

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000074621_01

Certified AMS: MIR 9000e for CO, NO_x as NO₂, N₂O, SO₂, CH₄, O₂ and CO₂

Manufacturer: ENVEA
111, Boulevard Robespierre
78304 Poissy Cedex
France

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 (2007)
as well as EN 14181 (2014).**

Certification is awarded in respect of the conditions stated in this certificate
(this certificate contains 13 pages).

The present certificate replaces certificate 0000074621_00 dated 03 September 2021.



Suitability Tested
EN 15267
QAL1 Certified
Regular
Surveillance

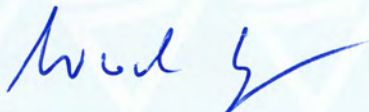
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ID 0000074621

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

This certificate will expire on:
01 August 2028

German Environment Agency
Dessau, 05 September 2023

TÜV Rheinland Energy GmbH
Cologne, 04 September 2023



Dr. Marcel Langner
Head of Section II 4



ppa. Dr. Peter Wilbring

www.umwelt-tuv.eu
tre@umwelt-tuv.eu
Tel. + 49 221 806-5200

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:	936/21254192/A dated 27 January 2023
Initial certification:	05 August 2021
Expiry date:	01 August 2028
Publication:	BAnz AT 02.08.2023 B7, chapter I No. 2.1

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), 30th BImSchV:2019, TA Luft:2021 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 month field test at a waste incineration.

The AMS is approved for an ambient temperature range of +5 ° to 40 °C.

The notification of suitability of the AMS, performance testing and the uncertainty calculation have been effected on the basis of the regulations applicable at the time of testing. As changes in legal provisions are possible, any potential user should ensure that this AMS is suitable for monitoring the 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 936/21254192/A dated 27 January 2023 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 02.08.2023 B7, chapter I No. 2.1,
Announcement by UBA dated 05 July 2023:

AMS designation:

MIR 9000e for CO, NOx as NO₂, N₂O, SO₂, CH₄, CO₂ and O₂

Manufacturer:

ENVEA, Poissy, France

Field of application:

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

Measuring ranges during the performance test:

Component	Certification range	Additional range		Unit
CO	0 - 75	0 – 3.000	-	mg/m ³
NOx as NO ₂	0 - 100*	0 – 1.500	-	mg/m ³
N ₂ O	0 - 50	0 - 100	0 - 200	mg/m ³
SO ₂	0 - 75	0 - 1.500	-	mg/m ³
CH ₄	0 - 50	0 - 100	0 - 200	mg/m ³
O ₂	0 - 25	-	-	Vol.-%
CO ₂	0 - 20	0 - 30	-	Vol.-%

* complies to 65 mg/m³ as NO

Software version: 1.0.v

Restrictions: None

Notes:

1. The maintenance interval is three months.
2. The performance test includes the MIR 9000e version (equipped with NOx converter type ENVEA NOx-CONVe) and the MIR 9000e* version (equipped with NOx converter type CG-2M from M&C).
3. The internal automatic QAL3 option can be used for the regular check of the span points in the maintenance interval.
4. Supplementary test (maintenance interval extension, qualification QAL3-option) with regard to the announcements of the Federal Environment Agency (UBA) of 29 June 2021 (BAnz AT 05.08.2021 B5, chapter I number 3.1) and of 21 February 2023 (BAnz AT 20.03.2023 B6, chapter IV notification 18).

Test institute:

TÜV Rheinland Energy GmbH, Cologne
Report No.: 936/21254192/A dated 27 January 2023

Certified product

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

The MIR9000e measuring system is an extractive multi-component analysis system for continuous monitoring of flue gases.

The extractive AMS tested here consists of the following components:

- Heated sampling probe, type M&C Techgroup SP2000, heated to 200 °C
- Sampling line, heated to 180 ° (length 10 m in laboratory test und 20 m in field test)
- Test gas cooler, Typ CSS-V2-E, manufacturer M&C Techgroup, dew point 4 °C
- NOx converter Typ CG-2M, manufacturer M&C Techgroup, heated to 350 °C
- Alternative NOx converter Typ ENVEA NOx converter
- Analyser MIR9000e

With the exception of the heated sampling probe and the heated sample gas line, all components together with the electrical distribution and the analogue modules are located in a lockable measurement cabinet.

The sample gas (approx. 3.0 l/min) is taken from the exhaust gas flow with a heated probe and fed to the measuring system. The probe is heated to 200 °C and equipped with a ceramic filter. The probe leads the sample gas to the measurement cabinet via a PTFE line, heated to 180 °C. The line lengths were 10 m in the laboratory test and 20 m in the field test. In the measuring cabinet, the sample gas is passed over a test gas cooler and cooled to +4 °C. A condensate pump discharges the moisture which is separated here. Downstream of the test gas cooler, a partial flow (approx. 0.5 l/min) of the dried sample gas is fed into the analysis module. The remaining sample gas is discharged via a bypass.

The clean and dry gas sample is pumped by the analyzer module's internal pump into the multi-reflection chamber, whose sensitivity is increased by the length of the optical path (path length: 8 m). The optics chamber is traversed by the radiation emitted by an infrared source. The semiconductor detector receives the optical beam after it passes through several interference filters and gas cells mounted on a wheel rotating at high speed.

The signal output by the detector is amplified and electronically processed. The concentration is displayed in real time according to a response time pre-programmed by the user.

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 as well as 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: gal1.de.

History of documents

Certification of MIR 9000e 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. 0000074621_00: 03 September 2021

Expiry date of the certificate: 04 August 2026

Test report: 936/21246251/B dated 3 May 2021

TÜV Rheinland Energy GmbH

Publication: BAnz AT 05.08.2021 B5, chapter I number 3.1

UBA announcement dated 29 June 2021

Notifications

Statement issued by TÜV Rheinland Energy GmbH dated 16 September 2021

Publication: BAnz AT 11.04.2022 B10, chapter VI notification 32

UBA announcement dated 9 March 2022

(Software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 9 September 2022

Publication: BAnz AT 20.03.2023 B6, chapter IV notification 18

UBA announcement dated 21 February 2023

(Software changes)

Supplementary testing according to EN 15267

Certificate No. 0000074621_01: 05 September 2023

Expiry date of the certificate: 01 August 2028

Test report: 936/21254192/A dated 27 January 2023

TÜV Rheinland Energy GmbH

Publication: BAnz AT 02.08.2023 B7, chapter I number 2.1

UBA announcement dated 5 July 2023

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

Measuring system

Manufacturer	ENVEA
AMS designation	MIR9000e
Serial number of units under test	21 / 24
Measuring principle	NDIR

Test report

Test laboratory	936/21254192/A
Date of report	TÜV Rheinland
	2023-01-27

Measured component

Certification range	CO	0 - 75 mg/m ³
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	1.52 mg/m ³
Sum of negative CS at zero point	-0.42 mg/m ³
Sum of positive CS at span point	2.33 mg/m ³
Sum of negative CS at span point	0.00 mg/m ³
Maximum sum of cross-sensitivities	2.33 mg/m ³
Uncertainty of cross-sensitivity	u_i 1.347 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

			u^2
Standard deviation from paired measurements under field conditions *	u_D	0.291 mg/m ³	0.085 (mg/m ³) ²
Lack of fit	u_{lof}	0.329 mg/m ³	0.108 (mg/m ³) ²
Zero drift from field test	$u_{d,z}$	-0.303 mg/m ³	0.092 (mg/m ³) ²
Span drift from field test	$u_{d,s}$	0.953 mg/m ³	0.908 (mg/m ³) ²
Influence of ambient temperature at span	u_t	0.346 mg/m ³	0.120 (mg/m ³) ²
Influence of supply voltage	u_v	0.168 mg/m ³	0.028 (mg/m ³) ²
Cross-sensitivity (interference)	u_i	1.347 mg/m ³	1.814 (mg/m ³) ²
Influence of sample gas flow	u_p	0.156 mg/m ³	0.024 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.606 mg/m ³	0.368 (mg/m ³) 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)	$u_c = \sqrt{\sum (u_{max\ i})^2}$	1.88 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	3.69 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the ELV 50 mg/m³	7.4
Requirement of EN 15267-3	U in % of the ELV 50 mg/m³	10.0
	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	ENVEA
AMS designation	MIR9000e
Serial number of units under test	21 / 24
Measuring principle	NDIR

Test report

Test laboratory	936/21254192/A
Date of report	TÜV Rheinland
	2023-01-27

Measured component

Certification range	CH ₄	0 - 50 mg/m ³
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.78 mg/m ³
Sum of negative CS at zero point	-0.87 mg/m ³
Sum of positive CS at span point	1.74 mg/m ³
Sum of negative CS at span point	-0.69 mg/m ³
Maximum sum of cross-sensitivities	1.74 mg/m ³
Uncertainty of cross-sensitivity	u_i 1.005 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

		u^2
Standard deviation from paired measurements under field conditions *	u_D 0.374 mg/m ³	0.140 (mg/m ³) ²
Lack of fit	u_{inf} -0.173 mg/m ³	0.030 (mg/m ³) ²
Zero drift from field test	$u_{d,z}$ 0.173 mg/m ³	0.030 (mg/m ³) ²
Span drift from field test	$u_{d,s}$ 0.375 mg/m ³	0.141 (mg/m ³) ²
Influence of ambient temperature at span	u_t 0.208 mg/m ³	0.043 (mg/m ³) ²
Influence of supply voltage	u_v 0.215 mg/m ³	0.046 (mg/m ³) ²
Cross-sensitivity (interference)	u_i 1.005 mg/m ³	1.010 (mg/m ³) ²
Influence of sample gas flow	u_n -0.058 mg/m ³	0.003 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u_m 0.404 mg/m ³	0.163 (mg/m ³) 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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	1.27 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	2.48 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the range 50 mg/m³	5,0
Requirement of EN 15267-3	U in % of the range 50 mg/m³	30,0 **
	U in % of the range 50 mg/m ³	22,5

** The EU-directive 2010/75/EC on industrial emissions does not define requirements for this component.
A value of 30,0 % was used instead.

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

Measuring system

Manufacturer	ENVEA
AMS designation	MIR9000e
Serial number of units under test	21 / 24
Measuring principle	NDIR

Test report

Test laboratory	936/21254192/A
Date of report	TÜV Rheinland
	2023-01-27

Measured component

Certification range	CO ₂	0 - 20 Vol.-%
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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 positive 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_i			u_i^2
Repeatability standard deviation at set point *	u_r	0.080	Vol.-%	0.006 (Vol.-%) ²
Lack of fit	u_{inf}	0.058	Vol.-%	0.003 (Vol.-%) ²
Zero drift from field test	$u_{d,z}$	0.023	Vol.-%	0.001 (Vol.-%) ²
Span drift from field test	$u_{d,s}$	0.127	Vol.-%	0.016 (Vol.-%) ²
Influence of ambient temperature at span	u_t	0.058	Vol.-%	0.003 (Vol.-%) ²
Influence of supply voltage	u_v	0.047	Vol.-%	0.002 (Vol.-%) ²
Cross-sensitivity (interference)	u_i	0.000	Vol.-%	0.000 (Vol.-%) ²
Influence of sample gas flow	u_n	0.006	Vol.-%	0.000 (Vol.-%) ²
Uncertainty of reference material at 70% of certification range	u_m	0.162	Vol.-%	0.026 (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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.24	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.47	Vol.-%

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the range 20 Vol.-%	2,4
Requirement of EN 15267-3	U in % of the range 20 Vol.-%	10,0 **
	U in % of the range 20 Vol.-%	7,5

** The EU-directive 2010/75/EC on industrial emissions does not define requirements for this component.
A value of 10,0 % was used instead.

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

Measuring system

Manufacturer	ENVEA
AMS designation	MIR9000e
Serial number of units under test	21 / 24
Measuring principle	NDIR

Test report

Test laboratory	936/21254192/A
Date of report	TÜV Rheinland
	2023-01-27

Measured component

Certification range	N ₂ O	0 - 50 mg/m ³
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.00 mg/m ³
Sum of negative CS at zero point	-1.48 mg/m ³
Sum of positive CS at span point	0.34 mg/m ³
Sum of negative CS at span point	-1.64 mg/m ³
Maximum sum of cross-sensitivities	-1.64 mg/m ³
Uncertainty of cross-sensitivity	u_i -0.947 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

			u^2
Standard deviation from paired measurements under field conditions *	u_D	0.618 mg/m ³	0.382 (mg/m ³) ²
Lack of fit	u_{inf}	0.289 mg/m ³	0.084 (mg/m ³) ²
Zero drift from field test	$u_{d,z}$	0.173 mg/m ³	0.030 (mg/m ³) ²
Span drift from field test	$u_{d,s}$	0.548 mg/m ³	0.300 (mg/m ³) ²
Influence of ambient temperature at span	u_t	0.400 mg/m ³	0.160 (mg/m ³) ²
Influence of supply voltage	u_v	0.178 mg/m ³	0.032 (mg/m ³) ²
Cross-sensitivity (interference)	u_i	-0.947 mg/m ³	0.897 (mg/m ³) ²
Influence of sample gas flow	u_n	0.115 mg/m ³	0.013 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u_m	0.404 mg/m ³	0.163 (mg/m ³) 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/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	2.81 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the range 50 mg/m³	5,6
Requirement of EN 15267-3	U in % of the range 50 mg/m³	20,0 **
	U in % of the range 50 mg/m ³	15,0

** The EU-directive 2010/75/EC on industrial emissions does not define requirements for this component.
A value of 20,0 % was used instead.

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

Measuring system

Manufacturer	ENVEA
AMS designation	MIR9000e
Serial number of units under test	21 / 24
Measuring principle	NDIR

Test report

Test laboratory	936/21254192/A
Date of report	TÜV Rheinland
	2023-01-27

Measured component

Certification range	NO _x	0 - 100 mg/m ³
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	1,55 mg/m ³
Sum of negative CS at zero point	-1,36 mg/m ³
Sum of positive CS at span point	2,08 mg/m ³
Sum of negative CS at span point	-1,58 mg/m ³
Maximum sum of cross-sensitivities	2,08 mg/m ³
Uncertainty of cross-sensitivity	u_i 1,201 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

		u^2	
Standard deviation from paired measurements under field conditions *	u_D 0,842 mg/m ³	0,709 (mg/m ³) ²	
Lack of fit	u_{lof} -0,577 mg/m ³	0,333 (mg/m ³) ²	
Zero drift from field test	$u_{d,z}$ 0,289 mg/m ³	0,084 (mg/m ³) ²	
Span drift from field test	$u_{d,s}$ 0,808 mg/m ³	0,653 (mg/m ³) ²	
Influence of ambient temperature at span	u_t 0,493 mg/m ³	0,243 (mg/m ³) ²	
Influence of supply voltage	u_v 0,284 mg/m ³	0,081 (mg/m ³) ²	
Cross-sensitivity (interference)	u_i 1,201 mg/m ³	1,442 (mg/m ³) ²	
Influence of sample gas flow	u_n 0,173 mg/m ³	0,030 (mg/m ³) ²	
Uncertainty of reference material at 70% of certification range	u_{rm} 0,808 mg/m ³	0,653 (mg/m ³) ²	
Converter efficiency for AMS measuring NO _x	u_{ce} 1,905 mg/m ³	3,630 (mg/m ³) 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)	$u_c = \sqrt{\sum (u_{max,i})^2}$	2,80 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	5,49 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the ELV 66 mg/m³	8,3
Requirement of EN 15267-3	U in % of the ELV 66 mg/m³	20,0
	U in % of the ELV 66 mg/m³	15,0

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

Measuring system

Manufacturer	ENVEA
AMS designation	MIR9000e
Serial number of units under test	21 / 24
Measuring principle	Zirconiumdioxide

Test report

Test laboratory	936/21254192/A
Date of report	TÜV Rheinland
	2023-01-27

Measured component

Certification range	O ₂	0 - 25 Vol.-%
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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 positive 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
Standard deviation from paired measurements under field conditions *	u_D	0.089	Vol.-%	0.008 (Vol.-%) ²
Lack of fit	u_{inf}	0.058	Vol.-%	0.003 (Vol.-%) ²
Zero drift from field test	$u_{d,z}$	0.046	Vol.-%	0.002 (Vol.-%) ²
Span drift from field test	$u_{d,s}$	0.081	Vol.-%	0.007 (Vol.-%) ²
Influence of ambient temperature at span	u_t	0.045	Vol.-%	0.002 (Vol.-%) ²
Influence of supply voltage	u_v	0.058	Vol.-%	0.003 (Vol.-%) ²
Cross-sensitivity (interference)	u_i	0.000	Vol.-%	0.000 (Vol.-%) ²
Influence of sample gas flow	u_n	0.017	Vol.-%	0.000 (Vol.-%) ²
Uncertainty of reference material at 70% of certification range	u_m	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)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.26	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.51	Vol.-%

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the range 25 Vol.-%	2,0
Requirement of EN 15267-3	U in % of the range 25 Vol.-%	10,0 **
	U in % of the range 25 Vol.-%	7,5

** The EU-directive 2010/75/EC on industrial emissions does not define requirements for this component.
A value of 10,0 % was used instead.

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

Measuring system

Manufacturer	ENVEA
AMS designation	MIR9000e
Serial number of units under test	21 / 24
Measuring principle	NDIR

Test report

Test laboratory	936/21254192/A
Date of report	TÜV Rheinland
	2023-01-27

Measured component

Certification range	SO ₂	0 - 75 mg/m ³
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Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.74 mg/m ³
Sum of negative CS at zero point	-0.80 mg/m ³
Sum of positive CS at span point	2.78 mg/m ³
Sum of negative CS at span point	-1.70 mg/m ³
Maximum sum of cross-sensitivities	2.78 mg/m ³
Uncertainty of cross-sensitivity	u_i 1.606 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

		u^2	
Standard deviation from paired measurements under field conditions *	u_D 0.827 mg/m ³	0.684	(mg/m ³) ²
Lack of fit	u_{inf} 0.637 mg/m ³	0.406	(mg/m ³) ²
Zero drift from field test	$u_{d,z}$ -0.217 mg/m ³	0.047	(mg/m ³) ²
Span drift from field test	$u_{t,s}$ 0.866 mg/m ³	0.750	(mg/m ³) ²
Influence of ambient temperature at span	u_t 0.321 mg/m ³	0.103	(mg/m ³) ²
Influence of supply voltage	u_v 0.279 mg/m ³	0.078	(mg/m ³) ²
Cross-sensitivity (interference)	u_i 1.606 mg/m ³	2.579	(mg/m ³) ²
Influence of sample gas flow	u_b 0.231 mg/m ³	0.053	(mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u_m 0.606 mg/m ³	0.368	(mg/m ³) 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)	$u_c = \sqrt{\sum (u_{max, j})^2}$	2.25 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	4.41 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the ELV 50 mg/m³	8,8
Requirement of EN 15267-3	U in % of the ELV 50 mg/m ³	20,0
	U in % of the ELV 50 mg/m ³	15,0