

vario TOC cube



TOC/TN_b analysis without limitations

For over 30 years, Elementar has been the German pioneer in high temperature TOC analysis. Compared to low temperature UV-digestion or wet chemical methods (e.g. COD) to measure organic contaminations the high temperature combustion developed by Elementar provides a multitude of advantages:

- Analysis time of 2–3 min compared to up to 1.5 hours in case of COD
- Safe and environmentally clean operation without concentrated acids, oxidizing agents or other aggressive chemicals or hazardous waste
- 100% C recovery independent from sample type and matrix also with particle or salt containing solutions
- Simultaneous analysis of totally bound nitrogen (TN_b) in addition to TOC
- Fully automatic operation with high sample throughput and low analysis costs

The vario TOC cube is a totally new analyzer for TOC/TN_b analysis for all types of samples from ultrapure (pharmaceutical) water, drinking water, industrial waste water, suspensions or solids with even very difficult sample matrices.

The basic concept

combines for the first time the features of a high performance water analyzer with a century of experience in organic elemental analysis of carbon in solids.

The measuring principle for all operation modes is the oxidation of bound carbon into CO₂. The liquid sample is directly injected into the combustion reactor at 900 °C in an air carrier gas stream. Solid samples are weighed in a tin container and fed automatically via a ball valve. The gas is dried, flow stabilized and finally measured with a NDIR detector. A connected PC calculates from the measured CO₂ signal and the sample weight the total carbon concentration (TC).

Inorganic (carbonate) carbon (TIC) can be measured automatically by acidifying the sample in a sparger and stripping and detecting of the released CO₂. The equation TOC=TC-TIC gives you the content of total organic carbon. In addition also the total bound nitrogen (TN_b) can be measured simultaneously to TOC by means of NO sensitive electrochemical (EC) or chemiluminescence (CLD) detectors.

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No limitations in sample nature

Oxidation temperatures of permanently up to 1200 °C or even temporarily 1800 °C provide absolute C recovery for even refractory samples. Due to a unique matrix separation concept also concentrated salt solutions can be analyzed in larger quantities. The special tin capsule sampling technique serves for the accurate analysis of unlimited sized particles, suspensions and bulk solids in addition to easy liquid handling. Sample volume can range from 3 µl to 2 ml.

Unmatched analytical performance

All parameters like TOC, NPOC, TC, TIC, DOC, POC and TN_b can be measured with the same basic unit. Detection of low ppb for ultrapure water but also undiluted 60,000 ppm industrial waste water or up to 20 mg C abs. in solids represents a measuring range which cannot be met by any other instrument. No modifications of the instrument hardware or detection range is even necessary. A TC measurement takes only 3 min.

Customized instrument versions

Based on just one very compact basic unit vario TOC cube can be equipped according to your typical applications. This is e.g. for manual or automatic sample changing, analysis of liquids or solids as well as for the determination of TOC only or TN_b in addition to the choice of NDIR-, CLD- or EC- detection. For TIC measurements in solids a separate unit can be attached. This allows the most cost effective solution for your analytical task.

Automation at the highest level

Automatic sample handling of up to 80 liquid samples incl. stirring can be performed. Absolutely unique is the possibility of the automatic feeding of up to 120 solid samples. In connection with the very short analysis time a high sample throughput can be reached. Autosamplers are fully integrated and easily attachable to the basic unit without additional space requirement. Change of autosamplers e.g. from liquid to solid can be easily performed.

TOC/ TN_b , precise and easy

Most modern electronics and software

vario TOC cube is based on advanced microelectronics. All instrument functions incl. gas flow and pressures are under digital control thus allowing automatic optimization of measuring parameters, leak checking as well as operation and trouble shooting via the internet. The 24-bit data processing provides plenty of measuring dynamics. Security of the electronic data generation and storage is ensured in full compliance with 21 CFR Part 11.

Long time stability and low maintenance

vario TOC cube is designed for long lasting trouble free operation with only one valve in the sampling line and very short tube length. Sample feeding and gas drying is practically maintenance free. The catalyst and combustion tube are protected against contamination and damages and the analysis gas flow is stabilized by an electronic mass flow controller. The complete system works under low voltage conditions and the furnace has a 10 years warranty!

Low installation and operation costs

The footprint of vario TOC cube is only 48 × 55 cm including the autosamplers. This results in the saving of precious laboratory space. For operation, only synthetic air and electrical power are required. Long life of the combustion tube, catalyst and components like the furnace reduce the cost per analysis to an absolute minimum. Due to high automation, robustness and easy handling, labor expenses are reduced as well.

In accordance with the official standards

vario TOC cube operates in full compliance with all relevant national and international norms or standards like ISO 8245, 10694, EPA 415.1, European standard acc. to EN 1484, ENV 12260, U.S. Pharmacopoeia NF, USP 30 (643)2007, European Pharmacopoeia 5.0, vol.1 (2024)2005, p.68