices referring to suitability-tested AMS manufactured by SICK Engineering GmbH and SICK AG (Excerpt)

No.	AMS manufacturer	Notice	Notification	Statement of the test institute
…	…	…	…	…
8	GM 32 In-Situ Analysator in its Cross Duct version and in Its GMP probe version/ SICK AG	as regards notification 13 (serial No. 7) of this notice	The current software version of the SOPAS ET platform, which controls the AMS is, SOPAS ET 2.38	TÜV Rheinland Energie und Umwelt GmbH of 25 March 2013
…	…	…	…	…

Publication in the German Federal Gazette: BAnz AT 01.04.2014 B12, chapter VI notification 16, Announcement by UBA dated 27 February 2014:

16 Notification as regards Federal Environment Agency (UBA) notices of 3 August 2009 (BAnz. p. 2929, chapter I number 3.3) and of 3 July 2013 (BAnz AT 23.07.2013 B4, Chap. V Note 12 [no. 7] and Note 13 [no. 8])

The current firmware versions of the GM 32 in-situ gas analyser emission measuring system in the GMP measuring probe version for NO and SO_2 by SICK AG are:

Firmware version with old processor card (CPU PXA255): 9125967 X938
Firmware version with new processor card (CPU TX25): 9171698 X938

Statement of TÜV Rheinland Energie und Umwelt GmbH of 10 October 2013

Publication in the German Federal Gazette: BAnz AT 26.08.2015 B4, chapter V notification 36, Announcement by UBA dated 22 July 2015:

36 Notification as regards Federal Environment Agency (UBA) notices of 3 August 2009 (BAnz. p. 2929, chapter I number 3.3) and of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter VI notification 16)

The sensitivity of the diode array of the GM 32 in-situ gas analyser for NO und SO_2, cross-duct version, manufactured by Sick AG, was decreased from 49 mA/W to 36 mA/W at a wavelength of 210 nm. The part itself remains unchanged. The change has no significant influence on the performance of the system.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 25 March 2015

Publication in the German Federal Gazette: BAnz AT 15.03.2017 B6, chapter V notification 28, Announcement by UBA dated 22 February 2017:

28 Notification as regards Federal Environment Agency (UBA) notices of 3 August 2009 (BAnz. p. 2929, chapter I number 3.3) and of 22 July 2015 (BAnz AT 26.08.2015 B4, chapter V, notification 36)

The current software version of the GM-32 in-situ gas analyser in the measurement version GMP version for NO and SO_2 manufactured by SICK AG is YE19 9171698.

Deuterium lamp D2Plus may now also be used for the measuring system.

Statement issued by TÜV Rheinland Energy GmbH dated 12 October 2016

Publication in the German Federal Gazette: BAnz AT 31.07.2017 B12, chapter II notification 18, Announcement by UBA dated 13 July 2017:

18 Notification as regards Federal Environment Agency (UBA) notices of 3 August 2009 (BAnz p. 2929, chapter I number 3.3) and of 22 February 2017 (BAnz AT 15.03.2017 B6, chapter V notification 28)

Deuterium lamp D2Plus-DS Type XD6201-01 (transmittance version) may now also be used for the GM 32 in-situ gas analyser in its GMP probe version measuring NO and SO_2 manufactured by SICK AG.

Statement issued by TÜV Rheinland Energy GmbH dated 8 March 2017

Publication in the German Federal Gazette: BAnz AT 26.03.2019 B7, chapter IV notification 55, Announcement by UBA dated 27 February 2019:

55 Notification as regards Federal Environment Agency (UBA) notices of 3 August 2009 (BAnz. p. 2929, chapter I number 3.3) and of 22 February 2017 (BAnz AT 15.03.2017 B6, chapter V notification 18)

The current software version of the GM32 in-situ gas analyser in the measurement version GMP version for NO and SO_2 manufactured by SICK AG is 9172060_PI10

In addition, the following software version has been approved for this instrument version:
9171698_YHU0

Statement issued by TÜV Rheinland Energy GmbH dated 8 October 2018

Publication in the German Federal Gazette: BAnz AT 22.07.2019 B8, chapter VI notification 2, Announcement by UBA dated 28 June 2019:

2 Correction as regards Federal Environment Agency (UBA) notices of 27 February 2019 (BAnz AT 26.03.2019 B7, chapter IV notification 55)

The information on the latest software version of the GM32 GMP measuring system for NO and SO2 manufactured by SICK AG given in the notice cited above is incorrect. The latest software version of the measuring system is:
9172060_10PI

The software version 9172060_PI10 incorrectly published is not relevant.

Publication in the German Federal Gazette: BAnz AT 05.08.2021 B5, chapter IV notification 45, Announcement by UBA dated 29 June 2021:

45 Notification as regards Federal Environment Agency (UBA) notices of 3 August 2009 (BAnz. p. 2929, chapter I number 3.3) and of 28 June 2019 (BAnz AT 22.07.2019 B8, chapter IV correction 2)

The latest software version of the GM32 GMP measuring system for NO and SO_2 manufactured by SICK AG is:
9245976_17CH

Statement issued by TÜV Rheinland Energy GmbH dated 23 February 2021

Certified product

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

The GM32 in-situ gas analyser continuously measures NO and SO_2 concentrations in the gas duct.
The GM32 in-situ gas analyser in its GMP probe version is based on an in-situ technology with electro-optical direct measurement. Measured values are recorded directly in the gas flow without contact using the open measuring path of the GMP probe which extends into the duct.

The GM32 SR-unit determines the concentration of the respective gases based on light absorption by the gas mixture in the active measuring path which is specific to the wavelength.
Light from the sender/receiver unit (SR-unit) passing through the measuring path in the gas duct is reflected back by a triple reflector situated at the end of the probe. The beam splitter diverts the returning light to the polychromatic subassembly comprising a condenser lens with slit diaphragm, optical grid and receiver element. The optical grid dissects the returning light spectrally and maps it to the receiver element consisting of a highly sensitive diode array.

The algorithms of the GM32 evaluation software process the measured signals of the receiver element together with the related parameters according to the DOAS-principle (Differential Optical Absorption Spectroscopy).

In order to ensure stable measurements, the measuring system carries out a reference cycle at certain intervals (standard setting: once every 60 min). This reference cycle compensates for changes in lamp intensity (e.g. through aging) and possible contamination in the SR-unit. Precisely adjusting the intensity of the spectra and recording the dark and zero point spectra (with the blanking diaphragm retracted) allows to generate an intensity spectrum which corresponds to that of a spectrum determined in a smoke-free path and hence facilitates the creation of a reference spectrum as a basis for compensation.

Furthermore, the measuring system monitors the stability of the zero and span points by means of a check cycle. Two grid filters, an NO cell and a zero point reflector which can be swivelled in are used as a measuring means for the checks.
This check cycle allows to determine possible wavelength scale drifts, resolution drifts and extinction drifts, and therefore to monitor measurement stability.

Zero point:
The zero point is determined by creating a zero spectrum by swivelling in a zero point reflector. This spectrum corresponds to a measurement with a measuring path free from gas. The relevant measured concentration values are determined by means of the device's calibration function. A maintenance request is signalled when one of the zero values exceeds a certain limit value (in this case: 2 % of the FS).

Span point:
In addition to the zero point reflector, an internal swivel element with 2 grid filters and an NO-filled cell is swivelled in during the check cycle, and the reference value is measured. The control values are scaled to 70 % of the measuring range selected.
The median deviation of the extinction measurement of the 2 grid filters is used to calculate the reference value, and the value of (70 % + deviation) x FS is output in per cent for all components. A maintenance request is signalled when the limit value is exceeded (in this case: > 2 % of the FS).
The expression “concentration measuring path product” is used to describe the connection between full scale value and active measuring path length.

The concentration measuring path product is used to calculate the relevant fullscale value for any active measuring path length. The measuring range indications refer to an active measuring path of 1 m. In accordance with the measuring path length x, all measuring ranges are reduced or increased by the factor 1/x [m].

The table below gives some examples of such factors.

Active measuring path length or measuring gap in mm	Factor for full-scale value FS
1000	FS * 1
1250	FS * 0,8
1860	FS * 0,538
3000	FS * 0,333

Instrument variants

Version "Pro"
As "Basis" version, plus
- Check cycle (QAL3) + CUSUM-card
- Control unit

Version "Comfort"
As "Pro" version, plus
- 2 separately calibrated measured ranges per component

Two instruments of the "Comfort" version were used for the testing at hand. In terms of hardware and software components, the version "Pro" is identical to the "comfort" version – however, there is only 1 instead of 2 calibrated measured ranges for each component.
According to the type coding, the "Comfort" version is called "C" and the "Pro" version is called "P".

Device designation according to type code	NO	SO_2
C1 or P1		x
C2 or P2	x	x
C4 or P4	x	

"C"= variant "Comfort"
"P"= variant "Pro"

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 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 and the certification mark remains property of TÜV Rheinland Energy 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 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 GM32 GMP is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

Basic test
Test report 936/21209185/B dated 6 March 2009
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH
Publication BAnz. 25 August 2009, No. 125, p. 2929, chapter I number 3.3
UBA announcement dated 3 August 2009

Notifications
Statement issued by TÜV Rheinland Immissionsschutz und Energiesysteme GmbH dated 9 October 2009
Publication BAnz. 12 February 2010, No. 24, p. 553, chapter IV notification 8
UBA announcement dated 25 January 2010
(Software changes)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 4 October 2010
Publication BAnz. 26 January 2011, No. 14, p. 294, chapter IV notification 1
UBA announcement dated 10 January 2011
(Software changes)

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)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 24 March 2011
Publication BAnz. 29 July 2011, No. 113, p. 2725, chapter III notification 16
UBA announcement dated 15 July 2011
(Soft- and hardware changes)

Initial certification according to EN 15267
Certificate No. 0000037052_00: 20 August 2012
Expiry date of the certificate: 19 July 2017
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 20 March 2012
Test report 936/21209185/B dated 6 March 2009
Publication BAnz AT 20.07.2012 B11, chapter IV number 22
UBA announcement dated 6 July 2012

Notifications
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 2 October 2012
Publication BAnz AT 05.03.2013 B10, chapter V notification 18
UBA announcement dated 12 February 2013
(Soft- and hardware changes)

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
(Producer formerly SICK MAIHAK GmbH)

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 10 October 2013
Publication BAnz AT 01.04.2014 B12, chapter VI notification 16
UBA announcement dated 27 February 2014
(Software changes)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 25 March 2015
Publication BAnz AT 26.08.2015 B4, chapter V notification 36
UBA announcement dated 22 July 2015
(Hardware changes)

Statement issued by TÜV Rheinland Energy GmbH dated 12 October 2016
Publication BAnz AT 15.03.2017 B6, chapter V notification 28
UBA announcement dated 22 February 2017
(Soft- and hardware changes)

Renewal of certificate
Certificate No. 0000037052_01: 18 July 2017
Expiry date of the certificate: 19 July 2022

Notifications
Statement issued by TÜV Rheinland Energy GmbH dated 8 March 2017
Publication BAnz AT 31.07.2017 B12, chapter II notification 18
UBA announcement dated 13 July 2017
(Hardware changes)

Statement issued by TÜV Rheinland Energy GmbH dated 8 October 2018
Publication BAnz AT 26.03.2019 B7, chapter IV notification 55
UBA announcement dated 27 February 2019
(Software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 1 March 2019
Publication BAnz AT 22.07.2019 B8, chapter VI notification 2
UBA announcement dated 28 June 2019
(Correction (software version))

Statement issued by TÜV Rheinland Energy GmbH dated 23 February 2021
Publication BAnz AT 05.08.2021 B5, chapter IV notification 45
UBA announcement dated 29 June 2021
(Software changeSoftwareänderung)

Renewal of certificate
Certificate No. 0000037052_02: 20 July 2022
Expiry date of the certificate: 19 July 2027

Calculation of overall uncertainty for QAL1 in EN 14181 and EN 15267-3

Manufacturer data		
Manufacturer	SICK MAIHAK	
Name of measuring system	GM32, Messlanze GMP	
Serial Number	8043 / 8044	
Measuring Principle	UV-DOAS	
TÜV Data		
Approval Report	936/21209185/B	
	2009-03-06	
Editor	Pletscher	
Date	2009-03-03	
Measurement Component	NO	
Certificated range	70	mg/m³

Evaluation of the cross sensitivity (CS)	QE $\Delta X_{max,j}$	
to 3 Vol.-% Oxygen	0.00	mg/m³
to 21 Vol.-% Oxygen	0.00	mg/m³
to 30 Vol.-% Humidity	0.00	mg/m³
to 300 mg/m³ Carbon monoxide	- 0.34	mg/m³
to 15 Vol.-% Carbon dioxide	0.00	mg/m³
to 50 mg/m³ Methane	0.29	mg/m³
to 100 mg/m³ Dinitrogen monoxide	0.49	mg/m³
to 30 mg/m³ Nitrogen dioxide	0.49	mg/m³
to 20 mg/m³ Ammonia	0.57	mg/m³
to 1000 mg/m³ Sulphur dioxide	- 0.66	mg/m³
to 200 mg/m³ Hydrogen chloride	1.40	mg/m³
Sum of positive cross sensitivities	3.23	mg/m³
Sum of negative cross sensitivities	- 1.00	mg/m³

Calculation of the combined standard uncertainty

Test Value	$\Delta X_{max,j}$			u	u^2
Standard deviation from paired measurements under field conditions *	0.81	mg/m³	u_r	0.81	0.656
Lack of fit	- 0.63	mg/m³	u_{lnf}	-0.36	0.132
Zero drift from field test	0.42	mg/m³	$u_{fl,z}$	0.24	0.059
Span drift from field test	- 1.61	mg/m³	$u_{fl,s}$	-0.93	0.864
Influence of ambient temperature at span	0.42	mg/m³	u_t	0.24	0.059
Influence of supply voltage	0.21	mg/m³	u_v	0.12	0.015
Cross sensitivity (interference) **	3.23	mg/m³	u_i	1.87	3.486
Influence of sample pressure	0.00	mg/m³	u_n	0.00	0.000
Uncertainty of reference material at 70% of certification range	0.98	mg/m³	u_{rm}	0.57	0.320
Excursion of measurement beam	- 0.70	mg/m³	u_{mb}	-0.40	0.163

* The bigger value of: "Repeatability standard deviation at span" or "Standard deviation from paired measurements under field conditions"

** The absolut value of the Sum of positiv cross sensitivity is greater than the Sum of negativ cross sensitivity

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max,j})^2}$	2.4	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1{,}96$	4.70	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 40 mg/m³**	**11.8**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 40 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 40 mg/m³	15.0

Umwelt Bundesamt

Certificate:
0000037052 / 20 July 2022

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Calculation of overall uncertainty for QAL1 in EN 14181 and EN 15267-3

Manufacturer data	
Manufacturer	SICK MAIHAK
Name of measuring system	GM32, Messlanze GMP
Serial Number	8043 / 8044
Measuring Principle	UV-DOAS
TÜV Data	
Approval Report	936/21209185/B
	2009-03-06
Editor	Pletscher
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Measurement Component	SO_2
Certificated range	75 mg/m³

Evaluation of the cross sensitivity (CS)	QE $\Delta X_{max, j}$	
to 3 Vol.-% Oxygen	0.00	mg/m³
to 21 Vol.-% Oxygen	0.00	mg/m³
to 30 Vol.-% Humidity	0.00	mg/m³
to 300 mg/m³ Carbon monoxide	0.00	mg/m³
to 15 Vol.-% Carbon dioxide	0.00	mg/m³
to 50 mg/m³ Methane	0.46	mg/m³
to 100 mg/m³ Dinitrogen monoxide	0.00	mg/m³
to 300 mg/m³ Nitrogen monoxide	- 2.01	mg/m³
to 30 mg/m³ Nitrogen dioxide	1.07	mg/m³
to 20 mg/m³ Ammonia	0.61	mg/m³
to 200 mg/m³ Hydrogen chloride	- 0.54	mg/m³
Sum of positive cross sensitivities	2.14	mg/m³
Sum of negative cross sensitivities	- 2.55	mg/m³

Calculation of the combined standard uncertainty

Test Value	$\Delta X_{max, j}$			u	u^2
Standard deviation from paired measurements under field conditions *	1.04	mg/m³	u_r	1.04	1.082
Lack of fit	0.60	mg/m³	u_{lof}	0.35	0.120
Zero drift from field test	1.43	mg/m³	$u_{rl,z}$	0.82	0.677
Span drift from field test	- 1.58	mg/m³	$u_{rl,c}$	-0.91	0.827
Influence of ambient temperature at span	0.38	mg/m³	u_t	0.22	0.047
Influence of supply voltage	0.53	mg/m³	u_v	0.30	0.092
Cross sensitivity (interference) **	- 2.55	mg/m³	u_i	-1.47	2.168
Influence of sample pressure	0.00	mg/m³	u_n	0.00	0.000
Uncertainty of reference material at 70% of certification range	1.05	mg/m³	u_{rm}	0.61	0.368
Excursion of measurement beam	1.28	mg/m³	u_{mb}	0.74	0.542

* The bigger value of: "Repeatability standard deviation at span" or "Standard deviation from paired measurements under field conditions"

** The absolut value of the Sum of negativ cross sensitivity is greater than Sum of positiv cross sensitivity

Combined standard uncertainty (u_C)	$u_c = \sqrt{\sum (u_{max, j})^2}$	2.4	mg/m³
Total expanded uncertainty	$U = u_c * k = u_c * 1,96$	4.77	mg/m³

Relative total expanded uncertainty	**U in % of the ELV 35 mg/m³**	**13.6**
Requirement of 2000/76/EC and 2001/80/EC	**U in % of the ELV 35 mg/m³**	**20.0**
Requirement of EN 15267-3	U in % of the ELV 35 mg/m³	15.0