

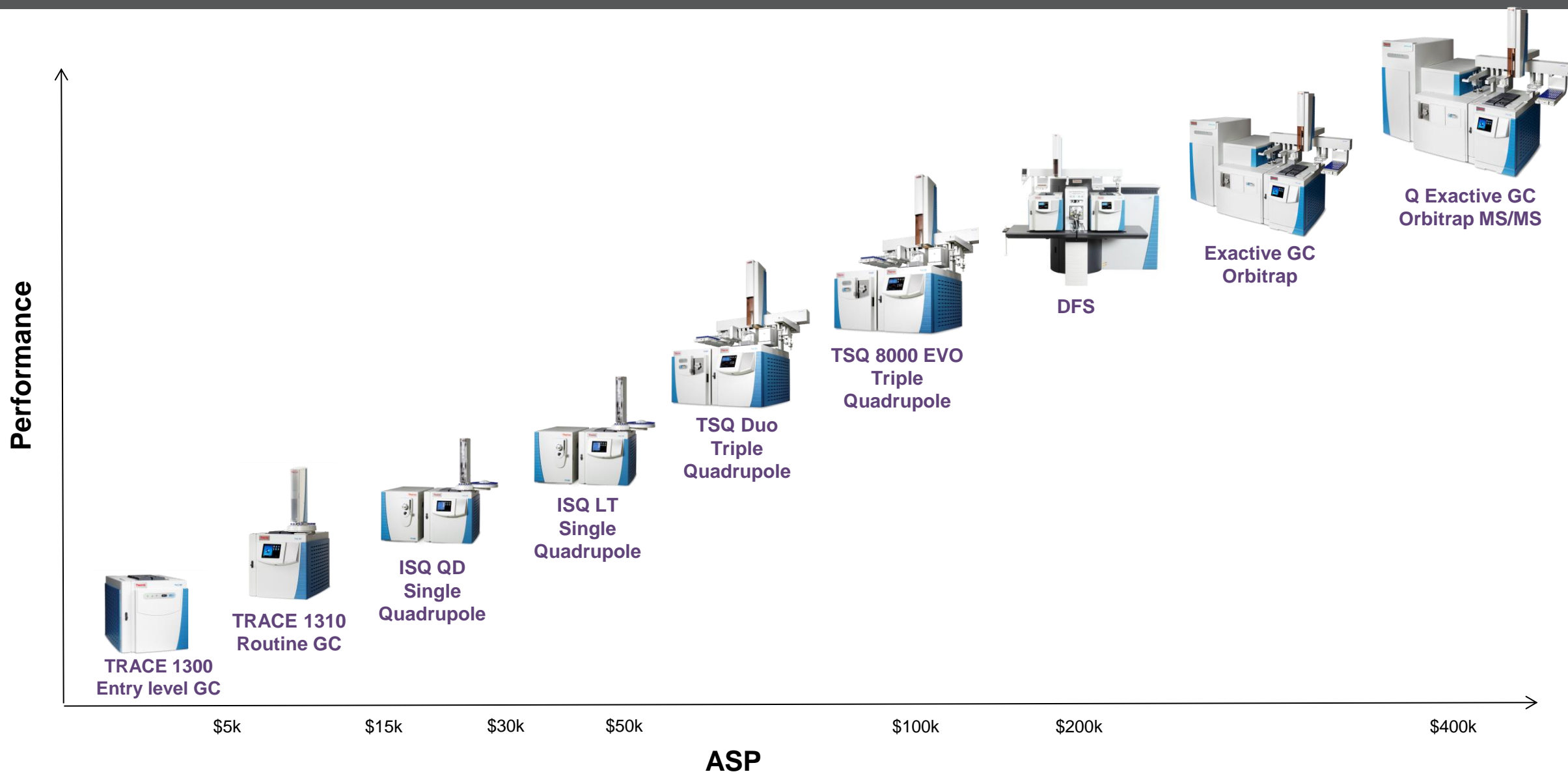


## State of art for GC/GCMS Product Portfolio

**Miloš Korman**

October 18<sup>h</sup> , 2017  
Sofia, Bulgaria

# GC&GCMS - 2017 NEW Product Pipeline



# GC & GC-MS Product Portfolio



**TRACE 1300 Series**

**ISQ Series GCMS**

**TSQ Series GCMS & MS/MS**

**DFS GC HRMS**

**Exactive GC GC HRMS**

**Q Exactive GC GC HRMS & MS/MS**

Laboratory GC Multiple detectors and inlets	Single Quadrupole MS	Triple Quadrupole MS	Magnetic Sector MS	Hybrid Quadrupole-Orbitrap	Hybrid Quadrupole – Orbitrap
Detection with Multiple Detectors	Confirmation by Mass Spectrum or SIM	High speed and high capacity MS/MS and SRM	High Resolution Full Scan MS	High Resolution and Accurate Mass Full Scan MS	High Resolution and Accurate Mass Full Scan & MS/MS
General organics, pollutants, purity assays,	EPA Regulated Methods (524, 525, 8260, 8270)	Target Analysis requiring ultimate sensitivity/selectivity	Biomarkers in crude oil, target congener analysis POPs Dioxines	Targeted and untargeted screening Routine grade performance High confidence quantitation	Compound discovery identification and quantitation, metabolomic profiling
QA/QC, Petro, Petrochemical, Environmental	Environmental, general organic, forensic chemistry and toxicology	Food Testing, Environmental, Doping Control	Geochemistry Environmental, Research	High end routine environment Food Safety, Environmental, Forensic/Toxicology, Doping control	Metabolomics, Environmental, Food Safety and Authenticity, doping and clinical toxicology



# SELECTIVITY



**ThermoFisher**  
S C I E N T I F I C

**Thermo Trace1300 Series GC**

The world leader in serving science

# TRACE 1300 Series GC – Two Models Available

**TRACE 1300 GC:** Local built-in ultra-simplified user interface – two buttons and four LEDs



**TRACE 1310 GC:** Touch screen interface provides instant access for ease of use and local control



## Modules available:

**Injectors:** SSL - SSL backflush - PTV - PTV backflush - **TSI** - **OCI** - **Helium Saver SSL+**

**Detectors:** FID - TCD - ECD - NPD – **FPD** - **PDID** - MS\*

**Other Options:** **MS NoVent**, **Auxiliary Oven**, Inj/Oven Cryo, Aux carrier

**Software drivers:** Chromeleon **6.8**, 7.1 and **7.2** CDS, Xcalibur, ChromQuest, ChromCard

Agilent™ **OpenLAB**™ EZChrom ed. CDS, Agilent **EZChrom**™ (Agilent is a trademark of Agilent Corporation)

# Customers challenges are our challenges

## Business Challenges

- Increasing cost of ownership
- Trace analysis in complex matrices



- More value to customer investment with upgradeability options and smart design
- High end performances for routine environment



Two-tiers GC platforms with high-end performances , no compromise



Unique "instant connect" modularity offering upmost versatility in configuration  
*No more idle GC for backup*

Full range of interchangeable fast detectors (*no more limited configuration*)

High quality materials, smart maintenance, routine grade reliability

Extended GC applicability with the Silflow Microfluidic device kits

- Helium Saver
- Injectors Integrated Backflush
- Large Volume Injection
- Compatibility with multivendors consumables



Expanded external connectivity with new AOI and GDI modules

# Customers challenges are our challenges

## Optimizing Efficiency

- Demands for higher throughput
- Quicker return on capital investment



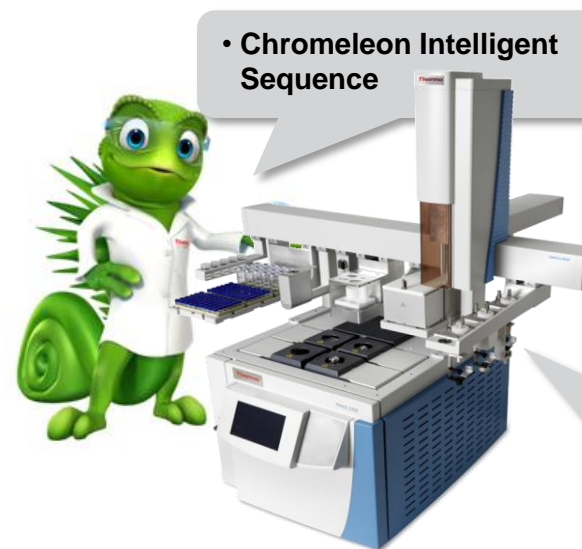
- High quality and robustness for best customers' experience
- Smarter and unique iConnect modules solutions for no downtime during maintenance
- Flexible sample handling automation



Unique "instant connect" modularity eliminating instrument downtime



- Swap modules for continuous operation
- No-stop preventive maintenance



• Chromeleon Intelligent Sequence

- Customized PrepCycles
- Unattended swap of different sampling techniques
- Clone mode for extended throughput

Expand throughput with flexible automation

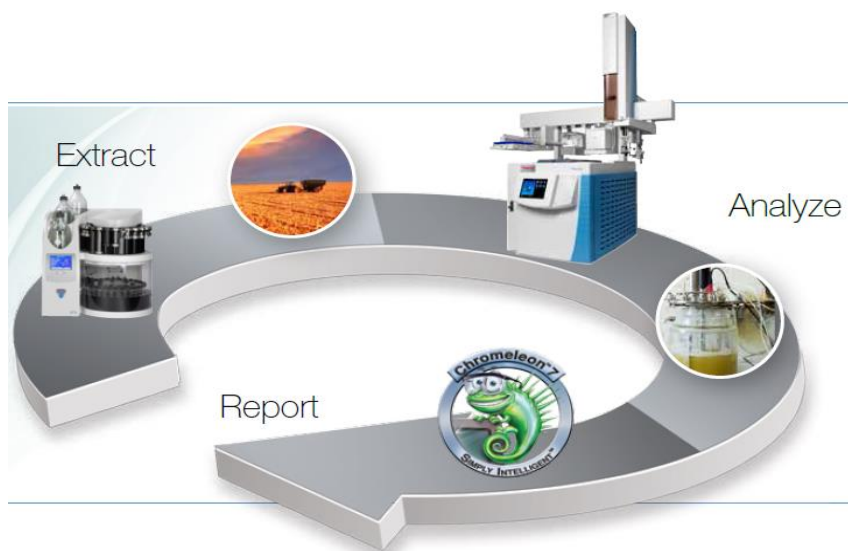
# Customers challenges are our challenges

## Resource Allocation

- Less time for method development
- Limited technical experience



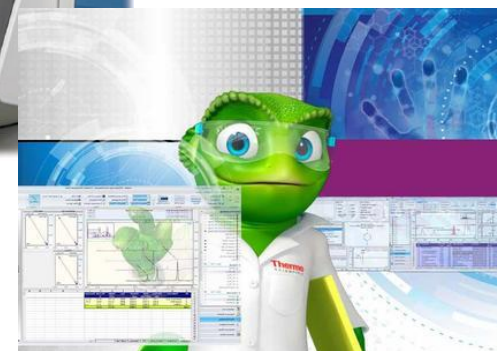
- Workflow solutions from sample prep to reporting
- Excellent expertise for analytical on-site support



**Comprehensive Workflow offering from sample prep to reporting**



- Quick adoption of standard method
- Short learning curve through local interface and Chromleon
- Dedicated eWorkflow for routine environment



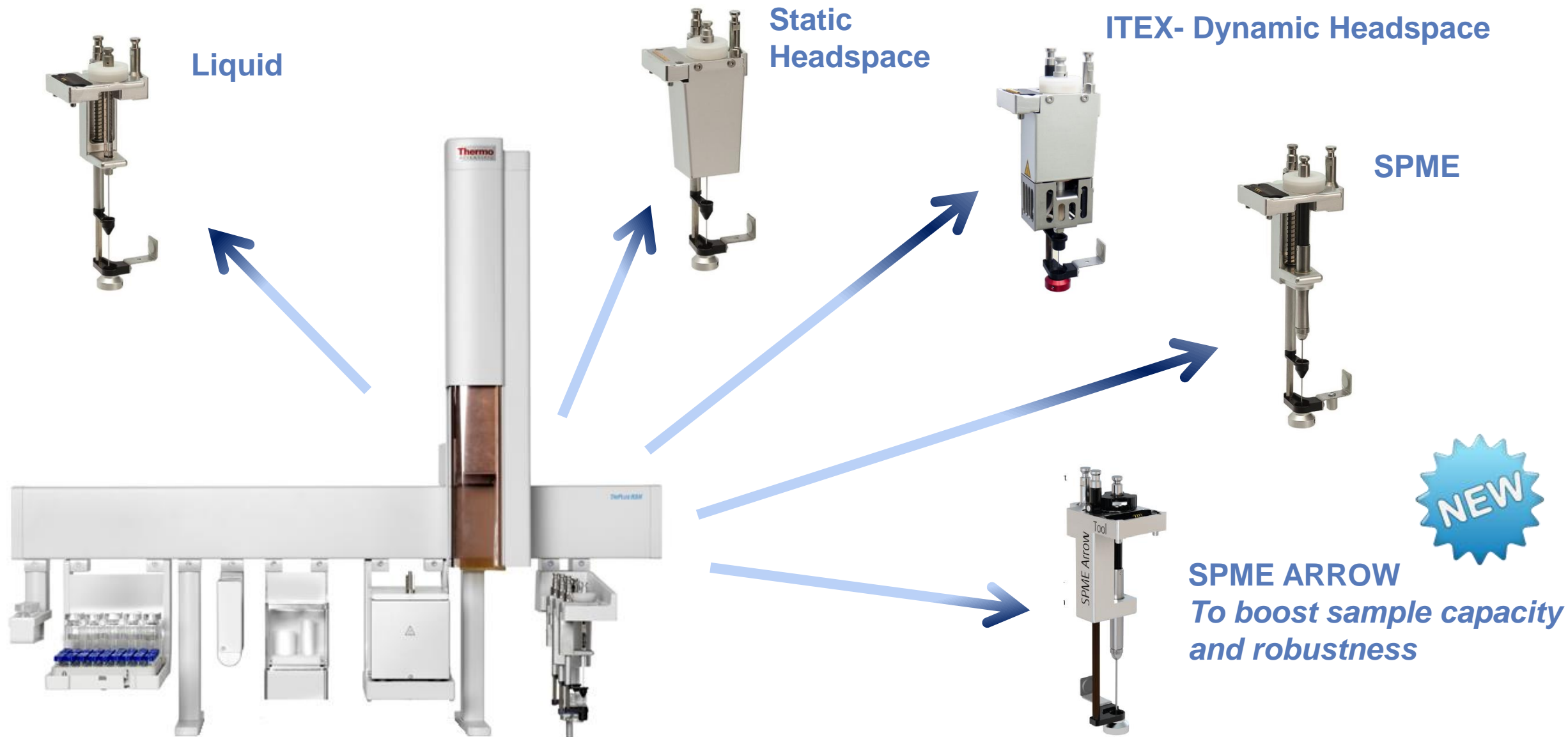




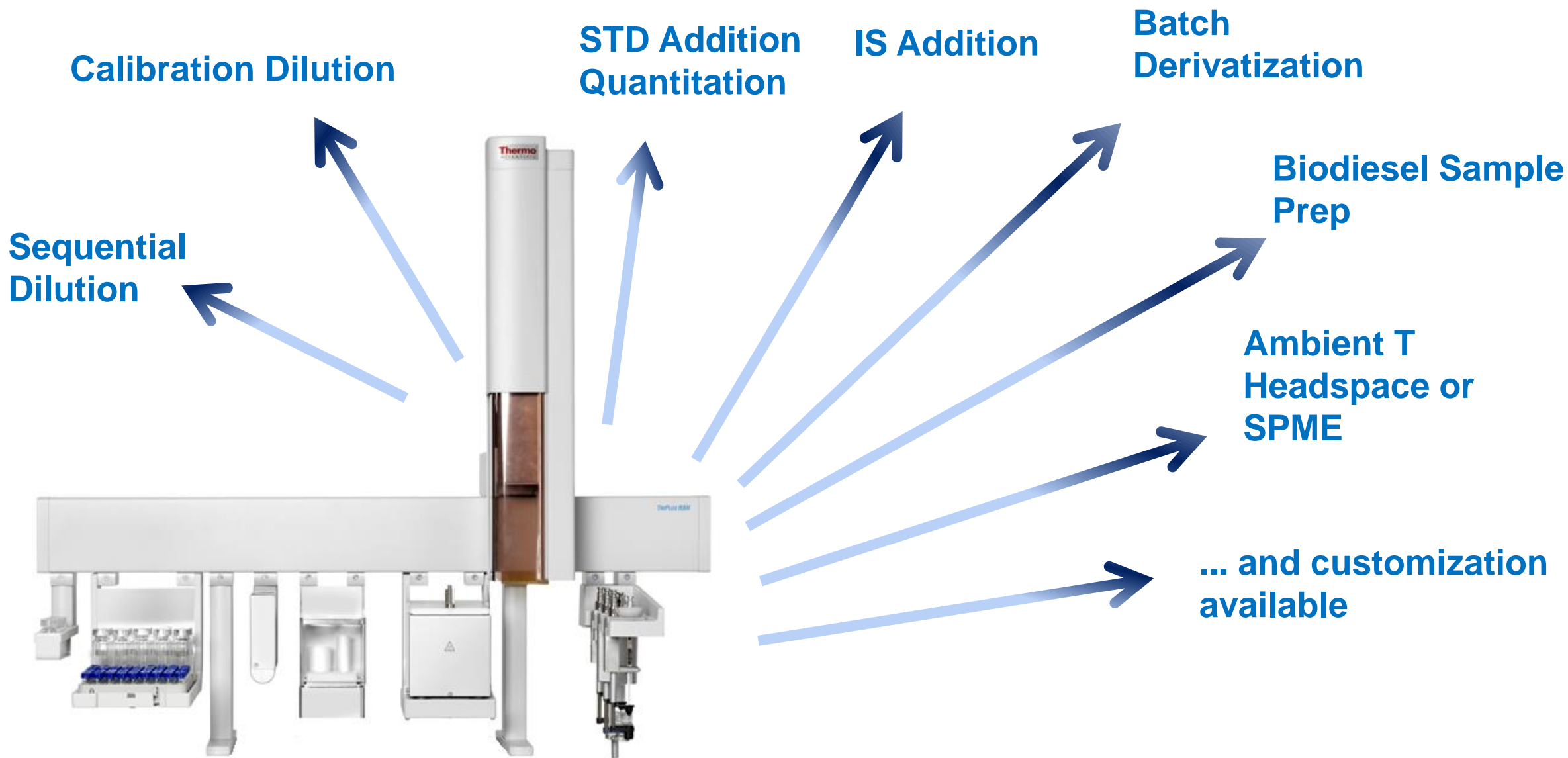
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## TriPlus RSH and PrepStation concept

# Triplus RSH expanded options for VOC and SVOC market



# Triplus RSH Sample Preparation Capability – Prep Cycles



# TriPlus RSH Autosampler: Additional tools

Any basic configuration is fully compatible with:



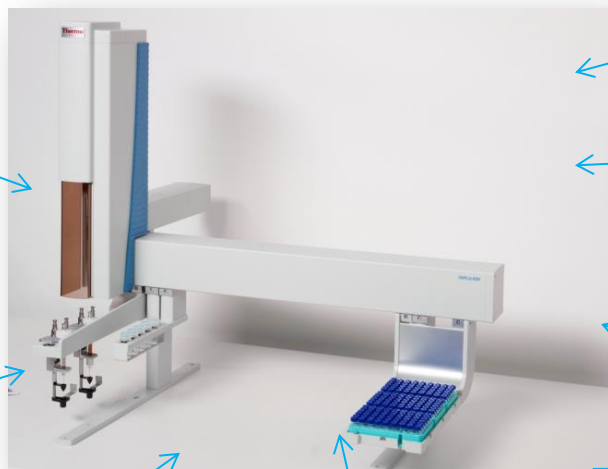
Large Volume Wash Station



Large Solvent Station



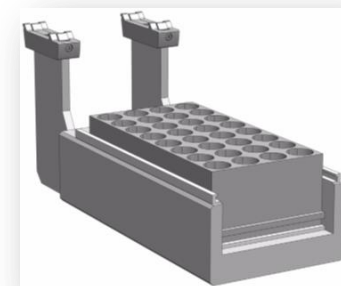
Vortexer for Intensive sample mix



Dilutor



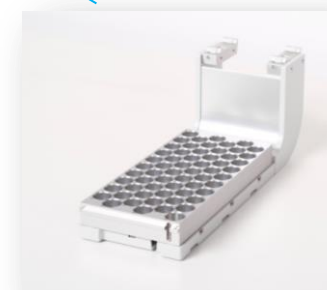
Peltier heating or cooling of samples



Liquid cooler/heater trayholder



Barcode reader for sample tracking



More sample trays for higher capacity

# Enhanced Sample Handling with Triplus RSH



Liquid



Static Headspace



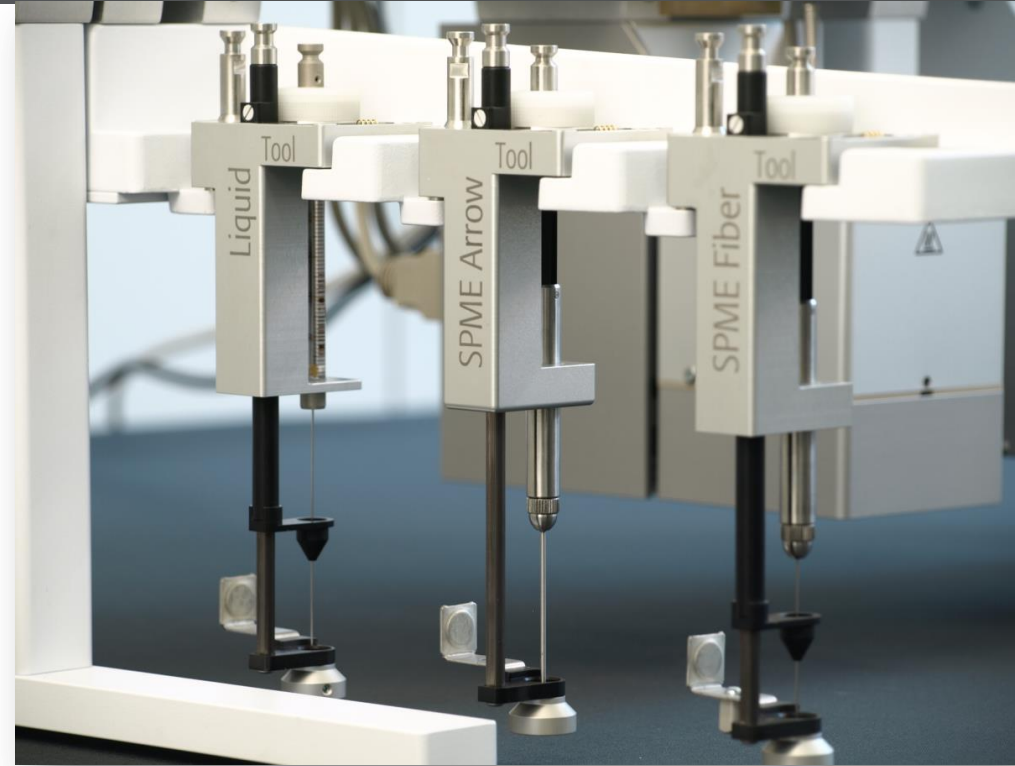
SPME



ITEX



CM 7.2 SR5



# SPME Arrow - Consumables



- ✓ Full assortment of SPME Arrow fibers
- ✓ Easy fiber identification
- ✓ One kit of five different fibers included in each SPME Arrow tool kit and base unit
- ✓ Available from CCS

Diameter (mm)	Phase Thickness (µm)	Color Code	Description	
1.10	100	grey	Acrylate (Polyacrylate)	*
1.10	120	light blue	Carbon WR/PDMS (Carbon Wide Range)	*
1.10	120	violet	DVB/PDMS (Divinylbenzene)	*
1.10	100	red	PDMS (Polydimethylsiloxane)	*
1.50	250	black	PDMS (Polydimethylsiloxane)	*
1.10	110	dark grey	DVB /CWR/PDMS	

\* Included in the collection

# TriPlus RSH Autosampler: Sample Preparation capabilities

**TriPlus RSH ATC (Automatic Tool Change) station** provides foundation for basic and advanced sample handling and sample preparation capabilities:

- Heating/Mixing
- Vortexing
- Internal standard addition
- Calibration Dilution
- Standard addition calibration method
- Batch Derivatization
- .....customized Prep Cycles available





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**Thermo ISQ QD & LT (Single Quad)**



## Single Quadrupole MS Series



### ISQ QD

Single Quadrupole Mass Spectrometer

- 66 L/s Pump
- EI only
- Time Event as option



### ISQ QD 300

Single Quadrupole Mass Spectrometer

- 300 L/s Pump
- EI only
- Time Event included



### ISQ LT

Single Quadrupole Mass Spectrometer

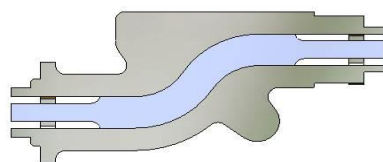
- 300 L/s Pump
- EI / CI
- DIP / DEP
- Time Event included

#### Unique Dual-Filament

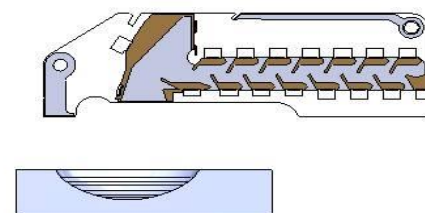


ExtractaBrite™ ion

#### s-shaped ion guide



Solid, homogeneous, and maintenance-free metal quadrupole rods



DynaMax™ XR detection

# ISQ Series – ISQ QD GC-MS Value Proposition

For budget-minded lab owners seeking a reliable replacement for stand-alone GCs, the ISQ QD from Thermo Scientific offers a robust solution with Quality Design, MS Operational Simplicity, and Proven Dependability.

**ISQ QD**  
*Single Quadrupole Mass Spectrometer*



Unlike other systems, ISQ QD is a GC-MS that any chromatographer can run, afford, and rely upon.

# ISQ Series – ISQ LT GC-MS Value Proposition

For high-throughput, analytically-demanding laboratories, requiring Utmost Sensitivity and Unstoppable Productivity, the ISQ LT from Thermo Scientific offers the future-proof investment into the Leading Technology, Simply Intelligent GC-MS platform.

**ISQ LT**  
*Single Quadrupole Mass Spectrometer*



Unlike other systems, ISQ LT does not need to be vented to exchange the source, while enjoying industry-best sensitivity, lowest detection limits, and unlimited flexibility.

## Unique Elite Offering on ISQ LT and TSQ8000EVO

- ✓ The Top-Tier ISQ LT and TSQ8000EVO are featuring the unique capability to remove the entire ion source without breaking the vacuum through the Vacuum Probe Interlock
- ✓ Easy maintenance without downtime exchange ion source (*ExtractaBrite*)
- ✓ Easy swap between CI and EI without downtime
- ✓ Added versatility with the DIP / DEP Probe capability
  - Direct Exposure Probe (DEP)
  - Direct Insertion Probe (DIP)
  - Can be used in EI and CI modes
  - Indispensable for non-chromatographable compounds
  - DEP is ideal and quick (60 seconds) screening tool
  - DIP can be used for analysis of polymers by in-source pyrolysis



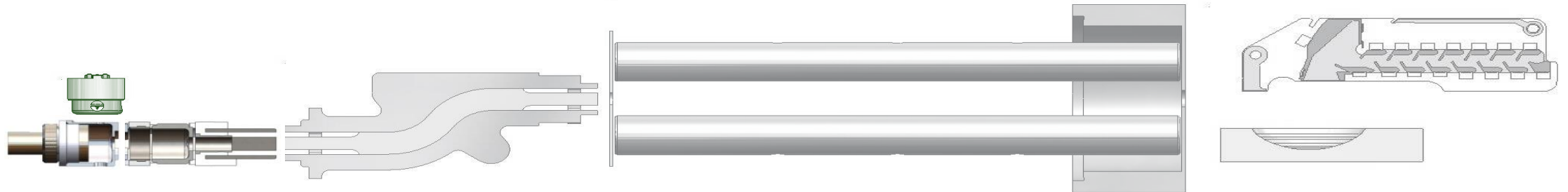
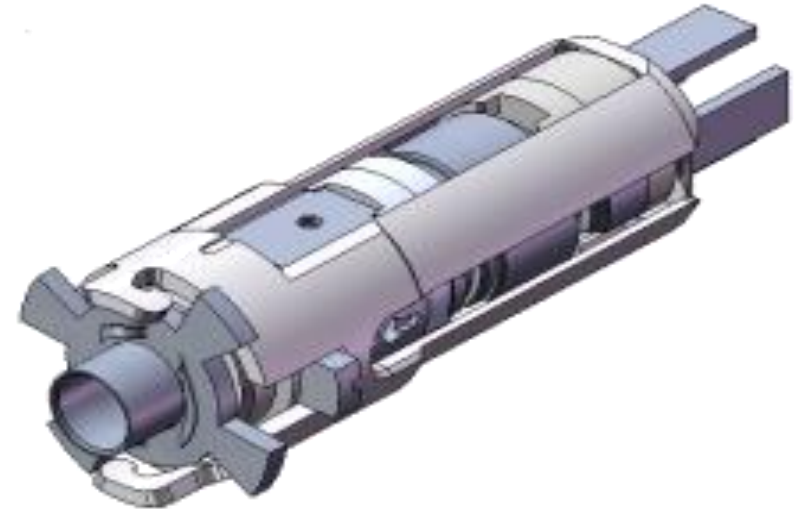
NO VIP BUT VPI



# ISQ and TSQ Series - ExtractaBrite Ion Source –

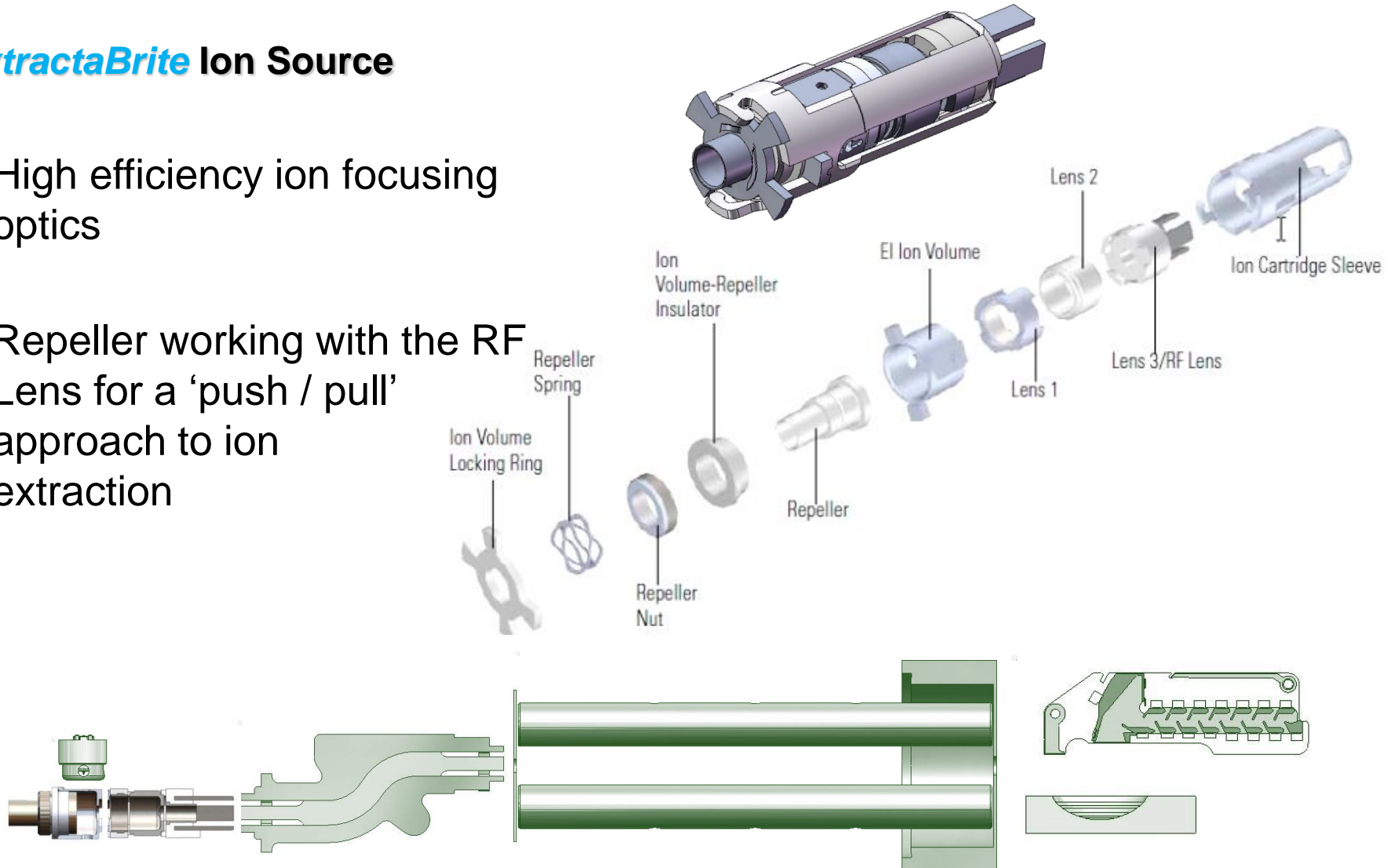
Designed for **Simplicity, Sensitivity and Robustness**

- ✓ E/CI source wireless assembly
- ✓ Highly inert ion volume material ensures reliable performance in all ionization modes, including EI and CI
- ✓ High temperature ion optical path
- ✓ Independent heating of the ion source, and ion optics/mass analyzer



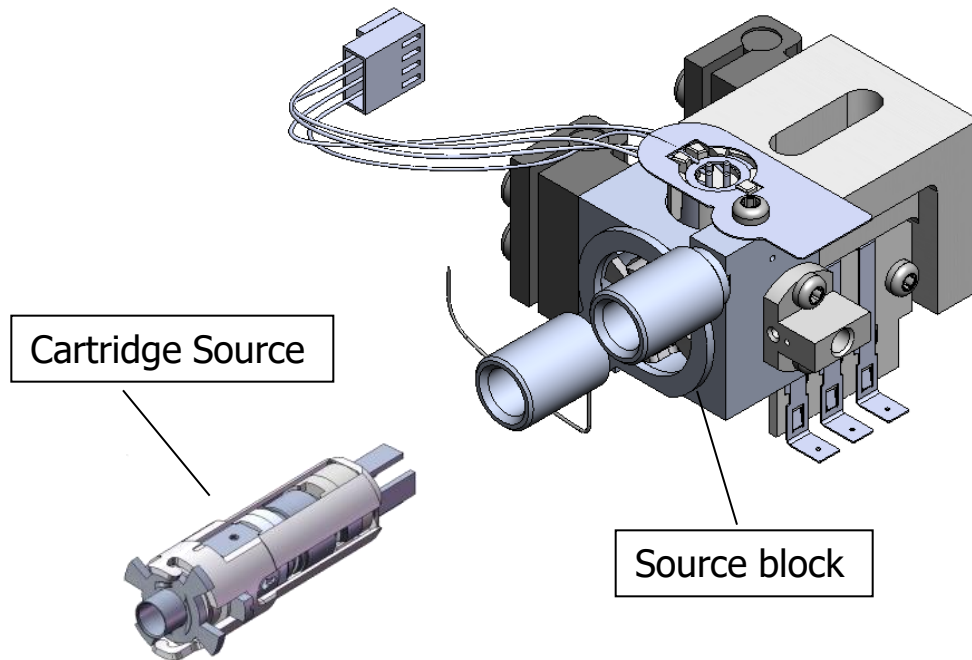
## ExtractaBrite Ion Source

- High efficiency ion focusing optics
- Repeller working with the RF Lens for a 'push / pull' approach to ion extraction



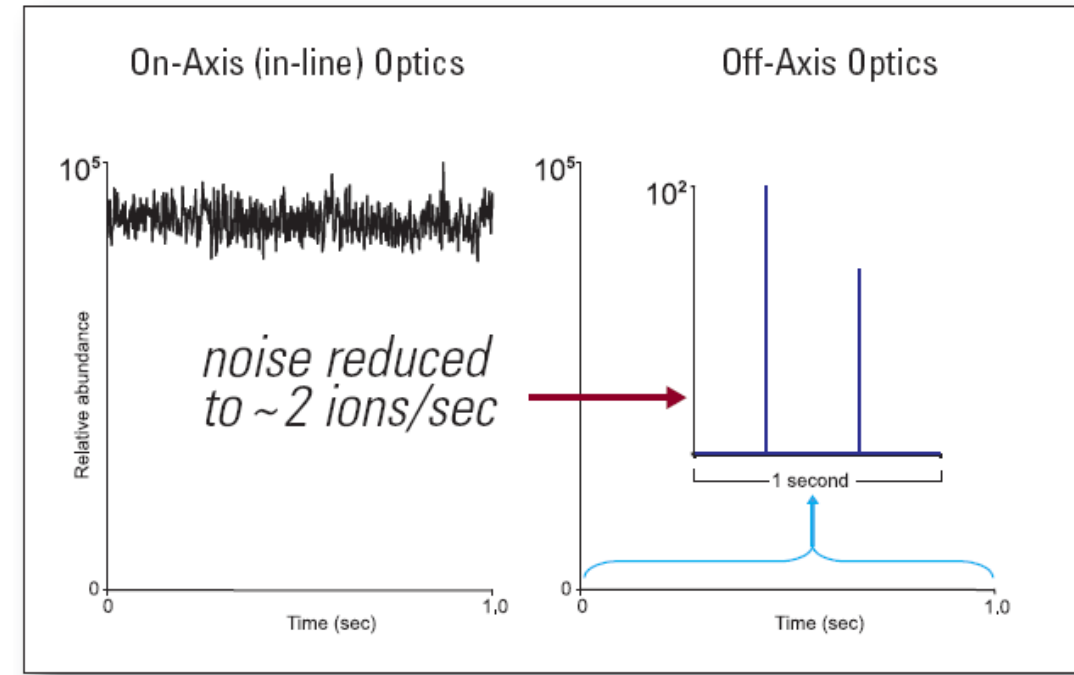
- **Full Source Removal**

- Extraction of the cartridge containing the repeller, source and lenses while still under vacuum

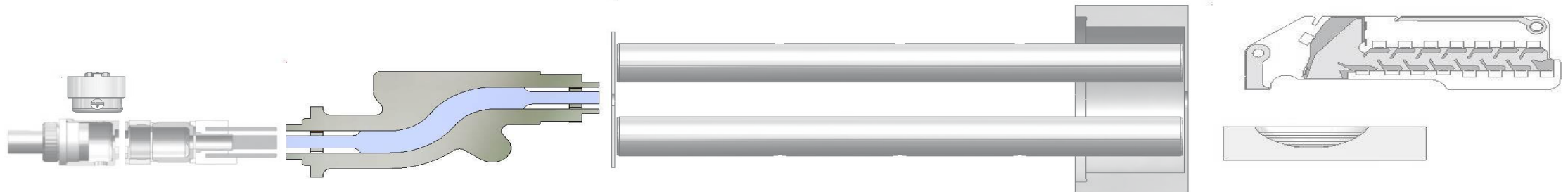


## The S-Shaped Ion Guide

- Reduces neutral noise created by excited helium atoms striking the detector.
- Enables lower detection limits (sensitivity) and better selectivity.
- Serves as an off-axis pre-filter, removing the neutrals right in the beginning – so there is less interference down the ion path.



*The off-axis design of the detector allows neutrals to pass through and be eliminated by the vacuum system without hitting the detector.*





# GCMS Analyzer Kits



- Aim to target routine Environmental Laboratories with proven robustness, sensitivity and high sample throughput
- Compatible with ISQ QD and ISQ LT
- Ready to use package with method, troubleshooting and reporting
- Dedicated consumables and spares to complete the package
- Compatible with both Chromeleon and TraceFinder
- Compatible with Helium Saver



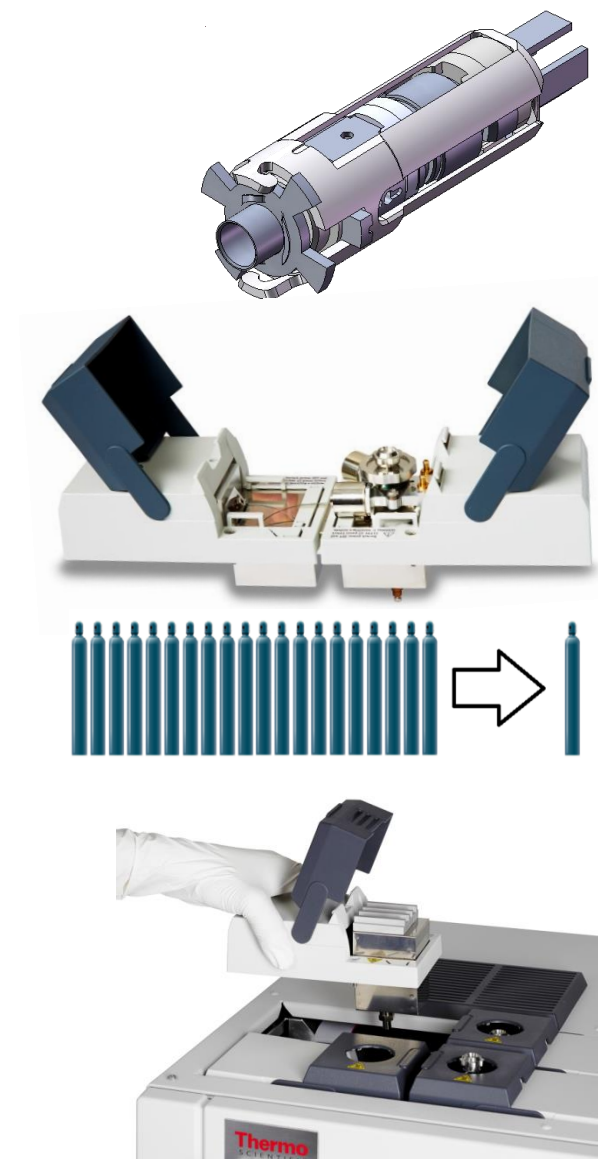
Dedicated to  
**semivolatile  
contaminants in  
environmental  
samples**  
*(EPA 8270D)*



Dedicated to  
**semivolatile  
contaminants in  
drinking water**  
*(EPA 525.3)*

# ISQ Series – Intelligent, Sensitive, Robust

- **Performance – A Legacy of Innovation**
  - DynaMAX™ XR detection system
  - Fully Modular TRACE 1300 and 1310 GC
- **Robustness – Unstoppable Productivity**
  - *ExtractaBrite™* Robust Source
- **Reliability – Unstoppable Reliability**
  - *Full Source Removal™*
  - Dual filament, also in CI
- **Productivity – The *Best Business Decision***
  - Choice of two turbomolecular pumps (66- or 300 L/s)
  - High-speed data acquisition and write-to-disk
- **Ease of Use – Power to the User**
  - Trace Finder 3.1 or Chromeleon 7.2
- **Flexibility – Ready for the Future Needs Today**
  - Fully upgradable on both GC and MS moieties





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## Thermo TSQ Series Duo & EVO (Triple Quad)

## Triple Quadrupole MS Series



**TSQ Duo**  
Mass Spectrometer

- 300 MRM / second
- EI only
- CI upgradable
- Time Event as option



**TSQ 8000 EVO NO VPI**  
Triple Quadrupole Mass Spectrometer

- 800 MRM / second
- EI only
- CI upgradable
- Time Event included

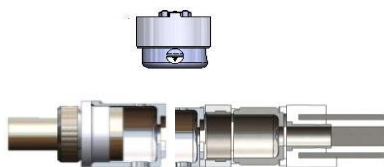


**TSQ 8000 EVO**  
Triple Quadrupole Mass Spectrometer

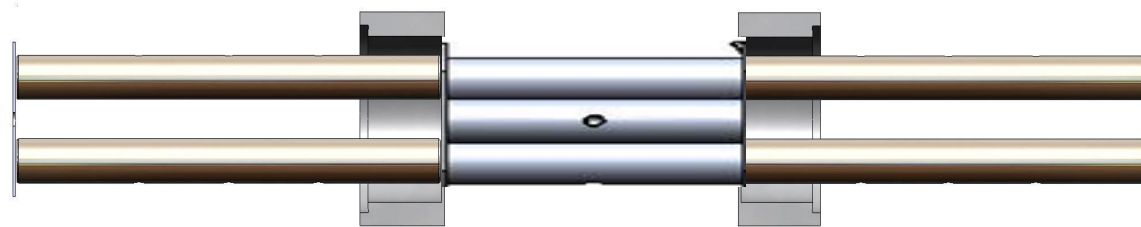
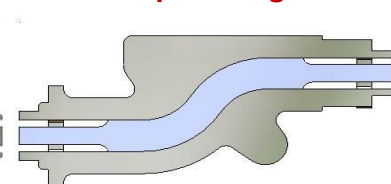
- 800 MRM / second
- EI / CI
- DIP / DEP
- Time Event included

Unique Dual-Filament

s-shaped ion guide



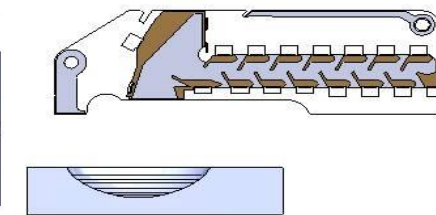
ExtractaBrite™ ion



Quadrupole 1 (Q1)

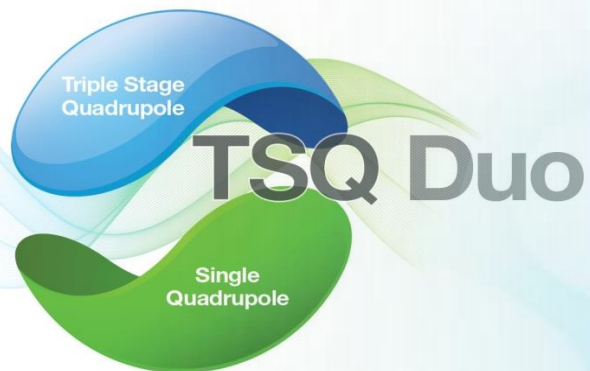
Quadrupole 2 (Q2)  
Collision Cell

Quadrupole 3 (Q3)



DynaMax™ XR detection

# For Chromatographers & Single Quad Users



- Simply Unique GC-MS/MS
- Excellent Performance
  - Selected Ion Monitoring (SIM)
  - Full Scan
  - Selected Reaction Monitoring (SRM)
  - Other MS/MS modes
- Thermo Scientific™ Dionex™ Chromeleon™ 7 CDS—Operational Simplicity™

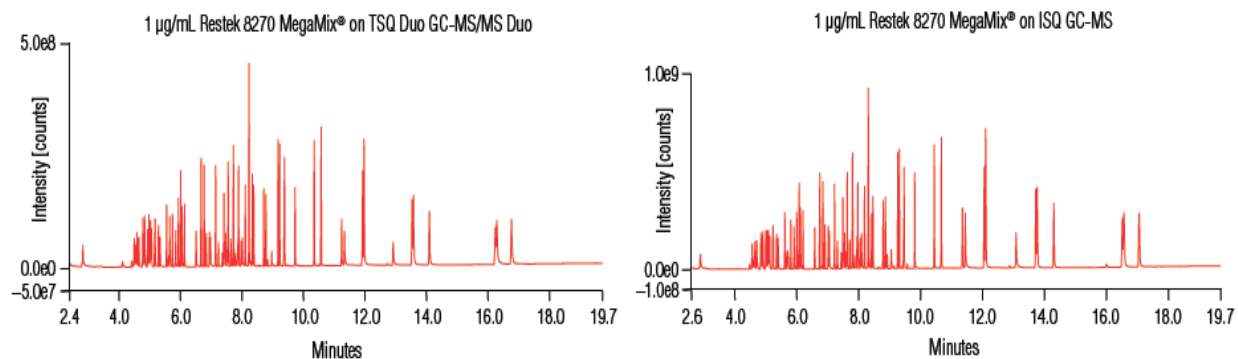
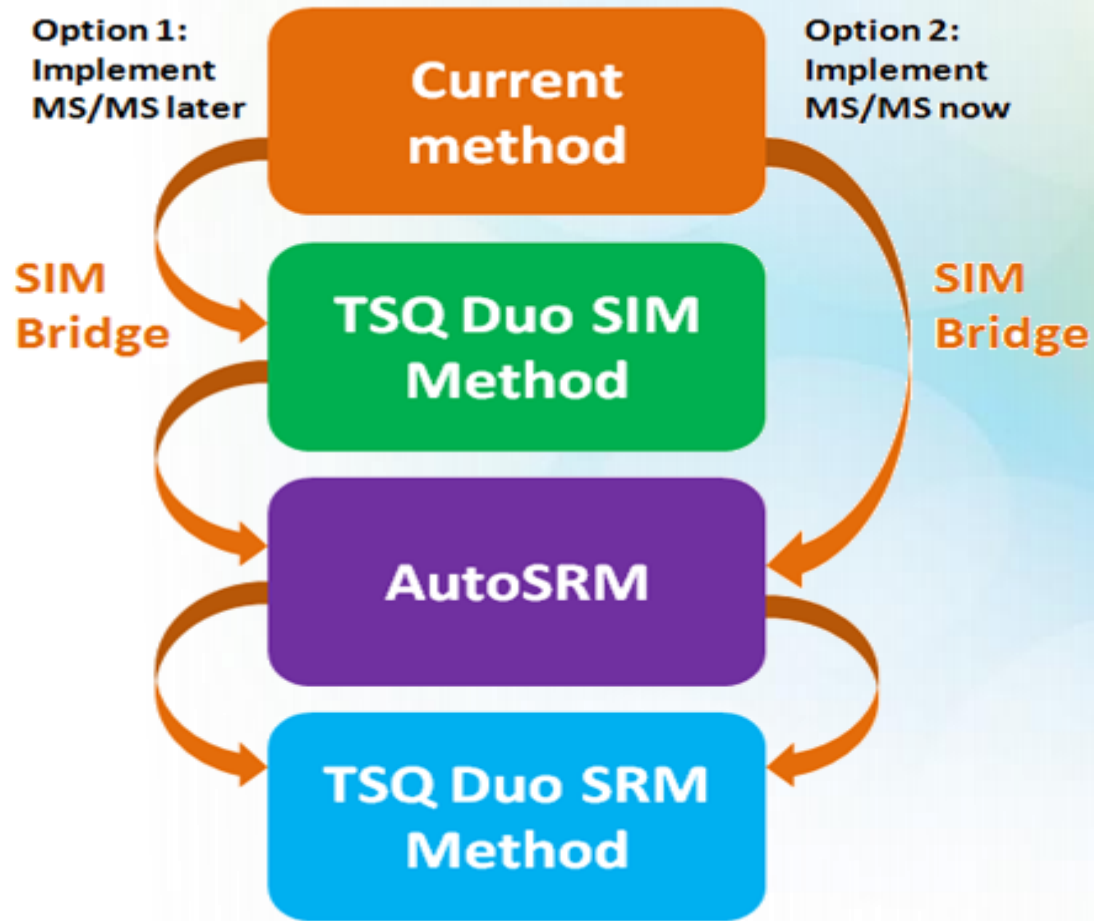


Figure 1. Comparing chromatograms for injections done on the TSQ Duo GC-MS/MS and the ISQ GC-MS.

# Make the Step to Triple Quad When You Choose



- Translate your current method into the TSQ Duo method using SIM Bridge
  - Continue with SIM analysis now and move to MS/MS later
  - Or immediately go to MS/MS analysis

# GCMSMS Analyzer Kits



- Aim to target routine Environmental and Food Safety Laboratories with proven robustness, sensitivity and high sample throughput
- Compatible with TSQ DUO and TSQ8000EVO
- Ready to use package with method templates, report templates, compound database and workflow instructions
- Dedicated consumables and spares to complete the package
- Compatible with both Chromeleon and TraceFinder
- Compatible with Helium Saver



## Pesticide Analyzer

CDB extended to 1001 compounds with 3 optimized transitions

## Dioxins Analyzer

Dedicated workflow and SOP for Dioxins Analysis





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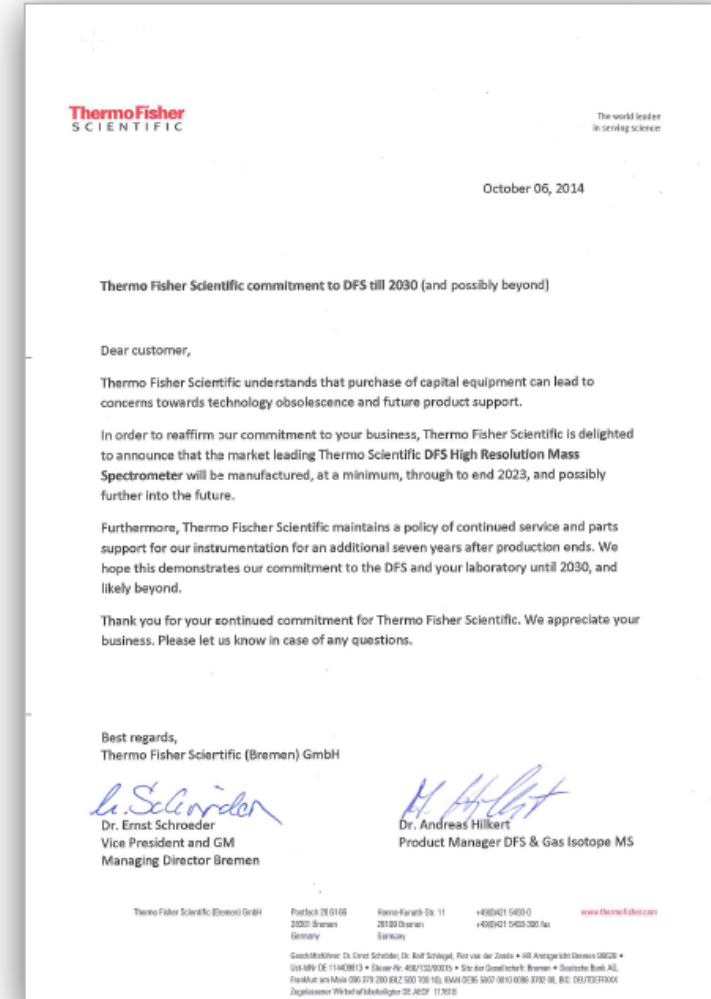
DFS GC-HRMS: **Gold** Standard for Dioxins



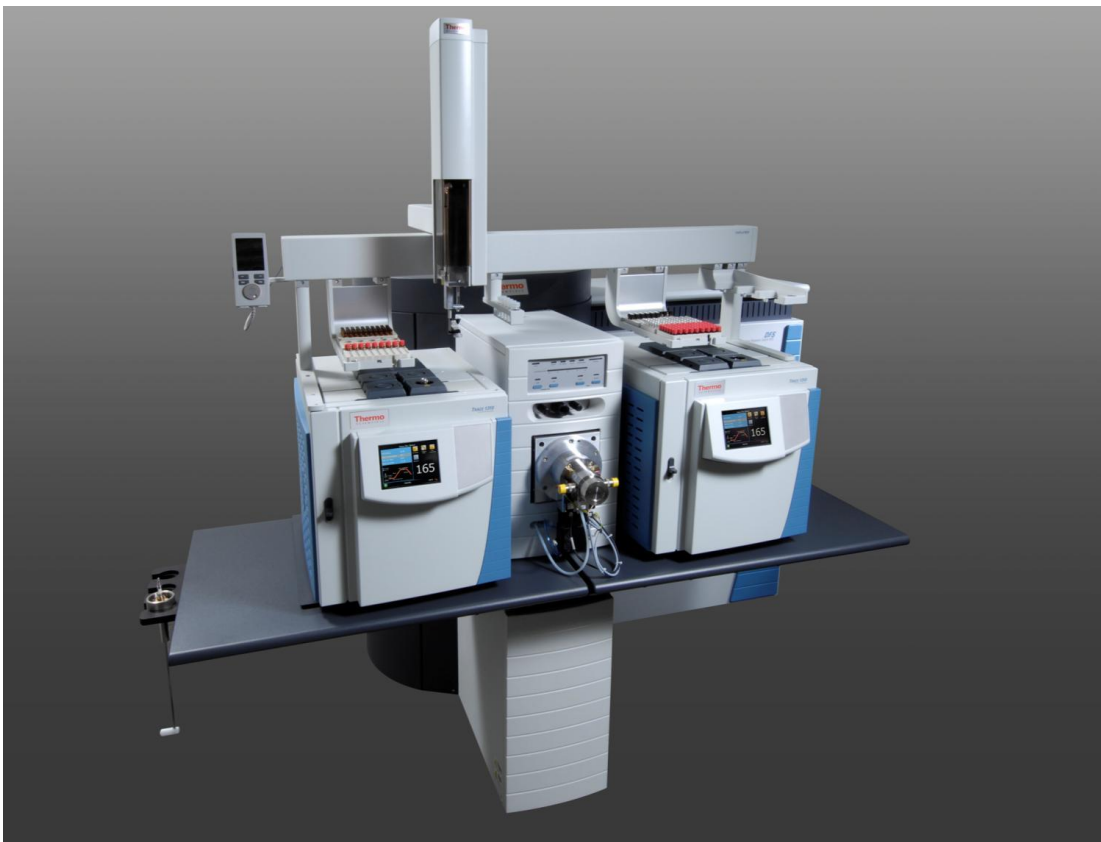
# Our commitment to our DFS customers

Buy with confidence...

- Letter of commitment to DFS →
- Thermo Scientific are committed to DFS production until at least **2023**, likely beyond
- Committed to parts, service and application support until at least **2030**, likely longer



Strong commitment to DFS as TFS flagship for Dioxin analysis



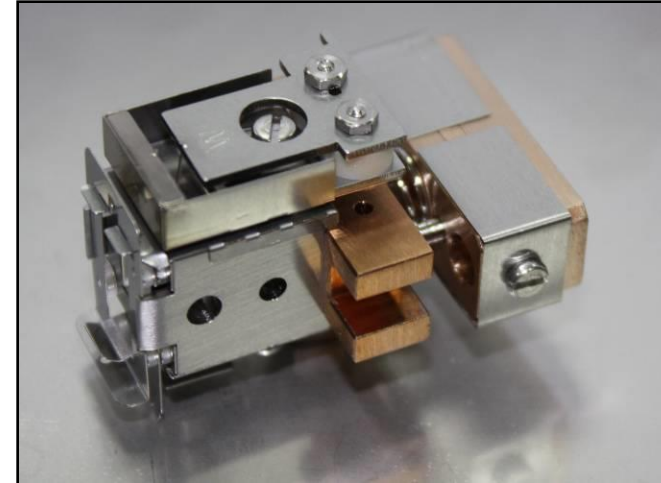
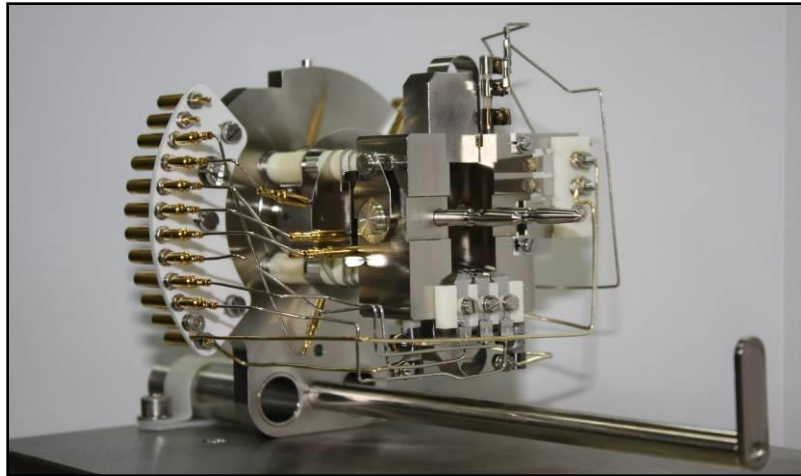
*Proven solution:*

Sensitivity & Robustness

for

years of high sensitivity Dioxin routine  
analysis in complicated matrices

- DFS GC-HRMS – designed for Dioxin analysis
- highest available analytical performance for Dioxins & POPs



DFS ion source - designed for combining ultimate sensitivity with robustness, because sensitivity alone is not enough

Sensitivity: e.g. 1 - 2 mA emission current at 70 eV for high ionization efficiency

“Robustness by size”

# DFS tailored packages - flexibility

Package 1



## Single GC

Ultra-trace  
Quantification in  
complex matrices

Package 2



## Dual GC

Ultra trace quantification  
&  
Application flexibility

Package 3



## DualData G2

Ultra trace quantification  
&  
Application flexibility  
&  
High throughput

***Flexible packages for ultra trace quantification***



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## Orbitrap GCMS Update



Redefining Routine GC-MS  
RP 60,000 (FWHM @  $m/z$  200)  
EI/CI; Full-scan; Timed-SIM

**Thermo Scientific™ Exactive™  
GC system**



## Thermo Scientific Q Exactive GC system

Unprecedented Depth in Analysis

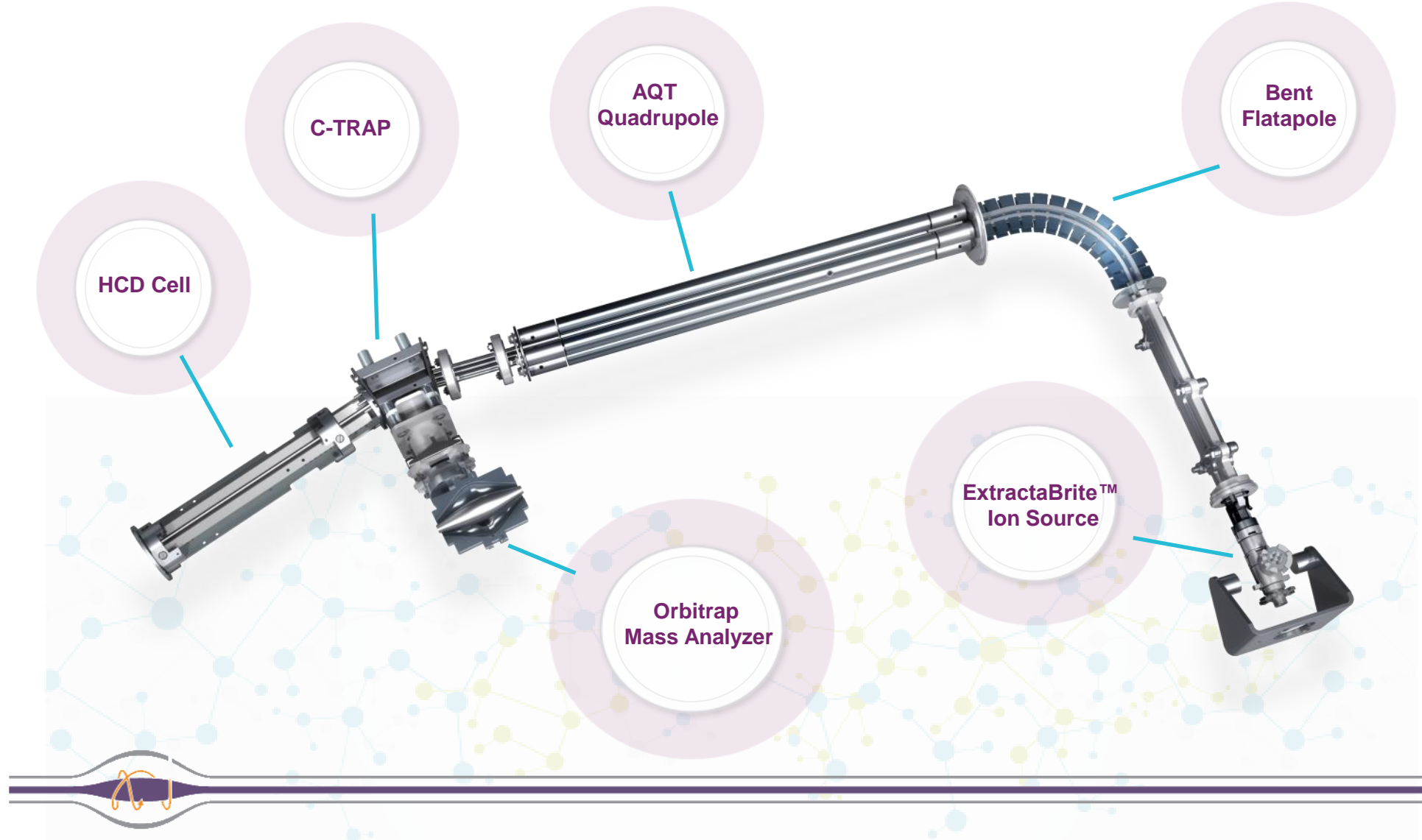
RP 120,000 (FWHM @  $m/z$  200)

EI/CI; Full-scan, Timed-SIM

MS/MS capability



# Bringing GC and Orbitrap Technology Together



# Orbitrap GC-MS : The Technology



**Orbitrap mass analyzer**

**Incredible HRAM performance**

**Highly regarded Q Exactive GC system platform**



**Thermo Scientific™ TRACE™ 1310 GC System**

**Unique modular injector and detector design**

**Rapid heat cycling**

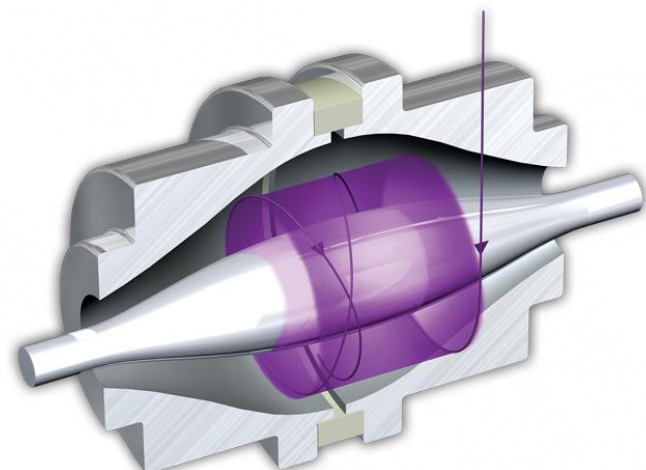
**Thermo Scientific™ ExtractaBrite™ Ion Source technology**

**Routine grade robustness**

**Patented RF lens**

**Removable without breaking vacuum through VPI**

**Source Plug enabling no-vent column change**





# NEW to Thermo Scientific Orbitrap GC-MS



new

## Enhancements to Thermo Scientific Q Exactive GC and Exactive GC

### Variable electron voltage (VeV) Technology

Enables lower eV settings for Electron Ionisation (EI). It is a **softer EI technique**, which **promotes higher mass signals and increases sensitivity** for compounds prone to extensive fragmentation.

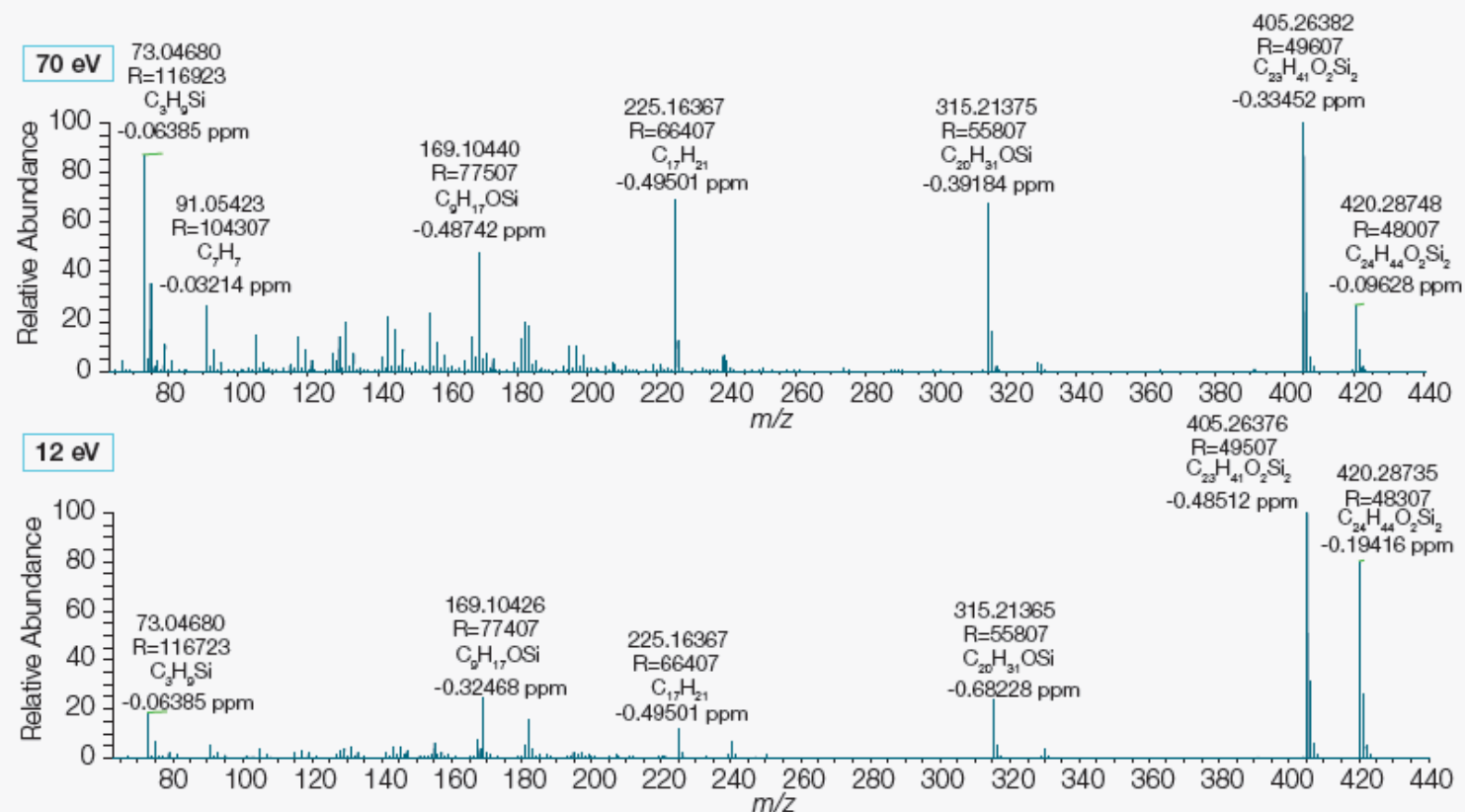
### Orbitrap GC-MS HRAM Metabolomics Library

**Streamlining metabolite ID** with the **first commercially available** high resolution accurate mass (HRAM) metabolomics library for electron ionisation (EI) Orbitrap GC-MS. >800 Primary and secondary metabolites

### Tracefinder Automated Compound Identification

Tracefinder features a specialist spectral deconvolution and automated compound ID tool for Orbitrap GC-MS. New addition of **Kovats retention index** to the scoring algorithm means **confidence in compound identification is further improved**, especially relating to isomeric compounds.

# Main Feature: Variable electron Voltage Tuning



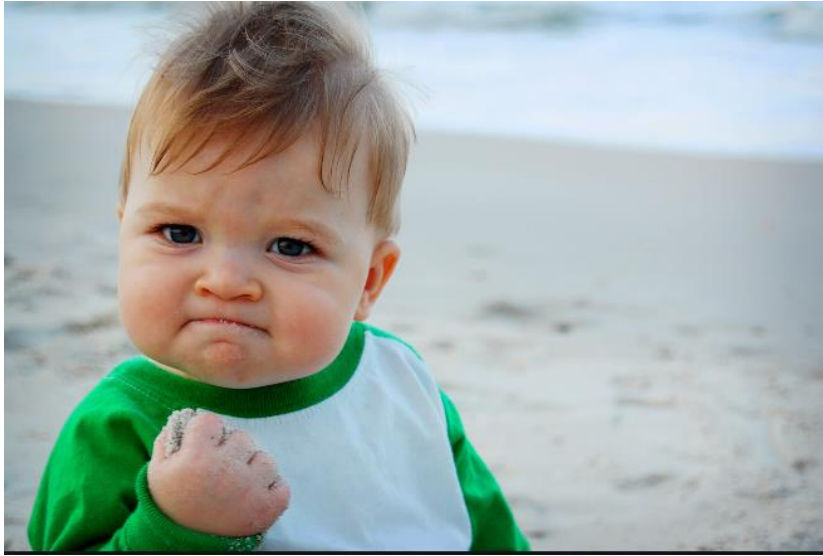
Standard EI  
(70 eV)

VeV  
(12 eV)

Epitestosterone shown with standard EI and VeV EI. Using VeV, the molecular ion signal and high mass fragment abundance are greatly increased, improving sensitivity for quantitative analysis and further MS/MS fragmentation experiments.

**Tuning to very low electron energies reduces fragmentation, allowing for easier elemental composition of molecular ion**

Thank you for your attention



***We are changing the game!***

