

PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

Model 42i NO/NO_x 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 :

NO	0 to 1000 ppb
NO ₂	0 to 250 ppb

Project No.: 70111288
Certificate No: Sira MC070093/06
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

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Certificate Contents

Approved Site Application	2
Basis of Certification	2
Product Certified.....	2
Certified Performance	3
Description.....	5
General Notes	5

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/C1 dated 05 th January 2006
TÜV Rheinland	Report Number: 936/21221382/B dated 21 st September 2013

Product Certified

The Model 42i NO/NO_x analyser measuring system consists of the following parts:

- NO₂-NO converter
- Ozonator
- NO₂-NO mode solenoid valve
- Reaction chamber
- Photomultiplier tube
- Sample pump

This certificate applies to all instruments fitted with software version V01.04.15 (V 01. 03. 00. 094) onwards (serial number 42i-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

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					0.21 nmol/mol	<1nmol/mol
Repeatability at hourly limit value					1.21 nmol/mol	<3 nmol/mol
Residual lack of fit at zero					0.48 nmol/mol	<5 nmol/mol
Lack of fit (largest residual from the linear regression line)			1.30			<4%
Sensitivity coefficient to sample gas pressure					0.08 nmol/mol/kPa	<8 nmol/mol/kPa
Sensitivity coefficient to sample gas temperature					0.31 nmol/mol/K	<3 nmol/mol/K
Sensitivity coefficient to surrounding air temperature					Zero: 0.18 nmol/mol/K Span: 0.39 nmol/mol/K	<3nmol/mol/K <3 nmol/mol/K
Sensitivity coefficient to electrical supply voltage					0.04 nmol/mol/V	<0.3 nmol/mol/V
Converter efficiency					98.0%	>95%
Residence Time					2.21 seconds	<3 seconds
Interference by H ₂ O (at concentration of 19 nmol/mol)					1.34 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 NH ₃ (at concentration of 200 nmol/mol)					1.00 nmol/mol	<5 nmol/mol
Interference by CO ₂ at concentration of 500 μmol/mol					2.33 nmol/mol	<5 nmol/mol
Interference by Ozone at concentration of 200 nmol/mol					0.34 nmol/mol	<2 nmol/mol
Averaging effect				2.68		<7%
Short term zero drift (over 12h)					0.4 nmol/mol	<2 nmol/mol
Short term span drift (over 12h)					0.5 nmol/mol	<6 nmol/mol
Response time (rise)					79 s	180 s
Response time (fall)					83 s	180 s
Difference between rise and fall time					5.9 s	<10s
Reproducibility under field conditions ^{Note 1}				3.85		<5% averaged over three month period
Long term zero drift (over 3months) ^{Note 1}					0.04 nmol/mol	<5 nmol/mol
Long term span drift (over 3 months) ^{Note 1}	0.27					<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}					96%	>90%
Total Expanded Uncertainty					13.77%	<15%

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

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Description

The Model 42i operates on the principle that nitric oxide (NO) and ozone (O₃) react to produce a characteristic luminescence with an intensity linearly proportional to the NO concentration. Specifically, Nitrogen dioxide (NO₂) must first be transformed into NO before it can be measured using the chemiluminescent reaction. NO₂ is converted to NO by a molybdenum NO₂-to-NO converter heated to about 325 °C.

The ambient air sample is drawn into the Model 42i through a particulate filter, a sample permeation dryer, a capillary, and then to the mode solenoid valve. The solenoid valve routes the sample either straight to the reaction chamber (NO mode) or through the NO₂-to-NO converter and then to the reaction chamber (NO_x mode).

Dry air passes through a silent discharge ozonator. The ozonator generates the ozone needed for the chemiluminescent reaction. At the reaction chamber, the ozone reacts with the NO in the sample to produce excited NO₂ molecules. A photomultiplier tube (PMT) housed in a thermoelectric cooler detects the luminescence generated during this reaction. The model 42i calculates the NO- NO₂- and NO_x concentration.

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 MC070093/06
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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