

PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

ACF5000 measuring system

Manufactured by:

ABB Automation GmbH

Stierstädter Strasse 5
60488 Frankfurt am Main
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) and T-CEMS, Version 4 dated July 2018
EN15267-3:2007,
& QAL 1 as defined in EN 14181: 2014**

Certification Ranges :

CO	0 – 75 (0 – 300, 0 – 4000) mg/m ³	NH ₃	0 – 5 (0 – 15, 0 – 230) mg/m ³
NO	0 – 150 (0 – 400, 0 – 2000) mg/m ³	H ₂ O	0 – 40 Vol.-%
NO ₂	0 – 80 (0 – 600, 0 – 1000) mg/m ³	CO ₂	0 – 30 Vol.-%
N ₂ O	0 – 50 (0 – 1000) mg/m ³	H ₂ CO	0 – 20 mg/m ³
SO ₂	0 – 75 (0 – 300, 0 – 5000) mg/m ³	CH ₄	0 - 7.5 (0 – 200) mg/m ³
HCl	0 – 15 (0 – 90, 0 – 2000) mg/m ³	Total C (FID)	0 – 15 (0 – 30, 0 – 300, 0 – 500) mg/m ³
HF	0 – 3 (0 – 6, 0 – 300) mg/m ³	O ₂ (ZrO ₂)	0 – 25 Vol.-%

Project No. : 70068936/70211812
Certificate No : Sira MC160309/02
Initial Certification : 19 August 2016
This Certificate issued : 05 March 2019
Renewal Date : 18 March 2021

Emily Alexander
Environmental Project Engineer

MCERTS is operated on behalf of the Environment Agency by

Sira Certification Service

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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

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.

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:

TÜV Rheinland Report 936/21219814/A dated 6th April 2016

TÜV Rheinland Report 936/21219814/C dated 24th January 2017

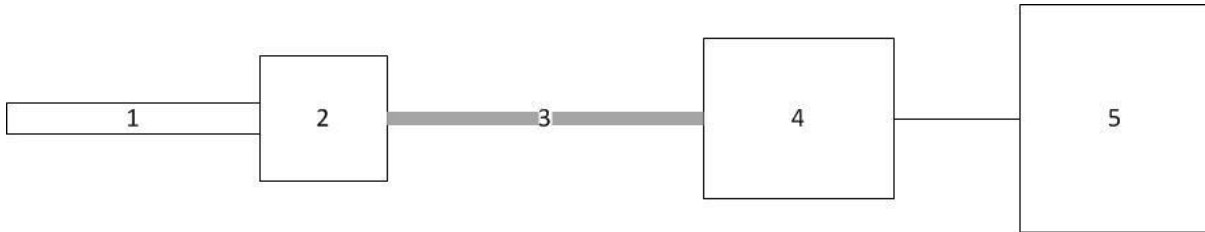
TÜV Rheinland Report 936/21219814/G dated 8th October 2018

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Product Certified

The ACF5000 measuring system consists of the following parts:



1. Sample Probe	2. Heated Filter	3. Heated Sample Line	4. Gas Conditioning	5. Analyser
Model: ABB Type 40 (screw mounted) or Type 42 (flange-mounted) probe tube	Model: ABB PFE2 filter	Model: Heated ABB TBL01-S sampling line (180°C) with an inner diameter of 6mm, made of teflon, max 60m long	Model: ASP-block (integrated)	Model: ACF5000 Analyser cabinet with: · Interferometer · FID · O ₂ Sensor · Air improvement · Cooling unit (for use at 5 – 45 °C, or fan for use at 5 – 30 °C)

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.

This certificate applies to all instruments fitted with software version 5.2.16 (Syscon), 3.5.99 (AMC), and serial number 3.351922.3 onwards.

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Certified Performance

The instrument was evaluated for use under the following conditions:

Ambient Temperature Range: +5°C to +45°C

Instrument IP rating: IP54

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. The CEM is nominally equipped with an air-conditioning unit and testing took place in the temperature range between 5°C and 45°C. Additionally, the CEM may be used with a fan instead of an air-conditioning unit, in the temperature range between 5°C and 30°C.

Results are expressed as error % of certification range, unless otherwise stated.

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Response time						
O ₂ (0-25%Vol)					37s	<200s
CO (0-75mg/m ³)					185s	<200s
CO (0-300 mg/m ³)					136s	<200s
CO (0-4000 mg/m ³)					127s	<200s
NO (0-150 mg/m ³)					134s	<200s
NO (0-400 mg/m ³)					178s	<200s
NO (0-2000 mg/m ³)					128s	<200s
NO ₂ (0-80 mg/m ³)					172s	<200s
NO ₂ (0-600 mg/m ³)					137s	<200s
NO ₂ (0-1000 mg/m ³)					164s	<200s
N ₂ O (0-50 mg/m ³)					158s	<200s
N ₂ O (0-1000 mg/m ³)					129s	<200s
SO ₂ (0-75 mg/m ³)					186s	<200s
SO ₂ (0-300 mg/m ³)					168s	<200s
SO ₂ (0-300 mg/m ³)					135s	<200s
HCl (0-15 mg/m ³)					278s	<400s
HCl (0-90 mg/m ³)					150s	<400s
HCl (0-2000 mg/m ³)					154s	<400s
HF (0-3 mg/m ³)					198s	<400s
HF (0-6 mg/m ³)					187s	<400s
HF (0-300 mg/m ³)					163s	<400s
NH ₃ (0-5 mg/m ³)					170s	<400s

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
NH ₃ (0-15 mg/m ³)					172s	<400s
NH ₃ (0-230 mg/m ³)					158s	<400s
H ₂ O (0-40%Vol)					137s	<200s
CO ₂ (0-30%Vol)					139s	<200s
H ₂ CO (0-20 mg/m ³)					127s	<200s
CH ₄ (0-7.5 mg/m ³)					192s	<200s
CH ₄ (0-200 mg/m ³)					133s	<200s
TOC (0-15 mg/m ³)					49s	<200s
TOC (0-30 mg/m ³)					50s	<200s
TOC (0-300 mg/m ³)					45s	<200s
TOC (0-500 mg/m ³)					49s	<200s
Repeatability standard deviation at zero point						
O ₂	0.0					<0.2%
CO	0.0					<2.0%
NO	0.1					<2.0%
NO ₂	0.3					<2.0%
N ₂ O	0.0					<2.0%
SO ₂	0.1					<2.0%
HCl	0.1					<2.0%
HF		0.6				<2.0%
NH ₃		0.7				<2.0%
H ₂ O	0.0					<2.0%
CO ₂	0.0					<2.0%
H ₂ CO	0.2					<2.0%
CH ₄	0.1					<2.0%
TOC	0.0					<2.0%

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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 reference point						
O ₂	0.05					<0.2%
CO	0.1					<2.0%
NO	0.1					<2.0%
NO ₂			1.4			<2.0%
N ₂ O	0.0					<2.0%
SO ₂	0.5					<2.0%
HCl	0.5					<2.0%
HF		0.6				<2.0%
NH ₃		0.8				<2.0%
H ₂ O	0.3					<2.0%
CO ₂	0.1					<2.0%
H ₂ CO	0.3					<2.0%
CH ₄	0.1					<2.0%
TOC	0.1					<2.0%
Lack-of-fit						
O ₂ (0-25%Vol)	0.05					<0.2%
CO (0-75mg/m ³)	0.27					<2.0%
CO (0-300 mg/m ³)	0.33					<2.0%
CO (0-4000 mg/m ³)	-0.38					<2.0%
NO (0-150 mg/m ³)	-0.27					<2.0%
NO (0-400 mg/m ³)	0.25					<2.0%
NO (0-2000 mg/m ³)	0.50					<2.0%
NO ₂ (0-80 mg/m ³)			1.00			<2.0%
NO ₂ (0-600 mg/m ³)		0.83				<2.0%
NO ₂ (0-1000 mg/m ³)	0.10					<2.0%
N ₂ O (0-50 mg/m ³)	0.34					<2.0%
N ₂ O (0-1000 mg/m ³)	-0.25					<2.0%
SO ₂ (0-75 mg/m ³)	0.48					<2.0%
SO ₂ (0-300 mg/m ³)		-0.67				<2.0%

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
SO ₂ (0-300 mg/m ³)	-0.28					<2.0%
HCl (0-15 mg/m ³)		-0.65				<2.0%
HCl (0-90 mg/m ³)		0.67				<2.0%
HCl (0-2000 mg/m ³)	0.45					<2.0%
HF (0-3 mg/m ³)		0.93				<2.0%
HF (0-6 mg/m ³)			1.00			<2.0%
HF (0-300 mg/m ³)		-1.00				<2.0%
NH ₃ (0-5 mg/m ³)		-1.00				<2.0%
NH ₃ (0-15 mg/m ³)		-0.80				<2.0%
NH ₃ (0-230 mg/m ³)		-0.87				<2.0%
H ₂ O (0-40%Vol)	-0.35					<2.0%
CO ₂ (0-30%Vol)	0.17					<2.0%
H ₂ CO (0-20 mg/m ³)	0.49					<2.0%
CH ₄ (0-7.5 mg/m ³)	-0.33					<2.0%
CH ₄ (0-200 mg/m ³)	-0.50					<2.0%
TOC (0-15 mg/m ³)	-0.47					<2.0%
TOC (0-30 mg/m ³)	-0.67					<2.0%
TOC (0-300 mg/m ³)	0.33					<2.0%
TOC (0-500 mg/m ³)	0.08					<2.0%
Influence of ambient temperature zero point (+5°C to +30°C)						
O ₂	0.03					<0.5%
CO	-0.1					<5.0%
NO	-0.4					<5.0%
NO ₂	-0.3					<5.0%
N ₂ O	0.3					<5.0%
SO ₂	0.5					<5.0%
HCl	-0.3					<5.0%
HF		-1.0				<5.0%
NH ₃			-1.6			<5.0%
H ₂ O	-0.1					<5.0%

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
CO ₂	0.0					<5.0%
H ₂ CO	0.5					<5.0%
CH ₄	0.4					<5.0%
TOC	0.4					<5.0%
Influence of ambient temperature span point (+5°C to +30°C)						
O ₂	-0.19					<0.5%
CO	-0.3					<5.0%
NO	-0.5					<5.0%
NO ₂				2.4		<5.0%
N ₂ O			1.2			<5.0%
SO ₂	-0.5					<5.0%
HCl		0.9				<5.0%
HF				-2.3		<5.0%
NH ₃				-2.4		<5.0%
H ₂ O	-0.5					<5.0%
CO ₂	-0.3					<5.0%
H ₂ CO		-1.0				<5.0%
CH ₄			-0.3			<5.0%
TOC	-0.9					<5.0%
Influence of ambient temperature zero point (+5°C to +45°C)						
O ₂	0.02					<0.5%
CO	0.1					<5.0%
NO	-0.2					<5.0%
NO ₂		0.8				<5.0%
N ₂ O	-0.1					<5.0%
SO ₂	0.4					<5.0%
HCl	-0.5					<5.0%
HF		-0.7				<5.0%
NH ₃			-1.6			<5.0%

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
H ₂ O	-0.2					<5.0%
CO ₂	0.0					<5.0%
H ₂ CO	0.4					<5.0%
CH ₄		-0.7				<5.0%
TOC	0.4					<5.0%
Influence of ambient temperature span point (+5°C to +45°C)						
O ₂	-0.21					<0.5%
CO	0.2					<5.0%
NO	-0.4					<5.0%
NO ₂			-1.5			<5.0%
N ₂ O	-0.4					<5.0%
SO ₂			1.2			<5.0%
HCl		0.9				<5.0%
HF				-2.3		<5.0%
NH ₃			1.4			<5.0%
H ₂ O	0.4					<5.0%
CO ₂	0.5					<5.0%
H ₂ CO			1.2			<5.0%
CH ₄		0.7				<5.0%
TOC	0.5					<5.0%
Influence of sample gas flow for extractive CEMS						
O ₂	-0.15					<0.2%
CO		-0.7				<2.0%
NO		-0.9				<2.0%
NO ₂			-1.4			<2.0%
N ₂ O		-1.0				<2.0%
SO ₂			-1.5			<2.0%
HCl	0.5					<2.0%
HF		0.8				<2.0%

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	<0.5	<1	<2	<5		
NH ₃	-0.6					<2.0%
H ₂ O		0.9				<2.0%
CO ₂		-0.9				<2.0%
H ₂ CO		-1.0				<2.0%
CH ₄		-0.7				<2.0%
TOC			-1.5			<2.0%
Influence of voltage variations at zero (196V to 253V)						
O ₂	0.00					<0.2%
CO	0.1					<2.0%
NO	0.2					<2.0%
NO ₂	-0.3					<2.0%
N ₂ O	0.3					<2.0%
SO ₂	0.3					<2.0%
HCl	-0.5					<2.0%
HF		0.7				<2.0%
NH ₃		0.6				<2.0%
H ₂ O	0.0					<2.0%
CO ₂	0.0					<2.0%
H ₂ CO		0.6				<2.0%
CH ₄	-0.3					<2.0%
TOC	-0.1					<2.0%
Influence of voltage variations at reference (196V to 253V)						
O ₂	0.05					<0.2%
CO	0.2					<2.0%
NO	-0.2					<2.0%
NO ₂	0.3					<2.0%
N ₂ O	0.3					<2.0%
SO ₂		0.9				<2.0%

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	<0.5	<1	<2	<5		
HCl	0.5					<2.0%
HF		1.0				<2.0%
NH ₃		-1.0				<2.0%
H ₂ O	0.2					<2.0%
CO ₂	0.1					<2.0%
H ₂ CO	-0.3					<2.0%
CH ₄	0.3					<2.0%
TOC	-0.1					<2.0%
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						
O ₂	0.0					<0.4%
CO	0.0					<4.0%
NO		-0.64				<4.0%
NO ₂		0.61				<4.0%
N ₂ O		0.70				<4.0%
SO ₂				2.33		<4.0%
HCl			1.67			<4.0%
HF			-2.00			<4.0%
NH ₃			-1.80			<4.0%
H ₂ O	0.0					<4.0%
CO ₂	0.0					<4.0%
H ₂ CO	-0.45					<4.0%
CH ₄	0.0					<4.0%
TOC				3.07		<4.0%
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						
O ₂	0.37					<0.4%
CO			1.29			<4.0%
NO			-1.67			<4.0%
NO ₂				2.95		<4.0%

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
N ₂ O			-1.34			<4.0%
SO ₂				3.88		<4.0%
HCl				-3.75		<4.0%
HF				3.46		<4.0%
NH ₃				-3.80		<4.0%
H ₂ O				2.80		<4.0%
CO ₂			2.00			<4.0%
H ₂ CO			1.95			<4.0%
CH ₄			1.20			<4.0%
TOC				-3.61		<4.0%
Response factors for TOC CEMS:						
Methane					1.02	0.9 to 1.2
Aliphatic hydrocarbons					0.90 – 1.05	0.9 to 1.1
Aromatic hydrocarbons					0.91 – 1.08	0.8 to 1.1
Dichloromethane					0.92 – 0.93	0.75 to 1.15
Aliphatic alcohols					0.70 – 0.85	0.7 to 1.0
Esters and ketones					0.77	0.7 to 1.0
Organic acids					0.54 – 0.60	0.5 to 1.0

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Measurement uncertainty					Guidance - at least 25% below max permissible uncertainty	
O ₂					2.9%	<7.5% (10%)
CO (For an ELV of 50 mg/m ³)					5.0%	<7.5% (10%)
NO (For an ELV of 98 mg/m ³)					5.5%	<15% (20%)
NO ₂ (For an ELV of 50 mg/m ³)					9.6%	<15% (20%)
N ₂ O					3.6%	<15% (20%)
SO ₂ (For an ELV of 50 mg/m ³)					9.4%	<15% (20%)
HCl (For an ELV of 10 mg/m ³)					8.6%	<30% (40%)
HF (For an ELV of 1 mg/m ³)					18%	<30% (40%)
NH ₃ (For an ELV of 2 mg/m ³)					17.3%	<30% (40%)
H ₂ O					4.2%	<7.5% (10%)
CO ₂					3.1%	<7.5% (10%)
H ₂ CO					4.3%	<7.5% (10%)
CH ₄ (For an ELV of 5 mg/m ³)					5.2%	<22.5% (30%)
TOC (For an ELV of 10 mg/m ³)					10.1%	<22.5% (30%)
Calibration function (field)						
O ₂					0.99	>0.90
CO					0.99	>0.90
NO					0.99	>0.90
NO ₂					0.99	>0.90
N ₂ O					0.99	>0.90
SO ₂					0.99	>0.90
HCl					0.99	>0.90
HF					0.99	>0.90
NH ₃					0.98	>0.90
H ₂ O					0.97	>0.90
CO ₂					0.99	>0.90
H ₂ CO					0.99	>0.90
CH ₄					0.99	>0.90
TOC					0.98	>0.90

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Response time (field)						
O ₂					46s	<200s
CO					178s	<200s
NO					132s	<200s
NO ₂					172s	<200s
N ₂ O					162s	<200s
SO ₂					172s	<200s
HCl					233s	<400s
HF					178s	<400s
NH ₃					168s	<400s
H ₂ O					151s	<200s
CO ₂					132s	<200s
H ₂ CO					138s	<200s
CH ₄					178s	<200s
TOC					39s	<200s
Lack of fit (field)						
O ₂	-0.06					<0.2%
CO	0.24					<2.0%
NO	0.33					<2.0%
NO ₂	-0.49					<2.0%
N ₂ O		0.58				<2.0%
SO ₂	0.40					<2.0%
HCl			1.73			<2.0%
HF			1.42			<2.0%
NH ₃			-1.40			<2.0%
H ₂ O	-0.47					<2.0%
CO ₂			1.73			<2.0%
H ₂ CO	0.45					<2.0%
CH ₄	0.35					<2.0%
TOC	-0.20					<2.0%

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Maintenance interval					Note 1 12 months	>8 days
Zero and Span drift requirement	<p>There is an option to feed test gas automatically or manually to the measuring system. Furthermore, an internal validation unit can be used as an alternative to test gases for QAL3 checks of the FTIR measurement components. Logging of zero and span drift is possible and complies with the requirements of EN14181 for QAL3.</p> <p>The device is equipped with automatic zero and span point correction for the O₂ channel and the FID. Zero and span point at the O₂ channel were automatically checked and adjusted every 2 weeks. They were automatically monitored and adjusted every 3 weeks for the FID. Drift compensation of the components measured with the help of FTIR was not part of the performance test. Zero and span drift were determined during the field test by means of manually applying appropriate test gases to the sampling probe of the measuring system. The results of this test are presented in the field test section. Furthermore, the internal validation unit was part of the performance test.</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						
O ₂	0.15					<0.2%
CO	-0.3					<3.0%
NO	0.2					<3.0%
NO ₂		1.0				<3.0%
N ₂ O	-0.4					<3.0%
SO ₂		-0.8				<3.0%
HCl		0.9				<3.0%
HF			1.1			<3.0%
NH ₃				-2.3		<3.0%
H ₂ O	0.0					<3.0%
CO ₂	-0.1					<3.0%
H ₂ CO	0.5					<3.0%
CH ₄			1.1			<3.0%
TOC			-1.9			<3.0%

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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						
O ₂	-0.18					<0.2%
CO			1.3			<3.0%
NO			1.3			<3.0%
NO ₂				2.6		<3.0%
N ₂ O			1.9			<3.0%
SO ₂				2.3		<3.0%
HCl				2.6		<3.0%
HF				-2.1		<3.0%
NH ₃				-2.4		<3.0%
H ₂ O			-1.6			<3.0%
CO ₂		0.6				<3.0%
H ₂ CO			-2.0			<3.0%
CH ₄			1.9			<3.0%
TOC				2.3		<3.0%
Availability					98.5%	>95% (>98% for O ₂)

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Reproducibility						
O ₂	0.01					<0.2%
CO		0.6				<3.3%
NO	0.3					<3.3%
NO ₂		0.9				<3.3%
N ₂ O	0.2					<3.3%
SO ₂			1.8			<3.3%
HCl	0.4					<3.3%
HF		0.7				<3.3%
NH ₃		0.9				<3.3%
H ₂ O	0.0					<3.3%
CO ₂	0.2					<3.3%
H ₂ CO	0.4					<3.3%
CH ₄	0.4					<3.3%
TOC			1.1			<3.3%

Note 1: The ACF5000 has a maintenance interval of 12 months. The work detailed below has to be carried out at regular intervals, depending on local conditions. This includes regular visual inspections and checks of the test gas filter, gas conditioning system, sample gas line and inlets. During the maintenance interval, zero and span checks must be performed for all components measured with the FTIR analyser. Zero and Span checks for O₂ and TOC must also be performed. Refer to User Manual for this operation.

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Description

The ABB ACF5000 system is a hot/wet extractive multigas analyser using Fourier Transform Infrared (FTIR) analysis to measure several gaseous components (including water), a zirconia-sensor based monitoring system to measure oxygen, and a flame ionisation detector (FID) - to measure total content of organic carbon. The FID can be optionally integrated. An internal validation unit can be used as an alternative to test gases for QAL3 span checks of the FTIR measurement components.

The loss-free measurement of the lowest concentrations of water-soluble components is achieved by seamless heating of the system to 180°C – from the probe filter element to the analyzer. A low-maintenance electronically controlled air injector system conveys the sample gas from the chimney stack to the analyzers at constant pressure in order to avoid pressure dependencies, which could arise if an uncontrolled feed pump were used. An optional blow-back unit allows for uninterrupted measurements even in high-dust-loaded applications.

Analogue Output, PROFIBUS, Modbus or Ethernet offers unrivalled connectivity to PLC, Data Acquisition Handling Systems (DAHS) or DCS.

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'. The design of the product certified is defined in the Sira Design Schedule V00 for certificate No. Sira MC160309/01
2. 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.

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