PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

EMIRAK Multi Gas Analyser
NO/NOx (Hot Wet & Cold Dry), CO, O_2 (Dry & Wet) & SO_2

manufactured by:

Signal Group Ltd

Ambitech Division
Regal Way
Faringdon
Oxon SN7 7BX
England

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, Version 2.1 dated April 2003
& the performance criteria specified in Version 3.1 dated July 2008 (EN 15267-3: 2007)*
& QAL 1 as defined in EN 14181: 2004

Certification Ranges :

NO/NOx (wet) & (dry)	0 – 50	to	0 – 200	ppm	(0 – 67 mg/m^3 to 0 to 268 mg/m^3)
CO	0 – 100	to	0 – 1000	ppm	(0 – 125 mg/m^3 to 0 to 1250 mg/m^3)
SO_2	0 – 50	to	0 – 425	ppm	(0 – 143 mg/m^3 to 0 to 1215 mg/m^3)
SO_2	0 – 85	to	0 – 425	ppm	(0 – 243 mg/m^3 to 0 to 1215 mg/m^3)
O_2 (wet) & (dry)	0 - 25	%Vol			

* Laboratory and field tests conducted on one instrument.

Project No:	674/0187 & 674/0394
Certificate No:	Sira MC090141/05
Initial Certification:	17 March 2009
This Certificate Issued	12 February 2012
Renewal Date:	16 March 2014

Technical Director

MCERTS is operated on behalf of the Environment Agency by

Sira Certification Service
12 Acorn Industrial Park, Crayford Road, Crayford
Dartford, Kent, UK, DA1 4AL
Tel: 01322 520500 Fax: 01322 520501

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 Gas Turbine large 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 LCPD for the ranges specified. The lowest certified range for each determinand shall not be more than 2.5X the ELV for LCPD and other types of application.

Field Trial

The Emirak measuring system was installed for 3 months on a gas turbine 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:

Laboratory Test Report:	Report PED0193RevC, dated 03/03/2009
Field Test Report:	PB Power 63412A-0001, dated February 2009
Sira Report:	Report No. 06-2, dated 03/03/2009
Laboratory Test Report:	Report PED0224 Rev C, dated 15/04/2009
Sira Report:	Report No. 07-01, dated 16/04/2009
Laboratory Test Report:	Report PED0268 Rev C, dated 16/11/2009
Sira Report:	Report No. 08-01, dated 17/11/2009

Product Certified

The Emirak measuring system consists of the following parts:

- Sampling Probe M&C SP2000H
- Signal Heated Line 20m
- Sample Conditioning System based on a refrigerative chiller
- Air Conditioned Enclosure
- NOx converter (for SO_2 0-50ppm range option)

This certificate applies to all instruments fitted with software version V4.4 and V6.0 (serial number SP02742-005 onwards).

Certificate No:	Sira MC090141/05
This Certificate Issued:	12 February 2012

Certified Performance

Laboratory and field tests were conducted in accordance with the requirements of EN 15267-3: 2007 on one Emirak System Model SP02742-EMI, serial No. SP02742-005. Additional laboratory tests were conducted in accordance with the requirements of EN 15267-3: 2007 to include the NOx (cold, dry) analysis option on one Emirak system containing NOx analyser module serial No.WM08773-000.

Further laboratory tests were conducted in accordance with the requirements of EN 15267-3: 2007 to include SO_2 (0 to 50 ppm) analysis option on one Emirak system containing the SO_2 analyser module serial No. WM08918-001.

The instrument was evaluated for use under the following conditions:

Ambient Temperature Range: 18°C-26°C (see note below)
Enclosure IP rating: IP65

Note: 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.

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Response time						
CO					45s	<200s
NOx (Wet)					19s	<200s
NO (Wet)					17s	<200s
NOx (Dry)					27s	<200s
NO (Dry)					24s	<200s
SO_2 (0 to 85ppm)					70s	<200s
SO_2 (0 to 50 ppm)					60s	<200s
O_2 (Dry)					39s	<200s
O_2 (Wet)					27s	<200s

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Repeatability standard deviation at zero point						<2%
CO	0.12					<2%
NOx (Wet)	0.03					<2%
NO (Wet)	0.03					<2%
SO_2 (0 to 85ppm)	0.04					<2%
SO_2 (0 to 50ppm)	0.03					<0.2%
O_2 (Dry)	0.01					<0.2%
O_2 (Wet)	0.00					
Repeatability standard deviation at span point						
CO	0.08					<2.0%
NOx (Wet)	0.44					<2.0%
NO (Wet)	0.41					<2.0%
NOx (Dry)	0.08					<2.0%
NO (Dry)	0.10					<2.0%
SO_2 (0 to 85ppm)	0.38					<2.0%
SO_2 (0 to 50ppm)	0.11					<2.0%
O_2 (Dry)	0.08					<0.2%
O_2 (Wet)	0.05					<0.2%
Lack-of-fit						
CO		-0.79				<2.0%
NOx (Wet)		-0.69				<2.0%
NO (Wet)		-0.72				<2.0%
SO_2 (0 to 85ppm)	-0.28					<2.0%
SO_2 (0 to 50ppm)	0.25					<2.0%
O_2 (Dry)	0.10					<0.2%
O_2 (Wet)	0.15					<0.2%
Influence of ambient temperature zero point				-3.10		<5.0%
CO			-1.76			<5.0%
NOx (Wet)			-1.81			<5.0%
NO (Wet)						<5.0%

Certificate No: Sira MC090141/05
This Certificate Issued: 12 February 2012

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
SO_2 (0 to 85ppm)	0.29					<5.0%
SO_2 (0 to 50ppm)	0.12					<0.5%
O_2 (Dry)	-0.16					<0.5%
O_2 (Wet)	-0.38					
Influence of ambient temperature span point						
CO	0.00					<5.0%
NOx (Wet)				-3.80		<5.0%
NO (Wet)				-3.50		<5.0%
SO_2 (0 to 85ppm)				-2.10		<5.0%
SO_2 (0 to 50ppm)	0.19					<5.0%
O_2 (Dry)	-0.40					<0.5%
O_2 (Wet)	-0.35					<0.5%
Influence of sample gas flow for extractive						
CO	0.45					<2.0%
NOx (Wet)		-0.89				<2.0%
NO (Wet)		0.98				<2.0%
SO_2 (0 to 85ppm)		0.54				<2.0%
SO_2 (0 to 50ppm)	-0.10					<2.0%
O_2 (Dry)	-0.09					<0.2%
O_2(Wet)	-0.16					<0.2%

Certificate No: Sira MC090141/05
This Certificate Issued: 12 February 2012

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Influence of voltage variations 190 to 250V						
CO	0.27					<2.0%
NOx (Wet)			1.56			<2.0%
NO (Wet)			1.45			<2.0%
SO_2 (0 to 85ppm)	-0.21					<2.0%
SO_2 (0 to 50ppm)	0.40					<2.0%
O_2 (Dry)	0.04					<0.2%
O_2 (Wet)	0.06					<0.2%
Cross-sensitivity at zero with interferents						
CO		-0.54				<4.0%
NOx (Wet)			1.50			<4.0%
NO (Wet)			1.30			<4.0%
NOx (Dry)		0.70			Note 1	<4.0%
NO (Dry)		0.60				<4.0%
SO_2 (0 to 85ppm)				-3.82		<4.0%
SO_2 (0 to 50ppm)			1.96			<4.0%
O_2 (Dry)	0.00					<0.4%
O_2 (Wet)	0.00					<0.4%

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Cross-sensitivity at span with interferents						
CO	0.00	-0.75	-1.24		Note 1	<4.0%
NOx (Wet)						
NO (Wet)						
NOx (Dry)						
NO (Dry)	-0.75					<4.0%
SO_2 (0 to 85ppm)	0.00			2.38		<4.0%
SO_2 (0 to 50ppm)				2.03		<4.0%
O_2 (Dry)						<4.0%
O_2 (Wet)	0.00					<4.0%
	0.00					<0.4%
						<0.4%
Converter Efficiency (Wet)					97.3%	>95%
Converter Efficiency (Dry)					96.3%	>95%

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Measurement uncertainty						
CO (100 ppm)					4.27 mg/Nm^3	
CO (1000 ppm)					30.3 mg/Nm^3	
NOx (50 ppm) (Wet)					6.57 mg/Nm^3	
NOx (200 ppm) (Wet)					24.6 mg/Nm^3	
NO (50 ppm) (Wet)					3.91 mg/Nm^3	
NO(200 ppm) (Wet)					24.6 mg/Nm^3	Guidance – at least 25% below max permissible uncertainty
NOx (50 ppm) (Dry)					6.27 mg/Nm^3	
NOx (200 ppm) (Dry)					24.8 mg/Nm^3	
NO (50 ppm) (Dry)					3.78 mg/Nm^3	
NO(200 ppm) (Dry)					14.9 mg/Nm^3	
SO_2 (50ppm)					5.27 mg/Nm^3	
SO_2 (85 ppm)					13.7 mg/Nm^3	
SO_2 (425 ppm)					41.2 mg/Nm^3	
O_2 (dry)					0.74%vol	
O_2 (Wet)					0.68%vol	

Note 1: Cross-sensitivity test has been conducted with the following interferents:
O_2, H_2O, CO, CO_2, CH_4, NO, NO_2, SO_2. Not tested with interferents N_2O, NH_3 and HCl.

Cross-sensitivity test data was recalculated for NOx/NO (dry) from the original test data with the interferent H2O vapour removed.

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Calibration function (field)						
CO					0.98	>0.90
NOx (Wet)					0.99	>0.90
NO (Wet)					0.99	>0.90
SO_2					0.97	>0.90
O_2 (Dry)					0.99	>0.90
O_2 (wet)					0.99	>0.90
Response time (field)						
CO					42s	<200s
NOx (Wet)					22s	<200s
NO (Wet)					23s	<200s
SO_2					103s	<200s
O_2 (Dry)					42s	<200s
O_2 (Wet)					28s	<200s
Lack of fit (field)						
CO		-0.79				<2.0%
NOx (Wet)			1.38			<2.0%
NO (Wet)		-0.93				<2.0%
SO_2			-1.07			<2.0%
O2 (Dry)	0.03					<0.2%
O_2 (Wet)	-0.14					<0.2%
Maintenance interval					>8 days	>8 days

Certificate No: Sira MC090141/05
This Certificate Issued: 12 February 2012

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Zero and Span drift requirement	The system performs an automatic calibration daily at a preset time. Performing a y=mx+c correction to the data.					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						
CO			1.65			<3%
NOx (Wet)		0.46				<3%
NO (Wet)	0.39					<3%
SO_2		0.75				<3%
O_2 (Dry)	0.05					<0.2%
O_2 (Wet)	0.00					<0.2%
Change in span point over maintenance interval						
CO	0.32					<3%
NOx (Wet)				2.64		<3%
NO (Wet)				2.39		<3%
SO_2	0.47					<3%
O_2 (Dry)	0.09					<0.2%
O_2 (Wet)	0.06					<0.2%
Availability					98.2% 98.2%	>95% (>98% for O_2)
Reproducibility It was impractical due to size constraints to conduct parallel tests of the AMS. Therefore it was not possible to calculate the reproducibility.						

Description:

The Emirak multi gas analyser uses the following measuring principles:

- NO/NO_2/NOx Wet Hot Chemiluminescent analyser with partial vacuum
- NO/NO_2/NOx Dry Cold Chemiluminescent analyser with partial vacuum
- O_2 Hot Wet Zirconia analyser
- O_2 Dry Paramagnetic analyser
- H_2O calculated from Hot Wet O_2 and Dry O_2 measurements
- CO Dry Gas Filter Correlation (GFC) analyser operating on the infrared principle.
- SO_2 Dry Non-Dispersive analyser operating on the infrared principle.
- SO_2 Dry Non-Dispersive analyser operating on the infrared principle (requires NOx converter for 0-50ppm range)

The gaseous components of the emissions are monitored using extractive sampling which is achieved by continuously transporting a gas sample from the stack to the CEMS mounted in the equipment shelter. The power and the signals for the probe are controlled via the CEMs equipment within the shelter. The CEMS system is an integrated computer controlled gas analysis and data logging system. The data from the Emirak is collected by a Data Acquisition and Data Handling System (DAHS) computer which is located in the Turbine control room. The DAHS computer generates the emission compliance report to the regulating authority.

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 for certificate No. Sira MC090141/04.

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.