

## Thermo Scientific HiPerTOC: Reliable and Versatile TOC analysis in liquids and solids



### Flexible environmental customer solutions

The Thermo Scientific HiPerTOC analyzer is designed to offer a high performance, dedicated Total Organic Carbon (TOC) solution. An optional Total Nitrogen (TN<sub>b</sub>) module is also available to enhance the analytical capabilities when required. This multi-purpose analyzer includes high temperature and UV destruction techniques for flexible and versatile TOC/TN<sub>b</sub> analyses. The system fully meets the challenges of today's busy laboratories, like high productivity and accuracy, with a large variety of water and solid samples.

#### The choice is yours...

The HiPerTOC has 4 different destruction techniques in one single benchtop instrument, to give you the most flexibility when running TOC analyses. The best destruction technique is mostly dictated by the matrix of the sample:

#### 1. High temperature oxidation

This is an excellent technique for fast results in difficult to oxidize and low saline samples, and the best choice for particulated samples as well as real solids samples in the field of TOC analysis. For the optional TN<sub>b</sub> analysis module, the furnace can be adjusted to a temperature that meets this requirement.

#### 2. UV/Persulfate

The ideal oxidation technique for accurate results in routine environmental and seawater samples. This direct TOC analysis method is capable of handling large sample volumes.

#### 3. UV/Ozone promoted

A powerful oxidation without any hardware modification of the HiPerTOC for superior TOC analysis of waters containing inorganic chlorides and other salts up to 35 %.

#### 4. UV (Ultra Pure)

A reliable technique for extremely sensitive TOC analysis down to ppb level.

The different destruction techniques make TOC analysis using the HiPerTOC a lot easier and are supported by Thermo Scientific ThEuS operating software to get accurate TOC data. The standard HiPerTOC also features:

- A fully integrated 63-position XYZ-sampler supported with 2 specially designed needles for the automated introduction of water samples and acidifying of samples in case of NPOC analysis.
- A stirrer module which ensures the homogeneity of the samples, and enables customers to handle particulate samples up to 700 µm.
- High and low range NDIR detectors which are controlled by the ThEuS software to automatically select the right calibration line for dilute or re-measure of samples - without interpretation of the user. Users can select either a single HT or UV configuration, which can be upgraded to a combined HT/UV configuration.

This makes the HiPerTOC fully flexible to run samples with different oxidation techniques and calibration ranges in one sample queue sequence.

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### HiPerTOC SA

The HiPerTOC can be optionally extended with a solids module accessory, the HiPerTOC SA, to analyze TOC in solids samples. This compact add-on module incorporates a manual sample introduction system, and a high temperature furnace which is connected to the gas conditioning unit and NDIR detector of the HiPerTOC analyzer.

The HiPerTOC SA makes analysis of samples like soils, sediments and solid waste from low ppm to high %-level of carbon an easy task with excellent and accurate results. The horizontal sample introduction and combustion designs enable you to have optimum access to your dedicated application, save time and lower operational costs.

### Total Nitrogen (TN<sub>b</sub>) analysis by CLD technique

For the TN analysis of water samples using high temperature oxidation technique at 720°C with catalyst, the HiPerTOC can be optional extended with a so-called TN-CLD module. This Thermo Scientific TN<sub>b</sub> option fully complies with the stringent DIN and CEN requirements and has a linear working range up to 60 ppm.

The TN-CLD module makes the analysis of environmental samples containing ammonium and nitrate components very reliable using the chemiluminescence (CLD) detection technique. You can benefit from this option by saving time and operating costs, compared the traditional Kjehldal technique.

### ThEuS operating software

The HiPerTOC is fully controlled by the user friendly ThEuS software which is compatible with the current Windows® version. ThEuS incorporates a very simplified user-interface which makes today's TOC analysis a routine and smooth operation.

ThEuS software package includes the following features:

- automatic calibration procedure
- sample queue sequence for using different oxidation techniques in one run
- system diagnostics
- sample acidification and dilution functionalities (NPOC)
- real time measurement curves
- data evaluation and export to Excel and CSV format for LIMS connectivity
- customized sample curve, calibration line and sample data print-out reports
- service level operation tools for preventative and corrective service tasks
- method and configuration updates



## Market Applications

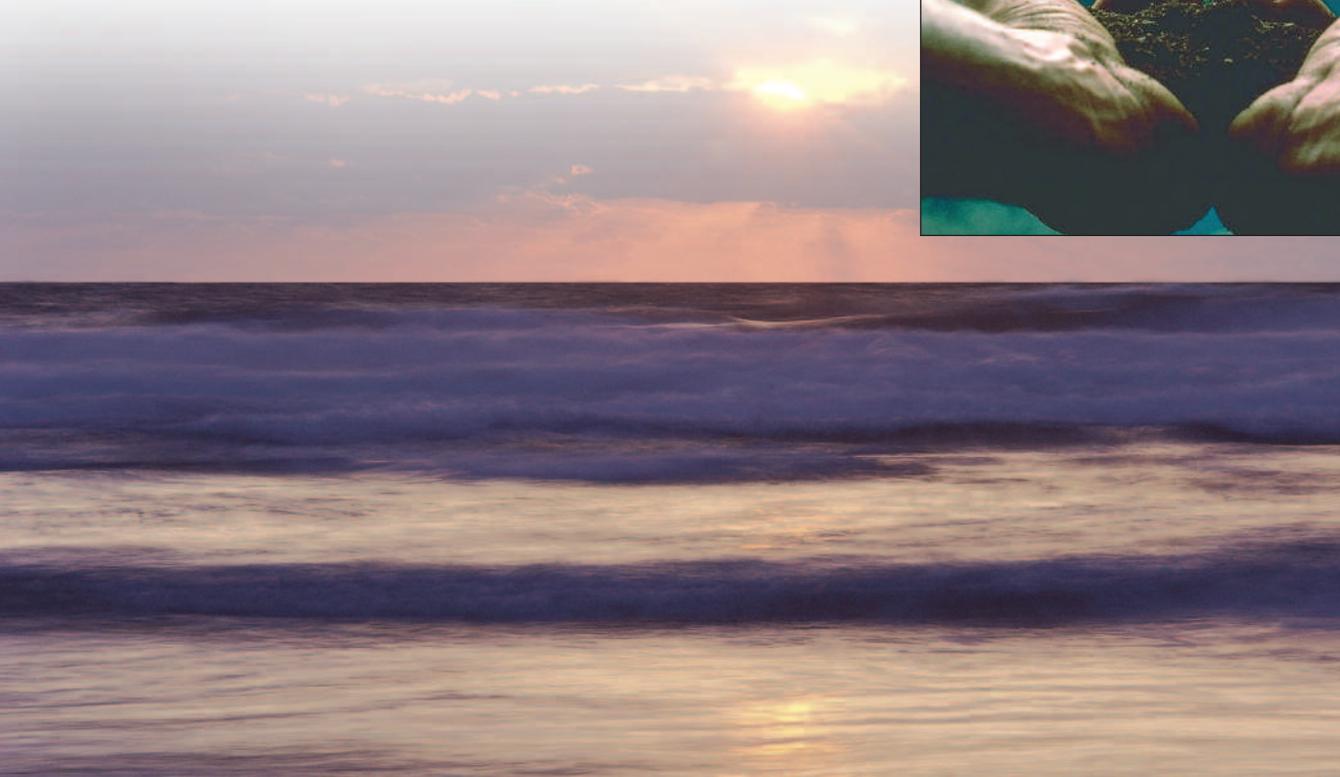
The HiPerTOC will satisfy the specific TOC needs of the following market applications:

APPLICATIONS	OXIDATION TECHNIQUE			
	HIGH TEMP	UV/ PERSULFATE	OZONE PROMOTED	UV ULTRA PURE
Drinking water	✓	✓		
Surface water	✓	✓		
Ground water	✓	✓		
Waste water	✓	✓	✓	
Cooling water		✓		
Sea water		✓	✓	
High purity water				✓
High salt contained water			✓	
Soil	✓			
Solid waste	✓			

The HiPerTOC fulfills the specific TOC needs of the following industries:  
Utilities, Chemical & Petrochemical, Environmental QC labs, Food & Beverage, Governmental, R&D Labs and Universities

## Summary of HiPerTOC analyzer benefits

FEATURES	ADVANTAGES	BENEFITS
63 positions autosampler	High sample throughput	Lower costs per analysis Major productivity gain Time saving
Analysis of samples with particles upto 700 um	No blocking of sample line	Less downtime Broad application coverage
UV + High Temp in ONE	Fulfills all application needs	Lower costs of investment - Two instruments for the price of one Certainty of TOC data
Benchtop model	Small footprint	Saves benchspace
HiPerTOC SA add-on module	No impact on sample throughput if furnace fails	Economic solution Less downtime
Autosampler needle assembly	Eliminate carry over from sample to sample	Improved reproducibility



## Typical Application Results

### TOC analysis in seawater

The increase of CO<sub>2</sub> and global warming effects make TOC analysis of seawater a demanding parameter. The HiPerTOC in UV/persulfate mode has proved an excellent and robust analyzer configuration to perform trouble free TOC analysis in high salt contained sample matrices without any effect on blockage, corrosion, interferences or carry-over effects of the system. Typical TOC data of seawater samples are:

SAMPLE	TOC (MG/L)	RSD (%)
1	3.86	1.16
2	3.99	0.55
3	3.98	1.33
4	0.79	1.33
5	0.80	2.52
6	0.84	1.75
7	0.74	1.58
8	0.63	1.23

### TOC analysis in various water samples

The use of four different oxidation techniques in one single instrument provides high productivity and flexibility gain. The following table shows a mix of typical water samples with corresponding TOC results.

SAMPLE	TECHNIQUE	TOC (MG/L)	RSD (%)
Drinking water 1	UV/persulfate	1,31	3,8
Drinking water 2	UV/persulfate	3,80	3,4
Industrial water 1	UV/Ozone prom	1,78	0,72
Industrial water 2	UV/Ozone prom	2,42	3,8
Cooling water 1	UV	0,066	5,7
Cooling water 2	UV	0,108	5,6
Waste water 1	High temp	493	2,2
Waste water 2	High temp	23,2	1,5

### TOC analysis in solids

The use of the compact add-on module, HiPerTOC SA, with a dedicated high temperature furnace and horizontal sample introduction system, results in a reliable and easy-to-use solution. The following typical results in soil and solid waste samples have been obtained.

SAMPLE	TOC (MG/KG)	RSD (%)
CRM 100	52.2	1.04
CRM 101	50.0	1.27
Soil 1	0.52	4.04
Soil 2	0.92	3.88
Soil 3	8.08	4.50
Solid waste 1	15.23	3.63
Solid waste 2	51.1	3.76
Solid waste 3	4.29	4.01

### TN<sub>x</sub> analysis in water samples

The Thermo Scientific TN-CLD module for HiPerTOC model analyzer is used as add-on and make use of 720°C catalyst oxidation technique. The TN-CLD module demonstrates in below given results an excellent linearity and matrix independent performance which solely complies with the DIN and CEN requirements.

SAMPLE	TNB (MG/L)	RSD (%)
NO3 standard 10 ppm	10,3	1,5
NH4 standard 10 ppm	9,94	0,8
NO3/NH4 mix 10 ppm	10,1	1,7
Industrial Effluent 1	23,4	1,8
Industrial Effluent 2	55,3	0,8
Drinking Water	12,1	1,6

COMPONENT	STANDARD 50 MG N/L RECOVERY	RECOVERY %
Sodium nitrate	55.2	110
Caffeine	51.4	103
Glycin	44.3	89
Urea	51.7	103
Glutamic acid	41.2	82
Thiocyanate	43.4	87
Arginine	42.4	85

### International Test-method Requirements

The HiPerTOC meets stringent ISO, DIN, CEN, ASTM and EPA requirements for the various range of TOC samples which make use of High Temp and UV oxidation technologies.

Each HiPerTOC also passes a factory acceptance test which is prepared in accordance with these test-methods and customer needs, before delivery.

Visit [www.thermo.com/ceadealers](http://www.thermo.com/ceadealers) to find your local dealer

