PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

Model 43i SO_2 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 10 dated June 2016

Certification Ranges :

SO_2 0 to 400 ppb

Project No.:	70111288
Certificate No:	Sira MC070094/06
Initial Certification:	10 January 2007
This Certificate issued:	10 January 2017
Renewal Date:	09 January 2022

Emily Alexander
Deputy Certification Manager

MCERTS is operated on behalf of the Environment Agency by

Sira Certification Service
Unit 6, Hawarden Industrial Park
Hawarden, Deeside, CH5 3US
Tel: +44 (0)1244 670 900

Form 1335
Issue 3

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 these tests this certificate is valid when the instrument is used for urban air quality monitoring and similar applications.

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: 936/21203248/D1 dated 07 July 2016
TÜV Rheinland	Report Number: 936/21221382/C dated 20 September 2013

Product Certified

The Model 43i SO2 analyser measuring system consists of the following parts:

- Hydrocarbon "kicker"
- Pulsating UV lamp
- Mirror Assembly
- Optical Chamber
- Photomultiplier tube
- Sample pump

This certificate applies to all instruments fitted with software version V 01.04.00 (V 01.03.00. 083) onwards (serial number 43i-PTR-1 onwards).

Certified Performance

The instrument was evaluated for use under the following conditions:

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

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 measured value				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Repeatability at zero					0.02 nmol/mol	<1 nmol/mol
Repeatability at hourly limit value					0.03 nmol/mol	<3 nmol/mol
Residual lack of fit at zero					0.56 nmol/mol	<5 nmol/mol
Lack of fit (largest residual from the linear regression line)			1.96			<4%
Sensitivity coefficient to sample gas pressure					0.05 nmol/mol/kPa	<2 nmol/mol/kPa
Sensitivity coefficient to sample gas temperature					0.21 nmol/mol/K	<1 nmol/mol/K
Sensitivity coefficient to surrounding air temperature					Zero: 0.02 nmol/mol/K Span: 0.26 nmol/mol/K	<1nmol/mol/K <1 nmol/mol/K
Sensitivity coefficient to electrical supply voltage					0.01 nmol/mol/V	<0.3 nmol/mol/V
Interference by H_2O (at concentration of 19 nmol/mol)					2.33 nmol/mol	<10 nmol/mol
Interference by H_2S (at concentration of 200nmol/mol)					0.67 nmol/mol	<5nmol/mol

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Test	Results expressed as % of measured value				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Interference by NH_3 (at concentration of 200 nmol/mol)					0.67 nmol/mol	<5 nmol/mol
Interference by NO (at concentration of 500nmol/mol)					4.0 nmol/mol	<5 nmol/mol
Interference by NO_2 (at concentration of 200nmol/mol)					1.0 nmol/mol	<5 nmol/mol
Interference by m-xylene (at concentration of 1μmol/mol)					1.0 nmol/mol	<10 nmol/mol
Averaging effect				3.56		<7%
Short term zero drift (over 12h)					0.02 nmol/mol	<2 nmol/mol
Short term span drift (over 12h)					0.02 nmol/mol	<6 nmol/mol
Response time (rise)					70 s	180 s
Response time (fall)					74 s	180 s
Difference between rise and fall time					9.9 s	<10 s
Reproducibility under field conditions Note 1				3.90		<5% averaged over three month period
Long term zero drift (over 3months) Note 1					0.12 nmol/mol	<4 nmol/mol
Long term span drift (over 3 months) Note 1	0.12					<5% of the max of certification range
Period of unattended operation Note 1					3 months	3 months not less than 2 weeks
Availability (data capture) Note 1					98%	>90%
Total Expanded Uncertainty					14.59%	<15%

Note 1: Field test: The field test was performed at an urban site for 3 months.

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Description

The Model 43i operates on the principle that SO2 molecules absorb ultraviolet (UV) light and become excited at one wavelength, then decay to a lower energy state emitting UV light at a different wavelength.

The sample flows through a hydrocarbon “kicker”, which removes hydrocarbons from the sample by forcing the hydrocarbon molecules to permeate through the tube wall. The SO2 molecules pass through the hydrocarbon “kicker” unaffected.

The sample flows into the fluorescence chamber, where pulsating UV light excites the SO2 molecules. The condensing lens focuses the pulsating UV light into the mirror assembly. The mirror assembly contains four selective mirrors that reflect only the wavelengths which excite SO2 molecules.

As the excited SO2 molecules decay to lower energy states, they emit UV light that is proportional to the SO2 concentration. The bandpass filter allows only the wavelengths emitted by the excited SO2 molecules to reach the photomultiplier tube (PMT). The PMT detects the UV light emission from the decaying SO2 molecules. The photodetector, located at the back of the fluorescence chamber, continuously monitors the pulsating UV light source and is connected to a circuit that compensates for fluctuations in the lamp intensity.

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 MC070094/06

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.