PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

AO2000 Series Multigas Analysers with SCC-K NO/NO_2 converter

Manufactured by:

ABB Automation GmbH

Stierstaedter Strasse 5
Frankfurt-am-main
D-60488
Germany

has been assessed by Sira Certification Service
And for the conditions stated on this certificate complies with:

MCERTS Performance Standards for Continuous Emission Monitoring Systems (CEMS), Version 4 dated July 2018
EN15267-3:2007,
& QAL 1 as defined in EN 14181: 2014

Certification Ranges :

CO	0 to 75 mg/m^3	to	0 to 4000 mg/m^3
NO	0 to 100 mg/m^3	to	0 to 5000 mg/m^3
NOx	0 to 150 mg/m^3	to	0 to 7500 mg/m^3
SO_2	0 to 75 mg/m^3	to	0 to 8000 mg/m^3
N_2O	0 to 100 mg/m^3	to	0 to 6700 mg/m^3
CO_2	0 to 20%vol		
O_2	0 to 10%vol	to	0 to 25%vol

Project No.:	674/0244/70164537
Certificate No:	Sira MC080121/15
Initial Certification:	17January 2008
This Certificate issued:	13 December 2019
Renewal Date:	13 January 2023

Emily Alexander
Environmental Project Engineer

MCERTS is operated on behalf of the Environment Agency by

Sira Certification Service
Unit 6, Hawarden Industrial Park
Hawarden, Deeside, CH5 3US
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Form 1335
Issue 8

Certificate Contents

Approved Site Application

Any potential user should ensure, in consultation with the manufacturer, that the monitoring system is suitable for the intended application. For general guidance on monitoring techniques refer to the Environment Agency Monitoring Technical Guidance Notes available at www.mcerts.net

On the basis of the assessment and the ranges required for compliance with EU Directives this instrument is considered suitable for use on waste incineration and large coal-fired combustion plant applications. This CEM has been proven suitable for its measuring task (parameter and composition of the flue gas) by use of the QAL 1 procedure specified in EN14181, for IED Chapter III and IED Chapter IV applications for the ranges specified. The lowest certified range for each determinand shall not be more than 1.5X the daily average emission limit value (ELV) for IED Chapter IV applications, and not more than 2.5X the ELV for IED Chapter III and other types of application.

Field test was performed on waste incinerator application for three months. Both the CEM1230KL and CEM2450 analysers were tested.

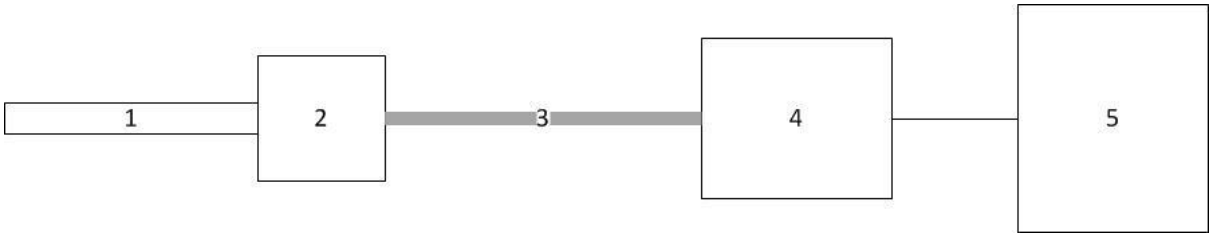
Basis of Certification

This certification is based on the following Test Report(s) and on Sira's assessment and ongoing surveillance of the product and the manufacturing process:

TUV SUD Report Number: 1710933 dated 30 September 2011
TUV Report Number 936/21236694/AE dated 20 March 2017

Product Certified

The AO2000 Series measuring system consists of the following parts:



1. Sample Probe	2. Heated Filter	3. Heated Sample Line	4. Gas Conditioning	5. Analyser
Model: PFE 2 Model No: 2308-0-5323010	Model: ABB ceramic filter, pore size <0.3µm	Model: ABB PTFE Length: 30m	Model: Advance SCC-C / SCC-F	Model: Uras 26 / Magnos 206 / Magnos 28 / O_2 Electro-chemical

Allowable variations could include:

- A different brand or model of sampling system of the same type, provided that there is evidence the alternative system works with similar types of CEM.
- Additional manifolds and heated valves used to allow more than one analyser to share a sampling system.
- SCC-K NO/NO2 converter (optional)

This certificate applies to all instruments fitted with software version 4.0.0 onwards (serial number 3.060607.T onwards).

Certified Performance

Ambient Temperature Range: +5°C to +40°C
Instrument IP rating: IP40 or IP54 (c/w protective case for cable connection)

Note: For outdoor installations the analyser needs to be mounted into an IP65 environment. If the instrument is supplied with an enclosure, then the ambient temperature shall be monitored inside the enclosure to ensure that it stays within the above ambient temperature range.

Please note, CEM1230KL includes the electrochemical oxygen measuring module, and CEM2450 includes the Magnos206 paramagnetic oxygen module.

Unless otherwise stated the evaluation was carried out on the certification range CO 0 to 75mg/m^3, NO 0 to 100mg/m^3, SO_2 0 to 75mg/m^3, N_2O 0 to 100mg/m^3, CO_2 0 to 20%vol and O_2 0 to 10%vol

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Response time (CEM1230KL)						
CO					66s	<200s
NO					68s	<200s
SO_2					139s	<200s
O_2					71s	<200s
Response time (CEM2450)						
CO_2					80s	<200s
NO					72s	<200s
N_2O					77s	<200s
O_2					51s	<200s
Response time (Magnos 28)						
O_2 (60m)					98s	<200s
O_2 (4m)					35s	<200s
Repeatability standard deviation at zero point (CEM1230KL)						
CO	0.01					<2%
NO	0.07					<2%
SO_2	0.13					<2%
O_2	0.01					<0.2%

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Repeatability standard deviation at zero point (CEM2450)						
CO_2	0.00					<2%
NO	0.03					<2%
N_2O	0.01					<2%
O_2	0.00					<0.2%
Repeatability standard deviation at zero point (Magnos 28)						
O_2	0.02					<0.2%
Repeatability standard deviation at reference point (CEM1230KL)						
CO	0.05					<2%
NO	0.05					<2%
SO_2	0.29					<2%
O_2	0.01					<0.2%
Repeatability standard deviation at reference point (CEM2450)						
CO_2	0.05					<2%
NO	0.07					<2%
N_2O	0.08					<2%
O_2	0.0					<0.2%
Repeatability standard deviation at reference point (Magnos 28)						
O_2	0.02					<0.2%
Lack-of-fit (CEM1230KL)						
CO	0.17					<2%
NO	0.23					<2%
SO_2	0.20					<2%
O_2	0.03					<0.2%
Lack-of-fit (CEM2450)						
CO_2	0.35					<2%
NO		-0.72				<2%
N_2O	0.11					<2%
O_2	0.03					<0.2%
Lack-of-fit (Magnos 28)						
O_2	0.03					<0.2%

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Influence of ambient temperature zero point (CEM1230KL)						
CO		0.7		3.1		<5%
NO						<5%
SO_2				-3.0		<5%
O_2	-0.07					<0.5%
Influence of ambient temperature zero point (CEM2450)						
CO_2	0.0		1.7			<5%
NO						<5%
N_2O		0.5				<5%
O_2	0.13					<0.5%
Influence of ambient temperature zero point (CEM1230)						
CO		0.7				<5%
SO_2		0.9				<5%
Influence of ambient temperature zero point (CEM1500)						
CO_2	0.1					<5%
CO	0.3					<5%
Influence of ambient temperature zero point (Magnos 28)						
O_2	0.1					<0.5%
Influence of ambient temperature reference point (CEM1230KL)						
CO			1.7			<5%
NO				3.9		<5%
SO_2				-2.2		<5%
O_2	-0.43					<0.5%

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Influence of ambient temperature reference point (CEM2450) CO_2 NO SO_2 O_2	 -0.10	 	 	 4.3 3.3 3.4		 <5% <5% <5% <0.5%
Influence of ambient temperature reference point (CEM1230) CO SO_2	 	 -0.7	 1.0 	 		 <5% <5%
Influence of ambient temperature reference point (CEM1500) CO_2 CO	 	 0.8	 	 2.1 		 <5% <5%
Influence of ambient temperature reference point (Magnos 28) O_2	 -0.08	 	 	 		 <0.5%
Influence of sample gas pressure					Note 1	<2.0%
Influence of sample gas flow for extractive (CEMS1230KL) CO NO SO_2 O_2	 -0.05	 -0.7 -0.5 	 -1.6 	 		 <2% <2% <2% <0.2%
Influence of sample gas flow for extractive (CEMS2450) CO_2 NO N_2O O_2	 -0.11	 -0.9 	 -1.7 -1.1 	 		 <2% <2% <2% <0.2%
Influence of sample gas flow for extractive (Magnos 28) O_2	 -0.10	 	 	 		 <0.2%

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2		<0.5	<1
Influence of voltage variations 190 to 250V (CEMS1230KL)						
CO	-0.2					<2%
NO	0.2					<2%
SO_2		0.5				<2%
O_2	0.03					<0.2%
Influence of voltage variations 190 to 250V (CEMS2450)						
CO_2	0.1					<2%
NO	0.3					<2%
N_2O	0.1					<2%
O_2	0.02					<0.2%
Influence of voltage variations 196 to 253V (Magnos 28)						
O_2	0.01					<0.2%
Influence of vibration (10 to 60Hz (±0.3mm), 60 to 150Hz at 19.6m/s^2)					Note 2	To be reported
Cross-sensitivity at zero with interferents O_2, H_2O, CO, CO_2, CH_4, N_2O, NO, NO_2, NH_3, SO_2, HCl, H_2S (CEM1230KL)						
CO				-2.4		<4%
NO				2.7		<4%
SO_2				3.3		<4%
O_2	0.1					<0.4%

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Cross-sensitivity at zero with interferents O_2, H_2O, CO, CO_2, CH_4, N_2O, NO, NO_2, NH_3, SO_2, HCl, H_2S (CEM2450)						
CO_2	0.0					<4%
NO			-1.9			<4%
N_2O				3.0		<4%
O_2	0.1					<0.4%
Cross-sensitivity at zero with interferents O_2, H_2O, CO, CO_2, CH_4, N_2O, NO, NO_2, NH_3, SO_2, HCl, H_2S (CEM1230)						
CO			1.9			<4%
SO_2				2.4		<4%
Cross-sensitivity at zero with interferents O_2, H_2O, CO, CO_2, CH_4, N_2O, NO, NO_2, NH_3, SO_2, HCl, H_2S (CEM1500)						
CO			1.2			<4%
Cross-sensitivity at zero with interferents CO, H_2O, CO_2, CH_4, N_2O, NO, NO_2, NH_3, SO_2, HCl (Magnos 28)						
O_2	0.0					<0.4%
Cross-sensitivity at reference with interferents O_2, H_2O, CO, CO_2, CH_4, N_2O, NO, NO_2, NH_3, SO_2, HCl, H_2S (CEM1230KL)						
CO				2.1		<4%
NO				-3.4		<4%
SO_2				3.9		<4%
O_2	0.0					<0.4%

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Cross-sensitivity at reference with interferents O_2, H_2O, CO, CO_2, CH_4, N_2O, NO, NO_2, NH_3, SO_2, HCl, H_2S (CEM2450)						
CO_2		-0.8				<4%
NO				-2.0		<4%
N_2O				3.6		<4%
O_2	-0.1					<0.4%
Cross-sensitivity at reference with interferents O_2, H_2O, CO, CO_2, CH_4, N_2O, NO, NO_2, NH_3, SO_2, HCl, H_2S (CEM1230)						
CO				3.6		<4%
SO_2				2.8		<4%
Cross-sensitivity at reference with interferents O_2, H_2O, CO, CO_2, CH_4, N_2O, NO, NO_2, NH_3, SO_2, HCl, H_2S (CEM1500)						
CO				4.0		<4%
Cross-sensitivity at reference with interferents CO, H_2O, CO_2, CH_4, N_2O, NO, NO_2, NH_3, SO_2, HCl (Magnos 28)						
O_2	0.0					<0.4%
Converter Efficiency					97.6%	>95%
Measurement uncertainty					NOTE 3	
CO					8.5%	Guidance - at least 25% below max permissible uncertainty
NO					17.6%	
SO_2					10.2%	
NO (200mg/m^3)					7.9%	
N_2O					5.4%	
O_2					4.2%	
O_2 (Magnos 28)					2.2%	

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Calibration function (field)						
CO					0.99	>0.95
NO					0.90	>0.95
SO_2					0.98	>0.95
NO (200mg/m^3)					0.96	>0.95
N_2O					0.90	>0.95
CO_2					0.99	>0.95
O_2					0.99	>0.95
O_2 (Magnos 28)					0.99	>0.95
Response time (field) (CEM1230KL)						
CO					104s	<200s
NO					104s	<200s
SO_2					194s	<200s
O_2					91s	<200s
Response time (field) (CEM2450)						
CO_2					103s	<200s
NO					102s	<200s
N_2O					119s	<200s
O_2					86s	<200s
Response time (field) (Magnos 28)						
O_2					40s	<200s
Lack of fit (field)						
CO			1.84			<2%
NO	0.31					<2%
SO_2						<2%
N_2O			1.69			<2%
CO_2	-0.36		1.61			<2%
O_2	-0.14					<0.2%
O_2 (Magnos 28)	0.06					<0.2%

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Maintenance interval Magnos 28 All other analysers					Note 4 4 weeks 3 weeks	 >8 days >8 days
Zero and Span drift requirement	URAS 26: The analyser is equipped with an internal auto-adjustment facility, operating with gas filled adjustment cells. A verification is required once a year with external reference gas. Magnos 206 & Oxygen Sensor: The analyser is equipped with automatic single-point adjustment during the maintenance interval, using ambient air. A verification of the analyser at the zero-point is required once a year. Magnos 28 If the automatic or manual single-point validation with ambient air is performed during the maintenance interval, a validation of the analyser at the zero-point is required once a year.					Clause 6.13 & 10.13 Manufacturer shall provide a description of the technique to determine and compensate for zero and span drift.
Change in zero point over maintenance interval (CEM1230KL) CO NO SO_2 O_2	 -0.5 0.6 -0.1		 1.2			 <3% <3% <3% <0.2%
Change in zero point over maintenance interval (CEM2450) CO_2 NO N_2O O_2	 0.1 0.3 -0.4 0.02					 <3% <3% <3% <0.2%
Change in zero point over maintenance interval (Magnos 28) O_2	 0.20					 <0.2%
Change in reference point over maintenance interval (CEM1230KL) CO NO SO_2 O_2	 0.08		 -2.0 2.0	 -2.7		 <3% <3% <3% <0.2%

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Change in reference point over maintenance interval (CEM2450) CO_2			-1.8			<3%
NO				2.5		<3%
N_2O				2.3		<3%
O_2	-0.05					<0.2%
Change in reference point over maintenance interval (Magnos 28)						
O_2	0.20					<0.2%
Availability						
CEM 1230KL					99.0%	>95%
CEM 2450					98.8%	(>98% for O_2)
Magnos 28					99.7%	
Reproducibility CEM1230 (field)						
CO		0.8				<3.3%
NO			1.9			<3.3%
SO_2			1.4			<3.3%
O_2	0.06					<0.2%
Reproducibility CEM2450 (field)						
CO_2	0.3					<3.3%
NO			1.3			<3.3%
N_2O			1.3			<3.3%
O_2	0.09					<0.2%
Reproducibility Magnos 28 (field)						
O_2	0.11					<0.2%

Note 1: Test not applicable as extractive analyser.
Note 2: Test not applicable as extractive analyser.
Note 3: The measurement uncertainty results for CO and NO (0 to 100 mg/m^3 range) meet the requirements of EN14181 (10% for CO & 20% for NO), but do not meet the recommendations of EN15267-3 (7.5% for CO & 15% for NO)
Note 4: If the analyser is fitted with calibration cells for particular gas or gases, then the span checks for these gases, using test-gases passed through the sampling system, need only take place during routine services. However, zero checks and span checks for oxygen will need to take place through the entire system at the maintenance interval.

Description

The AO2000 Series Continuous Gas Analysers, consisting of the model line AO2020 (19 inch rack mount) and AO2040 (Wall Mount), equipped with one module, or a combination of the following modules:

Infrared Analyser Module Uras 26
Paramagnetic Oxygen Module Magnos 206
Paramagnetic Oxygen Module Magnos 28
Electrochemical Oxygen Sensor

In its most extensive version, an AO2000 multi-analyser system consists of up to four analyser modules and it can measure six different components.

The system measures NOx by integrating the ABB SCC-K NO/NO_2 converter, which uses a molybdenum catalyst supported by carbon.

General Notes

1. This certificate is based upon the equipment tested. The Manufacturer is responsible for ensuring that on-going production complies with the standard(s) and performance criteria defined in this Certificate. 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 system shall be subject to regular surveillance according to 'Regulations Applicable to the Holders of Sira Certificates'.

2. The design of the product certified is defined in the Sira Design Schedule V10 for certificate No. Sira MC080121/15

3. If certified product is found not to comply, Sira Certification Service should be notified immediately at the address shown on this certificate.

3. The Certification Marks that can be applied to the product or used in publicity material are defined in 'Regulations Applicable to the Holders of Sira Certificates'.

4. This document remains the property of Sira and shall be returned when requested by the company.