

Total Organic Carbon (TOC) in Drinking water

Key Words

- TOC
- Drinking water
- UV-Persulfate method

Introduction

The production of high quality drinking water depends on a number of closely monitored parameters. The TOC value of drinking water is such an important parameter. Produced drinking water is often distributed in a matter of a few hours. Therefore, fast screening of the (allowed) Total Organic Carbon load of this product needs to be accurate and fast. Typical TOC values in drinking water may range up to 25 ppm. (Depending on regulatory compliance and territory)

The produced TOC number indicates Organic materials (natural), Disinfectants and Disinfection byproducts.

Referenced Documents

The HiPer-TOC analyzer complies with the following standard methods:

- EN 1484: Water analysis: Guidelines for the determination of Total Organic Carbon (TOC) and Dissolved Organic Carbon. (DOC)
- ASTM D4839: Total Carbon and Organic Carbon in Water by UV-Persulfate Oxidation, and/or Infrared Detection TC, IC, TOC in water, waste water and sea water.
- ASTM D4779: Total, Organic and Inorganic Carbon in High Purity Water by UV Persulfate Oxidation and/or Infrared Detection TC, IC, TOC in production water, high purity process water.

In addition, new EPA disinfection by-products rules require TOC monitoring of drinking water!!

Principle of operation

Preferred method for drinking water applications, using the HiPer-TOC, is the UV-Persulfate method. The sample is automatically taken by the standard XYZ autosampler, and injected into a uniquely designed reactor. Direct exposure to UV-light and Persulfate, ensures a complete oxidation of the water sample. The CO₂ gas is passed through a gas-liquid separator, and "air dried" by a peltier cooler. The CO₂, together with the carrier gas, is led through two IR detectors, one being 10 times more sensitive than the other one. To better fit the analytical range, both can be calibrated simultaneously, resulting in less need for dilution and always-accurate results, without over-ranging. ThEuS software allows storage of several multiple point calibration lines. Working ranges used are standard or customer defined. Generate data and peaks can be recalculated afterwards, or during analysis. Preferred method is the NPOC. (Non-Purgable Organic Carbon)

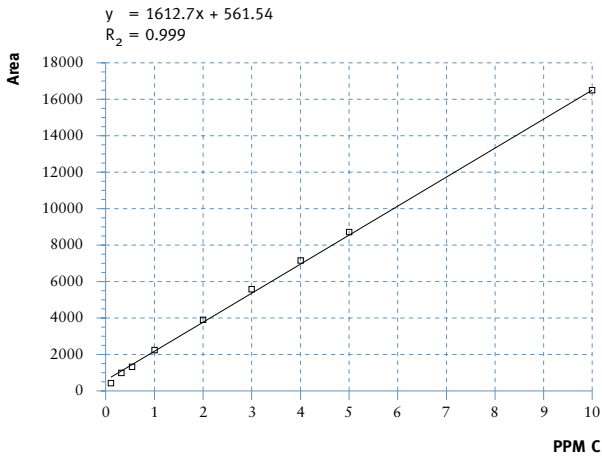
NPOC methods

- 1 TIC measured: The sample is introduced into the reactor, and mixed with acid. TIC is sparged off, and a peak appears on the measuring screen, representing the TIC result. Next, Persulfate is introduced into the reactor and the UV lamp goes on. The second peak appearing on the screen is representing the TOC result.
- 2 TIC sparged off: The sample is automatically acidified in the autosampler, and TIC is sparged off. The sample is taken, injected into the reactor. The UV lamp goes on, Persulfate is mixed and the peak appearing on the measuring screen represents the direct TOC value.

System settings

UV Reactor:	Heated up to approximately 85°
Carrier gas:	Oxygen, 250 ml/min
Sample volume:	3 ml
Injection speed:	250 µl/s
Sampler:	Standard XYZ
System configuration:	HiPer_TOC_UVp
ThEuS method:	NPOC_UVp

Standard Curve NPOC UV/Persulfate

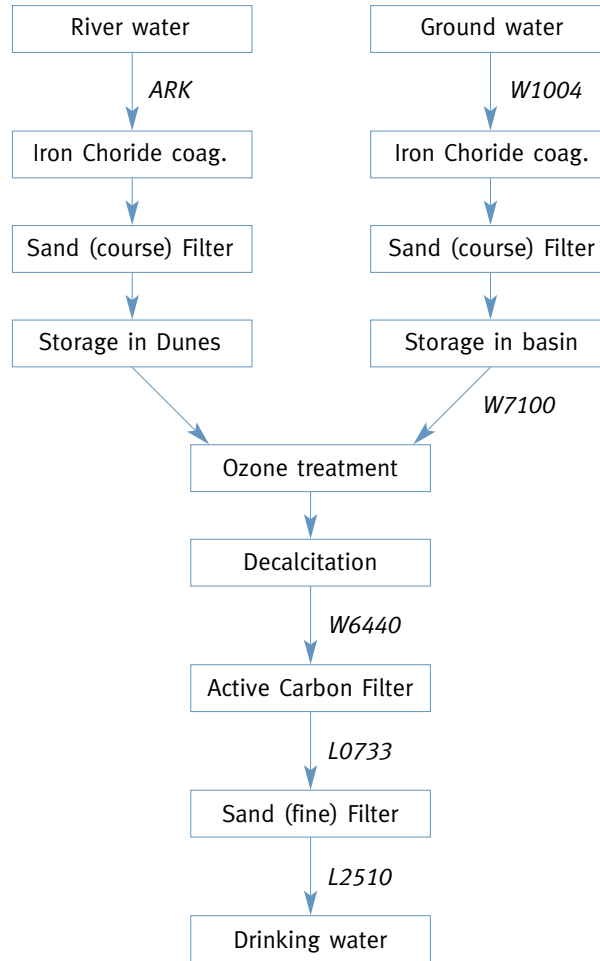


Concentration C PPM	Area
0,1	427
0,3	988
0,5	1312
1	2239
2	3891
3	5577
4	7155
5	8725
10	16508

NPOC results in drinking water and drinking water production

sample volume	3 ml
After sand infiltration (L2510)	1.36 ppm
After Active Carbon filtration (L0733)	5.36 ppm
After Storage in basin (W7100)	2.57 ppm
Intake river water (ARK)	2.78 ppm
After decalcification (W6440)	4.02 ppm
Ground water (W1004)	6.76 ppm

Purification proces: Drinking water



Thermo Electron Corporation has direct subsidiary offices in North America, Europe and Japan. To complement these direct subsidiaries, we maintain a network of representative organizations throughout the world. Use this reference list or visit our Web site to locate the representative nearest you.

Austria
Tel: +43 (0)1 333 50 34 0

France
Tel: +33 (0)1 39 30 53 00

Germany
Tel: +49 (0)6102 3671 0

Italy
Tel: +39 02 6601 6351

Netherlands
Tel: +31 76 5724840

Note: A complete Application Report with detailed test results is available on special request.