

PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

48iQ Carbon Monoxide 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 :

Carbon Monoxide : 0-100 mg/m³ (0-89 ppm or µmol/mol)

Project No.: 80039231
Certificate No: Sira MC200356/00
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

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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

All tests have been conducted in accordance with EN 14626. 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 carbon monoxide concentrations in ambient air 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/D, 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 48iQ carbon monoxide measuring system consists of the following parts:

A 48iQ measurement module including the following components:

- Optical bench
- Filter wheel motor
- Detector preamp
- Infrared source
- Common electronics
- Peripherals support system
- Flow pressure DMC

This certificate applies to all instruments of software version 1.6.0.32120 thereafter.

This certificate applies to all instruments of serial number 1180540007 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					0.02 µmol/mol	≤0.3 µmol/mol
Repeatability at hourly limit value					0.03 µmol/mol	≤0.4 µmol/mol
Residual lack of fit at zero					0.13 µmol/mol	≤0.5 µmol/mol
Lack of fit (largest residual from the linear regression line)			1.33			≤4%
Sensitivity coefficient to sample gas pressure					0.02 µmol/mol/kPa	≤0.7 µmol/mol/kPa
Sensitivity coefficient to sample gas temperature					0.10 µmol/mol/K	≤0.3 µmol/mol/K
Sensitivity coefficient to surrounding air temperature					Zero: 0.035 µmol/mol/K	≤0.3 µmol/mol/K
					Span: 0.081 µmol/mol/K	≤0.3 µmol/mol/K
Sensitivity coefficient to electrical supply voltage					0.00 µmol/mol/V	≤0.3 µmol/mol/V
Interference by H ₂ O (at concentration of 19 nmol/mol)					0.14 µmol/mol	≤1 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 $\mu\text{mol/mol}$)					-0.05 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol}$
Interference by CO ₂ (at concentration of 500 $\mu\text{mol/mol}$)					-0.03 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol}$
Interference by N ₂ O (at concentration of 50 nmol/mol)					0.00 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol}$
Averaging effect				2.0		<7%
Short term zero drift (over 12h)					0.04 $\mu\text{mol/mol}$	$\leq 0.1 \mu\text{mol/mol}$
Short term span drift (over 12h)					0.20 $\mu\text{mol/mol}$	$\leq 0.6 \mu\text{mol/mol}$
Response time (rise)					48.5 s	$\leq 180 \text{ s}$
Response time (fall)					47.5 s	$\leq 180 \text{ s}$
Difference between rise and fall time					1.0 s	$\leq 10 \text{ s}$
Reproducibility under field conditions ^{Note 1}			1.52			$\leq 5\%$ averaged over three month period
Difference between sampling and calibration port	-0.06					$\leq 1\%$
Long term zero drift (over 3months) ^{Note 1}					0.43 $\mu\text{mol/mol}$	$\leq 0.5 \mu\text{mol/mol}$
Long term span drift (over 3 months) ^{Note 1}				2.75		$\leq 5\%$ of the max of certification range
Period of unattended operation ^{Note 1}					14 days	3 months or less if indicated by manufacturer
Availability (data capture) ^{Note 1}					100 %	>90%
Total expanded uncertainty					9.58 %	$\leq 15\%$

Note 1: The field trial was performed in an urban background environment for a period of at least 3 months. The 48iQ measuring system has a maintenance interval of 14 days. The frequency at which the particle filter needs to be replaced depends on the dust concentrations in ambient air at the site of installation. The work detailed 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 14626
- In addition, follow the manufacturer's instructions indicated in the user manual

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Description

The 48iQ operates on the principle that carbon monoxide (CO) absorbs infrared radiation at a wavelength of 4.6 microns. Gas Filter Correlation (GFC) is an infrared technique that selectively measures light absorption uniquely due to CO by the ratio of sample-absorbed light to a filtered reference measurement.

Light from a broadband infrared source passes through a gas filter wheel alternating between N₂ and CO filled cells and passes through a narrow bandpass interference filter before passing into the volume containing sample gas. Light that passes through the N₂ cell is absorbed by CO in the sample gas normally as the *sample* signal; light that passes through the CO cell is already blocked where CO absorbs, and so is unchanged by sample CO as the *reference*.

The ratio of “sample” to “reference” (S/R) is acquired at high speeds and corrects for light intensity and other changes to achieve precision measurement. Because the filtering is achieved with CO gas itself, the GFC technique is specific for CO.

The 48iQ uses an internally stored calibration curve to accurately linearize the instrument output over any range up to a concentration of 10,000 ppm. The sample gas flows through the optical cell by use of a single stage pump and a capillary.

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 MC200356/00
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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