Total Chlorine Analyzer
ECS 1200/ ECS 3000

Many Applications, One Solution

Analyze • Detect • Measure • Control™

Thermo
ELECTRON CORPORATION

Total Chlorine Analyzer ECS 1200/ ECS 3000
Many Applications, One Solution

Total Chlorine Analyzer ECS 1200/ECS 3000

Total Chlorine content

Measuring Chlorine is very important for oil industries and refineries. Refineries do not accept crude oil containing more than 5 ppm of Organic Chlorides. Hydrochloric acid can be produced in hydro treating or reforming reactors and the acid accumulates in condensing regions of the refinery. Unforeseen concentrations of organic chlorides cannot be neutralized effectively and damage of the catalytic process can be the result.

Chlorine compounds are not known to be naturally present in crude oils and usually result from cleaning operations at production sites, pipelines and/or tanks. It is important for the oil industry to have common methods available for the determination of organic chlorines in crude oil, particularly when the transfer of custody is involved.

Chemical companies are striving for sustainable solutions and need to know the chlorine concentrations to recycle their waste chemicals effectively.

Organic Chlorine analysis in laboratories is based on two principles; oxidative pyrolysis and quantitative determination through microcoulometry. These techniques have been in existance for many years now, because of their ease of use, absolute detection and sensitivity. The ASTM D4929 method describes this technique particularly for crude oil analysis, which is applicable to the Thermo Electron Corporation Total Chlorine analyzers (models ECS 1200 and ECS 3000).

ECS 1200 & ECS 3000

Thermo Electron Corporation designed two state-of-the-art microcoulometric analyzers to meet the stringent compliance rules for Total Chlorine measurements in high-grade chemicals, petroleum products, LPG and gases.

The ECS 1200 is a compact analyzer designed for laboratories performing an average number of Total Chlorine analyses. The ECS 1200 produces accurate data at ppm level due to the combination of a temperature controlled dual furnace, a turbo combustion quartz tube and a large scrubber for optimal conditioning of gas. The ECS 3000 is a sensitive, robust and cost effective analyzer. When equipped with one of the auto samplers, it offers extremely reliable sub ppm level 24 hour operation.

This modular instrument saves bench space and reduces investment costs because of the fast and easy switching between the chlorine and sulfur detectors.

The key features of the Total Chlorine Analyzer are:

- Flexibility of design allows easy adoption of new application requirements
- Combustion in combination with microcoulometric detection is a proven technology
- Track record of successful analyses of various matrices in the concentration range from low ppm to very high ppm
- Superior to competitive techniques at the sub ppm level
- Use of high quality solid silver electrodes in the halogen capillary titration chamber
- A turbo quartz tube eliminates partial combustion and soot formation and increases the injection speed of the sample, which will generate sharper peaks and shorter analysis time.

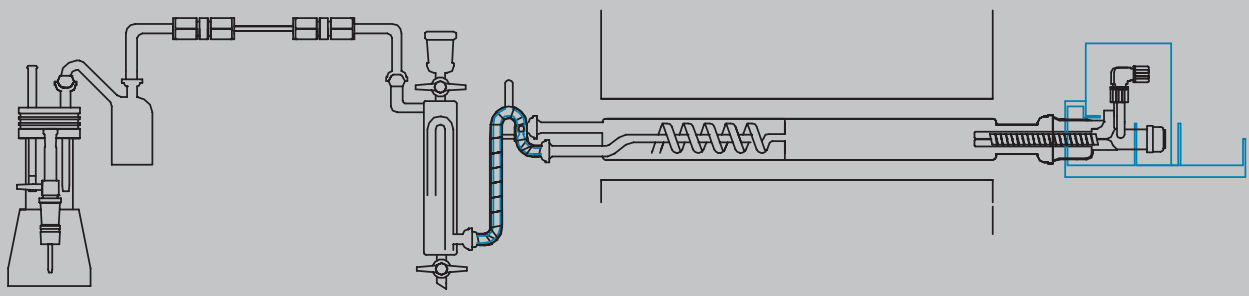
Principle of operation

The instrument pyrolyses the sample under controlled conditions at 1000 °C; using the patented turbo combustion tube principle to ensure complete combustion of organic chlorine to hydrogen chloride (HCl).

The combustion products go through a concentrated sulfuric acid scrubber to remove water out of the combustion gas into the coulometric titration cell. The amount of current needed to generate silver is directly related to respectively the total chlorine content.

$RX + O_2$	→	$HX + CO_2 + H_2O$	
$Ag^+ + X^-$	→	AgX	(1)
Ag	→	$Ag^+ + e$	(2)

Where X stands for: Cl, Br and I



Applications:

HIGH-GRADE CHEMICALS	PETROLEUM PRODUCTS	LPG AND GASES
Paraffin	Naphtha	Propylene
aromatic carbohydrates	petrol	ethylene
methanol	kerosene	natural liquid gas
Toluene	crude oil	liquefied petroleum gas
benzene	polypropylene	butadiene
polycarbonate	catalysts	hydrogen
acetic acid	resins	

Markets:

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

International Methods:

The ECS 1200 and ECS 3000 models comply with the following international standards for Chlorine analysis:
ASTM D4929, D5194 and D5808

Sample introduction

Liquids module

The Thermo Electron Corporation universal liquids module is suitable for fast injection of a wide range of light hydrocarbons. The unique design of catalyst free syringe type introduction module can achieve an operating temperature of 600 °C. This module is provided with quick gas connectors and can handle large volume of samples (max. 250 µl). Injection rate, sample volume and temperatures can be set by the ThEuS software, which ensures an optimum total sulfur analysis.

Solids module

For analysis of heavy hydrocarbons and solid samples, the Thermo Electron boat introduction module is the key. The automatic boat driven concept controlled by ThEuS software, provides the optimum solution for many applications. The high sample load capacity and integrated septum stopper minimizes weighing errors and eliminates problems caused by non-homogeneous samples.
The module is supported with quick gas connectors for carrier gas and oxygen as well.

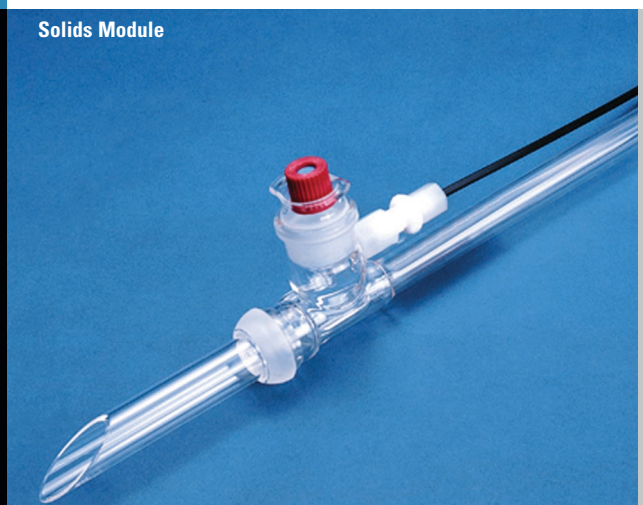
Gas & LPG module

The EGM 1700 is the module for introduction of gas and LPG samples into the Thermo Electron Elemental analyzers. The auto sampler is provided with a vaporizer and exchangeable sample loop and easy connection to the liquids module.
Key advantages of the EGM 1700 are:

- Adjustable multiple injection
- Easy switching between loops
- Optimal conversion from liquid to gaseous phase by controlling vaporizer temperature
- High reproducibility and low detection limit.

Liquids Module

Solids Module



Autosamplers

ELS 3000 model

The Thermo Electron ELS 3000 auto sampler is designed for fully automated introduction of light hydrocarbon samples. The sampler has 74 positions for 2 ml screw capped sample vials and can inject a maximum of 250 µl.

Key advantages of the ELS 3000 autosampler are:

- Designed for a 24 hours operation
- All operations fully controlled by Windows® Thermo Electron Software (ThEuS)
- Easy connection to universal syringe type liquids or boat introduction modules,
- Wash solvent and waste containers included.

ESA 2000 model

For the automatic introduction of solids and highly viscous liquid samples into the ECS 3000 and ECS 1200 models, the ESA 2000 auto sampler is the best choice. The sampler is provided with a 47 position sample tray suitable for quartz sample cups, which will be picked up from the sample tray and transferred automatically to the quartz boat of the solids module.

The main advantages of the ESA 2000 are:

- Optimal conditioning of samples by using purge flow and a protective lid on the sample carrousel,
- Works around the clock
- Fully supported by intelligent Thermo Electron Software (ThEuS)

Sulfur options: Fits with your Sulfur needs

Beside Chlorine also the Sulfur content is a vital parameter for a broad range of companies. Sulfur compounds have a very strong effect on the effectiveness of catalysts and causes severe catalyst poisoning, while sulfur dioxide is a major source of pollution.

The Thermo Electron Chlorine Analyzers, models ECS 1200 and ECS 3000, can be upgraded with two types of Total Sulfur Detectors: Microcoulometric and Pulsed UV-Fluorecsence.

MicroCoulometric option

The Total Chlorine Analyzer can be transformed into a fully-fledged Coulometric Sulfur analyzer by simply changing the complete titration cell. In this cell, a bundle of capillaries connect the reference and indicator electrode. This unique feature stretches the life span of the cell and reduces the need for cleaning and maintenance.

Samples are combusted at high temperature in an argon/oxygen atmosphere and sulfur dioxide is formed. These gases are led through a scrubber with sulphuric acid that removes water out of the combustion gas into the iodometric titration cell. Here a coulometric titration takes place with iodide. The amount of current needed to generate iodide is directly related to the total sulfur content.

The Thermo Electron ECS 1200 and ECS 3000 models fully comply with ASTM D3120, D3246 and D3961 for this sulfur analysis.

TS-UV module

The sulfur UVF module has a short start-up time and is able to perform a large number of simultaneous chlorine & sulfur analyses supported by the Thermo Electron Software (ThEuS).

The pulsed UV-fluorescence module is connected to the ECS 3000 as of an add-on package and operates in serial sequence. No other parts of the basic ECS 3000 model like combustion tube or sample introduction module need to be amended or exchanged.

Key advantages of the ECS 3000 chlorine & sulfur analyzer are:

- Increases quality control performance and reduction of operational costs
- Fully meets ASTM approved methodology (D5453 and D6667)
- Performance down to ppb level for typical applications
- Fully temperature-controlled titration cells and high capacity of 35 ml which is well suited for routine analysis

Benefits you can count on

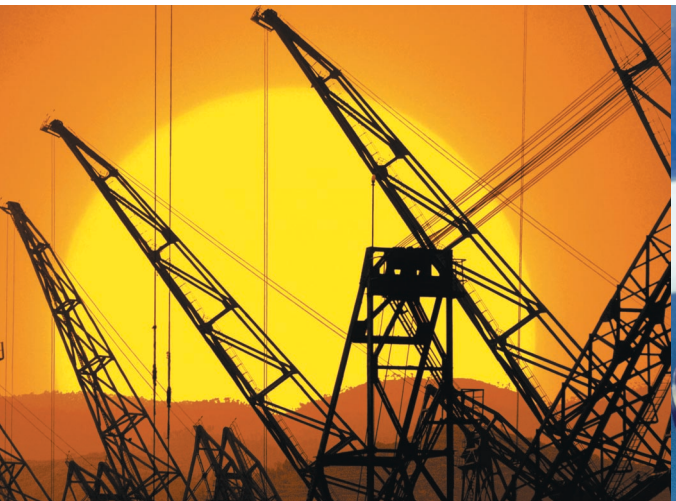
FEATURES	ADVANTAGES	BENEFITS
Modular design analyzer	Easy and fast switching between chlorine and sulfur	No need for two separate instruments, reducing both bench space and investment costs
Dual-temperature furnace	Real-time information on temperature, precise control	Maximum flexibility with respect to your applications
Turbo quartz tube	Optimal combustion, No soot formation	Increased speed of analysis Less down time
Auto sampler for liquids and solids	Higher throughput, 24-hour operation	Lower cost per analysis
Large volume scrubber	Optimal conditioning of gases	Accurate data
Windows™-based software	Intuitive user interface	No need for extensive training, less error-prone
Temperature controlled Titration cell	High sensitivity Broad dynamic working range	Certainty by repetition
Meets standards ASTM, IP, DIN, ISO and UOP	Broad acceptance of results	Works with all customers, Applicable in interlaboratory studies

ThEuS Analytical Software

The advanced user interface of the Thermo Electron Corporation Software (ThEuS) design makes operation of the ECS 1200 and ECS 3000 both intuitive and straight forward. ThEuS assists the user in achieving routine TX analysis in an efficient, fast and reliable way. Clear and user friendly icons, allow simple instrument operation at a glance. The fully multi-tasking operation, makes it possible to modify sample queues, evaluate data and calibration lines independently, while operating the analyzer. Results are presented in customized print reports or exported in a variety of data formats.

Key features of ThEuS are:

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	Efficiency, user friendly and time saving



The technologies you need.
The brand you trust.
The service you deserve.

Thermo Electron Corporation

Your solid partner for:

- Elemental analysis
- Customer specific applications
- Advanced service support

For analyzing elements at trace levels Thermo has built a solid reputation with a wide range of elemental analyzers. Various applications for total sulfur, total nitrogen, total chlorine, organic halogens and total organic carbon in liquids, solids and gasses can be performed. Our instruments help you to achieve environmental regulatory, process control, quality control, quality improvement and increasing profitability.

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
+31 162 460200 • info@ankersmid.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

BR42002_E01/04

Thermo
ELECTRON CORPORATION