

# CERTIFICATE

## of Product Conformity (QAL1)

Certificate No.: 0000074625

**Certified AMS:** X-CEMS for CO, NO<sub>x</sub>, SO<sub>2</sub>, CO<sub>2</sub> and O<sub>2</sub>

**Manufacturer:** Emerson Process Management GmbH & Co. OHG  
Industriestraße 1  
63594 Hasselroth  
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 (2007)  
and EN 14181 (2014).**

Certification is awarded in respect of the conditions stated in this certificate  
(this certificate contains 12 pages).



Suitability Tested  
EN 15267  
QAL1 Certified  
Regular  
Surveillance

www.tuv.com  
ID 0000074625

Publication in the German Federal Gazette  
(BAnz.) of 03 May 2021

This certificate will expire on:  
02 May 2026

German Federal Environment Agency  
Dessau, 02 June 2021

TÜV Rheinland Energy GmbH  
Cologne, 01 June 2021



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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:** 936/21247061/A of 10 December 2020  
**Initial certification:** 03 May 2021  
**Expiry date:** 02 May 2026  
**Publication:** BAnz AT 03.05.2021 B9, chapter I number 3.2

### **Approved application**

The tested AMS is suitable for use at combustion plants according to Directive 2010/75/EU, chapter III (13<sup>th</sup> BImSchV), at waste incineration plants according to Directive 2010/75/EU, chapter IV (17<sup>th</sup> BImSchV), 27<sup>th</sup> BImSchV, 30<sup>th</sup> BImSchV, 44<sup>th</sup> BImSchV and TA Luft. 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 three-month field test at a waste incineration plant.

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 valid at the time of performance testing. As changes in legal regulations are possible, any potential user should ensure that this AMS is suitable for monitoring the 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.

### **Basis of the certification**

This certification is based on:

- Test report 936/21247061/A of 10 December 2020 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 03.05.2021 B9, chapter I number 3.2,  
Announcement by UBA dated 31 March 2021:

**AMS designation:**

X-CEMS for CO, NO<sub>x</sub>, SO<sub>2</sub>, CO<sub>2</sub> and O<sub>2</sub>

**Manufacturer:**

Emerson Process Management GmbH & Co. OHG, Hasselroth

**Field of application:**

Modular measuring system for plants requiring official approval  
and plants according to 27. BImSchV

**Measuring ranges during the performance test:**

Component	Certification range	Supplementary measurement ranges	Unit
CO	0 - 150	0 - 3000	mg/m <sup>3</sup>
NO <sub>x</sub> *	0 - 150	0 - 2000	mg/m <sup>3</sup>
SO <sub>2</sub>	0 - 150	0 - 2500	mg/m <sup>3</sup>
CO <sub>2</sub>	0 - 25	-	Vol.-%
O <sub>2</sub> (paramagnetic)	0 - 25	-	Vol.-%
O <sub>2</sub> (electrochemical)	0 - 25	-	Vol.-%

\*specified as NO, corresponds to 0 – 230 mg/m<sup>3</sup> NO<sub>x</sub> as NO<sub>2</sub>

**Software version:**

1.7.0

**Restrictions:**

None

**Notes:**

1. The maintenance interval is four weeks.
2. The measuring module for SO<sub>2</sub> can monitor limit values greater than 60 mg/m<sup>3</sup>.

**Test report:**

TÜV Rheinland Energy GmbH, Cologne  
Report No.: 936/21247061/A of 10 December 2020

### Certified product

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

The modular measuring device X-CEMS is an extractive emission measuring device. Different measuring principles are used depending on the measuring component. The measuring principle of non-dispersive infrared absorption (NDIR) is used to determine the components CO, NO and CO<sub>2</sub> and the measuring principle of non-dispersive ultraviolet absorption (NDUV) is used to determine the component SO<sub>2</sub>. Either paramagnetic or electrochemical oxygen measurement is used to determine O<sub>2</sub>.

The measuring system tested here consists of:

- Heated (180 ° C, self-regulating) sampling probe Bühler GAS 222.17 (filter material: ceramic, pore size 3 µm)
- The use of the variants GAS 222.15 (without weather protection hood) and GAS 222.31 (adjustable heating and backwashing option) is also possible.
- Heated (180 ° C) sampling line PFA, internal diameter 4 mm, length 20 m
- Measuring cabinet with temperature-controlled exhaust fan consisting of the following components, mounted on a swing frame:
  - 2-stage sample gas cooler Bühler EKG 2-19
  - Sample gas pump
  - X-Stream enhanced analyzer
  - NOX converter Bühler BÜNOx 2+
  - Condensate pumps and condensate tanks with level monitoring

The X-Stream enhanced analyzer can determine a maximum of 5 components. You can choose between 4 photometer channels (CO, NO, SO<sub>2</sub> and CO<sub>2</sub>) and an oxygen channel (para-magnetic or electrochemical). A separate optical bench is available for each component (except for oxygen). There are no compensations between the individual channels.

The following combinations of modules are possible for the X-Stream analyzer:

Module 1	Module 2	Module 3	Module 4	Module 5
CO				O <sub>2</sub> electrochemical or paramagnetic
NO				
SO <sub>2</sub>				
CO <sub>2</sub>				
CO	NO			
CO	SO <sub>2</sub>			
CO	CO <sub>2</sub>			
NO	SO <sub>2</sub>			
NO	CO <sub>2</sub>			
SO <sub>2</sub>	CO <sub>2</sub>			
CO	NO	SO <sub>2</sub>		
CO	NO	CO <sub>2</sub>		
CO	SO <sub>2</sub>	CO <sub>2</sub>		
NO	SO <sub>2</sub>	CO <sub>2</sub>		
CO	NO	SO <sub>2</sub>	CO <sub>2</sub>	

The measuring device can automatically apply test gas and ambient air via switchable solenoid valves. The measuring device adjusts the position of the zero points of CO, NO and SO<sub>2</sub> (if available) as well as the reference point of the O<sub>2</sub> channel daily with cleaned ambient air.

In addition, the measuring device checks the position of the zero and reference points of the measuring components determined by the photometer on a weekly basis. For this purpose a test gas (mixed gas consisting of measured photometer components) is automatically applied. This adjusts the position of the reference points and the zero point of the O<sub>2</sub> channel. Then the zero points of the photometer channels and the reference point of the O<sub>2</sub> channel are adjusted with purified ambient air. The test gas is applied between the two cooler stages without further dilution.

The zero and reference point checks can also be carried out in the maintenance interval (QAL3) using the automatic test gas supply. In addition, nitrogen must be applied to the probe to check for leaks.

### **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: [\*\*qal1.de\*\*](http://qal1.de).

### **History of documents**

Certification of X-CEMS 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. 0000074625: 02 June 2021  
Expiry date of the certificate: 02 May 2026  
Test report 936/21247061/A dated 10 December 2020  
TÜV Rheinland Energy GmbH, Cologne  
Publication: BAnz AT 03.05.2021 B9, chapter I number 3.2  
Announcement by UBA dated 31 March 2021

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

#### Measuring system

Manufacturer	Emerson Process Management GmbH & Co. OHG
AMS designation	X-CEMS
Serial number of units under test	3242850 - System 1 / 3242850 - System 2
Measuring principle	NDIR

#### Test report

Test laboratory	TÜV Rheinland
Date of report	2020-12-10

#### Measured component

Certification range	CO	0 - 150 mg/m <sup>3</sup>
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#### Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	2.81 mg/m <sup>3</sup>
Sum of negative CS at zero point	0.00 mg/m <sup>3</sup>
Sum of positive CS at span point	2.90 mg/m <sup>3</sup>
Sum of negative CS at span point	0.00 mg/m <sup>3</sup>
Maximum sum of cross-sensitivities	2.90 mg/m <sup>3</sup>
Uncertainty of cross-sensitivity	$u_i$ 1.676 mg/m <sup>3</sup>

#### Calculation of the combined standard uncertainty

##### Tested parameter

			$u^2$
Standard deviation from paired measurements under field conditions *	$u_D$	0.264 mg/m <sup>3</sup>	0.070 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$	0.277 mg/m <sup>3</sup>	0.077 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	0.173 mg/m <sup>3</sup>	0.030 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$	0.693 mg/m <sup>3</sup>	0.480 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	0.513 mg/m <sup>3</sup>	0.263 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$	0.204 mg/m <sup>3</sup>	0.042 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	1.676 mg/m <sup>3</sup>	2.809 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	$u_p$	-0.271 mg/m <sup>3</sup>	0.073 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	1.212 mg/m <sup>3</sup>	1.470 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty ( $u_c$ )

$$u_c = \sqrt{\sum (u_{max,j})^2} \quad 2.31 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c \cdot k = u_c \cdot 1.96 \quad 4.52 \text{ mg/m}^3$$

#### Relative total expanded uncertainty

**U in % of the ELV 60 mg/m<sup>3</sup>** **7.5**

Requirement of 2010/75/EU

**U in % of the ELV 60 mg/m<sup>3</sup>** **10.0**

Requirement of EN 15267-3

U in % of the ELV 60 mg/m<sup>3</sup> 7.5

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

**Measuring system**

Manufacturer	Emerson Process Management GmbH & Co. OHG
AMS designation	X-CEMS
Serial number of units under test	3242850 - System 1 / 3242850 - System 2
Measuring principle	NDIR

**Test report**

Test laboratory	TÜV Rheinland
Date of report	2020-12-10

**Measured component**

Certification range	NO	0 - 150 mg/m <sup>3</sup>
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**Evaluation of the cross-sensitivity (CS)**

(system with largest CS)

Sum of positive CS at zero point	4.41 mg/m <sup>3</sup>
Sum of negative CS at zero point	0.00 mg/m <sup>3</sup>
Sum of positive CS at span point	2.28 mg/m <sup>3</sup>
Sum of negative CS at span point	-2.28 mg/m <sup>3</sup>
Maximum sum of cross-sensitivities	4.41 mg/m <sup>3</sup>
Uncertainty of cross-sensitivity	$u_i$ 2.546 mg/m <sup>3</sup>

**Calculation of the combined standard uncertainty**

**Tested parameter**

			$u^2$
Standard deviation from paired measurements under field conditions *	$u_D$	1.716 mg/m <sup>3</sup>	2.945 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	$u_{lof}$	0.684 mg/m <sup>3</sup>	0.468 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	0.866 mg/m <sup>3</sup>	0.750 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	$u_{d,s}$	1.992 mg/m <sup>3</sup>	3.968 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	1.617 mg/m <sup>3</sup>	2.615 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	$u_v$	0.572 mg/m <sup>3</sup>	0.327 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	2.546 mg/m <sup>3</sup>	6.482 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	$u_p$	-0.812 mg/m <sup>3</sup>	0.659 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	1.212 mg/m <sup>3</sup>	1.470 (mg/m <sup>3</sup> ) <sup>2</sup>
Converter efficiency for AMS measuring NOx	$u_{ce}$	3.984 mg/m <sup>3</sup>	15.872 (mg/m <sup>3</sup> ) <sup>2</sup>

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

Combined standard uncertainty ( $u_c$ )	$u_c = \sqrt{\sum (u_{max,i})^2}$	5.96 mg/m <sup>3</sup>
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	11.69 mg/m <sup>3</sup>

**Relative total expanded uncertainty**

Requirement of 2010/75/EU	<b>U in % of the ELV 80 mg/m<sup>3</sup></b>	<b>14.6</b>
Requirement of EN 15267-3	<b>U in % of the ELV 80 mg/m<sup>3</sup></b>	<b>20.0</b>
	<b>U in % of the ELV 80 mg/m<sup>3</sup></b>	<b>15.0</b>



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

#### Measuring system

Manufacturer	Emerson Process Management GmbH & Co. OHG
AMS designation	X-CEMS
Serial number of units under test	3242850 - System 1 / 3242850 - System 2
Measuring principle	NDUV

#### Test report

Test laboratory	TÜV Rheinland
Date of report	2020-12-10

#### Measured component

Certification range	SO <sub>2</sub> 0 - 150 mg/m <sup>3</sup>
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#### Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	3.38 mg/m <sup>3</sup>
Sum of negative CS at zero point	0.00 mg/m <sup>3</sup>
Sum of positive CS at span point	2.81 mg/m <sup>3</sup>
Sum of negative CS at span point	-4.40 mg/m <sup>3</sup>
Maximum sum of cross-sensitivities	-4.40 mg/m <sup>3</sup>
Uncertainty of cross-sensitivity	u <sub>i</sub> -2.537 mg/m <sup>3</sup>

#### Calculation of the combined standard uncertainty

##### Tested parameter

			u <sup>2</sup>
Standard deviation from paired measurements under field conditions *	u <sub>D</sub>	1.007 mg/m <sup>3</sup>	1.014 (mg/m <sup>3</sup> ) <sup>2</sup>
Lack of fit	u <sub>lof</sub>	0.615 mg/m <sup>3</sup>	0.378 (mg/m <sup>3</sup> ) <sup>2</sup>
Zero drift from field test	u <sub>d,z</sub>	1.126 mg/m <sup>3</sup>	1.268 (mg/m <sup>3</sup> ) <sup>2</sup>
Span drift from field test	u <sub>d,s</sub>	2.078 mg/m <sup>3</sup>	4.318 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of ambient temperature at span	u <sub>t</sub>	1.769 mg/m <sup>3</sup>	3.129 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of supply voltage	u <sub>v</sub>	1.078 mg/m <sup>3</sup>	1.162 (mg/m <sup>3</sup> ) <sup>2</sup>
Cross-sensitivity (interference)	u <sub>i</sub>	-2.537 mg/m <sup>3</sup>	6.436 (mg/m <sup>3</sup> ) <sup>2</sup>
Influence of sample gas flow	u <sub>p</sub>	-0.902 mg/m <sup>3</sup>	0.814 (mg/m <sup>3</sup> ) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	u <sub>rm</sub>	1.212 mg/m <sup>3</sup>	1.470 (mg/m <sup>3</sup> ) <sup>2</sup>

\* The larger value is used :

"Repeatability standard deviation at set point" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u <sub>c</sub> )	$u_c = \sqrt{\sum (u_{max,j})^2}$	4.47 mg/m <sup>3</sup>
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	8.76 mg/m <sup>3</sup>

#### Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the ELV 60 mg/m <sup>3</sup>	14.6
Requirement of EN 15267-3	U in % of the ELV 60 mg/m <sup>3</sup>	20.0
	U in % of the ELV 60 mg/m <sup>3</sup>	15.0

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

**Measuring system**

Manufacturer	Emerson Process Management GmbH & Co. OHG
AMS designation	X-CEMS
Serial number of units under test	3242850 - System 1 / 3242850 - System 2
Measuring principle	NDIR

**Test report**

Test laboratory	TÜV Rheinland
Date of report	2020-12-10

**Measured component**

Certification range	CO <sub>2</sub>	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	-0.20	Vol.-%
Maximum sum of cross-sensitivities	-0.20	Vol.-%
Uncertainty of cross-sensitivity	$u_i$	-0.115 Vol.-%

**Calculation of the combined standard uncertainty**

**Tested parameter**

				$u^2$
Standard deviation from paired measurements under field conditions *	$u_D$	0.023	Vol.-%	0.001 (Vol.-%) <sup>2</sup>
Lack of fit	$u_{lof}$	0.046	Vol.-%	0.002 (Vol.-%) <sup>2</sup>
Zero drift from field test	$u_{d,z}$	-0.014	Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Span drift from field test	$u_{d,s}$	0.217	Vol.-%	0.047 (Vol.-%) <sup>2</sup>
Influence of ambient temperature at span	$u_t$	0.102	Vol.-%	0.010 (Vol.-%) <sup>2</sup>
Influence of supply voltage	$u_v$	0.020	Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Cross-sensitivity (interference)	$u_i$	-0.115	Vol.-%	0.013 (Vol.-%) <sup>2</sup>
Influence of sample gas flow	$u_p$	-0.176	Vol.-%	0.031 (Vol.-%) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	$u_{rm}$	0.202	Vol.-%	0.041 (Vol.-%) <sup>2</sup>

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

Combined standard uncertainty ( $u_c$ )	$u_c = \sqrt{\sum (u_{max, j})^2}$	0.38	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.75	Vol.-%

**Relative total expanded uncertainty**

<b>Requirement of 2010/75/EU</b>	<b>U in % of the range 25 Vol.-%</b>	<b>3.0</b>
<b>Requirement of EN 15267-3</b>	<b>U in % of the range 25 Vol.-%</b>	<b>10.0 **</b>
	<b>U in % of the range 25 Vol.-%</b>	<b>7.5</b>

\*\* 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	Emerson Process Management GmbH & Co. OHG
AMS designation	X-CEMS
Serial number of units under test	3242850 - System 1 / 3242850 - System 2
Measuring principle	electrochemic

**Test report**

Test laboratory	TÜV Rheinland
Date of report	2020-12-10

**Measured component**

Certification range	O <sub>2</sub>	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	-0.11	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	-0.11	Vol.-%
Uncertainty of cross-sensitivity	u <sub>i</sub>	-0.064 Vol.-%

**Calculation of the combined standard uncertainty**

**Tested parameter**

				u <sup>2</sup>
Standard deviation from paired measurements under field conditions *	u <sub>D</sub>	0.067	Vol.-%	0.004 (Vol.-%) <sup>2</sup>
Lack of fit	u <sub>lof</sub>	0.058	Vol.-%	0.003 (Vol.-%) <sup>2</sup>
Zero drift from field test	u <sub>d,z</sub>	0.035	Vol.-%	0.001 (Vol.-%) <sup>2</sup>
Span drift from field test	u <sub>d,s</sub>	-0.035	Vol.-%	0.001 (Vol.-%) <sup>2</sup>
Influence of ambient temperature at span	u <sub>t</sub>	0.175	Vol.-%	0.031 (Vol.-%) <sup>2</sup>
Influence of supply voltage	u <sub>v</sub>	0.026	Vol.-%	0.001 (Vol.-%) <sup>2</sup>
Cross-sensitivity (interference)	u <sub>i</sub>	-0.064	Vol.-%	0.004 (Vol.-%) <sup>2</sup>
Influence of sample gas flow	u <sub>p</sub>	-0.088	Vol.-%	0.008 (Vol.-%) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	u <sub>rm</sub>	0.202	Vol.-%	0.041 (Vol.-%) <sup>2</sup>

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

Combined standard uncertainty (u <sub>c</sub> )	$u_c = \sqrt{\sum (u_{max, j})^2}$	0.31	Vol.-%
Total expanded uncertainty	U = u <sub>c</sub> * k = u <sub>c</sub> * 1.96	0.60	Vol.-%

**Relative total expanded uncertainty**

<b>Requirement of 2010/75/EU</b>	<b>U in % of the range 25 Vol.-%</b>	<b>2.4</b>
<b>Requirement of EN 15267-3</b>	<b>U in % of the range 25 Vol.-%</b>	<b>10.0 **</b>
	<b>U in % of the range 25 Vol.-%</b>	<b>7.5</b>

\*\* 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	Emerson Process Management GmbH & Co. OHG
AMS designation	X-CEMS
Serial number of units under test	3242850 - System 1 / 3242850 - System 2
Measuring principle	paramagnetic

**Test report**

Test laboratory	TÜV Rheinland
Date of report	2020-12-10

**Measured component**

Certification range	O <sub>2</sub>	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 <sub>i</sub>	0.000 Vol.-%

**Calculation of the combined standard uncertainty**

**Tested parameter**

				u <sup>2</sup>
Standard deviation from paired measurements under field conditions *	u <sub>D</sub>	0.017	Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Lack of fit	u <sub>lof</sub>	0.052	Vol.-%	0.003 (Vol.-%) <sup>2</sup>
Zero drift from field test	u <sub>d,z</sub>	0.023	Vol.-%	0.001 (Vol.-%) <sup>2</sup>
Span drift from field test	u <sub>d,s</sub>	-0.029	Vol.-%	0.001 (Vol.-%) <sup>2</sup>
Influence of ambient temperature at span	u <sub>t</sub>	0.101	Vol.-%	0.010 (Vol.-%) <sup>2</sup>
Influence of supply voltage	u <sub>v</sub>	0.006	Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Cross-sensitivity (interference)	u <sub>i</sub>	0.000	Vol.-%	0.000 (Vol.-%) <sup>2</sup>
Influence of sample gas flow	u <sub>p</sub>	-0.098	Vol.-%	0.010 (Vol.-%) <sup>2</sup>
Uncertainty of reference material at 70% of certification range	u <sub>rm</sub>	0.202	Vol.-%	0.041 (Vol.-%) <sup>2</sup>

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

Combined standard uncertainty (u <sub>c</sub> )	$u_c = \sqrt{\sum (u_{max, j})^2}$	0.26	Vol.-%
Total expanded uncertainty	U = u <sub>c</sub> * k = u <sub>c</sub> * 1.96	0.50	Vol.-%

**Relative total expanded uncertainty**

<b>Requirement of 2010/75/EU</b>	<b>U in % of the range 25 Vol.-%</b>	<b>2.0</b>
<b>Requirement of EN 15267-3</b>	<b>U in % of the range 25 Vol.-%</b>	<b>10.0 **</b>
	<b>U in % of the range 25 Vol.-%</b>	<b>7.5</b>

\*\* The EU-directive 2010/75/EC on industrial emissions does not define requirements for this component.  
A value of 10.0 % was used instead.