



Thermo Scientific TSO 8000 Evo
Triple Quadrupole GC-MS/MS

Expect more productivity

with the evolution of ultimate performance GC-MS/MS

Thermo
SCIENTIFIC

Expect **More** Productivity

Evolving with the changing laboratory environment

The pressure on analytical laboratories has never been greater. Managers face a dynamic environment of changing regulatory requirements, lower detection levels, more compounds, less time, lower budgets and increased competition. Laboratories must evolve to stay ahead of the game, and their analytical systems need to evolve, too.

The **Thermo Scientific™ TSO 8000™ Evo Triple Quadrupole GC-MS/MS** is for labs looking for the next step up in triple quadrupole GC-MS/MS productivity. It is the latest evolution of the highly successful TSO 8000 GC-MS/MS system and the evolution of unsurpassable productivity, MS/MS simplicity, and ultimate performance S/M.

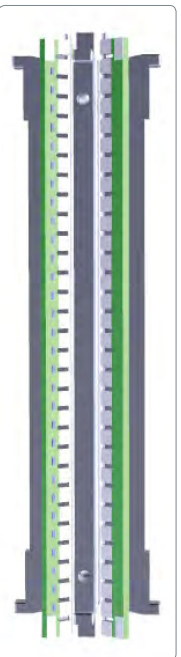
The TSO 8000 Evo triple quadrupole GC-MS/MS has been designed for and developed with high throughput analytical laboratories. It is a unique system that offers a harmonious combination of hardware and software features that help laboratories adapt to their changing environment and deliver quality results on time, every time.



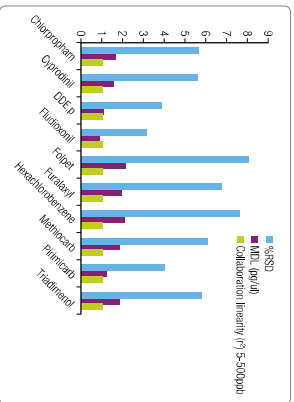
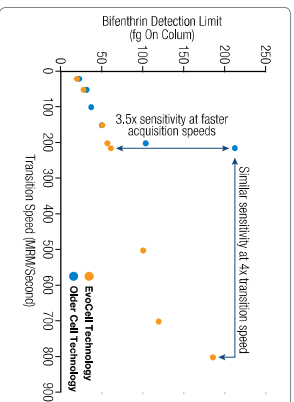
Expect More Capacity

Fast EvoCell technology and intelligent instrument control

More capacity is offered through the acquisition of more information, more compounds, and more results per unit time in your laboratory. This enables higher levels of productivity and efficiency in analytical workflows. Innovative EvoCell collision cell technology, in combination with the high efficiency, timed-SRM capability of the TSO 8000 Evo GC-MS/MS, opens the door to new possibilities for high-complexity methods in routine laboratories.



Enhanced velocity optics driving EvoCell collision cell technology provide high SRM transition speeds, precision, and sensitivity for even the most complex methods



Increased sensitivity at fast transition speeds allows the use of up to 4x transition speeds of standard collision cell technology

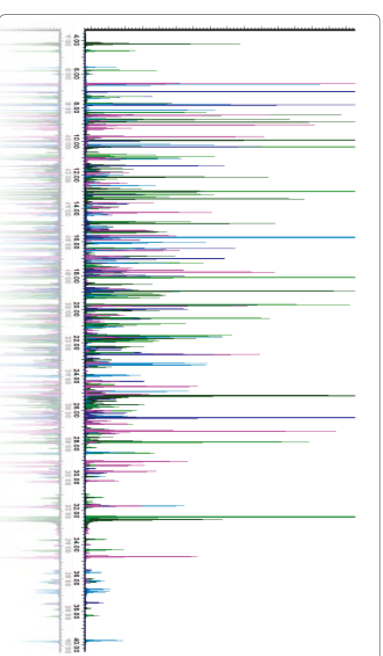
Analysis of pesticides in rice (10 µg/kg) with the EvoCell collision cell at 500 µs dwell time, acquiring 800 transitions per second

Features	Benefits	Impact
Increased number of transitions per compound	More points of confirmation More resistance to matrix interference	Higher confidence More on-time results
Increased number of compounds	Higher capacity methods	More method consolidation More efficiency in result production
Fast GC compatible	Faster run times	Faster turnaround More on-time results
Wider SRM windows	More resistance to the effects of RT shift caused by matrix	Faster turnaround More on-time results

Truly powerful methods use speed efficiently

As more compounds are added to a single run, managing acquisition windows becomes increasingly complex. The TSO 8000 Evo GC-MS/MS system dramatically reduces this complexity by automatically optimizing the targeting of a particular compound.

Simply enter the retention time and the time required to capture the peak, and t-SRM takes care of the rest. This ensures that compound detection is optimized for maximum sensitivity, and more compounds can be added to the method without compromising the excellent sensitivity of each individual analyte. The mass spectrometer is not consuming valuable resources scanning for compounds at the times when those compounds are not eluting.



Multiple single quadrupole pesticides methods consolidated into one 40-minute, 350 pesticides (700 transitions) run

Traditional Segmented SRM

- Complicated set-up
- Wasted dwell time
- Reduced sensitivity
- Reduced tolerance to RT shifts

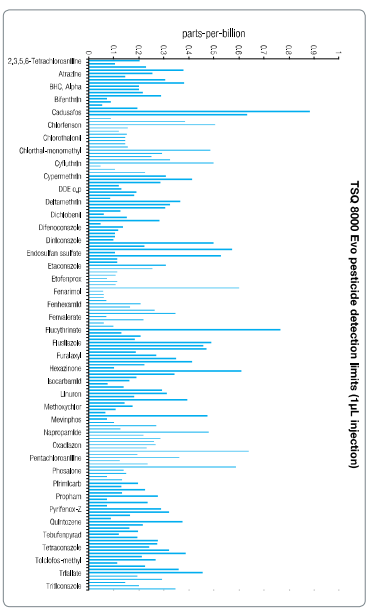
TSO 8000 Evo GC-MS/MS Timed SRM

- Automated set-up
- Optimized dwell time
- Maximized sensitivity
- Increased resistance to RT shifts

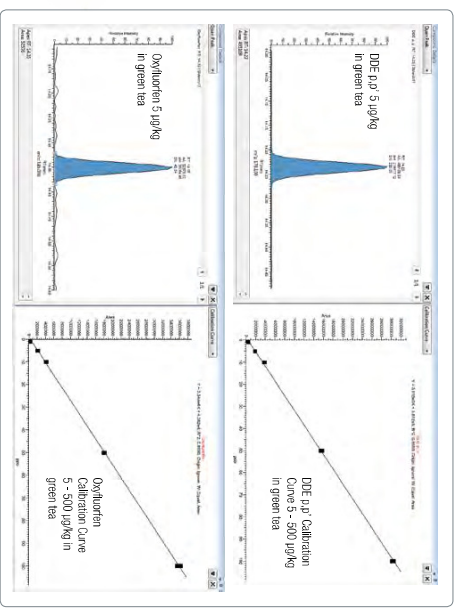


Ultimate sensitivity SRM

Laboratories performing analyses in food safety, environmental monitoring, and sports doping can all benefit from high selectivity and ultimate sensitivity selected reaction monitoring (SRM) enabled by the TSQ 8000 Evo GC-MS/MS, which is the highest performing triple quadrupole GC-MS/MS offered on the market.



▶ Detection limit (99% confidence level) of 166 pesticides based upon 0.5 and 1 ppb peak area precision (no internal standard correction) using 1 µL FTY injection (n=10)



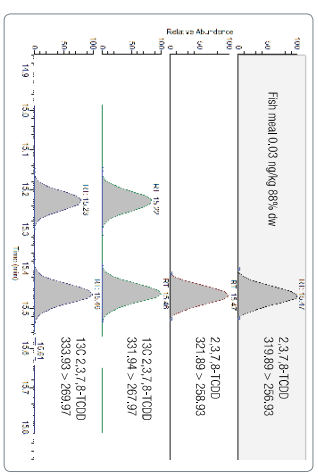
The TSQ 8000 Evo GC-MS/MS is a perfect fit for laboratories in need of high efficiency pesticide methods. Enhanced selectivity, speed, and sensitivity translate into real routine efficiency and productivity. Expect performance above and beyond former triple quadrupole instruments.

▶ High selectivity of low concentrations in complex tea matrix

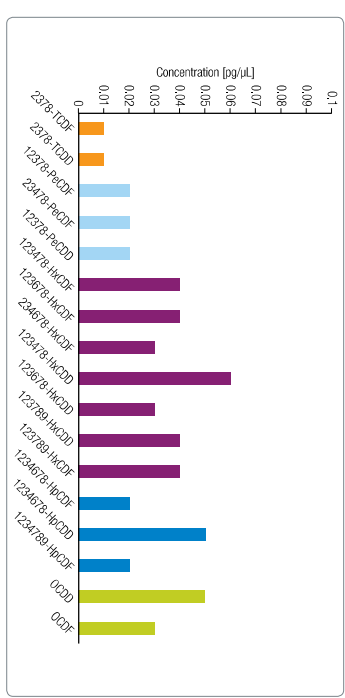
Expect More Performance

Ultimate sensitivity for contaminants regulated at the lowest levels

The confirmatory determination of polychlorinated dibenzodioxins and furans (PCDD/Fs) is one of the most challenging of the ultra-trace analytical methods in contaminant analysis. This challenge is due to the extremely low regulated levels and stringent analytical criteria in force. Meeting that challenge requires externally powered SRM that the TSQ 8000 Evo GC-MS/MS delivers routinely.



▶ Fish meal containing low levels of 2,3,7,8-TCDD



▶ Instrument detection limit (IDL) for PCDD/Fs when satisfying all confirmatory criteria CS4 x 5 dilution (n=10) injected using splitless mode

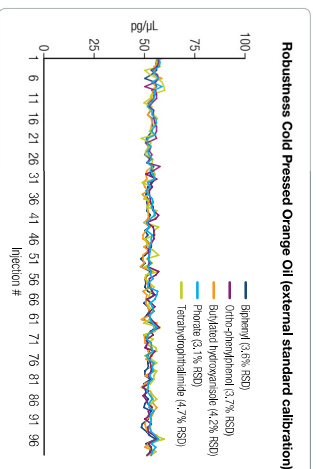
European Commission GC-MS/MS Confirmatory Performance Criteria	TSQ 8000 Evo GC-MS/MS Capabilities	Compliance Confirmed
Two specific precursor ions with two specific production ions	All recommended methods developed as defined in criteria Fully optimized by AdvSciSM	Yes
Tolerance of ion ratios within ± 15%	< 10% measured at EPA 1613 CSL level (n=14)	Yes
Resolution of each quadrupole equal to or better than unit mass resolution	All recommended methods developed Q1 and Q3 at 0.7 Da	Yes
The % RSD of the file (or model Relative Response Factors (RRFs) for each unlabeled PCDD/PCDF and labelled internal standards must not exceed 20%	6 point curve EPA 1613 CSL-CS4 2%	Yes

Expect More Robustness

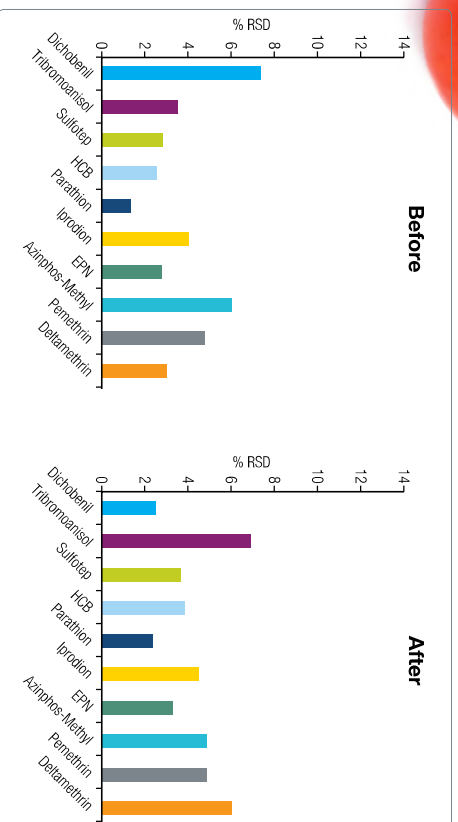
Unstoppable productivity

The Thermo Scientific™ ISQ™ Series single quadrupole GC-MS and TSQ 8000 triple quadrupole GC-MS/MS have a strong reputation in allowing laboratories to tackle the demands of producing results on time, every time. The TSQ 8000 Evo triple quadrupole GC-MS/MS continues that legacy by enabling routine-grade robustness for ultimate performance applications in some of the most challenging matrices.

The patented Thermo Scientific™ ExtractaBrite™ ion source is heated throughout and includes the first RF region (RF lens), commonly the first place susceptible to ion burn. This design ensures high matrix tolerance for high throughput applications. Crucially, it is fully removable, even when hot, under vacuum for necessary cleaning or snapping with a spare source. There is never a need to vent to clean your instrument or to heat or clean quadrupoles. Enjoy constant productivity.



▲ Robustness of 1:20 diluted orange oil spiked with pesticides and injected directly (n=100)



▲ %RSD pesticides (10 ppb) before and after 1,400 vegetable matrix injections

Expect More Flexibility

Flexibility to best solve your analytical challenge

The TSQ 8000 Evo GC-MS/MS addresses many laboratory mass spectrometry needs through various scan modes along with source and probe options. Excellent performance is enabled for single quadrupole-type scan modes which, in turn, expand system versatility in the modern laboratory.

Mode	Q1	Q2 (Evocell)	Q3	Application
Selected Ion Monitoring (SIM)	Transmission only	Transmission only	Selected m/z	Target quantitation
Full scan	Transmission only	Transmission only	Scanning	Unknown ID, library search
Selected reaction monitoring (SRM)	Selected m/z	CID	Selected m/z	Target quantitation
Product ion scan	Selected m/z	CID	Scanning	SRM method development and compound elucidation, build and search libraries
Precursor ion scan	Scanning	CID	Selected m/z	Searching for unknown compounds giving characteristic fragments
Constant neutral loss	Scanning	CID	Scanning (-neutral loss offset)	Searching for unknown compounds with common structures, e.g. acids
SPM/All Scan	Alternating selected m/z and transmission only	Alternating CID/Transmission only	Alternating selected m/z and scanning	Target quantitation and unknown ID by library search

Ion sources and probes are removable without requiring a break in the vacuum, and they enable you to perform MS and MS/MS experiments on solids in real time while effortlessly switching between electron ionization (EI) and chemical ionization (CI).

Direct Insertion Probe (DIP)

Slower volatilization with heated capillary tube for solid samples. The DIP can be utilized for rapid analysis of solids or trace components in solid matrices such as forensic samples, tissue, etc.

Direct Exposure Probe (DEP)

Rapid heating filament for liquids or solutions. The DEP is ideal for rapid molecular weight confirmation of solids dissolved or suspended in a suitable solvent.

Chemical Ionization

Chemical ionization is a softer form of ionization than electron ionization (EI). It offers a greater opportunity to generate more abundant high mass and molecular ions and a higher degree of selectivity or sensitivity in the source ionization process, especially with negative chemical ionization (NCI), favoring electronegative compounds such as halogenated species. Chemical ionization is ideally used for structure elucidation also in MS/MS mode.



brilliant Design Results for brilliant

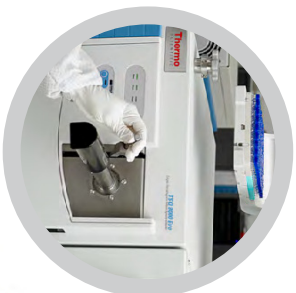
Industry-Leading Detector Linearity

The Thermo Scientific DynaMax detection system standard on the TSQ 8000 Evo system offers industry-best linearity. Combined with the low detection limits attainable by SRM, this detector makes the mass spectrometer the ultimate quantitative instrument.

REMOVE THE SOURCE OF YOUR DOWNTIME
Allows full source removal without venting the MS including ion guide surface. No wire connections are necessary, and venting is never necessary to clean your instrument.



Extracable wireless ion source cartridge



NEVER CLEAN OR REPLACE QUADS
Heated ion guide protects the main quadrupole sets so they never require cleaning or replacement.

EVOCCELL COLLISION CELL TECHNOLOGY
High performance SRM at high velocity transition speeds.

DUAL HEATED ZONES ON SOURCE MAXIMIZE RUGGEDNESS
Dual independently-heated zones on the TSQ 8000 Evo system allow for thousands of injections of the dirtiest matrices before source cleaning is required.

NO HELIUM REQUIRED
Choose between nitrogen or argon for collision gas. No expensive helium is required.



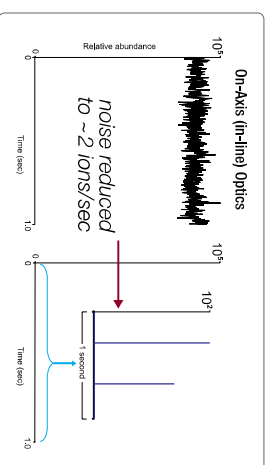
SWITCH BETWEEN FULL SCAN, SIM AND MRM IN MILLISECONDS
Effortless switching is made possible with the fast scanning capabilities of the TSQ 8000 Evo GC/MS/MS.

FAST SCANNING ALLOWS FAST CHROMATOGRAPHY
Dynamic ion expulsion in the collision cell allows hundreds of MRM transitions per second. Combined with iSRM for efficiently managed transition scheduling, the TSQ 8000 Evo system can analyze hundreds of compounds with multiple transitions each over short chromatographic runs.

NO NOISE IS GOOD NOISE
Off-axis optics provided by the curved ion guide effectively eliminate neutral noise, resulting in less background and lower limits of detection.



DUAL FILAMENTS FOR PROLONGED UPTIME
Intelligent dual filament design keeps you running longer between maintenance intervals.



Expect More Simplicity

Easy MS/MS

The advantages of selected reaction monitoring (SRM) and multiple reaction monitoring (MRM) analysis often come with challenges, especially with respect to adoption of new technology in the laboratory. These challenges are due to the method set-up and optimization and management of complex analytical methods. Laboratories that strive to realize the benefits of MS/MS must overcome some barriers in the tuning, set-up and optimization to reduce the time required to achieve a smooth operating routine.

The TSQ 8000 Evo GC-MS/MS was built to guarantee an easy start-up. Whether you are managing retention times, starting a completely new analysis, transferring a method from a single quadrupole system, or porting a known MRM method from another instrument, the TSQ 8000 Evo system ensures the fastest route to routine high performance results through its integrated software tools.

- **AutoSRM:** A purpose-built software for automated SRM method creation and optimization from full scan to the complete analytical method setup
- **TSQ 8000 Evo GC-MS/MS Instrument Method:** Offers true time-based SRM operation, allowing for high sensitivity and ease of use for the most complex SRM methods
- **Thermo Scientific™ TraceFinder™ Software:** State of the art, multi-platform user-friendly chromatography analysis software

From the Start

For new compounds choose to begin the AutoSRM function, ask for a precursor ion study (Step 1), and place a vial with the compound mix in the autosampler. The AutoSRM function reports a full scan chromatogram of the injection, and you simply identify your peaks and choose the most appropriate precursors that AutoSRM presents. In the case of co-eluting compounds, AutoSRM automatically performs one injection per compound.

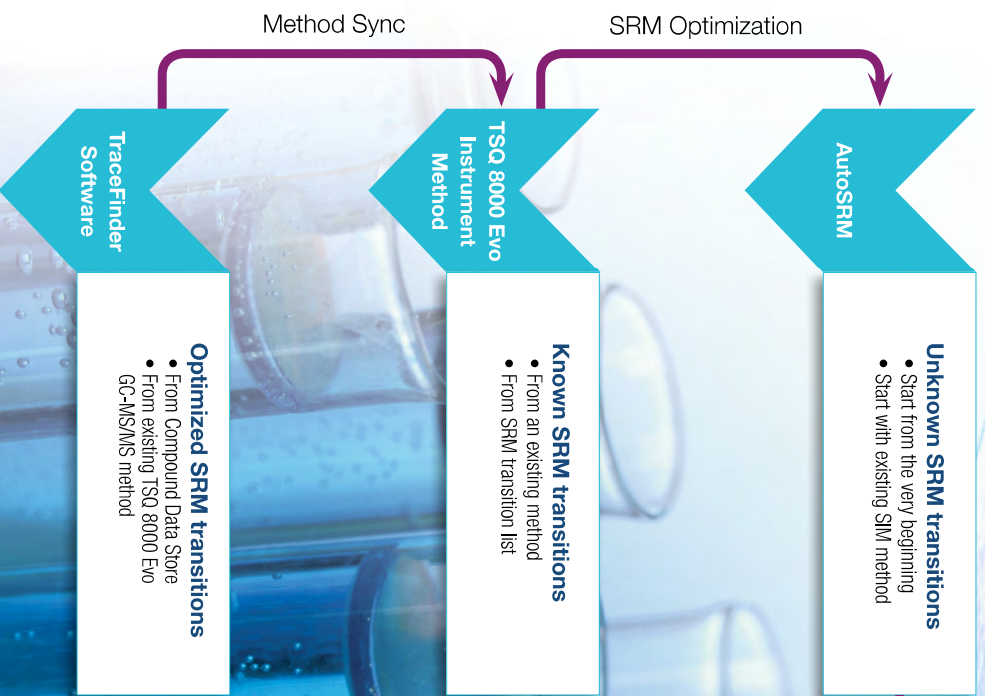
From an Existing SIM Method

If you are moving from a single quadrupole GC-MS method using SIM analysis, or you already know which ions you want to select for your precursor ions, you can start with Step 2. The AutoSRM function performs product ion scans for each selected precursor and presents the results in a single window. Simply select (or ask AutoSRM to select) the best product ion for that compound.

From a Previous MS/MS Method

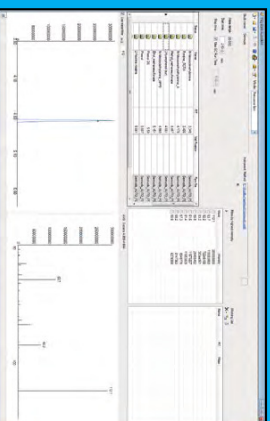
If you have already performed previous AutoSRM steps or are simply moving from another MS/MS system, then Step 3 can take you to the final fully optimized SRM transitions for your compounds. Fully automated collision energy optimization is performed to ensure that transitions are as sensitive as they can be. These optimized SRM transitions are then exported into a finished MRM method ready for analyzing real samples in routine.

Your Starting Point

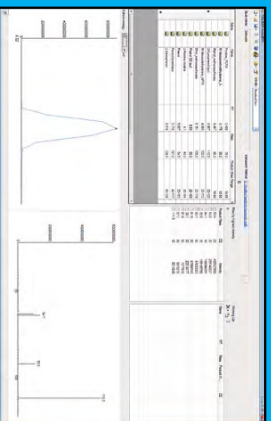


AutoSRM Workflow

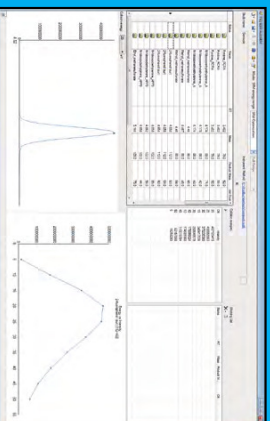
Step 1: Selects your precursor ions from full scan



Step 2: Selects your product ions from product ion scans



Step 3: Optimizes the collision energy for selected transitions



Be More Productive

Fast, flexible, easy-to-use mass spectrometry software

The challenge

The constant pressure to increase productivity challenges laboratory staff at every level, from the technician to management. Streamlined, workflow-driven software solutions are needed to address these challenges. At the same time, the growing list of compounds that laboratories must quantify and screen, combined with increasingly complex regulatory requirements, necessitate flexible method development and powerful reporting tools.

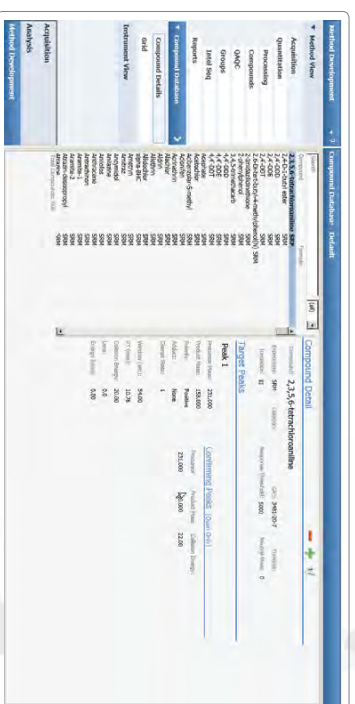
TraceFinder software is the solution

TraceFinder software makes routine quantitation simple, fast and productive. It offers a complete solution that can be used to develop methods, acquire and process data, and generate standard and customized reports with the full portfolio of Thermo Scientific mass spectrometers.

Powerful method development

TraceFinder software provides powerful tools for method developers, including:

- Compound databases (CDB) for rapid selected reaction monitoring (SRM) method development
- User-defined flags for nearly every parameter
- Automated retention time and ion ratio adjustment



Compound Database contains hundreds of compounds and parameters for SRM work flows, allowing rapid method development

Simple, full-featured data review

TraceFinder software offers simple, yet exceptionally, feature-rich data review capabilities. The intuitive, workflow-driven arrangement of information simplifies the technician's role in reviewing data.

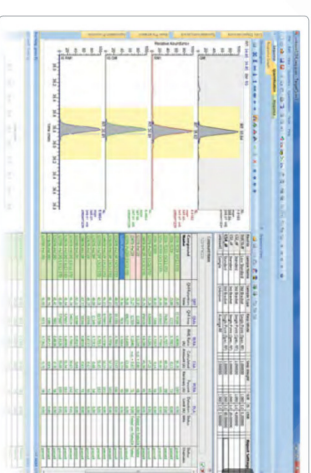
The technician can quickly and easily observe the data processing status, view compound-related flags to locate compounds which need attention, and take appropriate steps to address any problems.

Powerful, automated reporting

The new TraceFinder software report designer offers enhanced laboratory productivity with customizable, automated reporting with numerous standard report templates.

Leading the way in regulatory POPs quantitation

Thermo Scientific TargetQuan software is uniquely tailored for a workflow-orientated POPs quantitation, like PCDD/Fs, PCBs, POCs and others. This software package is designed specifically to serve laboratories charged with performing routine quantitation of POPs in a regulated environment. With TargetQuan 3 software, comprehensive processing of MS, MS/MS and HRMS data is possible on a single software platform, compliant with the US EPA 1613 requirements.



Experience **More** innovation

Tackle future challenges through GC modularity

Enable Quick Customization with GC Modularity

Tailor the Thermo Scientific™ TRACE™ 1300 Series GC to your needs with its proprietary user-exchangeable Instant Connect injector and detector modules. Swapping modules is easily done by the removal and replacement of three screws, accessible from the top of the GC. The entire process takes less than five minutes without requiring specialized service assistance. This enables budget-conscious laboratories to purchase a base-configured GC today, then easily expand their capabilities to accommodate new application and throughput demands.

Example of plug-in module installation by user



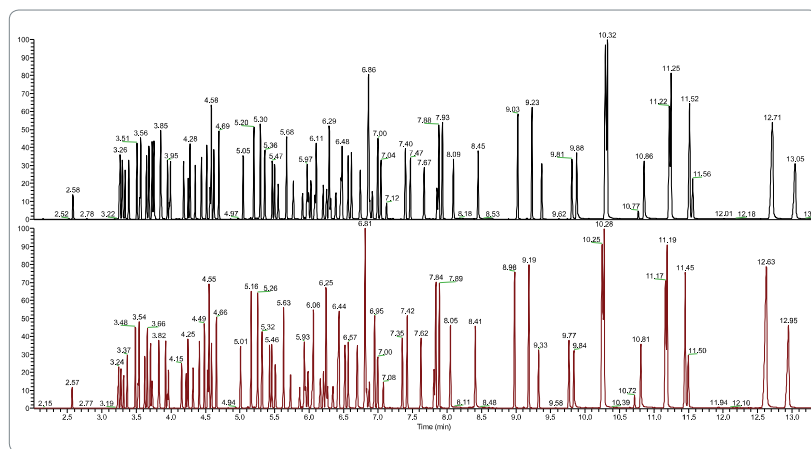
GC and GC-MS Operating Conditions*	Estimated Cylinder Lifetime	
	Conventional Operation	With the Instant Connect Helium Saver Module
Around the Clock Analysis 24 hours a day, 7 days a week, 365 days a year	5 months	3.5 years
Daily Operations Leaving the GC idle at the end of workdays and on weekends	15 months	14.6 years

* Conditions: Operating a TRACE 1300 Series GC with helium at 4 mL/min (sccm) using a typical helium cylinder of 48 L volume at 2250 psig.

Ensure Uninterrupted Analyses and Save Budget by Conserving Helium

The helium shortage continues to inflict price pressure and supply uncertainty on laboratories that require these gas supplies to perform their research and analyses.

Realizing the importance of finding a safe, cost-effective solution, the proprietary Instant Connect Helium Saver Module has been introduced to drastically reduce helium carrier gas consumption and extend helium cylinder lifetime up to 14 years per instrument, without any GC or GC-MS method modifications. Helium is continuously saved, both while the GC is in operation and while it is idle. Previously acquired retention times remain unchanged, and no method revalidation is required.

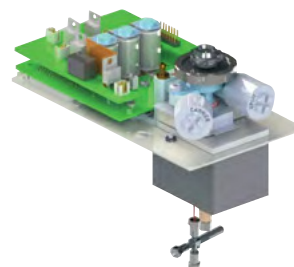


Using the Instant Connect Helium Saver Module, results from US EPA Method 8270C (semi-volatiles) remain unchanged

Backflush and Large Volume Capabilities

The capabilities of the Instant Connect injector modules are further enhanced by the available concurrent backflush options. These solutions enable the user to reverse the flow inside the injector, eliminating heavy or “undesired” compounds concurrently during the analysis run, protecting the column and detector while cutting down non-productive times, thus increasing throughput.

Instant Connect-SSL concurrent backflush. The T-piece for column connections and its carrier gas control are integrated within the module



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