

# PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

## **43iQ Sulphur Dioxide Analyzer**

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, June 2016**

Certification Ranges :

Sulphur Dioxide: 0-1000 µg/m<sup>3</sup>

Project No.: 80039230  
Certificate No: Sira MC200355/00  
Initial Certification: 14 July 2020  
This Certificate issued: 14 July 2020  
Renewal Date: 13 July 2025



Emily Alexander  
Environmental Project Engineer

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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*The MCERTS certificate consists of this document in its entirety.  
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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)*

All tests have been conducted in accordance with EN 14212. On the basis of these tests this certificate is valid when the instrument is used for urban air quality monitoring and similar applications. For the continuous measurement of sulphur dioxide concentrations from stationary sources.

## 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 Report No. : 936/21242986/B, Cologne, 2 October 2018

TÜV Report No. : 936/212446911/A, Cologne, 20 August 2019

TÜV Report No. : 936/21247113/A, Cologne, 22 August 2019

## Product Certified

The 43iQ sulphur dioxide measuring system consists of the following parts:

A 43iQ measurement module including the following components:

- DMC measurement bench
- HC kicker
- Optical bench
- Flash lamp assembly
- PMT tube
- Common electronics
- Peripherals support system
- Flow pressure DMC

This certificate applies to all instruments of software version 1.5.1.32120 thereafter.

This certificate applies to all instruments of serial number 1180540005 thereafter.

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## Certified Performance

The instrument was evaluated for use under the following conditions:

Ambient Temperature Range: 0°C to +30°C

Results are expressed as error % of certification range, unless otherwise stated.

Test	Results expressed as % of measured value				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Repeatability at zero					0.26 nmol/mol	≤1 nmol/mol
Repeatability at hourly limit value					0.55 nmol/mol	≤3 nmol/mol
Residual lack of fit at zero					0.52 nmol/mol	≤5 nmol/mol
Lack of fit (largest residual from the linear regression line)				2.4		≤4%
Sensitivity coefficient to sample gas pressure					0.38 nmol/mol	≤2 nmol/mol/kPa
Sensitivity coefficient to sample gas temperature					0.15 nmol/mol/K	≤1 nmol/mol/K
Sensitivity coefficient to surrounding air temperature					Zero: 0.079 nmol/mol/K Span: 0.339 nmol/mol/K	≤1 nmol/mol/K ≤1 nmol/mol/K
Sensitivity coefficient to electrical supply voltage					0.02 nmol/mol/V	≤0.3 nmol/mol/V
Interference by H <sub>2</sub> O (at concentration of 19 nmol/mol)					0.16 nmol/mol	≤10 nmol/mol
Interference by H <sub>2</sub> S (at concentration of 200nmol/mol)					1.37 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 <sub>3</sub> (at concentration of 200 nmol/mol)					0.90 nmol/mol	<5 nmol/mol
Interference by NO (at concentration of 500nmol/mol)					0.08 nmol/mol	<5 nmol/mol
Interference by NO <sub>2</sub> (at concentration of 200nmol/mol)					4.17 nmol/mol	<5 nmol/mol
Interference by m-xylene (at concentration of 1µmol/mol)					4.23 nmol/mol	<10 nmol/mol
Averaging effect			2.1			<7%
Short term zero drift (over 12h)					0.12 nmol/mol	<2 nmol/mol
Short term span drift (over 12h)					0.9 nmol/mol	<6 nmol/mol
Response time (rise)					84 s	180 s
Response time (fall)					82 s	180 s
Difference between rise and fall time					2 s	<10s
Reproducibility under field conditions <sup>Note 1</sup>				0.46		<5% averaged over three month period
Long term zero drift (over 3months) <sup>Note 1</sup>					1.03 nmol/mol	<4 nmol/mol
Long term span drift (over 3 months) <sup>Note 1</sup>		0.55				<5% of the max of certification range
Period of unattended operation <sup>Note 1</sup>					14 days	3 months or less if indicated by manufacturer
Availability (data capture) <sup>Note 1</sup>					100%	>90%
Total expanded uncertainty					11.61%	<15%

Note 1: The field trial was performed in an urban background environment for a period of at least 3 months. The 43iQ measuring system has a maintenance interval of 14 days. The operational status may be monitored and checked by visual inspections of the instruments' display or via an external PC connected to the AMS. The frequency at which the particle filter needs to be replaced depends on the dust concentrations in ambient air. The work details below has to be carried out at regular intervals, depending on local conditions;

- Regular visual inspections/telemetric inspections,
- Instrument status ok,
- No error messages,
- Replace the external Teflon filter at the sample gas inlet as required by measurement site conditions
- Perform zero and reference checks using suitable test gas every two weeks in accordance with standard EN 14212.
- In addition, follow the manufacturer's instructions indicated in the user manual.

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## Description

The 43iQ operates on the principle that SO<sub>2</sub> 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 SO<sub>2</sub> molecules pass through the hydrocarbon “kicker” unaffected.

The sample then flows into the fluorescence chamber, where pulsating UV light excites the SO<sub>2</sub> 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 SO<sub>2</sub> molecules.

As the excited SO<sub>2</sub> molecules decay to lower energy states they emit UV light that is proportional to the SO<sub>2</sub> concentration. The bandpass filter allows only the wavelengths emitted by the excited SO<sub>2</sub> molecules to reach the photomultiplier tube (PMT).

The PMT detects the UV light emission from the decaying SO<sub>2</sub> 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 UV light.

## 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’.
2. The design of the product certified is held and maintained by TUV Rheinland for certificate No. Sira MC200355/00
3. If certified product is found not to comply, Sira Certification Service should be notified immediately at the address shown on this certificate.
4. 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’.
5. This document remains the property of Sira and shall be returned when requested by the company.

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