

PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

Hach BioTector B7000 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 Ranges :

TOC	0 to 50 mg/L
	0 to 1000 mg/L
	0 to 10000 mg/L

Project No: 16W23654
Certificate No: Sira MC120199/04
Initial Certification: 20 July 2012
This Certificate Issued: 8 November 2017
Renewal Date: 19 July 2022

Emily Alexander BSc (Hons)
Deputy Certification Manger

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
Field Test Results	5
Description.....	6
General Notes	7

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, surface water and estuarine/coastal 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 Biotector Evaluation Report CWMS Part 2 Online 2016
BioTector MCERTS test report version 2.0 dated April 2014

Product Certified

The measuring system consists of the following parts:

- Hach BioTector B7000 TOC Analyzer
- Hach BioTector B7000i TOC Analyzer
- EMPP tube or Norprene tube (optional).

This certificate applies to all instruments fitted with software version 4.00 onwards (serial number BAC 400 938 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

Unless otherwise stated the evaluation was carried out on the certification range 0 to 1000 mg/L

Test	Results % reading				Other results	MCERTS Specification % reading
	<0.5	<1	<2	<5		
Combined performance characteristic						
0 to 50 mg/L					5.13% Note 1 Note 2	<12%
0 to 1000 mg/L					3.89%	<12%
0 to 10000 mg/L					6.74%	<12%
Warm up time					<12 mins	To be reported
Response time					6 min 47 sec	(Batch analyser) To be reported
Mean error						
0 to 50 mg/L			1.65			10% (or 0.2mg/L)
0 to 1000 mg/L			1.60			10% (or 0.2mg/L)
0 to 10000 mg/L				2.94		10% (or 0.2mg/L)
Linearity						
0 to 50 mg/L			1.17			<5.0%
0 to 1000 mg/L	0.97					<5.0%
0 to 10000 mg/L			1.50			<5.0%
Repeatability						
0 to 50 mg/L				2.06		5.0% (or 0.1mg/L)
0 to 1000 mg/L			1.28			5.0% (or 0.1mg/L)
0 to 10000 mg/L				2.60		5.0% (or 0.1mg/L)
Sample matrix effects						
TIC carry over	0.18					<3.0% span
Salt interference	0.42				Note 3	<3.0% span
Drift		0.87				<5.0%

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Test	Results % reading				Other results	MCERTS Specification % reading
	<0.5	<1	<2	<5		
Output impedance 50 to 500Ω	0.03					<2.5%
Supply voltage 207 to 235 V AC	0.4					<2.5%
Ambient temperature +5°C to +40°C	0.33					<5.0%
Relative humidity 95% RH		0.63				<5.0%
Sample temperature +5°C to +60°C			1.15		Note 4	<5.0%

Note 1: The original certification (pre-design change) applied to instruments with serial number starting from BAC 300 609 (where the middle three digits are 3xx referring to software version 3.00 onwards) and included the certification range 0 to 20 mg/L. The data is summarised below:

TOC performance characteristics are calculated as % reading. As a result, the test data for the 0-20mg/L range at 1 mg/L (test point 1) is always the maximum error. The results have been summarised below;

	1 mg/L (test point 1)	5 mg/L – 20mg/L (test point 2-5)	Specification (% reading)
Uc	8.03%	4.31%	12%
Mean error	6.00% / 0.06 mg/L	1.27%	10% (or 0.2mg/L)
Repeatability	0.08 mg/L	1.21%	5% (or 0.1mg/L)

Note 2: The 0 to 50 mg/L range was added based on new test results from an updated design of the instrument.

All of the data in the 'Certified Performance' table (page 3 & 4) applies to this updated design. This new design was implemented with the introduction of the mixer reactor system, with serial number starting from BAC 400 742 (where the middle three digits are 4xx or higher referring to software version 4.00 onwards).

The original combined performance characteristics were as follows:

Range	Combined Performance Characteristic
0 to 20 mg/L	8.03
0 to 1,000 mg/L	4.51
0 to 10,000 mg/L	4.86

Note 3: Salt interference tested with 5% and 20% salt

Note 4: Testing conducted with Norprene Chemical tubing. EMPP tubing result was 0.33%.

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Field Test Results

The field trial was conducted for > 3 months on an industrial WWTP and for 1 week on a surface water application

Test	Results				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Error under field conditions	100% Note 5 Note 6					>90% of errors ≤ Uc value (12% reading)
Response time (start)					6 min 49sec	To be reported
Response time (end)					6 min 47 sec	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%

Note 6: The field trial was conducted as part of the original MCERTS certification in 2012.

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Description

Hach BioTector B7000 TOC Analyzers are specifically developed for continuous on-line analysis of TOC. Hach BioTector B7000 TOC Analyzers use a patented self-cleaning oxidation technology, the Two-Stage Advanced Oxidation method, or (TSAO).

The Hach BioTector B7000 TOC Analyzer can analyze samples with no restrictions on the chloride level in the sample. This includes samples saturated with up to 30% sodium chloride.

THE MEASUREMENT PROCESS CAN BE DESCRIBED IN FIVE STAGES

1. **SAMPLING:** A representative unfiltered sample from the stream to be measured is pumped into the analyzer. The sample injection valve 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 TIC is not carried over into the TOC.
3. **OXIDATION:** The BioTector's patented oxidation method (TSAO) is used to achieve total and complete oxidation of sample, including organic carbon to CO₂. 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-detector. 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. A dairy mode is also available, which has an automated Base (Sodium Hydroxide) wash of the sample line. Up to 6 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 MC120199/03.
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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