

# PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

## ***Model 49i O<sub>3</sub> 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 :

O<sub>3</sub> 0 to 250 ppb

Project No.: 70111288  
Certificate No: Sira MC070096/06  
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  
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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](http://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/B1 dated 05 January 2006
TÜV Rheinland	Report Number: 936/21221382/A dated 21 March 2013

## Product Certified

The Model 49i O3 analyser measuring system consists of the following parts:

- Ozone scrubber
- Sample/reference solenoid valves
- UV lamp
- Optical cells
- Detectors

This certificate applies to all instruments fitted with software version V 01.04.02 (V 01.01.02.105) onwards (serial number Pilot 1 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

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					0.10 nmol/mol	<1 nmol/mol
Repeatability at hourly limit value					0.17 nmol/mol	<3 nmol/mol
Residual lack of fit at zero					0.30 nmol/mol	<5 nmol/mol
Lack of fit (largest residual from the linear regression line)			1.64			<4%
Sensitivity coefficient to sample gas pressure					1.0 nmol/mol/kPa	<2 nmol/mol/kPa
Sensitivity coefficient to sample gas temperature					0.16 nmol/mol/K	<1 nmol/mol/K
Sensitivity coefficient to surrounding air temperature					Zero: 0.03 nmol/mol/K Span: 0.16 nmol/mol/K	<1 nmol/mol/K <1 nmol/mol/K
Sensitivity coefficient to electrical supply voltage					0.03 nmol/mol/V	<0.3 nmol/mol/V
Residence Time					2.9 seconds	<3 seconds
Interference by H <sub>2</sub> O (at concentration of 19 nmol/mol)					1.64 nmol/mol	<10 nmol/mol
Interference by m-xylene (concentration of 0.5 μmol/mol)					0.94 nmol/mol	<5 nmol/mol

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Test	Results expressed as % of measured value				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Interference by toluene (at concentration of 0.5µmol/mol)					0.97 nmol/mol	<0.5 nmol/mol
Averaging effect				4.07		<7%
Short term zero drift (over 12h)					0.08 nmol/mol	<2 nmol/mol
Short term span drift (over 12h)					1.34 nmol/mol	<6 nmol/mol
Response time (rise)					59 s	180 s
Response time (fall)					66 s	180 s
Difference between rise and fall time					9 s	<10s
Reproducibility under field conditions <sup>Note 1</sup>				0.6		<5% averaged over three month period
Long term zero drift (over 3months) <sup>Note 1</sup>					0.59 nmol/mol	<5 nmol/mol
Long term span drift (over 3 months) <sup>Note 1</sup>	0.48					<5% of the max of certification range
Period of unattended operation <sup>Note 1</sup>					3 months	3 months not less than 2 weeks
Availability (data capture) <sup>Note 1</sup>					98%	>90%
Total Expanded Uncertainty					7.10%	<15%

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

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## Description

The 49i ambient air analyser measures Ozone (O<sub>3</sub>) using the UV absorption method. This principle uses the characteristic that ozone molecules absorb infrared radiation at a wavelength of 254nm. The relationship between intensity of the absorbance of the UV-light and the ozone concentration follows the law of Lambert-Beer.

The sample is split into two gas streams. One gas stream flows through an ozone scrubber to become the reference gas (I<sub>o</sub>). The reference gas then flows to the reference solenoid valve. The sample gas (I<sub>s</sub>) flows directly to the sample solenoid valve. The solenoid valves alternate the reference and sample gas streams between cells A and B every 10 seconds. When cell A contains reference gas, cell B contains sample gas and vice versa.

The UV light intensities of each cell are measured by detectors A and B. When the solenoid valves switch the reference and sample gas streams to opposite cells, the light intensities are ignored for several seconds to allow the cells to be flushed.

## 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 MC070096/06
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.

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