

PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

Hach BioTector B3500 TOC Analyzer

manufactured by:

BioTector Analytical Systems Ltd

*Raffeen House
Ringaskiddy
Co Cork
Ireland*

has been assessed by Sira Certification Service
and for the conditions stated on this certificate complies with:

**MCERTS Performance Standards for Continuous Water Monitoring Equipment, Part 2:
online analysers, Version 3.1, dated August 2010**

Certification Range :

TOC 0 to 25 mg/L

Project No: 16W28604
Certificate No: Sira MC130228/02
Initial Certification: 24 July 2013
This Certificate Issued: 24 July 2018
Renewal Date: 23 July 2023

Technical Director

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



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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

On the basis of the assessment this instrument is considered suitable for use on treated wastewater, untreated wastewater and receiving water applications.

A three month field trial was conducted on an industrial WWTP with an additional one week trial on a surface water application.

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:

Reports:

Sira Evaluation Report 16W28604 dated 28 June 2013

Product Certified

The measuring system consists of the following parts:

- Hach BioTector B3500c TOC Analyzer
- Hach BioTector B3500s TOC Analyzer
- Hach BioTector B3500dw TOC Analyzer

This certificate applies to all instruments listed above and programmed with software version 1.00 onwards (serial number B5C 100 001 onwards).

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Certified Performance

The instrument was evaluated for use under the following conditions:

Ambient Temperature Range: 5°C to 45°C

Unless otherwise stated the evaluation was carried out on the certification range 0 to 25 mg/L

Test	Results % reading				Other results	MCERTS Specification % reading
	<0.5	<1	<2	<5		
Combined performance characteristic 0 to 25 mg/L				3.15		12%
Warm up time					<11 min	Value to be reported
Response time					5 min 29 s (batch analyser)	Value to be reported
Mean error 0 to 25 mg/L			1.43		Note 1	10% (or 0.2mg/L)
Linearity 0 to 25 mg/L		-0.59				5%
Repeatability 0 to 25 mg/L			1.89		Note 1	5% (or 0.1mg/L)
Sample matrix effects TIC carry over Salt interference	0.14 0.22				Note 2	3% span
Drift (7 days)		0.76				5%
Output impedance (50 - 500Ω)	0.04					2.5%

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Test	Results % reading				Other results	MCERTS Specification % reading
	<0.5	<1	<2	<5		
Supply voltage (207V to 253V)		0.32				2.5%
Ambient temperature (5 to 45°C)	0.38					5%
Relative humidity (95%)	0.31					5%
Sample temperature (5 to 60°C)		0.77			Note 3	5%

Note 1: TOC performance characteristics are expressed as % reading. Therefore, the test data at 1.25 mg/L (test point 1) is always the maximum error. The full results are summarised below:

	1.25 mg/L (test point 1)	5 mg/L – 25mg/L (test point 2-5)	Specification (% reading)
Mean error	1.43% (0.018 mg/L)	1.29%	10% (or 0.2mg/L)
Repeatability	1.89% (0.024 mg/L)	1.09%	5% (or 0.1mg/L)
Linearity	-0.59% (0.008 mg/L)	0.27%	5%

Note 2: Salt interference tested with 5% and 20% salt

Note 3: Testing conducted with EMPP tubing

Note 4: The following tests are not applicable to the analyser:
 6.3.9 Incident light
 6.3.11 Sample flow rate
 6.3.12 Sample pressure

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Field Test Results

The field trial was conducted > 3 months on an industrial WWTP and for 1 week on a surface water application on the BioTector TOC Analyzer (certificate Sira MC120199/00) – see results table below.

Test	Results				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Error under field conditions	100% Note 5					>90% of errors ≤ Uc value (12% reading)
Response time (start)					6 min 49 s	To be reported
Response time (end)					6 min 47 s	To be reported
Up-time					99.86%	>95%
Maintenance	Routine maintenance as specified by the manufacturer					To be reported

Note 5: Uncertainty of the test method has been included. Error under field conditions has been calculated from the following;

- 26 paired readings with a KHP standard at 250mg/L. Error range -2.52% to +2.92%.
- 10 paired readings with a bench top/laboratory BioTector analyzer at ~30mg/L. The sample was biologically active and was not filtered therefore included particulate in the analysis. Error range -9.58% to +13.62%
- 5 paired readings with laboratory analysis at ~5mg/L. Error range -7.40% to -0.35%

Additional field trials on the Hach BioTector B3500 TOC Analyzer for 6.5 weeks on an industrial WWTP and 5.5 weeks on a municipal WWTP, demonstrating reliability of the analyzer with only routine maintenance as specified by the manufacturer conducted over this time.

The analyser was tested according to EN1484:1997 Annex C, for determination of samples containing hard particles (with the use of cellulose). A recovery of 90% was obtained by the Hach BioTector B3500 TOC Analyzer during this test. From EN1484:1997 Annex C, expected recoveries for alternative technologies are given in the table below:

	Recovery, %
Combustion technology	83.2
UV-oxidation	2.7

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Description

Hach BioTector B3500 TOC Analyzers are specifically developed for continuous on-line analysis of TOC and use a patented self-cleaning oxidation technology, the Two-Stage Advanced Oxidation method, or (TSAO).

The measurement process can be described in five stages:

1. **SAMPLING:** A representative sample from the stream to be measured is pumped into the analyzer. The Hach BioTector B3500 TOC Analyzer automatically selects the appropriate sample volume for the optimum measuring range.
2. **TIC DETECTION:** Acid is added to lower the pH so that inorganic carbon is sparged off as CO₂. This is measured to ensure Total Inorganic Carbon (TIC) is not carried over into the Total Organic Carbon (TOC).
3. **OXIDATION:** The BioTector's patented oxidation method (TSAO) achieves total and complete oxidation of sample, including organic carbon to CO₂, nitrogen compounds to nitrate and phosphorus compounds to phosphate. TSAO utilizes hydroxyl radicals generated within the analyzer by combining oxygen, which passes through the ozone generator, with sodium hydroxide.
4. **TOC MEASUREMENT:** To remove the CO₂ from the oxidized sample, the pH of the sample is lowered again. The CO₂ is sparged and measured by the specially developed NDIR CO₂ analyzer. The result is displayed as Total Organic Carbon (TOC).
5. **CLEANING:** The entire system is automatically self-cleaned by the reaction process during every cycle. No additional cleaning solution is required.

The analyser can measure TOC, TIC, TC and VOC. Up to 3 streams can be analysed.

Calibration is achieved by analysing a standard TOC solution which contains a known concentration of TOC, and adjusting the analyser's result to match that of the TOC solution. The analyzer is designed so that calibration is only required every 6 months.

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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 V01 for certificate No. Sira MC130228/01
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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