

Mass spectrometry

# Sensitive. Selective. Smart.

Thermo Scientific™ Orbitrap Exploris™ GC S  
Mass Spectrometer



thermo scientific

# Future-ready performance for POPs

Set a new standard for dioxin, pesticide, and POPs analysis with the Thermo Scientific™ Orbitrap Exploris™ GC S mass spectrometer, engineered to deliver absolute confidence in every result. **Purpose-built for food safety and environmental laboratories**, it combines the sensitivity and robustness required for high-throughput POPs analysis within a single, flexible platform that supports multiple analytical workflows. Building on Thermo Fisher Scientific's legacy in magnetic sector GC-HRMS, and powered by Orbitrap™ technology, the system integrates the proven Advanced Electron Ionization (AEI) source to deliver consistent, high-quality data, enabling confident decision-making for the most demanding analyses.

## One system. Multiple applications.

Dioxin & dl-PCBs 

- Sensitivity to meet regulatory limits
- Robustness demanded for daily analysis
- Simple implementation with eWorkflows

PFAS 

- Quantitative volatile PFAS analysis
- Wide dynamic range
- Discover PFAS compounds

Pesticides 

- Gain the flexibility to increase scope
- Secure right first time results
- Exceed sensitivity targets

Emerging POPs 

- Broad scope screening
- Confident compound identification
- Flexibility to adapt



Thermo Scientific Orbitrap Exploris GC S

Sensitive | Selective | Smart

## Advanced Electron Ionization (AEI) source: precision at every level

The Advanced Electron Ionization (AEI) source delivers exceptional sensitivity and stability for precise, reproducible quantitation of trace compounds. Its robust design ensures reliable performance even in complex matrices. Combined with Orbitrap technology, it enhances signal intensity, mass accuracy, and dynamic range, empowering laboratories to achieve confident, high-resolution results across every analysis.

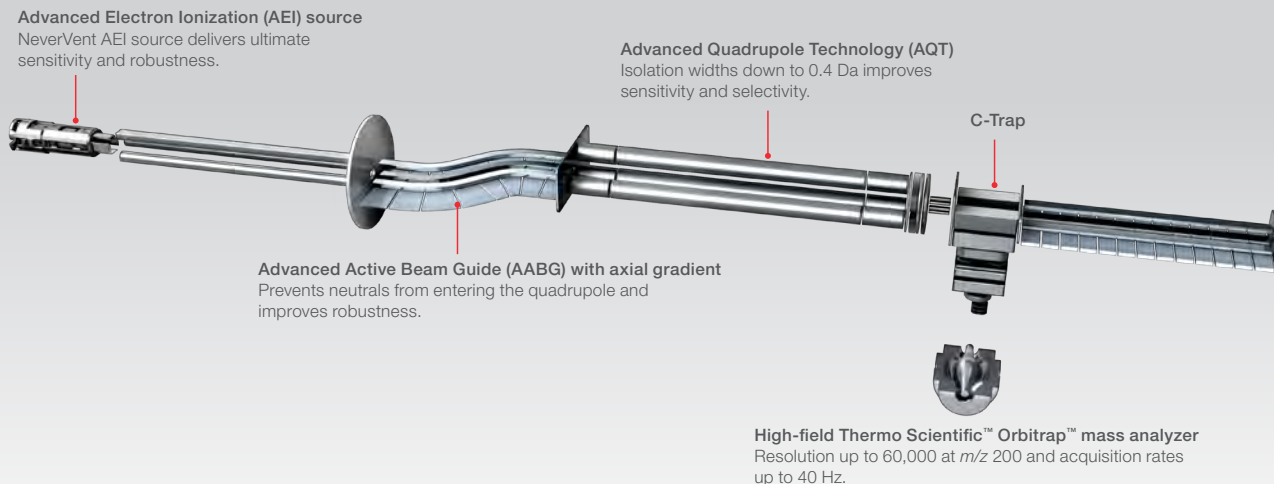
## NeverVent technology—maximum uptime, minimal downtime

Using Thermo Scientific™ NeverVent™ technology with the Vacuum Probe Interlock (VPI) and V-Lock™ source plug, planned maintenance—such as column changes and ion source cleaning—can be performed without venting the mass spectrometer, keeping you productive and maximizing uptime.

NeverVent technology is available on the AEI source, where even the filament can be replaced without venting, ensuring continuous operation and simplified maintenance.

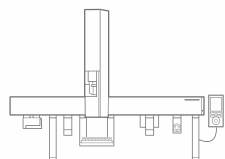
# Unprecedented GC Orbitrap sensitivity

## Schematic of Orbitrap Exploris GC S Mass Spectrometer



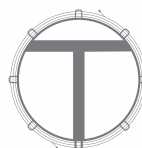
## Orbitrap Exploris GC S Dioxin workflow

End-to-end solutions for seamless operation



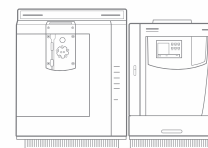
### Thermo Scientific™ TriPlus™ RSH SMART autosampler

Exceptional precision, flexibility, and productivity with robotic sample handling



### Thermo Scientific™ TRACE™ Dioxin column

Unique selectivity for toxic dioxin and furan congeners and separation of critical pairs



### Thermo Scientific Orbitrap Exploris GC S mass spectrometer

Ultimate selectivity with high resolution accurate mass detection at 60,000 resolving power



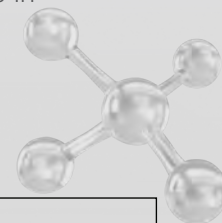
### Thermo Scientific™ Chromeleon™ Dioxin HRAM eWorkflow

Simple implementation with instrument, processing, and reporting templates

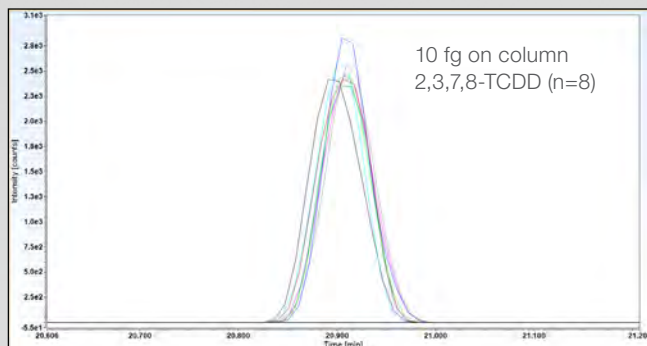


# Modernizing dioxin analysis

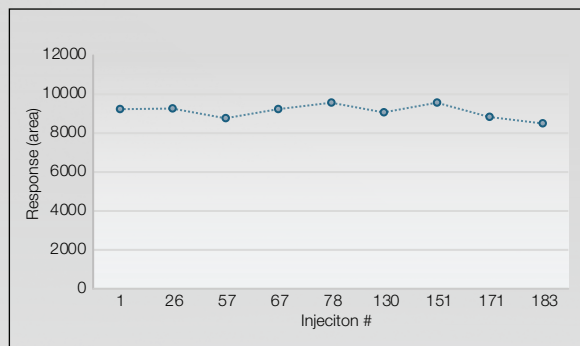
Dioxin analysis demands uncompromising sensitivity, selectivity, and data integrity at ultra-trace levels. The Orbitrap Exploris GC S mass spectrometer combines high-resolution accurate-mass (HRAM) performance with exceptional robustness to confidently meet regulatory requirements, even in the most complex food and environmental matrices. By enabling expanded scope, regulatory-ready identification, and streamlined workflows in an easy-to-use mass spectrometer system, laboratories can exceed analytical targets while maximizing throughput.



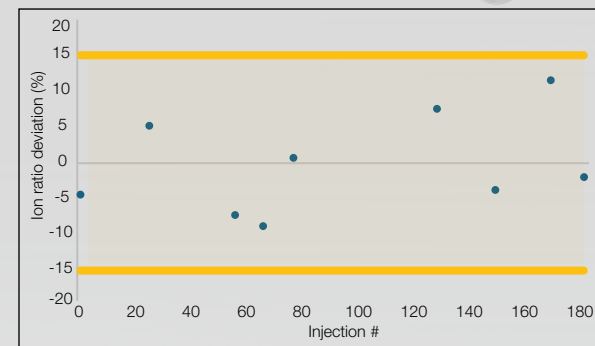
## Regulatory ready performance



**Sensitivity at ultra trace level.** Eight QC replicates across ~180 injection analytical run at 10 fg. 2,3,7,8-TCDD in solvent.



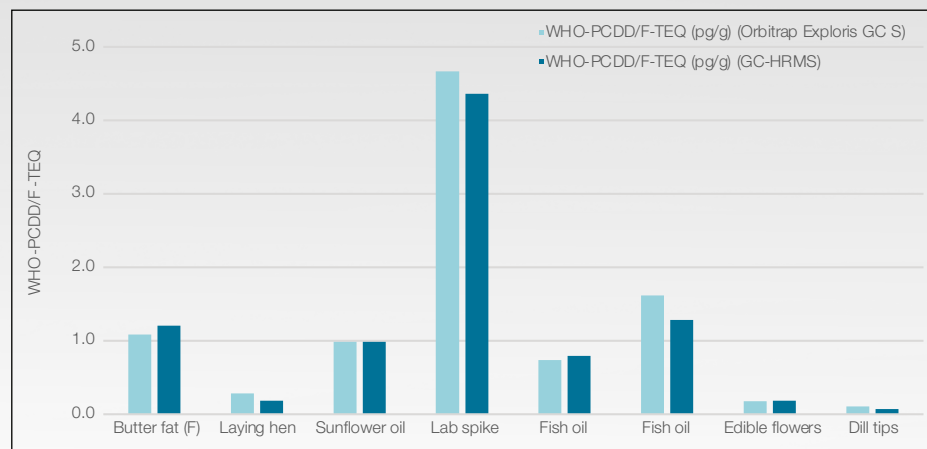
**Repeatability in matrix.** Repeated injections 10 fg 2,3,7,8-TCDD quality control standard across batch of ~180 injections.



**Ion ratio.** Ion ratio compliance ( $\pm 15\%$ ) at 10 fg on column for 2,3,7,8-TCDD. Repeated injections quality control standard across batch of ~180 injections.

| Peak Name     | Peak Area counts*s |           | m/z resolution 5% peak height |       |
|---------------|--------------------|-----------|-------------------------------|-------|
|               | CSL                | CS4       | CSL                           | CS4   |
| 2378-TCDF     | 111475             | 48095554  | 23060                         | 22916 |
| 2378-TCDD     | 71838              | 31227755  | 23111                         | 22774 |
| 12378-PeCDF   | 453187             | 206532509 | 21818                         | 22904 |
| 23478-PeCDF   | 463519             | 217386114 | 22978                         | 22848 |
| 12378-PeCDD   | 238698             | 112045640 | 21578                         | 21959 |
| 123478-HxCDF  | 389641             | 185151997 | 20894                         | 20821 |
| 123678-HxCDF  | 402773             | 192522663 | 21928                         | 20766 |
| 234678-HxCDF  | 387739             | 187061131 | 20829                         | 20753 |
| 123478-HxCDD  | 207340             | 100532029 | 20794                         | 21138 |
| 123678-HxCDD  | 213487             | 103987695 | 20782                         | 21038 |
| 123789-HxCDD  | 230199             | 111957383 | 20751                         | 21061 |
| 123789-HxCDF  | 370957             | 180874690 | 20889                         | 20801 |
| 1234678-HpCDF | 318461             | 155229864 | 20311                         | 20274 |
| 1234678-HpCDD | 195174             | 94364441  | 20538                         | 20184 |
| 1234789-HpCDF | 276246             | 137260521 | 20141                         | 20400 |
| OCDD          | 318446             | 165088774 | 19756                         | 18943 |
| OCDF          | 328350             | 197739465 | 19776                         | 19754 |

**Mass resolution.** Thermo Scientific™ Chromleon™ Chromatography Data System (CDS) report view of m/z resolution at 5% peak height for all congeners in CSL (calibration solution lowest) and CS4 (calibration solution 4) exceeds regulation target of 10,000 with all at ~20,000.



**Accuracy.** Comparison of WHO-PCDD TEQ result in food matrices between Orbitrap Exploris GC S and GC-HRMS (Thermo Scientific DFS Magnetic Sector).

# Simplify the complexity of dioxin analysis

Implement routine dioxin analysis quickly with an integrated, compliance-ready workflow. The combination of Orbitrap Exploris GC S mass spectrometer and Chromeleon Dioxin HRAM eWorkflow delivers a guided, end-to-end solution that automates method setup, quality checks, data processing, and reporting, allowing laboratories to be operational with minimal manual configuration.

The Chromeleon Dioxin HRAM eWorkflow provides real-time compliance monitoring through dynamic, color-coded indicators for internal standard recovery, ion ratios, and TEQ calculations, while built-in system suitability checks ensure only compliant sequences proceed. Preconfigured reporting templates automatically generate complete, regulation-ready documentation—from  $^{13}\text{C}$ -labeled standard recoveries to LOQ flagging—simplifying data review, reducing operator burden, and ensuring consistent results across routine high-throughput analysis.

"For routine EPA 1613 testing, reliability, robustness, and data robustness are critical. Transitioning to Orbitrap GC has enabled us to maintain the performance we expect from high-resolution systems, while gaining operational advantages such as simplified workflows, lower maintenance costs, and flexibility for future analytical needs, all of which better support our long-term sustainability as a contract testing laboratory."

Dr Karl Mair,  
Eco Center s.p.a, Italy

Fast implementation with template method at every stage



## Chromeleon Dioxin HRAM eWorkflow



### Injection parameters

- Splitless (SSL)
- Programmable temperature vaporization (PTV)



### GC gradient

- GC Oven temperature program
- Dioxin column options



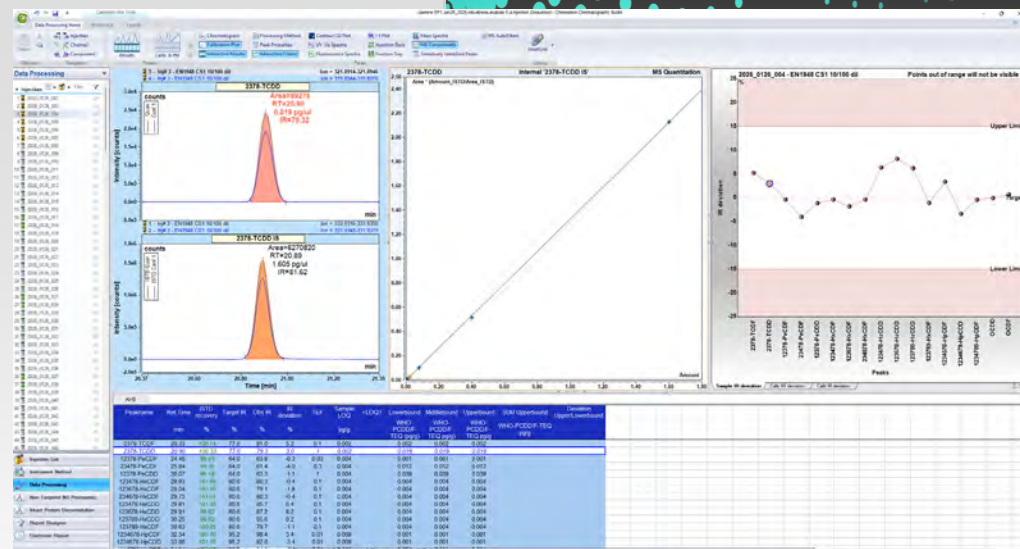
### HRAM acquisition

- SIM HRAM acquisition
- Orbitrap Exploris GC or GC S



### Data processing & reporting

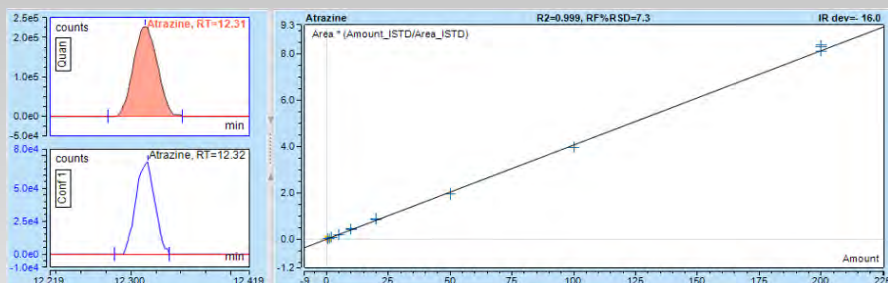
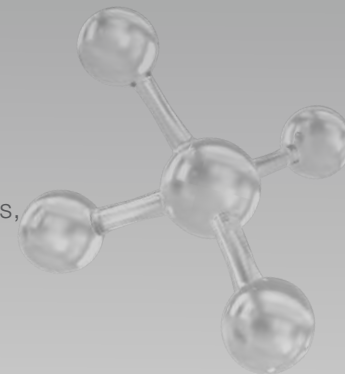
- Preinstalled & customizable templates for dioxin
- Sequence setup, data evaluation & reporting



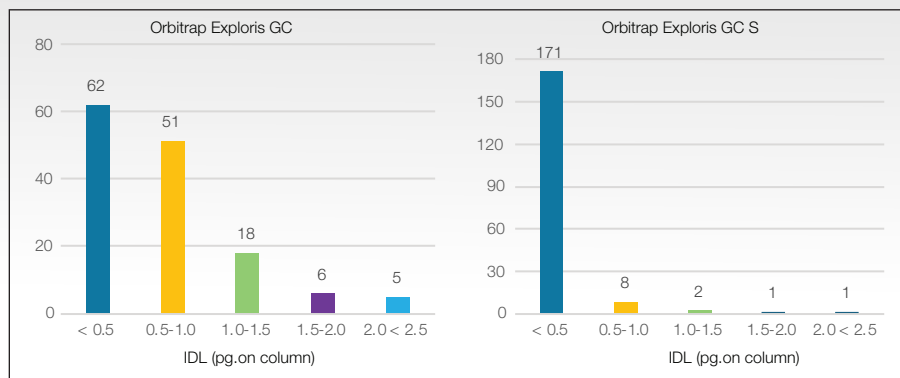
**Software view of dioxin quantitative data review.** Built-in capabilities for extensive sample reporting with  $^{13}\text{C}$ -labelled standards recovery, ion ratio, sum parameters, and LOQ flagging, automating the necessary calculations within the software. Ready-to-use templates provide easy implementation of compliant methodology.

# Precision and confidence for pesticide analysis

Deliver reliable pesticide results across complex matrices with a system designed for high throughput analysis. The Orbitrap Exploris GC S mass spectrometer provides precise quantitation and consistent detection at low concentration levels, supporting laboratories in meeting reporting requirements. Combining high-resolution accurate-mass (HRAM) performance with a wide linear dynamic range and ultimate sensitivity, the system enables reproducible results across a broad range of pesticide compounds and sample types, supporting both current monitoring needs and evolving analytical requirements.

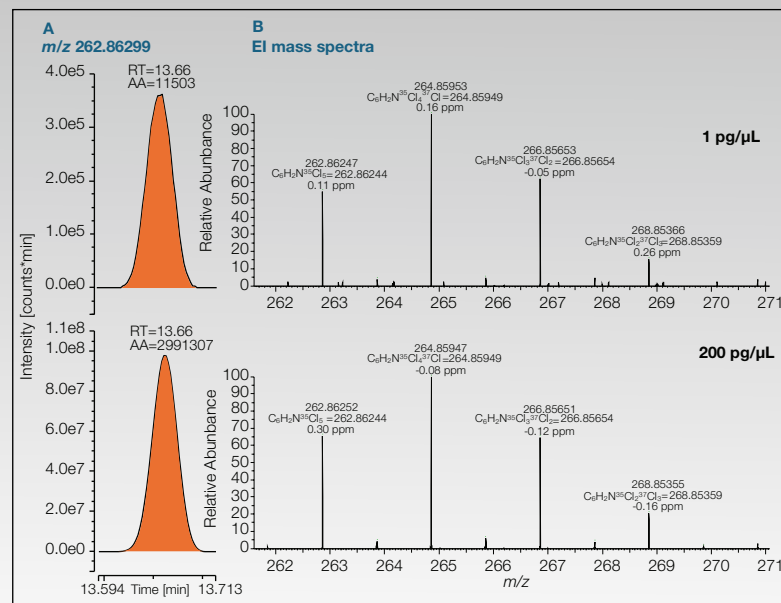


Chromleon software view of spinach matrix-matched calibration curve of Atrazine (0.5–200 µg/kg, triplicate injections), including extracted quantifier and qualifier ions at 0.5 µg/kg. Data were acquired using 60,000 mass resolving power.

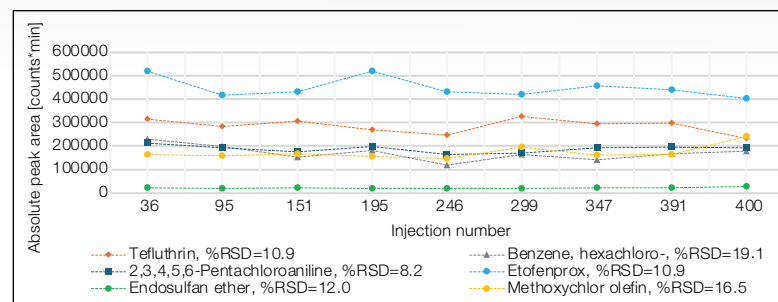


Distribution of calculated detection limits for 142 pesticides post spiked in wheat QueChERS extracts.

Distribution of calculated detection limits for 183 pesticides post spiked in babyfood-spinach QueChERS extracts.



Spectral fidelity for pentachloroaniline at two levels (1 and 200 pg/µL) in spinach. [A] extracted ion chromatograms (XIC) at each concentration. [B] zoomed-in view of EI mass spectra of the molecular ion cluster at each concentration level, annotated with the measured mass, elemental composition, theoretical mass, and mass accuracy (ppm).



Repeatability obtained across a period of four weeks for solvent, matrix-matched calibration standards and diverse matrices post spiked at 10 µg/kg without internal standard correction

# Benefits that improve flexibility

## Expand analytical scope

Add new compounds easily and extend analytical coverage without reconfiguring acquisition methods.

## Rapid system readiness

Walk-up tuning and calibration enable the system to be ready for analysis in minutes, ensuring consistent performance across users.

## Efficient data review and reporting

Multiple points of identification support rapid confirmation or rejection of detections. Accurate mass, isotope patterns, retention indices, and spectral matching streamline data review.

## Accurate quantitation across wide concentration ranges

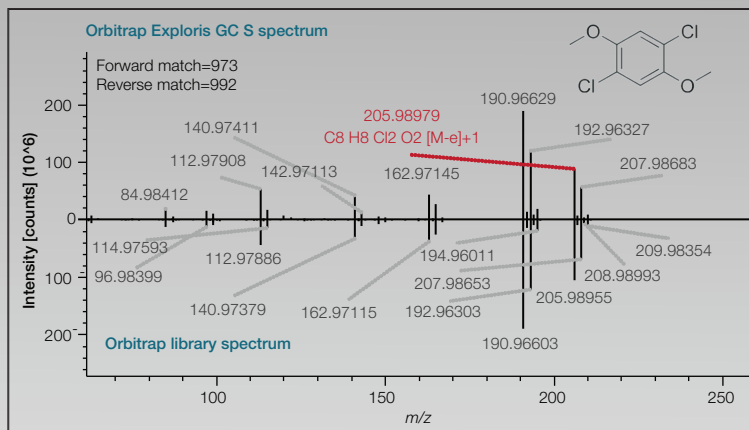
A broad linear dynamic range supports reliable quantitation in complex food and environmental matrices.

## Method consolidation on a single platform

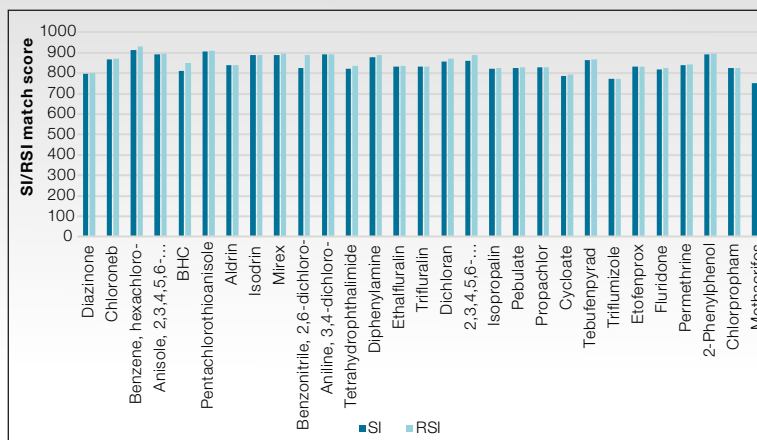
Consolidate screening, quantitation, and confirmation workflows onto one system, reducing the need for multiple instruments.

## Retrospective data interrogation

Address new analytical questions or emerging regulatory requirements without additional sample injections.



**Example spectrum library match for chloroneb.** Full scan data allows for multiple identification points, including multiple accurate mass ions, spectral matching, isotope pattern comparison, and ion ratio confirmation.



**Library search index scores for pesticide standard mix in acetonitrile.** Forward search scores (Match) and reverse search scores (R Match) when searched against the NIST library are given for each pesticide.

"In our initial experiments, GC Orbitrap shows promise in meeting the resolution, sensitivity, and ion ratio confirmation required, while offering a compact footprint, less restrictions on the maximum number of compounds monitored, and simpler operation compared with traditional sector-based systems."

Dr. Kerstin Krätschmer,  
Wageningen Food Safety  
Research, Netherlands

# Confidence at every stage with Thermo Scientific software

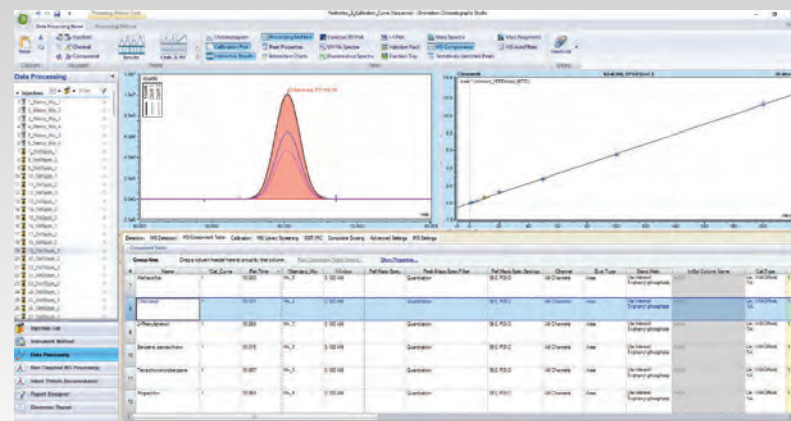
Turning exceptional data into confident results requires software that is intuitive, powerful, and built for modern laboratory workflows. Thermo Scientific™ software solutions streamline data processing from acquisition through reporting, enabling efficient screening, reliable quantitation, and confident identification across routine and advanced applications. With flexible workflows designed for users of all experience levels, these tools help laboratories maximize productivity, ensure data integrity, and extract deeper insights from every analysis.



## Chromleon Chromatography Data System (CDS)

### Enterprise-ready, regulatory-compliant quantitation

- **Streamlined, end-to-end workflows** for GC and GC-MS quantitation with integrated instrument control, data processing, and reporting
- **Built for regulated environments**, supporting GLP, GMP, and 21 CFR Part 11 compliance with secure data handling and audit readiness
- **Connected and scalable architecture** enables multi-site operation, centralized data management, and easy integration with third-party systems



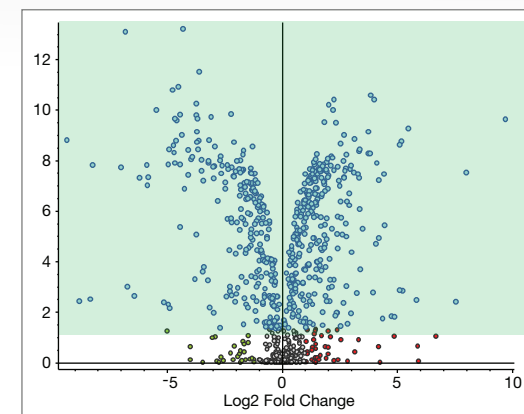
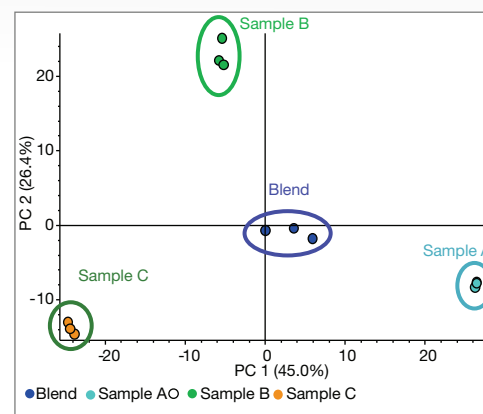
Chromleon CDS data review for quantitation and confirmation of contaminants.



## Thermo Scientific™ Compound Discoverer™ Software

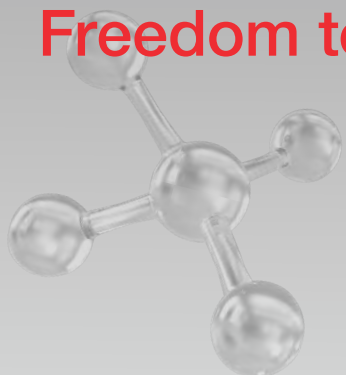
### Advanced sample profiling and unknown identification

- **Intelligent interrogation** of full-scan HRAM data to profile samples, identify unknowns, and uncover differences across sample sets
- **Flexible, node-based workflows** with deconvolution, statistical analysis, and customizable data visualization
- **Retrospective analysis capability** allows new questions to be answered from existing data without reanalysis or additional injections



Compound Discoverer solution statistical and compound identification tools provide fast and confident identifications.

# Freedom to configure



Full range of self-installable Thermo Scientific™ iConnect™ injector and detector modules to minimize GC downtime.

High-resolution touchscreen to support daily operations with video instruction that walks through common procedures.



Simplify and speed up column installation with quick, easy, and safe tool-free column connectors with the ability to work comfortably in an illuminated oven.

Instrument health icon is always visible on the GC touchscreen to alert users to maintenance needs.



Keep GC consumables and tools close at hand in GC drawer.



## Unstoppable confidence in uptime with a GC always ready to run

Designed for a new level of usability and uptime, the Thermo Scientific™ TRACE™ 1600 Series Gas Chromatograph (GC) delivers measurably more productivity and lower cost of operation. With a unique modular design and plug-and-play injectors and detectors, you have full flexibility to perform maintenance offline and use different configurations on the same GC to make the most of your GC-MS system. When combined with the Thermo Scientific™ TriPlus™ RSH SMART autosampler, the system offers extended automation capabilities from sample preparation to injection, to meet any sample-throughput demand.

# Step into modern gas chromatography



Access unprecedented flexibility. Switch instant-connect injectors and detectors in minutes without tools.

## Modularity increases uptime

The unique modular design of the Thermo Scientific™ TRACE™ 1600 Series GC empowers users with new time-saving capabilities and unmatched flexibility. Swapping modules is easy by removing and replacing just three screws, accessible from the top of the GC system. The entire process takes less than five minutes without requiring specialized service assistance. This modularity provides maximum uptime with offline cleaning and servicing of the GC inlet when a spare module is purchased.

Also, rapid response to different application needs or sudden workload requirements is possible with a limited investment in modules.

Take advantage of a comprehensive range of the iConnect injectors and detectors interchangeable modules. Take advantage of a comprehensive range of Thermo Scientific™ Instant Connect injectors and detector modules, all interchangeable and readily available at your fingertips for any application:

- Instant Connect Helium Saver split/splitless (SSL) injector
- iConnect Cold On-Column (COC) injector
- iConnect Flame Ionization Detector (FID)
- iConnect micro-volume Thermal Conductivity Detector (TCD)
- iConnect Electron Capture Detector (ECD)
- iConnect Nitrogen Phosphorous Detector (NPD)
- iConnect Flame Photometric Detector (FPD)
- iConnect Pulsed Discharge Detector (PDD)

## Add productivity with automated sample handling

The RSH SMART Autosampler offers advanced robotic sample handling to extend automation beyond liquid injection, headspace, and solid-phase microextraction (SPME). Your results will benefit from improved precision and reproducibility, while your laboratory will increase productivity with sample handling flexibility. Several tools are available to reliably automate the most common sample preparation procedures, such as dilution, internal standard addition, and complex derivatization methods, including online microSPE cleanup of QuEChERS extracts.

Ready-to-use prep cycles are available or it is possible to easily create custom workflows using the Thermo Scientific™ TriPlus™ RSH Sampling Workflow Editor Software, with intuitive drag-and-drop visual programming.

### Key benefits

- Improved data repeatability
- Increased automation and laboratory efficiency
- Reduced cost per sample



The TriPlus RSH SMART Autosampler delivers exceptional precision, flexibility, and productivity with robotic sample handling.

# High resolution accurate mass for every analytical question

## Orbitrap Exploris GC

The Thermo Scientific™ Orbitrap Exploris™ GC mass spectrometer streamlines everyday testing with exceptional selectivity, sensitivity, and robust full-scan EI or chemical ionization (CI) HRAM performance. Designed to simplify workflows, it delivers consistent quantitative accuracy across complex matrices. Its intuitive operation and broad application flexibility enable fast, confident results in routine and high-throughput environments.

### Key benefits

- Full-scan HRAM data enables multipoint compound identification using spectral matching, isotope patterns, retention indices, and elemental compositions.
- Flexible configuration: choose 30,000 or 60,000 resolving power, MS/MS capability, with field upgrade options to 60,000 or MS/MS for evolving analytical demands.
- ExtractaBrite™ source provides EI, positive/negative CI, or variable-energy (VeV) ionization modes to enable molecular-ion identification essential for unknown analysis or structural elucidation.



Thermo Scientific  
Orbitrap Exploris GC

## Orbitrap Exploris GC 240

The Thermo Scientific™ Orbitrap Exploris™ GC 240 mass spectrometer delivers unprecedented resolving power, versatility and accuracy for advanced research and complex discovery workflows. Its 240,000 resolving power and MS/MS as standard enables confident identification in challenging matrices, while full-scan HRAM data and flexible ionization modes uncover deeper sample insights to accelerate scientific discovery.

### Key benefits

- Breakthrough resolving power up to 240,000 with exceptional mass accuracy, enabling high-certainty identification in complex matrices.
- Versatile ExtractaBrite EI/CI/VeV ionization source, MS/MS capability, and fast switching between sources and probes expand analytical possibilities.
- Intuitive operation with integrated informatics for discovery, quantitation, and retrospective analysis to maximize scientific insight.



Thermo Scientific  
Orbitrap Exploris GC 240



## Expert support for every instrument

Count on us to keep your instruments operating at their best. Whether you need an instrument manual, spare parts, assistance submitting a repair request, or updates on your warranty or service contract, our team is here to help. With comprehensive technical and online support, you can feel confident knowing expert assistance is always within reach—whenever you need it.

Learn more at [thermofisher.com/technicalresources](https://thermofisher.com/technicalresources)

## Experience the advantages of Thermo Fisher Scientific service

Choosing Orbitrap Exploris GC S mass spectrometry means more than just acquiring advanced technology: it means partnering with Thermo Fisher Scientific, a leader in science, innovation, and support. Our Unity™ Lab Services delivers world-class solutions to support your instruments. Our comprehensive service portfolio includes instrument service plans, on-demand service (compliance service, maintenance, and installation), and education support.

Services Center allows you to easily request, manage, and view services via a centralized online platform. You can also check service plan or warranty coverage, access manually, and more.

Learn more at [unitylabservices.com](https://unitylabservices.com)

Find out more at [thermofisher.com/OrbitrapExplorisGCS](https://thermofisher.com/OrbitrapExplorisGCS)

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