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PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

Model 48i CO Analyser

manufactured by:

Thermo Fisher Scientific

*27 Forge Parkway
Franklin
MA 02038
USA*

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

**MCERTS Performance Standards for Continuous Ambient Air
Quality Monitoring Systems, Version 4 (September 2005)**

Certification Ranges :

CO 0 to 100 ppm

Project No: 674/0216B
Certificate No: Sira MC 070095/04
Initial Certification: 10 January 2007
This Certificate Issued: 22 February 2011
Renewal Date: 09 January 2012

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

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Approved Site Application

On the basis of these tests this certificate is valid when the instrument is used on urban air quality and similar applications.

Any potential user should ensure, in consultation with the manufacturer, that the air monitoring system is suitable for the process on which it will be installed.

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 Köln Report Number: 936/212003248/A dated 05/01/06

Product Certified

The Mode 48i CO analyser measuring system consists of the following parts:

- Infrared source
- Gas Filter Wheel
- Optical Chamber
- IR detector
- Sample pump

This certificate applies to all instruments fitted with software version V 01.04.00 onwards (serial number 48i-ptr-01 onwards).

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Certified Performance

The instrument was evaluated for use under the following conditions:

Ambient Temperature Range: +5°C to +40°C

Test	Results expressed as % of measured value				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Repeatability at zero					0.08 µmol/mol	<1 µmol/mol
Repeatability at hourly limit value					0.09 µmol/mol	<3 µmol/mol
Residual lack of fit at zero					0.13 µmol/mol	<0.2 µmol/mol
Lack of fit (largest residual from the linear regression line)		0.81				<4%
Sensitivity coefficient to sample gas pressure					0.09 µmol/mol/kPa	<0.7 µmol/mol/kPa
Sensitivity coefficient to sample gas temperature					0.04 µmol/mol/K	<0.3 µmol/mol/K
Sensitivity coefficient to surrounding air temperature					Zero: 0.01 µmol/mol/K Span: 0.06 µmol/mol/K	<0.3µmol/mol/K <0.3 µmol/mol/K
Sensitivity coefficient to electrical supply voltage					0.0 µmol/mol/V	<0.3 µmol/mol/V
Interference by H ₂ O (at concentration of 19 nmol/mol)					0.06 µmol/mol	<1.0 µmol/mol

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Test	Results expressed as % of measured value				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Interference by NO (at concentration of 1 µmol/mol)					0.10 µmol/mol	<0.5 µmol/mol
Interference by CO ₂ (at concentration of 500 µmol/mol)					0.11 µmol/mol	<0.5 µmol/mol
Interference by N ₂ O (at concentration of 50 nmol/mol)					0.11 µmol/mol	<0.5 µmol/mol
Averaging effect			2.22			<7%
Short term zero drift (over 12h)					0.0 µmol/mol	<0.1 µmol/mol
Short term span drift (over 12h)					0.26 µmol/mol	<0.6 µmol/mol
Response time (rise)					50 s	180 s
Response time (fall)					56 s	180 s
Difference between rise and fall time				9.0		<10%
Reproducibility under field conditions Note 1				5.0		<5% averaged over three month period
Long term zero drift (over 3 months) Note 1					0.50 µmol/mol	<0.5 µmol/mol
Long term span drift (over 3 months) Note 1				2.2	2.2 µmol/mol	<5% of the max of certification range
Period of unattended operation Note 1					34 days	3 months not less than 2 weeks
Availability (data capture) Note 1					98%	>90%
Combined performance characteristic					14.4%	<15%

Note 1: Field test: The field test was performed at an urban site for 4 months.

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Description:

The Model 48*i* operates on the principle that carbon monoxide (CO) absorbs infrared radiation at a wavelength of 4.6 microns. Because infrared absorption is a non-linear measurement technique, it is necessary to transform the basic analyzer signal into a linear output. The Model 48*i* uses an internally stored calibration curve to accurately linearise the instrument output over any range up to a concentration of 10,000 ppm.

The sample flows through the optical bench. Radiation from an infrared source is chopped and then passed through a gas filter alternating between CO and N₂. The radiation then passes through a narrow bandpass interference filter and enters the optical bench where absorption by the sample gas occurs. The infrared radiation then exits the optical bench and falls on an infrared detector.

The CO gas filter acts to produce a reference beam which cannot be further attenuated by CO in the sample cell. The N₂ side of the filter wheel is transparent to the infrared radiation and therefore produces a measurement beam which can be absorbed by CO in the cell. The chopped detector signal is modulated by the alternation between the two gas filters with an amplitude related to the concentration of CO in the sample cell. Other gases do not cause modulation of the detector signal since they absorb the reference and measure beams equally. Thus, the GFC system responds specifically to CO.

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 MC 070095/04.
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.

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