Primacs$^{SNC-100}$
Carbon and Nitrogen Analyzer

Skalar

your partner in chemistry automation

The Primacs$^{SNC-100}$ TOC / TN analyzer

A flexible solid sample analyzer with integrated 100-position autosampler for determination of Nitrogen (N) / Protein, Total Carbon (TC), Total Elemental Carbon (TEC), Total Inorganic Carbon (TIC) & Total Organic Carbon (TOC).

The analyzer provides fast, accurate and low level analysis for these parameters in applications such as soil & plant, sludges & sediments, animal feed & grain, food, malt, fertilizer etc.

The Primacs$^{SNC-100}$ contains a large integrated 100 position autosampler and is covered with a transparent lid. The sampler can analyze large daily sample loads in one batch. The sample rack is removable and re-usable ceramic crucibles are used for sample weights up to 3 g of solid material. The samples are introduced in the analyzer through a unique vertical sample introduction system. Sample ashes remain in the crucible after the analysis and are taken out of the instrument with removal of the crucible. This avoids sample ash build-up in the combustion zone and therefore reduces maintenance.

High temperature combustion with Non Dispersive Infrared detection (NDIR) is used for the analysis of TOC, TEC and TIC. The temperature settings are variable and a special temperature ramping program allows the analysis of TEC also called Residual Oxidizable Carbon (ROC) according to DIN 19539. TIC can also be analyzed separately using automatic acidification and purging.

The determination of TN / Protein is based upon DUMAS methodology and detection with Thermal Conductivity Detection (TCD). The Dumas technique for TN analysis is a fast and environmental friendly alternative for the Kjeldahl classical technology.

The analyzer uses various control systems to guarantee correct operation and accurate results such as:

- An internal active temperature stabilization system, which eliminates influences of room temperature
- An automated control system, for checking gas flow & pressure in the system

The system is delivered with a very practical and flexible software package, with pre-installed method files, user definable sample table set up and integrated QC features.

Applications

Skalar has developed applications for a variety of industries. Our comprehensive applications library provides a large selection of standardized references.

Soil & Plant

Soil testing is carried out to determine the level of nutrients in soil available for plants. Nitrogen is the most important element for plant development and carbon is essential for soil structure, energy for biological processes and provision of nutrients. With Skalar's Primacs$^{SNC-100}$ analyzer the determination of TN, TC, IC and TOC can be performed rapidly and easily.

Food & Animal feed

Animal feed and other food products are analyzed for several reasons, such as monitoring product quality and compliancy with official regulations. Also the analysis of protein, through the measurement of Nitrogen, is used as a marker for the nutritional quality of food products. The Primacs$^{SNC-100}$ is the perfect solution for accurate and rapid testing in laboratories, processing a wide variety of nutritional samples.

Waste management

In waste management, it is sometimes necessary to differentiate between the different carbon fractions such as TOC, TEC and TIC in a sample. High TOC levels in the soil prevent the anaerobic digestion process and limit the Nitrogen enrichment in the subsoil. Via the traditional high temperature combustion or the acidification method, the TOC value determined is the sum of TOC + TEC, instead of TOC only. The Primacs$^{SNC-100}$ offers a special temperature ramping program allowing for the analysis of TOC, TEC and TIC separately, according to DIN 195391 which perfectly suits this application.

Sludges & Sediments

In waste samples such as sludge, Nitrogen and Carbon analysis is important for pollution control. Ammonium, Nitrate, Nitrite and other Nitrogen compounds can serve as a nutrient source for troublesome water organisms. The Primacs$^{SNC-100}$ offers a fast and consistent determination of Nitrogen and Carbon levels simultaneously.

Other applications include:
Grain & Seed, Malt and Fertilizer.

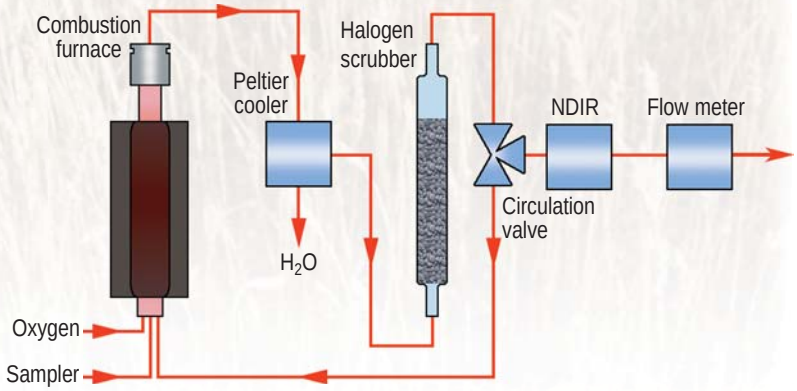
Principle of operation TC & TN analysis

For the determination of various types of Carbon and Nitrogen / Protein different analysis and detection methods are used in the analyzer.

The individual processes are described below, but can be combined in one unit:

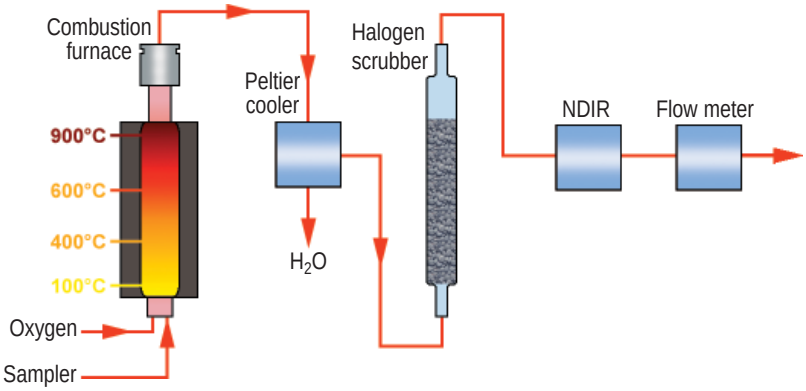
1. TC – by high temperature combustion

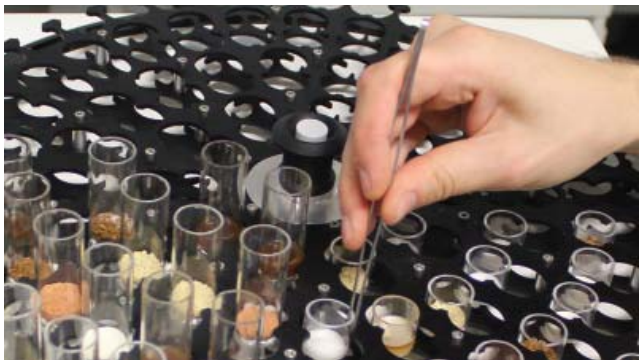
In the combustion furnace carbon is completely oxidized to CO_2, by continuously circulating the sample through the combustion furnace. The CO_2 is measured by Non Dispersive Infrared detection (NDIR) for Total Carbon.



2. OC, EC, IC – by Temperature dependent differentiation according to DIN 19539

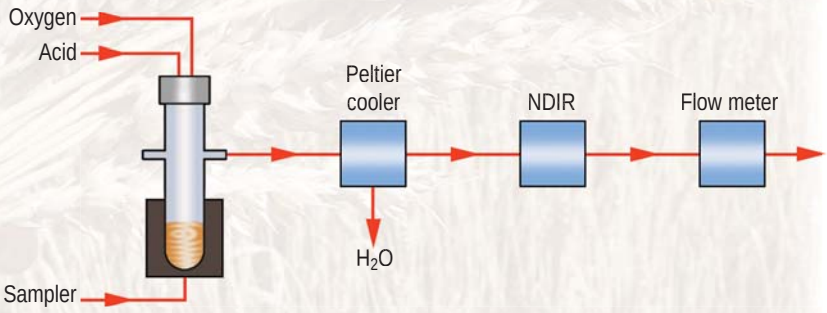
In case different C fractions need to be determined, samples are positioned at different heights in the combustion furnace. Each height has a different temperature. The first peak measured at 450 °C is the OC value, the second peak at 600 °C is the EC value and the last value at 900 °C is for IC. The advantage of this patented Skalar technique is that it is very fast, because there is no need to heat or cool down the furnace.





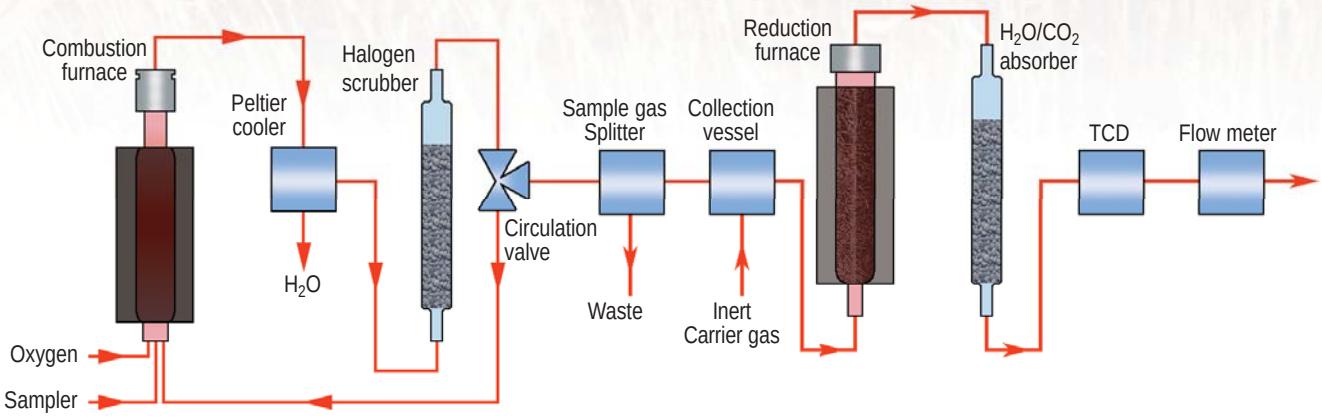
3. IC – by acidification

The samples are introduced in the IC reactor at 150°C. Phosphoric acid is automatically added to the sample. Carbonates are converted into CO_2. The CO_2 is purged by a carrier gas and measured by Non Dispersive Infrared detection (NDIR).



4. TN – by high temperature combustion according to Dumas methodology

In the combustion furnace, Nitrogen is converted into NxOy in presence of Oxygen. In the reduction furnace all Nitrogen is reduced to N_2. The N_2 gas is measured by Thermal Conductivity Detection (TCD).



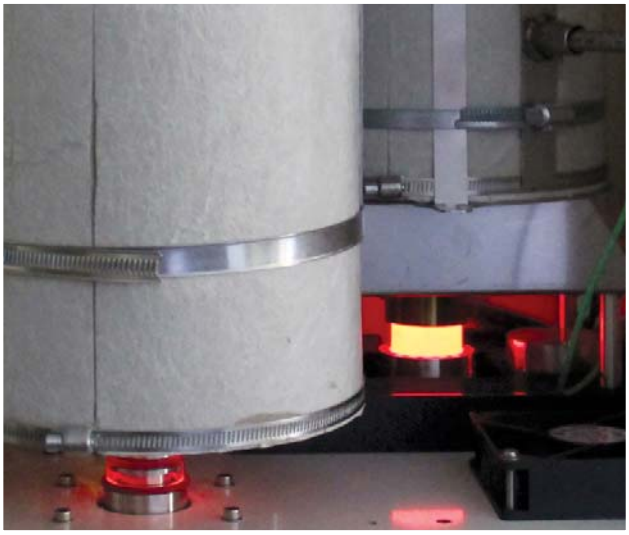
Typical Primacs$^{SNC-100}$ configurations

The inside of the Primacs$^{SNC-100}$ analyzer is flexible in construction. Depending on the requirement of the laboratory, a suitable configuration can be selected. Skalar offers in total 10 different models.

TC / IC / TOC / TN analyzer
- perfect for soil applications

TN analyzer
- suitable for food applications

TC / IC / EC / TN analyzer
- for waste management



Data Acquisition & Instrument Control

The Primacs$^{SNC-100}$ analyzer is controlled by Skalar's flexible SN-Access data acquisition software.

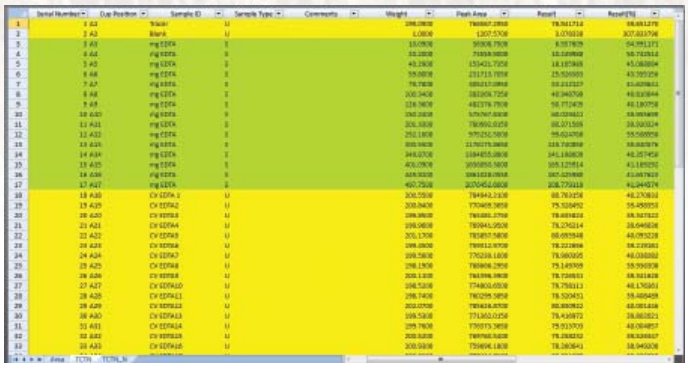
The software is easy to set up and very user-friendly Using pull-down menus for different actions, it allows the operator to start analysis within a few minutes.

Via pre-defined methods, the analysis settings such as oven temperature, sample time, valve settings etc. can be easily selected. An analysis table is created or imported from a text or Excel file. During analysis the table can be modified to enable the addition of priority samples also samples or sample positions can be edited or deleted.

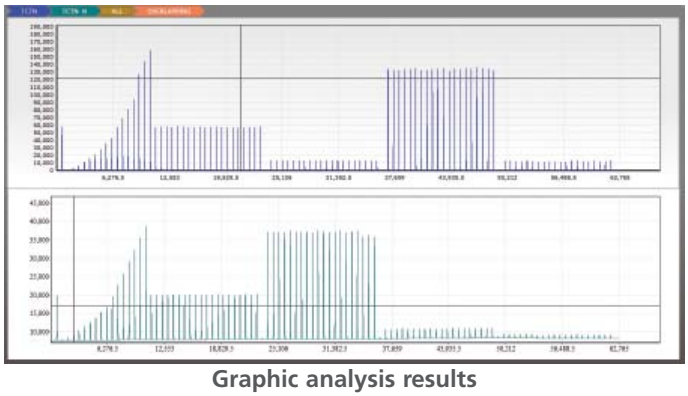
A dual display is available during the run to monitor both the Carbon and the Nitrogen channels in real-time simultaneously. Peak information is available and editable during analysis. An analyzer control screen displays real-time information such as temperatures and detector signals, which are of major importance for reliable elemental analysis.

All analytical results and calibration curves can be viewed and edited in the results window. The analysis results and calibration curves can easily be printed or exported to a LIMS system in a custom made report.

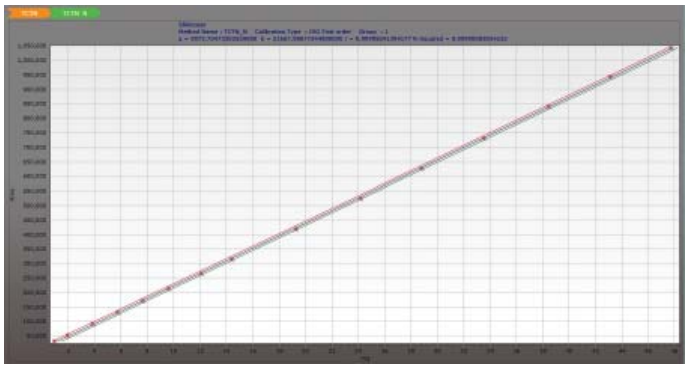
Analyzer control screen



Analysis results



Graphic analysis results



Calibration screen

SN-ACCESS SOFTWARE FEATURES

- Table wizard, for quick set up of the sample workload
- User defined alarm levels for safe and unattended operation
- User defined access levels to prevent unauthorized actions
- Separate raw data file storage
- Real-time graphs of analysis integration data for calibration
- Dual or single screen views of Carbon and Nitrogen
- Availability of peak editing mode, during or after analysis, for optimizing analysis data before reporting
- Export of analyzed data to other locations and to LIMS systems
- Storage of calibration curves and automatic "best curve" selection

Other Skalar TOC / TN Analyzers

Solid samples

Primacs^{SLC} TC / TIC / TOC analyzer

The Primacs^{SLC} provides Carbon analysis on solid materials. Based on a dual furnace design, the system is capable of performing fast, reliable and separate determinations of TC and TIC without sample pretreatment. The TOC is automatically calculated (TOC = TC – TIC).

Primacs^{MCS} TOC analyzer

The Primacs^{MCS} analyzer provides TOC analysis on solid materials. The analyzer is designed as an add-on module and operates in combination with the Formacs$^{HT/LT}$ TOC analyzer. It allows for the analysis of TC, IC and TOC.

Liquid samples

Formacs^{HT} TOC analyzer

The Formacs^{HT} TOC analyzer provides a fast and reliable analysis of Total Organic Carbon (TOC) in liquid samples using high temperature catalytic combustion. The unit is designed to measure TC, IC, TOC, NPOC, POC and DOC in water samples. The instrument is customized for the sample type and optimized from a range of different catalysts.

Formacs^{HT-I} TOC analyzer

The Formacs^{HT-I} TOC/TN analyzers provide fast, reliable analysis of TOC and TN in liquid samples by direct sample injection in a high temperature catalytic combustion furnace. The units are especially designed for particulate laden samples (suspensions), but can handle the concentration of nitrogen and/or carbon fractions from various other sample matrices.

Formacs^{TN} TN analyzer

A TN detector is available as an addition to the Formacs^{HT} analyzer for TN analysis using a chemiluminescence detector in combination with high temperature oxidation. Optionally the Formacs^{TN} can be extended for NO_3 + NO_2 analysis using Skalar's unique NN reactor.

Skalar's Headquarter

Skalar Analytical B.V.
Tinstraat 12
4823 AA Breda
The Netherlands
+31 (0)76 5486 486
+31 (0)76 5486 400
info@skalar.com
www.skalar.com

ISO 9001 Certified
ISO 14001 Certified

USA Headquarters
Skalar, Inc.
5012 Bristol Industrial Way # 107
Buford, GA 30518
Toll Free: 1 800 782 4994
T. + 1 770 416 6717
F. + 1 770 416 6718
E. info@skalar-us.com

Canada
Skalar, Inc.
Unit # 200, 270 Orenda Road
Brampton, L6T 4X6
Toll Free: 1 800 782 4994
T. + 1 770 416 6717
F. + 1 770 416 6718
E. info@skalar-us.com

United Kingdom
Skalar (UK) Ltd.
8 Warren Yard, Warren Park
Wolverton Mill
Milton Keynes,
Buckinghamshire, MK12 5NW
T. + 44 (0)1908 410168
E. info.uk@skalar.com

Germany
Skalar Analytic GmbH
Gewerbestraße Süd 63
41812 Erkelenz
T. + 49 (0)2431 96190
F. + 49 (0)2431 961970
E. info.germany@skalar.com

France
Skalar Analytique S.A.R.L.
35 - 37, rue Berthollet
94110 Arcueil
T. + 33 (0)1 4665 9700
F. + 33 (0)1 4132 1100
E. info.france@skalar.com

Czech Republic
Carbon Instruments s.r.o.
Nademlejnská 600
198 00 Praha 9
Czech Republic
T. + 420 242 481 706
E. info@skalar.com

Asia / Middle East
Skalar Analytical India Pvt. Ltd.
No. 7/4, Pappathiammal Street
Jain Colony, Kodambakkam
Chennai - 600024 - India
T. + 9144 2483 7007
F. + 9144 2483 6006
E. info.skalarindia@skalar.com

Skalar is represented in over 80 countries Worldwide
for details of your local agent please contact
Skalar's headquarters in the Netherlands.

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