



CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000040210 03

AMS designation:

Smart CEMS for CO, NO, NO2, NOX, SO2, CO2 and O2

Manufacturer:

Kontram Oy Tuupakantie 32 a 01740 Vantaa Finland

Test Laboratory:

TÜV Rheinland Energy GmbH

TÜVRheinland

CERTIFIED

This is to ce tify that the AMS has been tested

Certification is awarded in respect of the conditions stated in this certificate ate contain

certificate (

Suitability EN 15267 QAL1 Certified Regular Surveillance

0000402

01 of 01

www.tuv.com ID 0000040210

Publication in the German Federal Gazette

(BAnz) of 01 April 2014

German Federal Environment Agency Dessau, 01 July 2020

Dr. Marcel Langner Head of Section II 4.1

This certificate will expire on:

30 June 2025

TÜV Rheinland Energy GmbH Cologne, 30 June 2020

D- Pel W.

ppa. Dr. Peter Wilbring

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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 certificate D-PL-11120-02-00.

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Certificate:

0000040210_03 / 01 July 2020



Test Report: 936/21218430/B dated 2 April 2014

Initial certification: 01 April 2014 Expiry date: 30 June 2025

Certificate: Renewal (of previous certificate 0000040210_01 dated

01 April 2019 valid until 30 June 2020)

Publication: BAnz AT 05.08.2014 B11, chapter I number 5.1

Approved application

The tested AMS is suitable for use at combustion plants according to Directive 2010/75/EU, chapter III (13th BImSchV). 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 five-months field test at a municipal waste incinerator.

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 of the basis of the regulation applied bloom time and the time testing. As changed in legal provisions are possible any potential or each uld ansure that this AMS is suitable for monitoring the limit values and except concentrations relevant to the application.

Any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for the intended purese.

Basis of the certification
This certification is based on:

- Test report 936/21218430/B dated 2 April 2014 issued by 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

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Certificate:

0000040210_03 / 01 July 2020



Publication in the German Federal Gazette: BAnz AT 05.08.2014 B11, chapter I number 5.1, UBA announcement dated 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 plants according to the 13th BImSchV

Measuring ranges during performance testing:

Module	Component	Certification	supplementary	Unit
Module		range	range	Offic
CEMS T60i	CO	0-250	0-3 125	mg/m³
	NO	0–121	0–2 680	mg/m³
	NO ₂	₽–185	■ 0–1 025	mg/m³
	NO _x *	0-185	097	mg/m³
	S D2	0-486	0-: 7: 0	ma 13
	V.02	0-25		Vol-%
	O_2	0–25		Vol%
CEMS S4900	CO	0–125	0–625	mg/m³
CEMS S4900	NO	0–121	0-1 340	mg/m³
CEMS 490		0=2		ol%
CEMS S490	S 2	0-486	0-2 86	r g/m³
$*NO_x = NO_a s NO_a$	$_{2} + 1 O_{2}$			

Software versions:

S4900: 4000/653 rev3

T60i: 01.10.04.329, fw 11.19.119, detector fw 02.03.014

Restriction:

For the component CO, the CEMS-T60i module did not meet the performance criterion specified by EN 15267-3 for the cross-sensitivity to HCl at concentrations > 50 mg/m³.

Notes:

- 1. 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.
- 2. The functionality of a particular assembly of modules shall be checked in the context of verifying proper installation.
- 3. The measuring system Kontram CEMS is a modular system in which two analysers can be integrated.

CEMS a T60i

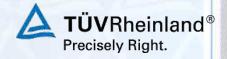
CEMS c S4900

CEMS b T60i + S4900

CEMS d S4900 + S4900

- 4. A type S4900 analyser can accommodate measuring cells for up to 3 different components.
- 5. The T60i analyser measures both NO and NO_2 and can also output NO_x as a calculated total.





6. Supplementary testing (extension to include the component O_2 for T60i and S4900 as well as an extension to include to a second type of gas sampling probe) as regards Federal Environment Agency notices of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter I number 4.1).

Test Report:

of "CEMS".

TÜV Rheinland Energie und Umwelt GmbH, Cologne Report no.: 936/21218430/B dated 2 April 2014

Publication in the German Federal Gazette: BAnz AT 14.03.2016 B7, chapter V notification 24, UBA announcement dated 18 February 2016:

Notification as regards Federal Environment Agency (UBA) notice of 17 July 2014 (BAnz AT 05.08.2014 B11, chapter I number 5.1).

The CEMS measuring system for CC NO, NO, NO, SC CO, and a promote cured by Kontrain Oversity been regised technically. For the new version, set of door with an attegrated ontrail casp by as applaced the briginal transparer front door. This display serves as the central control unit for the temperature of gas conditioning and applying test gases. A type 18112 pressure control manufactured by Fairchild has replaced the type 16232 by the same manufacturer which had previously been used. The person parity for the surge air of the parity attended to the SC Coult. If the CENS T60ic heasurement unit is in-built, an external hunidity sensor is not required in that case the internal humidity sensor of the IEMS T60ic measurement constitution of the IEMS T60ic measurement water.

The new version of the measuring system has been renamed "Smart CEMS" instead

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

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 23 October 2015

Publication in the German Federal Gazette: BAnz AT 24.03.2020 B7, chapter IV notification 56, UBA announcement dated 24 February 2020:

Notification as regards Federal Environment Agency (UBA) notices of 17 February 2014 (BAnz AT 05.08.2014 B11, chapter I number 5.1) and of 18 July 2016 (BAnz AT 14.03.2016 B7, chapter V 24th notification)

The latest software version of the CEMS T60i measuring module in the Smart CEMS measuring system for CO, NO, NO₂, NO_x, SO₂, CO₂ and O₂ manufactured by Kontram Oy is: 02.02.09

Statement issued by TÜV Rheinland Energy GmbH dated 23 September 2019





Certified product

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

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

The tested AMS consist of:

- ➤ Heated sample gas probe
 - o 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 analyst ry nockness T60i, 16ti + \$1900 or \$2, \$4,00

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 rather than diffraction gravings or prisms).

For oxygen as ara magnetic oxygen measuring cells used.

Analyser module Sico

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 remarks

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 manufacturing process for 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 document as well as the certification mark remains property of TÜV Rheinland Energy GmbH. Upon revocation of the publication the certificate loses its validity. After the expiration of the certificate and on request of TÜV Rheinland Energy GmbH this document shall be returned and the certificate mark must no longer be used.

The relevant version of this certificate and its expiration date are also accessible on the internet a quark. Value of Since $\frac{1}{2}$





Document history

Certification of the Smart CEMS measuring system is based on the documents listed below and the regular, continuous surveillance of the manufacturer's quality management system:

Initial certification according to EN 15267

Certificate no. 0000040210:

29 April 2014

Expiry date of the certificate:

31 March 2019

Test report no.: 936/21218430/A dated 8 October 2013

TÜV Rheinland Energie und Umwelt GmbH, Cologne

Publication: BAnz AT 01.04.2014 B12, chapter I number 4.1

UBA announcement dated 27 February 2014

Supplementary testing according to EN 15267

Certificate no. 0000040210 01:

09 September 2014

Expiry date of the certificate:

31 March 2019

Test report no.: 936/21218430/B dated 2 April 2014

TÜV Rheinland Energie und Umwelt GmbH, Cologne

Publication: BAnz AT 05.08.2014 B11 chapter I number 5.1 UBA announcement dated 17 July 2014

Notifications in

Statement Issued by TÜV Rneinland Energie und Umweit Gmbl

Publication: BAnz AT 14.03.2016 B7, chapter V notification 24

UBA announcement dated 18 February 2016

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Renewal of

Certificate

Expiry date of the certificate:

30 June 2020

Notifications in accordance with EN 15267

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 23 September 2019 Publication: BAnz AT 24.03.2020 B7, chapter V notification 56 UBA announcement dated 24 February 2020

(software updates)

Renewal of the certificate

Certificate no. 0000040210_03:

01 July 2020

Expiry date of the certificate:

30 June 2025

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

Measuring system

Manufacturer
AMS designation
Serial number of units under test
Measuring principle

Test report

Test laboratory Date of report

Measured component

Certification range

Kontram Oy CEMS_S4900 CEMS 1 / CEMS 2 IR-Spectroscopy

936/21218430/B TÜV Rheinland 2014-04-02

CO

0 - 125 mg/m³

Evaluation of the cross-sensitivity (CS)

(system with largest CS)

Sum of positive CS at zero point
Sum of negative CS at zero point
Sum of positive CS at span point
Sum of negative CS at span point
Maximum survof chast-ensibilities
Uncertainty or cross sensibility

1.10 mg/m³
0.00 mg/m³
1.60 mg/m³
-2.70 mg/m³
2.71 mg/m³
-551 mg/m³

Calculation of the combined standard uncertainty

Tested parameter

Standard deviation from paired measurements under field conditions * up

Lack of fit
Zero drift from field test
Span drift from find tes
Influence of a poient ten perat re

Influence of supply voltage Cross-sensitivity (interference)

Influence of sample gas flow

Uncertainty of reference material at 70% of certification range

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

Combined standard uncertainty (u _C)
Total expanded uncertainty

Requirement of 2010/75/EU Requirement of EN 15267-3

u_D	0.613	mg/m³		0.376	(mg/m³)
u	577	mg/		0.5 3	(mg/m³)
$u_{d.z}$	-9869	mg/m³	, ,	0.75	(mg/m³)
U _{d.s}	2.983	mg/m³		8.89	(mg/m³)
u	1.274	mgl n³		1.67 3	(mg/m³)
u_v	0.611	mg/m ³		0.373	(mg/m³)
ui	-1.559	mg/m³		2.430	(mg/m³)
Up	-0.150	mg/m³		0.023	(mg/m³)
U _{rm}	1.010	mg/m³		1.021	(mg/m³)

$$u_c = \sqrt{\sum (u_{\text{max } j})^2}$$
 3.98 mg/m³
 $J = u_c * k = u_c * 1.96$ 7.80 mg/m³

7.1

10.0

7.5





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

calculation of overall uncertainty according	to EN 14101 und EN 10207 0
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	936/21218430/B
Test laboratory	TÜV Rheinland
Date of report	2014-04-02
Measured component	NO
Certification range	0 - 121 mg/m³
Evaluation of the cross-sensitivity (CS)	
(system with largest CS)	
Sum of positive CS at zero point	0.00 mg/m³
Sum of negative CS at zero point	-1.45 mg/m³
Sum of postive CS at span point	0.80 mg/m³
Sum of negative CS at span point	-3.00 mg/m³
Maximum sum of cross-sensitivities	-3.00 mg/m³
Uncertainty of cross-sensitivity	-1.732 mg/m³
Calculation on the combined standard in certain	d cinco
Tested perameter	
Standard deviation from pail of measurable standard field	3.40 mg/m 3.40 3.40 mg/m^3
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 a lore, temperature at loan	$u_t = 95 \text{ mg/m}^3$ $(\text{mg/m}^3)^2$
Influence of supply valtage	$u_v = 0.47 \text{ mg/m}^3$ 0.166 $(\text{mg/m}^3)^2$
Cross-sensitivity (* terference)	$u_i = \frac{1}{32} \frac{mg/m^3}{mg/m^3} = \frac{3.000 (mg/m^3)^2}{mg/m^3}$
Influence of sample gas low	$u_p = 0.332 \text{ mg/m}^3 = 0.110 \text{ (mg/m}^3)^2$
	ange $u_m = 0.078 \text{ mg/m}$
* The larger value is used :	
"Repeatability standard deviation at span" or "Standard deviation from paired measurements under field	conditions"
panet medical find	
Combined standard uncertainty (u _C)	$u_{c} = \sqrt{\sum (u_{\text{max, j}})^{2}}$ 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/FII	

Requirement of EN 15267-3

U in % of the ELV 60 mg/m³	14.5
U in % of the ELV 60 mg/m ³	20.0
U in % of the ELV 60 mg/m ³	15.0





Measuring system					
Manufacturer	Kontram	Oy			
AMS designation	CEMS_S	4900			
Serial number of units under test	CEMS 1	CEM	S 2		
Measuring principle	Paramag	netic			
Test report	936/2121	8430/	В		
Test laboratory	TÜV Rhe	inland			
Date of report	2014-04-0	02			
Measured component	O ₂				
Certification range	0 -	25	Vol%		
Evaluation of the cross-sensitivity (CS)					
(system with largest CS)					
Sum of positive CS at zero point			Vol%		
Sum of negative CS at zero point			Vol%		
Sum of postive CS at span point			Vol%		
Sum of negative CS at span point			Vol%		
Maximum sum of cross-sensitivities			Vol%		
Uncertainty of cross-sensitivity	-0.	.274	Vol%		
Calculation on the combined standard or certain Tested parameter Standard deviation from paired measurements and or field and income.) 0	/ol-%		(ol%) ²
Lack of fit	u _{lof} 0.	.058	Vol%	0.003	(Vol%) ²
Zero drift from field test		.081	Vol%	0.007	(Vol%) ²
Span drift from field test		.098	Vol%	0.010	(Vol%) ²
Influence of a lore, temporal, re at loan	u _t	18	Vol%	JI	(Vol%) ²
Influence of supply saltage	$u_v = 0$.	7	Vol%	0.000	(Vol%) ²
Cross-sensitivity (interference)	u _i -6	Z 14_	Vol%	0.046	(Vol%) ²
Influence of sample gas low	u_p -0.	.057	VOI%	0.003	(Vol%) ²
Uncertainty confirmace in total at a confirmation range	u _{rn}	2	Vol%	04	(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)2	0.37	Vol%
Total expanded uncertainty	$U = u_c * k$				Vol%
rotal expanded uncertainty	J - u _c R	u _c	1.00	0.12	V OI /U
Relative total expanded uncertainty	U in % of	the r	ange 25 Vol%		2.9
Requirement of 2010/75/EU			ange 25 Vol%		10.0 **
Requirement of EN 15267-3			inge 25 Vol%		7.5
	S III 70 OI				

^{**} 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
AMS designation
Serial number of units under test
Measuring principle

CEMS_S4900 CEMS 1 / CEMS 2 IR-Spectroscopy

Test report Test laboratory Date of report

936/21218430/B TÜV Rheinland 2014-04-02

Kontram Oy

Measured component

SO₂

Certification range

0 -486 mg/m³

Evaluation of the cross-sensitivity (CS)

(system with largest CS)
Sum of positive CS at zero point
Sum of negative CS at zero point
Sum of postive CS at span point
Sum of negative CS at span point
Maximum_sum of cross-sensitivities
Uncertain of cross-sensitivity

2.29 mg/m³ -2.99 mg/m³ 12.50 mg/m³ mg/m³ -19.37 -19.37 mg/m³ -11. 85 mg/m³

Calculati Tested pa Standard

Lack of fit

Zero drift from field test Span drift from field test

Influence of ag Influence of supply Cross-sensitivity Influence of sa

 $(mg/m^3)^2$ 2.296 mg/m³ $u_{d,z}$ -4.186 mg/m³ 17.523 $(mg/m^3)^2$ mg/m³ 70.863 $(mg/m^3)^2$ $u_{d,s}$ 8.418 (mg/m³)²mg/m mg/m mg/m³)² mg/m³ mg/m³)²

Combined standard uncertainty (u_C) Total expanded uncertainty

()2		
$u_c = \sqrt{\sum (u_{\text{max, j}})^2}$	16.46	mg/m³
$U = u_c * k = u_c * 1.96$	32.27	mg/m³

Relative total expanded uncertainty Requirement of 2010/75/EU Requirement of EN 15267-3

U in % of the ELV 250 mg/m³	12.9
U in % of the ELV 250 mg/m ³	20.0
U in % of the ELV 250 mg/m ³	15.0

Uncertainty of The larger value is used

[&]quot;Repeatability standard deviation at span" or

[&]quot;Standard deviation from paired measurements under field conditions"





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		
7-1	02C/04240400/ID		
Test report	936/21218430/B		
Test laboratory	TÜV Rheinland		
Date of report	2014-04-02		
Measured component	CO		
Certification range	0 - 250 mg/m³		
ooranioanion rango	2555		
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point	1.20 mg/m³		
Sum of negative CS at zero point	0.00 mg/m³		
Sum of postive CS at span point	9.60 mg/m³		
Sum of negative CS at span point	-8.30 mg/m³		
Maximum sum of cross-sensitivities	9 <u>.6</u> 0 mg/m³		
Uncertainty of cross-sensitivity	5.543 mg/m³		
	CIDOO		
Calculation of the combined standard a certain			
Tested parameter			
Repeatability standard deviation at Securit.*	1.016 mg/m 1.012 (mg/m³) ²		
Zero drift from field test	u _{lof} 1.155 mg/m³ 1.334 (mg/m³)² u _{fl z} 0.239 mg/m³ 0.057 (mg/m³)²		
Span drift from field test	4,2		
	4 · · · · · · · · · · · · · · · · · · ·		
Influence of avoice, tem arable at pain Influence of supply altale	u_t 1.53 mg/m ³ u_v 1.69 mg/m ³ 1.414 (mg/m ³) ²		
Cross-sensitivity (* kerfe ence)	u_i 1.414 (mg/m) u_i 3.43 mg/m ³ 0.725 (mg/m ³) ²		
Influence of sample gas low	u_p 1.293 mg/m ³ 1.672 (mg/m ³) ²		
Uncertainty and force hat coal at 60% feet and imprange	u _m 1.266 mg/m 1.072 (mg/m³) ² (mg/m³) ²		
ango	(mg/m)		

Uncertainty confidence in the all at * The larger value is used :

"Repeatability standard deviation at span" or

Con Tota

ombined standard uncertainty (u _C)	$u_c = \sqrt{\sum_i (u_{max, j})}$	6.70	mg/m³
otal expanded uncertainty	$U = u_c * k = u_c * 1.96$	13.13	mg/m³

Relative total expanded uncertainty Requirement of 2010/75/EU Requirement of EN 15267-3

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

[&]quot;Standard deviation from paired measurements under field conditions"





Measuring system Manufacturer AMS designation Serial number of units under test	Kontram Oy CEMS_T60i CEMS 1 / CEMS 2		
Measuring principle	IR-Spectroscopy		
Test report Test laboratory Date of report	936/21218430/B 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 Sum of negative CS at zero point Sum of positive CS at span point Sum of negative CS at span point Sum of negative CS at span point Maximum sum of cross-sensitivities Uncertainty of cross-sensitivity	0.00 Vol% 0.00 Vol% 0.20 Vol% -0.80 Vol% -0.80 Vol% -0.462 Vol%		
Calculation on the combined standard occurain Tested point ter Standard deviation from paired measurants under field conditions * Lack of fit	S _D 0.432 /ol%		
Zero drift from field test Span drift from field test	$\begin{array}{ccccc} u_{d,z} & -0.075 & \text{Vol\%} & 0.006 & (\text{Vol\%})^2 \\ u_{d,s} & 0.294 & \text{Vol\%} & 0.086 & (\text{Vol\%})^2 \end{array}$		
Influence of according temperature at coarm Influence of supply I litable Cross-sensitivity (Ckerference) Influence of sample gas low	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		
Influence of sample gas low Uncertainty confidence in the all at the first per confidence range * The larger value is used: "Repeatability standard deviation at span" or "Standard deviation from paired measurements under field conditions"	u _p 0.078 vol% 0.006 (Vol%) ² (Vol%) ²		
Combined standard uncertainty (u _C)	$u_{c} = \sqrt{\sum (u_{\text{max, j}})^{2}}$ 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 Requirement of EN 15267-3	U in % of the range 25 Vol% 5.2 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.





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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	936/21218430/B
Test laboratory	TÜV Rheinland
Date of report	2014-04-02
Measured component	NO
Certification range	0 - 121 mg/m³
Evaluation of the cross-sensitivity (CS)	
(system with largest CS)	
Sum of positive CS at zero point	0.64 mg/m³
Sum of negative CS at zero point	-2.11 mg/m³
Sum of postive CS at span point	2.90 mg/m³
Sum of negative CS at span point	-1.50 mg/m³
Maximum sum of cross-sensitivities	2.90 mg/m³
Uncertainty of cross-sensitivity	1.077 mg/m³
Calculation of the combined standard occurain	d cinco
Calculation of the combined standard of certain Tested parameter	
Standard deviation from pailed measurants ande-	field distinous * up 1.632 .mg/m 2.762 .mg/m³)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 a wiew temporary te at warn	u_t 34 mg/m ³ σ_{zs} (mg/m ³) ²
Influence of supply litage	$u_v = 0.44 \text{ mg/m}^3$ 0.163 $(\text{mg/m}^3)^2$
Cross-sensitivity (interference)	u_i 2.812 (mg/m ³) ²
Influence of sample gas low	$u_p = 0.568 \frac{mg}{m^3} = 0.323 \frac{(mg/m^3)^2}{m^3}$
Uncertainty described at a language of the lan	range $u_m = 0.078 \text{ mg/m}^{-2}$ $(\text{mg/m}^3)^2$
* The larger value is used :	
"Repeatability standard deviation at span" or	old conditions"
"Standard deviation from paired measurements under fi	eia conditions
Combined standard uncertainty (u _C)	$u_{c} = \sqrt{\sum \left(u_{\text{max, j}}\right)^{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	U in % of the ELV 55 mg/m³	14.3
Requirement of 2010/75/EU	U in % of the ELV 55 mg/m ³	20.0
Requirement of EN 15267-3	U in % of the ELV 55 mg/m ³	15.0





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

Measuring system
Manufacturer
AMS designation
Serial number of units under test
Measuring principle
Test report
Test laboratory
Date of report
Measured component

Certification range

Evaluation of the cross-sensitivity (CS)
(system with largest CS)
Sum of positive CS at zero point
Sum of negative CS at zero point
Sum of postive CS at span point
Sum of negative CS at span point
Maximum sum of cross-sensitivities
Uncertainty of cross-sensitivity

Calculation of the combined standard of certain
Tested promoter
Repeatablety standard deviation at second.*

Lack of fit
Zero drift from field test
Span drift from field test
Influence of a point temporate at page.

Influence of supply solitate
Cross-sensitivity (factife ence)
Influence of sample gas low
Uncertainty configure last all at a factification
* The larger value is used:
"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined standard uncertainty (u_C)
Total expanded uncertainty

Relative total expanded uncertainty
Requirement of 2010/75/EU
Requirement of EN 15267-3

Kontram Oy		
CEMS_T60i		
CEMS 1 / CEMS 2		
IR-Spectroscopy		

936/21218430/B TÜV Rheinland 2014-04-02

 NO_2 0 - 185 mg/m³

3.02

2.06 mg/m³

0.00 mg/m³

mg/m³

mg/m³

mg/m³

	-3.527	mg/m³			
				2	
	0.36	mg/m		0.58.	mg/m³)²
u _{lof}	-1.186	mg/m³		1.407	$(mg/m^3)^2$
$u_{d,z}$	2.601	mg/m³	6	3.765	$(mg/m^3)^2$
$u_{d,s}$	3.031	mg/m³	9	9.187	(mg/m³)2
u _t	382	mg/m³		OZS	(mg/m³)2
u_v	0.9 1	mg/m³		.962	$(mg/m^3)^2$
u _i	-2 527	mg/m³	4	2.440	$(mg/m^3)^2$
U _n	1.743	mg/m³		8.038	$(mq/m^3)^2$

$$\begin{array}{lll} u_{c} = \sqrt{\sum \left(u_{max,\,j}\right)^{2}} & 6.28 & mg/m^{3} \\ U = u_{c} * k = u_{c} * 1.96 & 12.31 & mg/m^{3} \end{array}$$

U in % of the ELV 85 mg/m³	14.5
U in % of the ELV 85 mg/m ³	20.0
U in % of the ELV 85 mg/m ³	15.0





Measuring system			
Manufacturer	Kontram Oy		
AMS designation	CEMS_T60i		
Serial number of units under test	CEMS 1 / CEMS 2		
Measuring principle	Paramagnetic		
	000/01/01/01/0		
Test report	936/21218430/B		
Test laboratory	TÜV Rheinland		
Date of report	2014-04-02		
Measured component	O_2		
Certification range	0 - 25 Vol%		
Certification range	0 - 25 VOI70		
Evaluation of the cross-sensitivity (CS)			
(system with largest CS)			
Sum of positive CS at zero point	0.00 Vol%		
Sum of negative CS at zero point	0.00 Vol%		
Sum of postive CS at span point	0.00 Vol%		
Sum of negative CS at span point	-0.33 Vol%		
Maximum sum of cross-sensitivities	-0 <u>.3</u> 3 Vol%		
Uncertainty of cross-sensitivity	-0.191 Vol%		
Calculation on the combined standard or certain Tested perantiter	since		
Standard deviation from pailed measurant at sunder field and lions *	0.101 /ol% 0.01c /ol%) 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 account temperature at apart. Influence of supply solitate	$\begin{array}{cccccccccccccccccccccccccccccccccccc$		
Cross-sensitivity (ignerice ence)	u_i $v_{0.1-7}$ $v_{0.1-7}$ $v_{0.1-7}$ $v_{0.1-7}$ $v_{0.1-7}$ $v_{0.1-7}$ $v_{0.1-7}$ $v_{0.1-7}$		
Influence of sample gas low	u_p 0.021 vol% 0.000 (Vol%)		
Uncertainty configure to the sell at 1997 feet and the range	um 2002 Vol% (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)	$u_{c} = \sqrt{\sum (u_{\text{max, j}})^{2}}$ 0.34 Vol%		
Total expanded uncertainty	$U = u_c * k = u_c * 1.96$ 0.67 Vol%		
Total expanded differently	5 ac 1.55 0.07 vol70		
Relative total expanded uncertainty	U in % of the range 25 Vol% 2.7		
Requirement of 2010/75/EU	U in % of the range 25 Vol% 10.0 **		
Requirement of EN 15267-3	U in % of the range 25 Vol% 7.5		

^{**} The EU-directive 2010/75/EU on industrial emissions provides no requirements for this component. The chosen value is recommended by the certification body.





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

	system

Manufacturer
AMS designation
Serial number of units under test
Measuring principle

Kontram Oy CEMS_T60i CEMS 1 / CEMS 2 IR-Spectroscopy

Test report

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

Measured component

Certification range

 SO_2

0 - 486 mg/m³

Evaluation of the cross-sensitivity (CS)

(system with largest CS)
Sum of positive CS at zero point
Sum of negative CS at zero point
Sum of postive CS at span point

Sum of negative CS at span point Maximum sum of cross-sensitivities Uncertainty of cross-sensitivity 4.03 mg/m³
0.00 mg/m³
0.00 mg/m³
-11.25 mg/m³
-11.25 mg/m³
-6.498 mg/m³

-2.296

-0.982

8.418

 $u_{d,z}$

 u_t

mg/m³

mg/m³

mg/m³

mg/m

mg/m

mg/m³

Calculation of the combined standard receivaing Tested polariter Standard seviction from pailed measurantes and of field administrations.

Lack of fit

Zero drift from field test Span drift from field test

Influence of supply alta e Cross-sensitivity (interference)

Influence of sample gas of Uncertainty Conference In

at at a large

The larger value is used :

"Repeatability standard deviation at span" or

"Standard deviation from paired measurements under field conditions"

Combined	standard	uncertainty (u _c)
Total ovna	ndod uno	ortainty

$u_c = \sqrt{\sum (u_{\text{max } j})^2}$	
$U = u_c * k = u_c * 1.96$	į

12.23 mg/m³ 23.96 mg/m³

5.272

0.964

70.863

(mg/m3)2

 $(mg/m^3)^2$

 $(mq/m^3)^2$

mg/m³)² mg/m³)²

15.0

20.0

15.0

Relative total expanded uncertainty Requirement of 2010/75/EU

Requirement of EN 15267-3

U in % of the ELV 160 mg/m ³	
U in % of the ELV 160 mg/m ³	
U in % of the FLV 160 mg/m ³	