

**SphiNCX Analyzer**



**The Definitive Multi-Element Analyzer for Sulfur,  
Nitrogen, Carbon and Halogens**

## SphiNCX

### Multi-Element Analysis: What Lies Beneath?

#### State-of-the-Art Technology Encased in an Elegant Shell.

Thermo Electron Corporation has developed the SphiNCX, a multi-element analyzer offering fast, reliable and sensitive analysis of Sulfur (S), Nitrogen (N), Halogens (X) and Carbon (C). It offers a sophisticated and stylish finish yet, below the surface, the SphiNCX boasts unsurpassed performance, making it the ideal choice for the modern laboratory.

#### Overcoming Existing and Imminent Analytical Challenges.

Today's laboratory demands, enhanced detection limits and increased productivity from its analyzer. Furthermore, in a market strongly driven by new regulations and ever-progressing technology, it is vital to select a forward-looking instrument. Recent issues highlight the need for an analyzer that offers both reliability and high accuracy;

- Greater environmental awareness is behind a global drive to dramatically restrict Sulfur concentration in fuels.
- Sulfur and carbon monoxide contamination in fuel cells mean that sulfur and CO must be detected, even at extremely low levels.
- As Sulfur and Nitrogen poison refinery catalysts, superior detection capabilities are required to make the process easier to control and tune.
- In order to guarantee the quality of all water, the monitoring of sulfur, nitrogen, carbon and halogens is essential.

#### Beyond Multi-Element Analysis.

Thermo's SphiNCX analyzer offers everything expected from a high quality analyzer: accuracy, speed and numerous QC improvements. The SphiNCX also incorporates some hidden extras, making certain it stands out from the crowd;

- The SphiNCX offers a distinct design that can switch effortlessly between Total Nitrogen (TN), Total Sulfur (TS), Total Halogens (TX) and Total Carbon (TOC) analysis, eliminating the need for four instruments. Thus bench space and the cost of analysis are both dramatically reduced.
- Offering 4 detection techniques, the instrument can be configured to the customer's specifications. Detection systems are field installable so more elements can be added as needs evolve.
- The durable furnace prevents overheating and has a guaranteed lifetime of over 5 years.

- The SphiNCX incorporates the patented Turbo Quartz Tube, which ensures optimum combustion (no soot formation), and offers easy maintenance and less downtime.
- Offering a higher yield and cheaper results, the integrated NeXYZ auto sampler introduces liquid and solid samples quickly and effortlessly into the SphiNCX.
- The introduction modules are easily switched so that the SphiNCX can analyze solid, liquid, gas and highly viscous samples.

#### How Does it Work?

The sample is introduced automatically into a quartz combustion tube, ensuring thorough combustion. This forms quantities of SO<sub>2</sub>, NO, HX and CO<sub>2</sub> which correlate with the quantities of S, N, Cl and C present in the original product. This methodology, also known as a sum-parameter, is an ideal and cost-effective QC technique as it does not give information regarding the nature of the compounds.



## Crossing Boundaries in Sulfur Analysis

The need to analyze Sulfur has never been more prevalent. Recent fuel specifications and international regulations mean that the limitation placed on sulfur content has been set until 2015. In addition to this, there is a huge potential for growth in the market of fuel cell development, for example mobile phone batteries, where even the slightest contamination with sulfur will damage the catalyst, rendering it useless. Thermo's SphiNCX analyzes Sulfur for a wide range of applications, providing results of the highest accuracy.

## Why Choose the SphiNCX for Total Sulfur Analysis?

Thermo's SphiNCX offers several benefits for Sulfur analysis;

- Multiple selectable ranges are incorporated in the detector, meaning fast and optimum results. Less calibration is required due to the linearity of the system, and the calibration remains stable for more than a month.
- The Pulsed UV-Fluorescence detector incorporates automatic gain control (AGC) technology to control its stability. This minimizes the verification and calibration time, meaning less down time and thus lower operational costs.
- Because the UV signal is measured in the dark period of the detection, there is no interference, meaning that the achieved results are of the highest accuracy.

## How Does it Work?

Sulfur is measured by Pulsed-UV Fluorescence. SO<sub>2</sub> is formed during the oxidation and is transferred to the reaction chamber. Here it is excited by a pulsed UV light and as the excited state is unstable, the SO<sub>2</sub> instantly decays to its ground state energy level. During this process, UV light is emitted. As this light has a different wavelength than the original UV source, the photomultiplier tube is able to detect the change. The amount of light emitted relates to the total amount of SO<sub>2</sub> present in the gas, which in turn corresponds to the total amount of sulfur in the sample.

## Applications for Total Nitrogen analysis

REFINERY PRODUCTS	CHEMICALS	LPG AND GASES
Crude Oil	Acetic Acid	Butane
Kerosene	Polypropylene	Propane
Fuel Oil	Polyethylene	Butadiene
Gasoline	Aromatics	LPG
Diesel Fuel	Polycarbonate	LNG
Catalyst	Resins	Ethylene
Naphtha	Olefins	Propylene
Lubricants	Paraffin's	CO <sub>2</sub>

## The SphiNCX Analyzer - Offering Total Sulfur Analysis for:

- Petrochemical Plants
- Refineries
- Commercial Petro-testing Laboratories
- Research & Development Centers
- Chemical Plants
- Governmental Institutions

## International Standards:

The SphiNCX meets ASTM D5453, D6667, IP PM CL/99 and NF M 07-059 methodology following international standards for Total Sulfur Analysis. Furthermore, it can also comply with ASTM D3961, ASTM D3120 and ASTM D3246 if the optional micro coulometric cell is added. The methodology has a broad acceptance of results within a wide range of markets. It is also ideal for inter-laboratory studies.



# Total Nitrogen Analysis

SphiNCX Analyzer  
The Definitive Multi-Element Analyzer  
for Sulfur, Nitrogen, Carbon and Halogens

## Tackling Present and Future Nitrogen Regulations

Nitrogen analysis is needed to detect contamination in environmental sources such as water and soil. As it constitutes a basic element in feedstock and the additives present in plastic production, it has become necessary to tightly control the content of nitrogen in these processes. Nitrogen levels are likely to attract more attention in the petrochemical sector as soon as sulfur levels have been satisfactory reduced according to set national and international standards. Thermo's SphiNCX provides laboratories with the opportunity to comply with future regulations.

## Why Choose the SphiNCX for Total Nitrogen Analysis?

Thermo's SphiNCX offers several benefits for Nitrogen analysis;

- Highly accurate, qualitative results in a matter of moments. This technique offers a significant alternative to the time consuming Kjeldal Method.
- A large dynamic range, less dilution, faster analyses, high productivity. The patented flow through system ensures a linear range from low ppb to high ppm.
- A robust and low maintenance design, as the system operates without a catalyst or any other chemicals.

## How does it Work?

During the pyrolysis, nitric oxide (NO) is formed and fed into the reaction chamber where it reacts with electronically generated ozone. During this process, nitrogen dioxide (NO<sub>2</sub>) is formed in an excited state. Its instability means that it decays, emitting a light which is then detected by the Photo Multiplier Tube (PMT). The amount of light emitted corresponds with the amount of NO. This in turn represents the amount of N present in the sample.

## Applications for Total Nitrogen analysis

CHEMICALS	REFINERY PRODUCTS	LPG AND GASES	OTHERS
Acetic Acid	Crude Oil	Butane	Drinking water
Polypropylene	Kerosene	Propane	Waste water
Polyethylene	Fuel Oil	Butadiene	Process water
Aromatics	Gasoline	LPG	Milk powder
Polycarbonate	Diesel Fuel	LNG	Vegetable additives
Resins	Catalyst	Ethylene	Beverages
Olefins	Naphtha	Propylene	Proteins
Parrafines	Lubricants	CO <sub>2</sub>	Soil

## The SphiNCX - Offering Total Nitrogen Analysis for

- Chemical & Petrochemical Industries
- Refineries
- Commercial Petrochemical Testing Laboratories
- Research & Development Centers
- Environmental QC Laboratories
- The Food & Beverage Industry
- Government Institutions
- The Plastics Industry

## International methods:

The SphiNCX is ASTM D4629, ASTM D5762, ASTM 6069 and UOP 971 compliant following international standards for Total Nitrogen analysis.



# Halogens Analysis

## The SphiNCX: Uniquely Designed for Total Halogen Analysis

Chlorinated compounds have been on the blacklist since 1976 due to their extremely high toxicity and harmful effects. Thermo played a key role in the development of the first TOX/AOX standard within Germany and has close ties with the pulp and paper industries. As a founder of this method of analysis, Thermo has designed the most widely accepted process for obtaining information regarding the presence of organic halogens.

## Why Choose the SphiNCX for Total Halogen Analysis?

Thermo's SphiNCX analyzer offers several benefits for Total Halogen Analysis;

- By using the micro-coulometric titration technique which achieves absolute results, there is no need for calibration which saves time, leading to increased productivity.
- The large volume cell offers high capacity; a longer lifetime and can analyze dozens of samples in a run.
- High reproducibility and a broad dynamic working range are achieved via the temperature controlled titration cell.
- High sensitivity and cell stability are assured because of the unique solid silver electrodes combined with the cell configuration.

## How does it Work?

Halogens (Cl, Br and I) are measured by micro-coulometric titration. During the oxidative combustion, the halogen compounds are converted into hydrogen halide and transferred into the titration cell. The electrolyte solution contains a stable (known) amount of silver ions that will react with the halide and precipitate as silver chloride. As the quantity of silver ions decreases, an electric current flows through the cell electrodes. The titration cell responds to this reduction by creating more silver ions. The amount of silver ions produced forms a measure of the amount of chlorine in the combustion gases, which can be related back to the amount of chlorine in the sample.

## Applications:

HIGH-GRADE CHEMICALS	PETROLEUM PRODUCTS	LPG AND GASES	WATER SAMPLES
Paraffin	Naphtha	Propylene	Ground water
Aromatic carbohydrates	Petrol	Ethylene	Effluent water
Methanol	Kerosene	Natural liquid gas	Surface water
Toluene	Crude oil	Liquefied petroleum gas	Drinking water
Benzene	Polypropylene	Butadiene	Waste water
Polycarbonate	Catalysts	Hydrogen	Process water
Acetic acid	Resins		Soil

## MARKETS TOTAL ORGANIC HALOGENS:

Chemical & Petrochemical  
Refineries  
Commercial Petro-testing labs  
Research & Development Centers  
Food & Beverages  
Government  
Plastic Industry

## MARKET AOX/EOX/POX:

Drinking water  
Environmental QC labs  
Utilities  
Chemical & Petrochemical  
Semiconductor  
Government

## International Methods:

The SphiNCX meets standards ASTM, IP, DIN, ISO and UOP following international standards for Chlorine analysis and has a broad acceptance of results.



# Total Organic Carbon Analysis

**SphiNCX Analyzer**  
**The Definitive Multi-Element Analyzer**  
**for Sulfur, Nitrogen, Carbon and Halogens**

## Promoting the Future Quality of Water.

Analyzing the presence of carbon is vital for controlling water quality. Moreover, by monitoring the levels of organic material, the ecological balance of the water can be maintained. Organic compounds present in the water actually use up oxygen, which leads to the depletion of aquatic life. TOC analysis plays a vital role in helping to redress the balance.

## Why Choose the SphiNCX for Total Organic Carbon Analysis?

Thermo's SphiNCX offers several benefits for total organic carbon analysis;

- Accuracy - the rotating gas filter ensures interference-free results
- Extremely low detection limits and a large dynamic range
- A low maintenance, sturdy design that offers lower cost of ownership

## How does it Work?

Following combustion, carbon (C) is converted into carbon dioxide (CO<sub>2</sub>), which absorbs the infrared radiation. The Non-Dispersive Infra Red (NDIR) detection technique is in principle an IR light source that transmits an infrared beam through a rotating gas filter, which contains various chambers filled with carbon dioxide or nitrogen. This feature is unique to Thermo's SphiNCX and ensures an accurate CO<sub>2</sub> result, which is interference-free. The CO<sub>2</sub> in the combustion gasses are led into the absorbance chamber, where the CO<sub>2</sub> absorbs the infrared light. The attenuated IR-light is related to the amount of CO<sub>2</sub> present in the combustion gases. The number of CO<sub>2</sub> molecules in the combustion gases corresponds to the amount of carbon in the sample.

## Applications

- Drinking water
- Cooling water
- Ground, surface water and river water
- Industrial waste water
- Effluent streams
- High salt solutions
- Sludge, sediment and soil
- Solid material and solid waste
- Coal

## The SphiNCX: Offering Total Organic Carbon Analysis for:

- Drinking water laboratories
- Environmental QC laboratories
- Utilities
- Chemical & Petrochemical Industries
- The Food & Beverage Sector
- Semiconductor
- Pharmaceutical Companies
- The Mining Industry
- Governmental Institutions

## International Methods:

The SphiNCX analyzer meets ASTM, DIN, ISO, EPA and CEN standards. There is broad acceptance of the results by all customers. The SphiNCX is also suitable for inter-laboratory studies.



# Easy Sample Introduction For Added Peace Of Mind

## The NeXYZ Auto Sampler: The Ideal Accessory for Simple, Sensitive Analysis.

The multi-purpose auto sampler NeXYZ, incorporated into the SphiNCX, has been designed by Thermo Electron to offer fast and easy automatic sample introduction. It is the first universal auto sampler that can be used for solids, small volume hydrocarbons, large volume water samples and headspace analysis. The exchangeable sample tray and pick up heads make the NeXYZ the ultimate lab accessory. It works around the clock, guaranteeing higher throughput and cheaper results per analysis.

The NeXYZ can operate using customized modules for smooth and satisfactory analysis

## User-friendly and Automatic Introduction of...

### ...Water samples

Dedicated water sample introduction modules are available for the introduction of water samples into the SphiNCX analyzer. Thermo Electron offers a range of water modules depending on the application.

### ...Liquid samples

Thermo's Universal Liquids Module is suitable for fast injections of a wide range of light hydrocarbons. The unique syringe-type design of the catalyst free introduction module typically operates at 500°C and can handle a large volume of samples (max. 250 µl). The rapid gas connectors make the liquids module easy to install, whilst the sample volume and operating temperature are easy to set and control with ThEuS software.

### ...Solids and Highly Viscous Samples

For solids or highly viscous samples, the Boat Introduction Module can be used. The automatic boat-drive concept, controlled by ThEuS software, provides the optimum solution for a wide range of applications. The high sample load minimizes weighing errors and eliminates problems caused by inhomogeneous samples. The module is fully supported by an integrated septum stopper for liquids injection, and gas connectors for both carrier gas and oxygen.

### ...Gas & LPG Samples

The EGM 1700 is typically used for the introduction of gas and LPG samples into the SphiNCX analyzer. It includes a temperature controlled vaporizer, and an exchangeable sample loop, and can be easily connected to the liquids module.



## The EGM 1700 offers several key benefits:

- Adjustable multiple injection.
- Sample loops (100 µl – 10 ml) are easily substituted.
- Conversion from liquid to gaseous phase is optimized by controlled vaporizer temperature.
- High reproducibility and low detection limit.
- Reductive control over increasing vaporized pressure.
- Semi-automation.



## Complete System Support with ThEuS Analytical Software

The advanced user interface of the Thermo Electron Corporation Software (ThEuS) ensures the smooth operation of the SphiNCX. ThEuS assists the user to achieve routine analyses in an efficient, fast and reliable way. It can sample up to 5 data streams simultaneously, making the results

interpretation effortless, whilst instrument operation remains simple through the incorporation of clear and user friendly icons. This resourceful software makes it possible to modify sample queues, evaluate data and calibrate lines independently whilst operating the analyzer. Results can be presented in customized print reports or exported in a variety of data formats.

## The key features and benefits of ThEuS operating with the SphiNCX include:

FEATURES	BENEFITS
One software solution for all trace Elemental analyzers	Reduces complexity and improves productivity
Real time measurement curves	Maximal analysis control, easy to compare samples at a glimpse
Multi-Elemental analysis	Optimal analysis control and time saving procedure
Selectable user and service levels	Security and data integrity
Customized application and analysis methods	Full control of the analysis/system, flexible method structure,
Fully multi-tasking	Efficient, user friendly and time saving

The technologies you need

The brand you trust

The service you deserve



## Laboratory Solutions Backed by Worldwide Service and Support

*State-of-the-art instruments are only the beginning with Thermo Electron. Comprehensive service and support programs are offered on our products worldwide by a network of factory trained and highly qualified scientists and engineers. Our experts help you choose the right instruments for your lab, then keep the instruments performing to specification.*

*Contact us today for more information on how our specialized sales and service engineers can help you meet your laboratory needs.*

*In addition to these offices, Thermo Electron Corporation maintains a network of representative organizations throughout the world.*

### Australia

+61 2 9898 1244 • analyze.au@thermo.com

### Austria

+43 1 333 50340 • analyze.at@thermo.com

### Belgium

+32 2 482 30 30 • analyze.be@thermo.com

### Canada

+1 800 532 4752 • analyze.ca@thermo.com

### China

+86 10 5850 3588 • analyze.cn@thermo.com

### France

+33 1 60 92 48 00 • analyze.fr@thermo.com

### Germany

+49 6103 4080 • analyze.de@thermo.com

### Italy

+39 02 950 591 • analyze.it@thermo.com

### Japan

+81 45 453 9100 • analyze.jp@thermo.com

### Netherlands

+31 76 587 98 88 • analyze.nl@thermo.com

### Nordic

+46 8 556 468 00 • analyze.se@thermo.com

### South Africa

+27 11 570 1840 • analyze.sa@thermo.com

### Spain

+34 91 657 4930 • analyze.es@thermo.com

### Switzerland

+41 61 48784 00 • analyze.ch@thermo.com

### UK

+44 1442 233555 • analyze.uk@thermo.com

### USA

+1 800 532 4752 • analyze.us@thermo.com

[www.thermo.com](http://www.thermo.com)



Thermo Electron Corporation, Delft, the Netherlands is ISO certified

©2004 Thermo Electron Corporation. All rights reserved. All other trademarks are the property of Thermo Electron Corporation and its subsidiaries.

Specifications, terms and pricing are subject to change. Not all products are available in all countries. Please consult your local sales representative for details.

BR42022\_E 11/04

**Thermo**  
ELECTRON CORPORATION