



Thermo Scientific EA IsoLink IRMS System

Reach higher peaks with your EA-IRMS

Redefining EA-IRMS: Leverage the power of gas chromatography

Outstanding precision for CNSOH analysis with lowest cost per sample

Your analysis can reach higher peaks with the Thermo Scientific™ EA IsoLink™ IRMS System. With a straightforward analytical workflow leading you from sample to results, you can achieve higher sample throughput with minimal running costs and no compromise. The Thermo Scientific EA IsoLink IRMS System, built on 60 years of scientific, engineering and manufacturing excellence, includes the Thermo Scientific™ Flash IRMS™ Elemental Analyzer, the Thermo Scientific™ ConFlo IV™ Universal Interface and a Thermo Scientific™ Isotope Ratio Mass Spectrometer. The field installed base of Thermo Scientific™ Flash™ Elemental Analyzer Series and Thermo Scientific™ Isotope Ratio Mass Spectrometers proves system robustness and operational excellence.

With the EA IsoLink IRMS System, Thermo Fisher Scientific has fundamentally innovated EA-IRMS, based on decades of expertise and leadership in elemental analysis, gas chromatography and continuous flow isotope ratio mass spectrometry.



Why select the EA IsoLink IRMS system?

For the first time, temperature-ramped continuous flow gas chromatography is used in EA-IRMS analysis. You can gain shorter analysis times per sample, higher sample throughput and accurate and precise data, thanks to optimal baseline separation of analyte gases and sharp peak shapes, prerequisites for highest performance.

To ensure lowest possible helium consumption during your analysis, the Thermo Scientific™ Helium Management (He^m) Module significantly reduces your sample analysis costs.

With the EA IsoLink IRMS System, you gain:

- **Sharp peak shapes and clean backgrounds by temperature ramped gas chromatography**
- **Full insight and control over the whole analytical workflow**
- **Widest dynamic range in EA-IRMS for CNSOH analysis**
- **Lowest helium consumption combined with highest sample throughput**
- **Full system automation and lowest running cost**
- **Flexibility for all applications with an intuitive, modular system**
- **Unmatched robustness**
- **Complete integration between EA and IRMS**



Full insight and control of your analytical workflow

Turnkey reliability, from samples to results

Real-time access to all chromatographic details and background parameters of the analytical process are ensured with continuous flow GC, which improves reliability and precision of your analysis. A ramped temperature over the elution period of compounds has been used in GC and GC-IRMS for many decades, which guarantees complete separation of the gases produced during combustion and pyrolysis with sharp peaks and dedicated backgrounds.

By introducing temperature ramped GC for the first time in EA-IRMS, the EA IsoLink IRMS System provides you with excellent peak shapes and increased sample throughput, without analytical compromise. The combination of the in-line flash combustion technology with temperature-ramped GC separation significantly improves the performance for all your EA-IRMS applications. In addition, the blank and sample peaks are completely distinguished from their associated backgrounds, in comparison to other techniques such as adsorption/desorption.



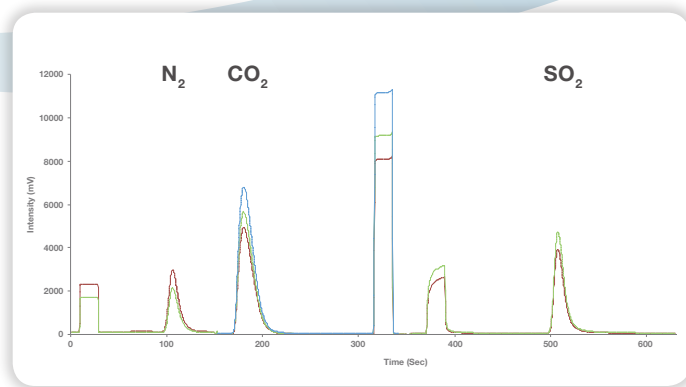
Sample Preparation



Sample Loading



Sample Processing



Separation by Gas Chromatography

With the EA IsoLink IRMS System using continuous flow GC, you gain:

- Superior precision and high sensitivity on low μg sample amounts with complete baseline separation and sharp peak shapes
- Real-time analytical control for full insight of the combustion and pyrolysis process
- Complete workflow automation from sample introduction to results within Thermo Scientific™ Isodat™ Software Suite
- Higher productivity with simultaneous determinations of elemental data and isotopic ratios from a single sample

“...High performance $\delta^{34}\text{S}$ measurements in crude oil...”

Petroleum and Exploration



- Coals
- Crude oils
- Kerogens
- Petroleum derivatives
- Lubricants
- Minerals
- Source rock
- Oil shale

The EA IsoLink IRMS System easily processes complex sample matrices, which contain difficult to combust organic structures like kerogens.

Source rock type	Fraction	$\delta^{34}\text{S}$ (‰)	% S
Marine Shale	Crude Oil A	6.58 ± 0.07	1.51
	Asphaltene A	6.49 ± 0.04	-
Marine Carbonate	Crude Oil B	5.12 ± 0.04	1.59
	Asphaltene B	5.29 ± 0.16	-

Table 1. Excellent reproducibility of $\delta^{34}\text{S}$ in crude oil and crude oil fractions.

High temperature flash combustion ensures complete conversion of all sample types and structures into N_2 , CO_2 and SO_2 . Together with the fully automated workflows, provided by the Thermo Scientific Isodat Software Suite, high precision data and ease-of-use are guaranteed. The data presented in Table 1 are not warranted because they exceed product specifications. The warranted product specification for $\delta^{34}\text{S}$ is $\pm 0.2\text{‰}$ (1 sd) for 50 μg of sulfur measured on Sulfanilamide.



Transfer of Gases



Isotope Analysis



Data Evaluation and Reporting

Access widest dynamic range in EA-IRMS for CNSOH analysis

Flexible smartEA analysis in one system: from low μg to high mg sample sizes

The Thermo Scientific™ smartEA™ option of the EA IsoLink IRMS System allows you to focus on your research by combining ease-of-use and unattended analysis to deliver high precision results.

The smartEA option uses the Thermal Conductivity Detector (TCD) trace in the Elemental Analyzer to define the required sample dilutions in the ConFlo IV Universal Interface. The straightforward and automated workflow allows the analysis of very small amounts, such as nitrogen and sulfur, alongside high abundant elements, such as carbon, from the same sample.

The EA IsoLink IRMS System provides automated CNS and OH isotope ratio and elemental analysis in single or multi-element modes within one system. You gain:

- High precision for all sample matrices in CNS and OH mode
- Dynamic range allowing analysis from 1 μg to more than 30,000 μg of analyte
- Fully automated dynamic range extension using the smartEA option
- Combustion and separation fidelity on highest C/N and C/S ratio samples



Marine Science and Ecology

“...1 μg S in CNS mode with C/S ratios greater than 7000:1...”



- Sediments
- Carbon budgets
- Food webs
- Particulate matter
- Plants
- Animal tissues
- Skeletal structure
- Soil
- Wood

Small sulfur amounts in sample matrices such as wood are made easy in your lab. For simultaneous $\delta^{15}\text{N}$, $\delta^{13}\text{C}$ and $\delta^{34}\text{S}$ analysis, the EA IsoLink IRMS System ensures excellent reproducibility, even on high C/S ratio samples.

Sample	Weight (mg)	$\delta^{13}\text{C}$ (‰)	$\delta^{15}\text{N}$ (‰)	$\delta^{34}\text{S}$ (‰)	$\mu\text{g S}$	C/S
Spruce	12.7	-24.10 ± 0.06	3.20 ± 0.23	5.92 ± 0.26	0.89	7905/1

Table 2. Simultaneous CNS analysis in wood.

Complete baseline separation of N_2 , CO_2 and SO_2 in high C/N and C/S ratio sample types is achieved thanks to continuous flow gas chromatography. The data presented in Table 2 are not warranted because they exceed product specifications. The warranted product specifications for $\delta^{13}\text{C}$ is $\pm 0.1\text{‰}$ (1 sd) for 50 μg of carbon, $\delta^{15}\text{N}$ is $\pm 0.15\text{‰}$ (1 sd) for 50 μg of nitrogen and $\delta^{34}\text{S}$ is $\pm 0.2\text{‰}$ (1 sd) for 50 μg of sulfur measured on Sulfanilamide.

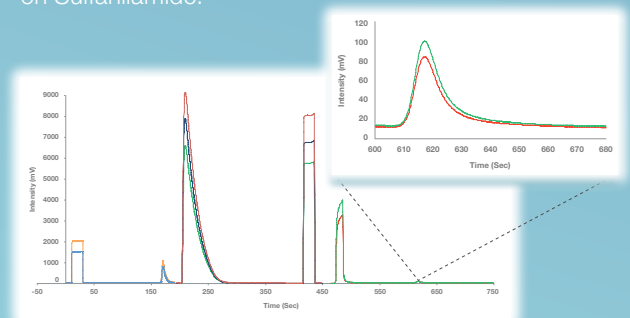


Figure 1. CNS chromatogram of a wood sample.

Experience lowest helium consumption and highest sample throughput

Increase your productivity with full system automation and lowest cost per sample

Recently, laboratories have suffered from increasing analytical costs due to worldwide reduced availability and higher market prices of helium. With the EA IsoLink IRMS System unique Helium Management (He^M) Module, you will reduce helium consumption by up to 60% per sample if compared to previous Thermo Scientific EA-IRMS Systems. Automated stand-by and wake-up functions further reduce helium consumption ensuring lowest cost of ownership and cost per sample analysis.

Your sample throughput is mainly influenced by analysis time, reactor capacity and autosampler flexibility. The EA IsoLink IRMS System improves productivity by reducing analysis time (temperature ramped GC) and offering flexibility in reactor capacity. The larger diameter reactor option allows significantly more standard size samples to be processed and for larger samples amounts, like 30 mg of carbon, to be analyzed within one configuration and one sequence.

Your advantages are:

- Lowest helium consumption by Helium Management (He^M) Module
- Highest sample throughput with short analysis times and greater reactor capacity
- Significantly reduced cost per sample
- CNS analysis in less than 10 minutes, NC in less than 6 minutes, and OH in less than 6 minutes, including the reference peaks
- Continuous 24/7 operation by ability to load additional samples at any time and complete software automation



Geo- and Environmental Sciences

“...Superior sensitivity giving you outstanding performance for less than 20 µg of nitrogen...”



- N,C,S cycles
- Sediments
- Rocks
- Water
- Soils
- Sewage/Sludge
- Pesticides
- Particulates in air and water

For real life $\delta^{15}\text{N}$ determinations from samples in fields like geo- and environmental sciences, the performance of low nitrogen amounts differentiates the quality of analysis.

Sample type	$\delta^{15}\text{N}$ (‰)	µg N
Spruce wood	3.20 ± 0.23	11
Peat Soil	3.42 ± 0.06	11
Sediment	3.91 ± 0.08	23

Table 3. Reproducibility of $\delta^{15}\text{N}$ on low amounts.

The EA IsoLink IRMS System shows outstanding sensitivity especially proven by the performance for $\delta^{15}\text{N}$ on samples containing very low nitrogen amounts. This performance is based on our leak tight chromatographic design paired with high transfer rates into the IRMS and the high sensitivity of the Thermo Scientific™ Delta V™ IRMS Series. The data presented in Table 3 are not warranted because they exceed product specifications. The warranted product specifications for $\delta^{15}\text{N}$ is $\pm 0.15\text{‰}$ (1 sd) for 50 µg of nitrogen and $\delta^{15}\text{N}$ is $\pm 0.4\text{‰}$ (1 sd) for 10 µg of nitrogen measured on Acetanilide or Urea.



Flexibility for all applications with easy-to-use modular system

Your samples, our experience, built on robustness

The straightforward yet modular design of the EA IsoLink IRMS System provides you with the highest flexibility for all applications. Through smart upgrade paths you can easily modify your system to increase performance and productivity at any time.

You can start from three EA IsoLink IRMS Systems.

- **EA IsoLink CN**

The powerful solution for N and C analysis, which can be upgraded for CNS analysis.

- **EA IsoLink CN/OH**

The versatile single system solution for N and C analysis by flash combustion and O and H analysis by pyrolysis. Upgrade options for sulfur analysis.

- **EA IsoLink CNSOH**

The fully automated single system CNSOH solution. Two Thermo Scientific™ MAS Plus Autosamplers and temperature ramped GC oven are included as standard.

All EA IsoLink IRMS Systems are provided with the Helium Management (He^m) Module, thermal conductivity detector for weight % determinations, isothermal GC oven the dedicated Isodat Software Suite for isotope and elemental analysis, with no limit to PC installations.

Various modules can be added to the different EA IsoLink System at anytime, which extend your laboratories capabilities and improve your workflow while supported by the comprehensive Isodat Software Suite:

- **Temperature ramped GC oven**

The ultimate workflow enhancement tool giving you higher throughput, precision and lower cost per sample. Superior analytical performance on smallest sulfur amounts, even in CNS mode, is achieved.

- **smartEA option**

The automated method developer for analysis of samples with a wide range of CNS and OH amounts, using the ConFlo IV incremental dilutions.

- **Thermo Scientific™ MAS Plus Autosampler**

125-position helium purged, low blank autosampler for CNS and OH analysis. For very low amounts of nitrogen a Thermo Scientific™ No Blank Device can be added.

- **Thermo Scientific™ AS 1310 Liquid Autosampler**

The versatile solution for the injection of liquid samples.

- **Macro reactor for CNS**

Analysis of large sample sizes (greater than 60 mg) and higher throughput on standard sample sizes (greater than 20 µg).

“...Complete N₂ – CO
baseline separation
for high precision
δ¹⁸O results...”

All-in-one analyzer for elemental and isotope applications: Flash EA Series

Thanks to the modularity of the Thermo Scientific Flash Elemental Analyzer Series, you gain over 20 configurations in one system for elemental and isotopic analyses. The flexibility of the Flash EA Series allows you to meet your growing analytical needs in IRMS and Organic Elemental Analysis (OEA).

The Thermo Scientific™ FlashSmart™ Elemental Analyzer for OEA features:

- Accuracy and precision with internationally recognized certifications
- Clean backgrounds and superior peak separation using continuous flow gas chromatography
- Straightforward modular design for optimized application configuration - CHN, CHNS, S, N/Protein, CN, CNS, CHNS/O and more
- Robust, reliable analyzer for long-term peace of mind and future-proof Elemental Analysis capabilities
- High throughput and low cost per sample with 24/7 operation and optimized helium consumption
- Virtually the most complete and fully automated dedicated OEA software, which grows with your analytical needs without the need for upgrade: Thermo Scientific™ EagerSmart™ Data Handling Software
- Easy, quick conversion – in less than 10 minutes - from IRMS to OEA workflow

Food, Forensics and Agronomy



- Authenticity and origin
- Food and beverages
- Isoscapes
- Explosives
- Hair
- Soil
- Fertilizers
- Feed
- Nutrient cycle

With the EA IsoLink IRMS System, you will gain high precision $\delta^{18}\text{O}$ results by pyrolysis. For nitrogen rich samples, such as caffeine, complete baseline separation of N_2 and CO is achieved based on our simple and modular continuous flow gas chromatography design.

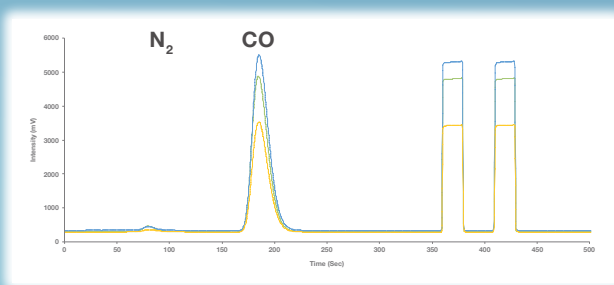


Figure 2. Complete N_2 and CO peak separation.

Five international standards and one laboratory standard of caffeine were run in replicates, with a $\delta^{18}\text{O}$ ranging from -4‰ to 71‰ versus VSMOW.



We manage your instruments so you can focus on the science.

With over 60 years of experience, Thermo Fisher Scientific is your reliable partner for Isotope Ratio MS. No matter how remotely you work, you will still get the support you need and a 15-year warranty for combustion and reduction furnaces and the Thermal Conductivity Detector.



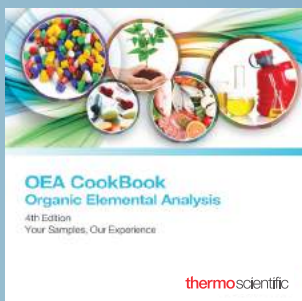
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EA IsoLink™ IRMS System



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