

PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

AO2000 Series Multigas Analysers
with SCC-K NO/NO₂ converter

Manufactured by:

ABB AG

Stierstaedter Strasse 5
Frankfurt am Main
D-60488
Germany

has been assessed by CSA Group
and for the conditions stated on this certificate complies with:

Environment Agency Guidance
“MCERTS for stack emissions monitoring equipment at industrial installations”
- Continuous emissions monitoring systems (CEMS)
Published 20 October 2020
EN 15267-1:2009, EN15267-2:2009, EN 15267-3:2007
& 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
NO _x	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 ₂ O	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 number: 80151095
Certificate number: CSA MC080121/16
Initial certification: 14 January 2008
This certificate issued: 09 January 2023
Renewal date: 13 January 2028



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MCERTS is operated on behalf of the Environment Agency by

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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

This instrument is considered suitable for use on waste incineration and large combustion plants. This CEMS 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. The lowest certified range for each determinand shall not be more than 1.5 times the daily average emission limit value (ELV) for incineration plants, and not more than 2.5 times the ELV for other types of applications.

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 CSA Group's assessment and ongoing surveillance of the product and the manufacturing process:

TÜV SÜD Report Number: 1710933 dated 30 September 2011
TÜV Report Number 936/21236694/AE dated 20 March 2017

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Product Certified

The AO2000 Series measuring system consists of the following parts:

1. **Sample Probe** - Model: PFE 2, Model No: 2308-0-5323010
2. **Heated Filter** - Model: ABB ceramic filter, pore size <math><0.3\mu\text{m}</math>
3. **Heated Sample Line** - Model: ABB PTFE, length: 30m
4. **Gas Conditioning** - Model: Advance SCC-C/SCC-F
5. **Analyser** - Model: Uras 26/Magnos 206/Magnos 28/O₂ 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).

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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/m³, NO 0 to 100mg/m³, SO₂ 0 to 75mg/m³, N₂O 0 to 100mg/m³, CO₂ 0 to 20%vol and O₂ 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 ₂ O					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 ₂ O	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 ₂ O	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 ₂ O	0.11					<2%
O ₂	0.03					<0.2%
Lack-of-fit (Magnos 28)						
O ₂	0.03					<0.2%

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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 NO SO ₂ O ₂	-0.07	0.7		3.1 -3.0		<5% <5% <5% <0.5%
Influence of ambient temperature zero point (CEM2450) CO ₂ NO N ₂ O O ₂	0.0 0.13		1.7 0.5			<5% <5% <5% <0.5%
Influence of ambient temperature zero point (CEM1230) CO SO ₂		0.7 0.9				<5% <5%
Influence of ambient temperature zero point (CEM1500) CO ₂ CO	0.1 0.3					<5% <5%
Influence of ambient temperature zero point (Magnos 28) O ₂	0.1					<0.5%
Influence of ambient temperature reference point (CEM1230KL) CO NO SO ₂ O ₂	-0.43		1.7	3.9 -2.2		<5% <5% <5% <0.5%

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	<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 ₂ O 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 <0.5	MCERTS specification <1
	<0.5	<1	<2			
Influence of voltage variations 190 to 250V (CEMS1230KL)						
CO	-0.2					<2%
NO	0.2	0.5				<2%
SO ₂						<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 ₂ O	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 ₂ O, CO, CO ₂ , CH ₄ , N ₂ O, NO, NO ₂ , NH ₃ , SO ₂ , HCl, H ₂ S (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 ₂ O, CO, CO ₂ , CH ₄ , N ₂ O, NO, NO ₂ , NH ₃ , SO ₂ , HCl, H ₂ S (CEM2450)						
CO ₂	0.0					<4%
NO			-1.9			<4%
N ₂ O				3.0		<4%
O ₂	0.1					<0.4%
Cross-sensitivity at zero with interferents O ₂ , H ₂ O, CO, CO ₂ , CH ₄ , N ₂ O, NO, NO ₂ , NH ₃ , SO ₂ , HCl, H ₂ S (CEM1230)						
CO			1.9			<4%
SO ₂				2.4		<4%
Cross-sensitivity at zero with interferents O ₂ , H ₂ O, CO, CO ₂ , CH ₄ , N ₂ O, NO, NO ₂ , NH ₃ , SO ₂ , HCl, H ₂ S (CEM1500)						
CO			1.2			<4%
Cross-sensitivity at zero with interferents CO, H ₂ O, CO ₂ , CH ₄ , N ₂ O, 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 ₂ O, CO, CO ₂ , CH ₄ , N ₂ O, NO, NO ₂ , NH ₃ , SO ₂ , HCl, H ₂ S (CEM1230KL)						
CO				2.1		<4%
NO				-3.4		<4%
SO ₂				3.9		<4%
O ₂	0.0					<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 reference with interferents O ₂ , H ₂ O, CO, CO ₂ , CH ₄ , N ₂ O, NO, NO ₂ , NH ₃ , SO ₂ , HCl, H ₂ S (CEM2450)						
CO ₂		-0.8				<4%
NO				-2.0		<4%
N ₂ O				3.6		<4%
O ₂	-0.1					<0.4%
Cross-sensitivity at reference with interferents O ₂ , H ₂ O, CO, CO ₂ , CH ₄ , N ₂ O, NO, NO ₂ , NH ₃ , SO ₂ , HCl, H ₂ S (CEM1230)						
CO				3.6		<4%
SO ₂				2.8		<4%
Cross-sensitivity at reference with interferents O ₂ , H ₂ O, CO, CO ₂ , CH ₄ , N ₂ O, NO, NO ₂ , NH ₃ , SO ₂ , HCl, H ₂ S (CEM1500)						
CO				4.0		<4%
Cross-sensitivity at reference with interferents CO, H ₂ O, CO ₂ , CH ₄ , N ₂ O, 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 ₂ O					5.4%	
O ₂					4.2%	
O ₂ (Magnos 28)					2.2%	

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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 ₂ O					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 ₂ O					119s	<200s
O ₂					86s	<200s
Response time (field) (Magnos 28)						
O ₂					40s	<200s
Lack of fit (field)						
CO						<2%
NO	0.31		1.84			<2%
SO ₂						<2%
N ₂ O			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	<p>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.</p> <p>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.</p> <p>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.</p>					<p>Clause 6.13 & 10.13</p> <p>Manufacturer shall provide a description of the technique to determine and compensate for zero and span drift.</p>
Change in zero point over maintenance interval (CEM1230KL) CO NO SO ₂ O ₂			1.2			<3% <3% <3% <0.2%
Change in zero point over maintenance interval (CEM2450) CO ₂ NO N ₂ O 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%

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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 ₂ O				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 ₂ O			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/m³ 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.

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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 NO_x by integrating the ABB SCC-K NO/NO₂ 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 CSA Group Testing UK Ltd Certificates'.
2. The design of the product certified is held and maintained by TÜV Rheinland for certificate No. CSA MC080121/16.
3. If a certified product is found not to comply, CSA Group should be notified immediately at the address shown on this certificate.
4. The certification marks that can be applied to the product or used in publicity material are defined in 'Regulations Applicable to the Holders of CSA Group Testing UK Ltd Certificates'.
5. This document remains the property of CSA Group and shall be returned when requested by CSA Group.

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