

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000040210_01

Certified AMS: CEMS for CO, NO, NO₂, NO_x, SO₂, CO₂ and O₂

Manufacturer: Kontram Oy
Tuupakantie 32 a
01740 Vantaa
Finland

Test Institute: TÜV Rheinland Energie und Umwelt GmbH

**This is to certify that the AMS has been tested
and found to comply with:**

**EN 15267-1: 2009, EN 15267-2: 2009, EN 15267-3: 2007
and EN 14181: 2004**

Certification is awarded in respect of the conditions stated in this certificate
(see also the following pages).

The present certificate replaces Certificate No. 0000040210 of 29 April 2014



Suitability Tested
EN 15267
QAL1 Certified
Regular
Surveillance

www.tuv.com
ID 0000040210

Publication in the German Federal Gazette
(BAnz.) of 5 August 2014

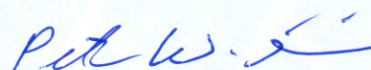
German Federal Environment Agency
Dessau, 9 September 2014



i. A. Dr. Marcel Langner

This certificate will expire on:
31 March 2019

TÜV Rheinland Energie und Umwelt GmbH
Cologne, 8 September 2014



ppa. Dr. Peter Wilbring

www.umwelt-tuv.de / www.eco-tuv.com
teu@umwelt-tuv.de
Tel. +49 221 806-5200

TÜV Rheinland Energie und Umwelt GmbH
Am Grauen Stein
51105 Cologne

Accreditation according to EN ISO/IEC 17025 and certified according to ISO 9001:2008.

Test report:	936/21218430/B of 2 April 2014
Initial certification:	1 April 2014
Expiry date:	31 March 2019
Publication:	BAnz AT 5 August 2014 B11, chapter I, no. 5.1

Approved application

The tested AMS is suitable for use at combustion plants according to Directive 2010/75/EU, chapter III. The measured ranges have been selected considering the wide application range of the AMS.

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a five-month field test at a municipal waste incinerator.

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

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 936/21218430/B of 2 April 2014 of TÜV Rheinland Energie und Umwelt 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 5 August 2014 B11, chapter I, no. 5.1
UBA announcement of 17 July 2014

AMS designation:

CEMS for CO, NO, NO₂, NO_x, SO₂, CO₂ and O₂

Manufacturer:

Kontram Oy, Helsinki, Finland

Field of application:

For measurements at plants according to Directive 2010/75/EU, chapter III combustion plants

Measuring ranges during the performance test:

Module	Components	Certification range	Supplementary ranges	Unit
CEMS T60i	CO	0 - 250	0 - 3125	mg/m ³
	NO	0 - 121	0 - 2680	mg/m ³
	NO ₂	0 - 185	0 - 1025	mg/m ³
	NO _x *	0 - 185	0 - 4097	mg/m ³
	SO ₂	0 - 486	0 - 5720	mg/m ³
	CO ₂	0 - 25	-	Vol.-%
	O ₂	0 - 25	-	Vol.-%
CEMS S4900	CO	0 - 125	0 - 625	mg/m ³
CEMS S4900	NO	0 - 121	0 - 1340	mg/m ³
CEMS S4900	O ₂	0 - 25	-	Vol.-%
CEMS S4900	SO ₂	0 - 486	0 - 2860	mg/m ³

*NO_x = NO as NO₂ + NO

Software versions:

S4900: 4000/653 rev3

T60i: 01.10.04.329, fw 11.19.119, detector fw 02.03.014

Restriction:

The CEMS-T60i module did not fulfil the performance criterion in accordance with EN 15267-3 as related to cross-sensitivities for the component CO as opposed to HCl at concentrations > 50 mg/m³.

Notes:

- The maintenance interval is four weeks. In the event of extending the CEMS measuring system by additional modules/components, the maintenance interval shall be determined upon proper installation.
- The functionality of a particular assembly of modules shall be checked in the context of verifying proper installation.
- The measuring system Kontram CEMS is a modular system in which two analysers can be integrated.
CEMS a T60i
CEMS b T60i + S4900
CEMS c S4900
CEMS d S4900 + S4900
- A type S4900 analyser can accommodate measuring cells for up to 3 different components.
- The T60i analyser measures both NO and NO₂ and can also output NO_x as a calculated total.
- Supplementary testing (extension to include the component O₂ for T60i and S4900 as well as an extension to include to a second type of gas sampling probe) as regards Federal Environmental Agency notices of 27 February 2014 (Federal Gazette (BAnz) AT 1 April 2014 B12, chapter I, no. 4.1).

Test report:

TÜV Rheinland Energie und Umwelt GmbH, Cologne

Report no.: 936/21218430/B of 2 April 2014

Certified product

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

The measuring system is a modular system comprising up to two different analysers of type T60i and/or S4900.

The tested measuring system comprises:

- Heated sample gas probe
 - JCT, type JES301 with gas filter element (SiC 2 µm) or
 - Bühler TYP GAS 222.20 with gas filter element (ceramic 3 µm)
- 50 m heated sampling hose in the field test, 180 °C, 6 mm PTFE gas tubing (a heated 5 m sampling hose was used in the laboratory)
- Measuring cabinet CEMS with sample gas pump (ejection pump)
Permeation dryer (PD-100T-24MSS, Permapure)
Flow volume regulator
- Up to two analyser modules (T60i, T60i + S4900 or 2 x S4900)

Analyser module T60i

The T60i module measures exhaust gas components using a non-dispersive infra-red analyser (NDIR) (this means that the measuring system uses optical band-pass filters as opposed to diffraction gratings or prisms).

For oxygen a paramagnetic oxygen measuring cell is used.

Analyser module S4900

A separate measuring cell with single-beam measurement with gas filter correlation is used for carbon monoxide, nitrogen monoxide and sulphur dioxide.

For oxygen a paramagnetic oxygen measuring cell is used.

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 Energie und Umwelt 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 can be applied to the product or used in publicity material for the certified product.

This document as well as the certification mark remains property of TÜV Rheinland Energie und Umwelt GmbH. With revocation of the publication the certificate loses its validity. After the expiration of the certificate and on requests of the TÜV Rheinland Energie und Umwelt 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.

Certification of CEMS for CO, NO, NO₂, NO_x, SO₂, CO₂ and O₂ 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. 0000040210: 29 April 2014
Expiry date of the certificate: 31 March 2019
Test report: 936/21218430/A of 8 October 2013
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Publication: BAnz AT 1 April 2014 B12, chapter I, no. 4.1
UBA announcement of 27 February 2014

Supplementary testing according to EN 15267

Certificate no. 0000040210_01: 9 September 2014
Expiry date of the certificate: 31 March 2019
Test report: 936/21218430/B of 2 April 2014
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Publication: BAnz AT 5 August 2014 B11, chapter I, no. 5.1
UBA announcement of 17 July 2014

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

Measuring system

Manufacturer	Kontram Oy
AMS designation	CEMS_S4900
Serial number of units under test	CEMS 1 / CEMS 2
Measuring principle	IR-Spectroscopy

Test report

Test laboratory	TÜV Rheinland
Date of report	2014-04-02

Measured component

Certification range	CO 0 - 125 mg/m ³
---------------------	---------------------------------

Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	1.10 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at span point	1.60 mg/m ³
Sum of negative CS at span point	-2.70 mg/m ³
Maximum sum of cross-sensitivities	-2.70 mg/m ³
Uncertainty of cross-sensitivity	-1.559 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

			u ²
Standard deviation from paired measurements under field conditions *	u _D	0.613 mg/m ³	0.376 (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}	-0.869 mg/m ³	0.755 (mg/m ³) ²
Span drift from field test	u _{d,s}	2.983 mg/m ³	8.898 (mg/m ³) ²
Influence of ambient temperature at span	u _t	1.274 mg/m ³	1.623 (mg/m ³) ²
Influence of supply voltage	u _v	0.611 mg/m ³	0.373 (mg/m ³) ²
Cross-sensitivity (interference)	u _i	-1.559 mg/m ³	2.430 (mg/m ³) ²
Influence of sample gas flow	u _p	-0.150 mg/m ³	0.023 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm}	1.010 mg/m ³	1.021 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)

$$u_c = \sqrt{\sum (u_{\max, j})^2} \quad 3.98 \text{ mg/m}^3$$

Total expanded uncertainty

$$U = u_c \cdot k = u_c \cdot 1.96 \quad 7.80 \text{ mg/m}^3$$

Relative total expanded uncertainty

Requirement of 2010/75/EU

Requirement of EN 15267-3

U in % of the ELV 110 mg/m³	7.1
U in % of the ELV 110 mg/m³	10.0
U in % of the ELV 110 mg/m ³	7.5

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

Measuring system

Manufacturer	Kontram Oy
AMS designation	CEMS_S4900
Serial number of units under test	CEMS 1 / CEMS 2
Measuring principle	IR-Spectroscopy

Test report

Test laboratory	936/21218430/B
Date of report	TÜV Rheinland
	2014-04-02

Measured component

Certification range	NO	0 - 121 mg/m ³
---------------------	----	---------------------------

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	-1.45 mg/m ³
Sum of positive CS at span point	0.80 mg/m ³
Sum of negative CS at span point	-3.00 mg/m ³
Maximum sum of cross-sensitivities	-3.00 mg/m ³
Uncertainty of cross-sensitivity	-1.732 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

			u ²
Standard deviation from paired measurements under field conditions *	u _D	1.867 mg/m ³	3.486 (mg/m ³) ²
Lack of fit	u _{lof}	-0.629 mg/m ³	0.396 (mg/m ³) ²
Zero drift from field test	u _{d,z}	-1.707 mg/m ³	2.914 (mg/m ³) ²
Span drift from field test	u _{d,s}	-2.096 mg/m ³	4.393 (mg/m ³) ²
Influence of ambient temperature at span	u _t	2.095 mg/m ³	4.389 (mg/m ³) ²
Influence of supply voltage	u _v	0.407 mg/m ³	0.166 (mg/m ³) ²
Cross-sensitivity (interference)	u _i	-1.732 mg/m ³	3.000 (mg/m ³) ²
Influence of sample gas flow	u _p	-0.332 mg/m ³	0.110 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm}	0.978 mg/m ³	0.957 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u _c)	$u_c = \sqrt{\sum (u_{max, i})^2}$	4.45 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	8.72 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU

Requirement of EN 15267-3

U in % of the ELV 60 mg/m³	14.5
U in % of the ELV 60 mg/m³	20.0
U in % of the ELV 60 mg/m³	15.0

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

Measuring system

Manufacturer	Kontram Oy
AMS designation	CEMS_S4900
Serial number of units under test	CEMS 1 / CEMS 2
Measuring principle	Paramagnetic

Test report

Test laboratory	936/21218430/B
Date of report	TÜV Rheinland
	2014-04-02

Measured component

Certification range	O ₂	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 positive CS at span point	0.00	Vol.-%
Sum of negative CS at span point	-0.37	Vol.-%
Maximum sum of cross-sensitivities	-0.37	Vol.-%
Uncertainty of cross-sensitivity	-0.214	Vol.-%

Calculation of the combined standard uncertainty

Tested parameter

				u^2
Standard deviation from paired measurements under field conditions *	u_D	0.100	Vol.-%	0.010 (Vol.-%) ²
Lack of fit	u_{lof}	0.058	Vol.-%	0.003 (Vol.-%) ²
Zero drift from field test	$u_{d,z}$	-0.081	Vol.-%	0.007 (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	0.118	Vol.-%	0.014 (Vol.-%) ²
Influence of supply voltage	u_v	0.017	Vol.-%	0.000 (Vol.-%) ²
Cross-sensitivity (interference)	u_i	-0.214	Vol.-%	0.046 (Vol.-%) ²
Influence of sample gas flow	u_p	-0.057	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 span" or
"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)	$u_c = \sqrt{\sum (u_{max, j})^2}$	0.37	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.72	Vol.-%

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the range 25 Vol.-%	2.9
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/EU on industrial emissions provides no requirements for this component.
The chosen value is recommended by the certification body.

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

Measuring system

Manufacturer	Kontram Oy
AMS designation	CEMS_S4900
Serial number of units under test	CEMS 1 / CEMS 2
Measuring principle	IR-Spectroscopy

Test report

Test laboratory	936/21218430/B
Date of report	TÜV Rheinland
	2014-04-02

Measured component

Certification range	SO ₂	0 - 486 mg/m ³
---------------------	-----------------	---------------------------

Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	2.29 mg/m ³
Sum of negative CS at zero point	-2.99 mg/m ³
Sum of positive CS at span point	12.50 mg/m ³
Sum of negative CS at span point	-19.37 mg/m ³
Maximum sum of cross-sensitivities	-19.37 mg/m ³
Uncertainty of cross-sensitivity	-11.185 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

			u ²
Standard deviation from paired measurements under field conditions *	u _D	4.490 mg/m ³	20.160 (mg/m ³) ²
Lack of fit	u _{lof}	2.296 mg/m ³	5.272 (mg/m ³) ²
Zero drift from field test	u _{d,z}	-4.186 mg/m ³	17.523 (mg/m ³) ²
Span drift from field test	u _{d,s}	8.418 mg/m ³	70.863 (mg/m ³) ²
Influence of ambient temperature at span	u _t	2.784 mg/m ³	7.751 (mg/m ³) ²
Influence of supply voltage	u _v	2.750 mg/m ³	7.563 (mg/m ³) ²
Cross-sensitivity (interference)	u _i	-11.185 mg/m ³	125.104 (mg/m ³) ²
Influence of sample gas flow	u _p	-1.169 mg/m ³	1.367 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm}	3.928 mg/m ³	15.431 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u _c)	$u_c = \sqrt{\sum (u_{\max, j})^2}$	16.46 mg/m ³
Total expanded uncertainty	$U = u_c \cdot k = u_c \cdot 1.96$	32.27 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the ELV 250 mg/m³	12.9
Requirement of EN 15267-3	U in % of the ELV 250 mg/m³	20.0
	U in % of the ELV 250 mg/m³	15.0

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

Measuring system

Manufacturer	Kontram Oy
AMS designation	CEMS_T60i
Serial number of units under test	CEMS 1 / CEMS 2
Measuring principle	IR-Spectroscopy

Test report

Test laboratory	936/21218430/B
Date of report	TÜV Rheinland
	2014-04-02

Measured component

Certification range	CO	0 - 250 mg/m ³
---------------------	----	---------------------------

Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	1.20 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at span point	9.60 mg/m ³
Sum of negative CS at span point	-8.30 mg/m ³
Maximum sum of cross-sensitivities	9.60 mg/m ³
Uncertainty of cross-sensitivity	5.543 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

	u_i		u^2
Repeatability standard deviation at set point *	u_r	1.006 mg/m ³	1.012 (mg/m ³) ²
Lack of fit	u_{lof}	1.155 mg/m ³	1.334 (mg/m ³) ²
Zero drift from field test	$u_{d,z}$	0.239 mg/m ³	0.057 (mg/m ³) ²
Span drift from field test	$u_{d,s}$	1.465 mg/m ³	2.146 (mg/m ³) ²
Influence of ambient temperature at span	u_t	1.553 mg/m ³	2.412 (mg/m ³) ²
Influence of supply voltage	u_v	1.189 mg/m ³	1.414 (mg/m ³) ²
Cross-sensitivity (interference)	u_i	5.543 mg/m ³	30.725 (mg/m ³) ²
Influence of sample gas flow	u_p	-1.293 mg/m ³	1.672 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u_{rm}	2.021 mg/m ³	4.083 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_c)	$u_c = \sqrt{\sum (u_{max, j})^2}$	6.70 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	13.13 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU

Requirement of EN 15267-3

U in % of the ELV 175 mg/m³	7.5
U in % of the ELV 175 mg/m³	10.0
U in % of the ELV 175 mg/m ³	7.5

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

Measuring system

Manufacturer	Kontram Oy
AMS designation	CEMS_T60i
Serial number of units under test	CEMS 1 / CEMS 2
Measuring principle	IR-Spectroscopy

Test report

Test laboratory	936/21218430/B
Date of report	TÜV Rheinland
	2014-04-02

Measured component

Certification range	CO ₂	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 positive CS at span point	0.20	Vol.-%
Sum of negative CS at span point	-0.80	Vol.-%
Maximum sum of cross-sensitivities	-0.80	Vol.-%
Uncertainty of cross-sensitivity	-0.462	Vol.-%

Calculation of the combined standard uncertainty

Tested parameter

				u^2
Standard deviation from paired measurements under field conditions *	u_D	0.182	Vol.-%	0.033 (Vol.-%) ²
Lack of fit	u_{lof}	0.058	Vol.-%	0.003 (Vol.-%) ²
Zero drift from field test	$u_{d,z}$	-0.075	Vol.-%	0.006 (Vol.-%) ²
Span drift from field test	$u_{d,s}$	0.294	Vol.-%	0.086 (Vol.-%) ²
Influence of ambient temperature at span	u_t	0.208	Vol.-%	0.043 (Vol.-%) ²
Influence of supply voltage	u_v	0.051	Vol.-%	0.003 (Vol.-%) ²
Cross-sensitivity (interference)	u_i	-0.462	Vol.-%	0.213 (Vol.-%) ²
Influence of sample gas flow	u_p	0.078	Vol.-%	0.006 (Vol.-%) ²
Uncertainty of reference material at 70% of certification range	u_{rm}	0.202	Vol.-%	0.041 (Vol.-%) ²

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

Combined standard uncertainty (u_c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.66	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	1.29	Vol.-%

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the range 25 Vol.-%	5.2
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/EU on industrial emissions provides no requirements for this component.
The chosen value is recommended by the certification body.

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

Measuring system

Manufacturer	Kontram Oy
AMS designation	CEMS_T60i
Serial number of units under test	CEMS 1 / CEMS 2
Measuring principle	IR-Spectroscopy

Test report

Test laboratory	936/21218430/B TÜV Rheinland
Date of report	2014-04-02

Measured component

Certification range	NO 0 - 121 mg/m ³
---------------------	---------------------------------

Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	0.64 mg/m ³
Sum of negative CS at zero point	-2.11 mg/m ³
Sum of positive CS at span point	2.90 mg/m ³
Sum of negative CS at span point	-1.50 mg/m ³
Maximum sum of cross-sensitivities	2.90 mg/m ³
Uncertainty of cross-sensitivity	1.677 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

			u ²
Standard deviation from paired measurements under field conditions *	u _D	1.662 mg/m ³	2.762 (mg/m ³) ²
Lack of fit	u _{lof}	-0.692 mg/m ³	0.479 (mg/m ³) ²
Zero drift from field test	u _{d,z}	1.648 mg/m ³	2.716 (mg/m ³) ²
Span drift from field test	u _{d,s}	2.096 mg/m ³	4.393 (mg/m ³) ²
Influence of ambient temperature at span	u _t	1.234 mg/m ³	1.523 (mg/m ³) ²
Influence of supply voltage	u _v	0.404 mg/m ³	0.163 (mg/m ³) ²
Cross-sensitivity (interference)	u _i	1.677 mg/m ³	2.812 (mg/m ³) ²
Influence of sample gas flow	u _p	0.568 mg/m ³	0.323 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm}	0.978 mg/m ³	0.957 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u _c)	$u_c = \sqrt{\sum (u_{max, j})^2}$	4.02 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	7.87 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU

Requirement of EN 15267-3

U in % of the ELV 55 mg/m³	14.3
U in % of the ELV 55 mg/m³	20.0
U in % of the ELV 55 mg/m³	15.0

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

Measuring system

Manufacturer	Kontram Oy
AMS designation	CEMS_T60i
Serial number of units under test	CEMS 1 / CEMS 2
Measuring principle	IR-Spectroscopy

Test report

Test laboratory	936/21218430/B
Date of report	TÜV Rheinland
	2014-04-02

Measured component

Certification range	NO ₂	0 - 185 mg/m ³
---------------------	-----------------	---------------------------

Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	2.06 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at span point	3.02 mg/m ³
Sum of negative CS at span point	-6.11 mg/m ³
Maximum sum of cross-sensitivities	-6.11 mg/m ³
Uncertainty of cross-sensitivity	-3.527 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

			u ²
Repeatability standard deviation at set point *	u _r	0.766 mg/m ³	0.587 (mg/m ³) ²
Lack of fit	u _{lof}	-1.186 mg/m ³	1.407 (mg/m ³) ²
Zero drift from field test	u _{d,z}	2.601 mg/m ³	6.765 (mg/m ³) ²
Span drift from field test	u _{d,s}	3.031 mg/m ³	9.187 (mg/m ³) ²
Influence of ambient temperature at span	u _t	1.682 mg/m ³	2.829 (mg/m ³) ²
Influence of supply voltage	u _v	0.981 mg/m ³	0.962 (mg/m ³) ²
Cross-sensitivity (interference)	u _i	-3.527 mg/m ³	12.440 (mg/m ³) ²
Influence of sample gas flow	u _p	1.743 mg/m ³	3.038 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm}	1.495 mg/m ³	2.236 (mg/m ³) ²

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

Combined standard uncertainty (u _c)	$u_c = \sqrt{\sum (u_{max, i})^2}$	6.28 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	12.31 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the ELV 85 mg/m³	14.5
Requirement of EN 15267-3	U in % of the ELV 85 mg/m³	20.0
	U in % of the ELV 85 mg/m³	15.0

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

Measuring system

Manufacturer	Kontram Oy
AMS designation	CEMS_T60i
Serial number of units under test	CEMS 1 / CEMS 2
Measuring principle	Paramagnetic

Test report

Test laboratory	936/21218430/B
Date of report	TÜV Rheinland
	2014-04-02

Measured component

Certification range	O ₂	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 positive CS at span point	0.00	Vol.-%
Sum of negative CS at span point	-0.33	Vol.-%
Maximum sum of cross-sensitivities	-0.33	Vol.-%
Uncertainty of cross-sensitivity	-0.191	Vol.-%

Calculation of the combined standard uncertainty

Tested parameter

				u ²
Standard deviation from paired measurements under field conditions *	u _D	0.101	Vol.-%	0.010 (Vol.-%) ²
Lack of fit	u _{lof}	0.052	Vol.-%	0.003 (Vol.-%) ²
Zero drift from field test	u _{d,z}	-0.087	Vol.-%	0.008 (Vol.-%) ²
Span drift from field test	u _{d,s}	0.115	Vol.-%	0.013 (Vol.-%) ²
Influence of ambient temperature at span	u _t	0.076	Vol.-%	0.006 (Vol.-%) ²
Influence of supply voltage	u _v	0.021	Vol.-%	0.000 (Vol.-%) ²
Cross-sensitivity (interference)	u _i	-0.191	Vol.-%	0.036 (Vol.-%) ²
Influence of sample gas flow	u _p	0.021	Vol.-%	0.000 (Vol.-%) ²
Uncertainty of reference material at 70% of certification range	u _{rm}	0.202	Vol.-%	0.041 (Vol.-%) ²

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

Combined standard uncertainty (u _c)	$u_c = \sqrt{\sum (u_{max,j})^2}$	0.34	Vol.-%
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	0.67	Vol.-%

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the range 25 Vol.-%	2.7
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/EU on industrial emissions provides no requirements for this component.
The chosen value is recommended by the certification body.

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

Measuring system

Manufacturer	Kontram Oy
AMS designation	CEMS_T60i
Serial number of units under test	CEMS 1 / CEMS 2
Measuring principle	IR-Spectroscopy

Test report

Test laboratory	936/21218430/B
Date of report	TÜV Rheinland
	2014-04-02

Measured component

Certification range	SO ₂	0 - 486 mg/m ³
---------------------	-----------------	---------------------------

Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point	4.03 mg/m ³
Sum of negative CS at zero point	0.00 mg/m ³
Sum of positive CS at span point	0.00 mg/m ³
Sum of negative CS at span point	-11.25 mg/m ³
Maximum sum of cross-sensitivities	-11.25 mg/m ³
Uncertainty of cross-sensitivity	-6.498 mg/m ³

Calculation of the combined standard uncertainty

Tested parameter

			u ²
Standard deviation from paired measurements under field conditions *	u _D	3.173 mg/m ³	10.068 (mg/m ³) ²
Lack of fit	u _{lof}	-2.296 mg/m ³	5.272 (mg/m ³) ²
Zero drift from field test	u _{d,z}	-0.982 mg/m ³	0.964 (mg/m ³) ²
Span drift from field test	u _{d,s}	8.418 mg/m ³	70.863 (mg/m ³) ²
Influence of ambient temperature at span	u _t	1.353 mg/m ³	1.831 (mg/m ³) ²
Influence of supply voltage	u _v	1.305 mg/m ³	1.703 (mg/m ³) ²
Cross-sensitivity (interference)	u _i	-6.498 mg/m ³	42.224 (mg/m ³) ²
Influence of sample gas flow	u _p	-1.052 mg/m ³	1.107 (mg/m ³) ²
Uncertainty of reference material at 70% of certification range	u _{rm}	3.928 mg/m ³	15.431 (mg/m ³) ²

* The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u _c)	$u_c = \sqrt{\sum (u_{max, j})^2}$	12.23 mg/m ³
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$	23.96 mg/m ³

Relative total expanded uncertainty

Requirement of 2010/75/EU	U in % of the ELV 160 mg/m³	15.0
Requirement of EN 15267-3	U in % of the ELV 160 mg/m³	20.0
	U in % of the ELV 160 mg/m³	15.0

CONFIRMATION

Notification: 0000040210_01_01
on changes according to EN 15267 regarding certificate 0000040210_01 dated 9 September 2014

Measuring system: CEMS for CO, NO, NO₂, NO_x, SO₂, CO₂ and O₂

Manufacturer: Kontram Oy
Tuupakantie 32 a
01741 Vantaa
Finland

German Federal Environmental Agency (UBA)

**Announcement about the uniform practice in
monitoring emissions and ambient air.
dated 14 March 2016
Federal Gazette: BAnz AT 14.03.2016 B7**

**V. Notifications to the uniform practice for the continuous monitoring of
emission and ambient air:**

**24 Notification as regards Federal Environment Agency (UBA) notices of
17 July 2014 (BAnz AT 05.08.2014 B11, chapter I No. 5.1)**

The CEMS measuring system for CO, NO, NO₂, NO_x, SO₂, CO₂ and O₂ manufactured by Kontram Oy was technically revised. For the new version, a steel door with an integrated control display replaced the original transparent front door. This display serves as the central control unit for the temperature of the gas conditioning and applying test gases.

A type 18112 pressure control manufactured by Fairchild replaced the type 16232 by the same manufacturer which had previously been used. The ejector pump for the purge air of the permeation dryer was relocated to the SCU unit. If the CEMS T60i measurement unit is in-built, an external humidity sensor is not required. In that case the internal humidity sensor of the CEMS T60i module is used to protect the system from drops of water.

The new version of the measuring equipment is renamed to „Smart CEMS instead of CEMS.

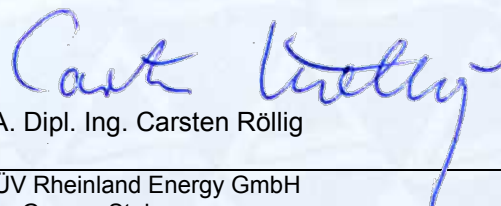
The new software version of the analyser module CEMS T60i is: 02.02.08.

Statement of TÜV Rheinland Energie und Umwelt GmbH of 23 October 2015

TÜV Rheinland Energy GmbH
Cologne, 26 April 2016



i. V. Dipl.-Ing. Guido Baum



i. A. Dipl. Ing. Carsten Röllig

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

TÜV Rheinland Energy GmbH
Am Grauen Stein
51105 Cologne

Test institute accredited to EN ISO/IEC 17025:2005 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.