



TSQ Altis Triple-Stage Quadrupole Mass Spectrometer

## Sensitivity and robustness without compromise

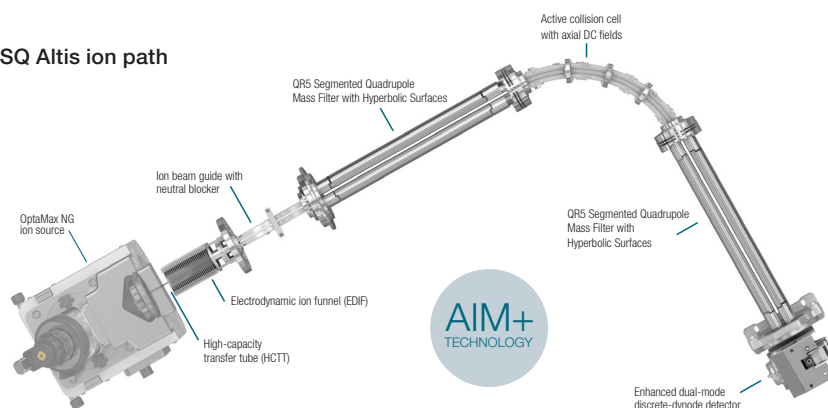
### Benefits

- Ultimate quantitative performance through enhanced Thermo Scientific™ Active Ion Management (AIM+) technology
- QR5 Segmented Quadrupoles with hyperbolic surfaces deliver attogram sensitivity consistently and reproducibly
- Industry leading selected-reaction monitoring speeds enable quantitation of more compounds in less time
- Robustness, reliability, and consistency that are unprecedented in a high-end triple quadrupole mass spectrometer
- Seamless integration with application-specific software ensures maximum productivity
- Automated compound optimization and intuitive instrument interface

The Thermo Scientific™ TSQ Altis™ triple-stage quadrupole mass spectrometer provides the sensitivity and robustness to meet the most demanding analytical challenges. With AIM+ technology, the TSQ Altis MS delivers ultimate performance in complex matrices and for low level samples. This superb analytical performance combined with automation tools and hardware that is designed to provide simple maintenance creates a platform with maximum usability, sensitivity, and robustness.

The TSQ Altis MS provides users the ultimate in performance without compromises.

### TSQ Altis ion path



## Hardware features

### Active Ion Management

AIM+ technology maximizes ion transmission, from inception to detection, with novel hardware designs to precisely manage electrical fields and remove sources of noise to achieve unprecedented levels of quantitative performance.

### Thermo Scientific™ OptaMax™ NG API source

- Automatic connection of all gases and voltages on installation simplifies operation and improves reliability
- Automatic source recognition simplifies use and data logging
- Sweep gas reduces chemical noise
- Enhanced exhaust port efficiently removes solvent vapor, improving uptime and reducing chemical noise
- Flexible X, Y, and Z positioning for all ionization probes maximizes performance
- Optimal 60 degree spray angle
- Integrated APCI functionality with interchangeable HESI and APCI ionization probes
- APPI compatibility

### High-capacity transfer tube

The optimized high-capacity transfer tube (HCTT) transfers more ions into the vacuum system for improved sensitivity while maintaining robustness and ease of use.

### Ion optics

#### *Electrodynamic ion funnel RF lens*

The electrodynamic ion funnel (EDIF) efficiently captures ions as they leave the transfer tube. Its broad transmission curve reduces ion losses, increasing sensitivity. By design, the EDIF gently moves ions from atmosphere to vacuum, reducing in-source fragmentation.

#### *Ion beam guide and neutral blocker*

The ion beam guide, with its neutral blocker, stops neutrals and high-velocity clusters, keeping the ion path cleaner, reducing noise, increasing sensitivity and robustness.

#### *QR5 Segmented Quadrupole Mass Filters with hyperbolic surfaces (Q1 and Q3)*

Segmented hyperbolic-surface quadrupole mass filters with 5.25 mm field radius deliver industry leading ion transmission across the mass range at resolutions up to 0.2 Da FWHM for the ultimate in sensitivity at all masses and resolutions.

### Active collision cell (Q2)

The 90 degree high-pressure argon-filled collision cell produces efficient fragmentation for high sensitivity while guiding ions away from neutral reaction products to reduce noise. The axial DC field speeds ion transits through the collision cell yielding up to 600 SRMs/sec with zero cross talk, providing excellent sensitivity and speed.

### Detector

- Discrete-dynode detector with increased surface area greatly extends the detector lifetime
- Dual-mode function increases sensitivity by operating in pulse-counting mode when ion flux is low and analog mode when ion flux is high
- Six orders of dynamic range provide high-confidence quantitation

### Vacuum system

- Four-stage differentially pumped vacuum manifold
- Advanced triple-inlet turbomolecular pump integrated with the vacuum manifold
- Dual-rotary vacuum pump configuration
- Dry-pump option available

### Integrated divert valve and syringe pump

Fully automated data system control of the divert valve and syringe pump with plug-and-play support. Automated control of the divert valve enables switching the solvent front, gradient end point, or any portion of the HPLC run to waste.

### Optional ion sources

- Thermo Scientific™ EASY-Spray™ NG ion source is designed for maximum nanospray performance with no need for adjustments
- Thermo Scientific™ Nanospray Flex™ NG ion source is designed for ultimate nanospray performance with complete flexibility of column selection
- Thermo Scientific™ VeriSpray™ PaperSpray™ ion source enables seamless integration of paper spray technology
- Thermo Scientific™ OptaMax™ Duet NG API ion source enables HESI and APCI functionality without manual changes in the hardware configuration
- Thermo Scientific™ FAIMS Pro™ interface improves signal to noise ratio by reducing isobaric interferences

## Software features

### Data system

- High-performance PC with Intel® microprocessor
- High-resolution LCD color monitor
- Microsoft® Windows® 10 operating system (64-bit)

### Standard MS software

- Thermo Scientific™ Xcalibur™ processing and instrument control software
- Tune editor for system calibration, diagnostics, and manual data acquisition
- Method editor with comprehensive application-specific template library and intuitive user interface to facilitate method development
- Fully automated loop injection or infusion based compound optimization. All instrument parameters, including source conditions, RF Lens, and collision energy are optimized and directly incorporated into the instrument method.
- Direct control of multiple vendors' LC systems and autosampler configurations through Xcalibur software

### Scan functions

- Highly sensitive full-scan MS
- Selected-ion monitoring (SIM)
- Selected-reaction monitoring (SRM) with up to 30,000 SRMs definable and up to 600 SRMs/sec and timed SRMs
- High-resolution (0.2 Da FWHM) selected-reaction monitoring (H-SRM)
- Product ion scan
- Precursor ion scan
- Neutral-loss scan
- Reverse energy ramp MS/MS spectra (RER) gives information-rich MS/MS spectra for compound identification
- Polarity switching capabilities
- Quantitation-enhanced data-dependent (QED) MS/MS
- Mixed Mode Scan Function
- Automated on-the-fly adjustment of retention time windows to accommodate chromatographic fluctuations

## Optional application-specific software

- Thermo Scientific™ TraceFinder™ software simplifies method development and routine analysis in food safety, environmental, clinical research, and forensic toxicology laboratories
- Thermo Scientific™ Mass Frontier™ spectral interpretation and classification software for the identification of unknowns
- Supports the use of Skyline™ software (MacCoss Lab, University of Washington) for method development and data analysis in peptide applications
- Thermo Scientific™ Chromeleon™ Chromatography Data System (CDS) software unifies workflows for routine quantitative MS analysis

## Performance specifications

### Sensitivity

#### *Positive electrospray (HESI)*

A 5 µL injection of a 200 fg/µL reserpine solution will produce a minimum signal-to-noise ratio of 500,000:1 for the transition of the protonated molecule at  $m/z$  609.3 to the fragment ion at  $m/z$  195.1 when operated in selected-reaction monitoring (SRM) mode with Q1 and Q3 resolution set to 0.2 and 0.7 Da FWHM respectively.

#### *Atmospheric pressure chemical ionization (APCI)*

A 5 µL loop injection of a 200 fg/µL reserpine solution will produce a minimum signal-to-noise ratio of 100,000:1 for the transition of the protonated molecular ion at  $m/z$  609.3 to the fragment ion at  $m/z$  195.1 when operated in selected reaction monitoring (SRM) mode with Q1 and Q3 resolution both set to 0.7 Da FWHM.

#### *Negative electrospray (nHESI)*

A 5 µL loop injection of a 200 fg/µL chloramphenicol solution will produce a minimum signal-to-noise ratio of 500,000:1 for the transition of the deprotonated molecular ion at  $m/z$  321.0 to the fragment ion at  $m/z$  152.0 when operated in selected reaction monitoring mode (SRM) with Q1 and Q3 resolution set to 0.7 Da FWHM.

## Mass range

$m/z$  5–2000

## Resolution

Q1 and Q3 adjustable to 0.2 Da peak width (FWHM) across the entire mass range

## Scan rate

- 15,000 amu/second at a resolution of 2 Da FWHM
- Up to 600 SRMs/sec (for resolutions from 0.2 through 2.0 FWHM)
- Polarity Switching: < 20 msec electronic switching (25 msec total including signal stabilization time)

## Mass stability

Mass assignment will be within  $\pm 0.1$  Da over a 24-hour period. The laboratory room temperature must be maintained between 18–27 °C (65–81 °F). The room temperature may not change by more than 5 °C (9 °F) during this period.

## Installation requirements

### Power

- Three 230 Vac  $\pm 10\%$ , 50/60 Hz at 16 A minimum
- Four 120 Vac  $\pm 6\text{--}10\%$ , 50/60 Hz at 20 A or four 230 Vac  $\pm 10\%$ , 50/60 Hz at 13 A
- Earth ground hardwired to main panel
- Free from voltage variations above or below the recommended operating range

### Gas

- Collision gas: 99.995% pure Argon (99.995% Nitrogen also supported)
- Collision gas supply pressure: 135  $\pm$  70 kPa (20  $\pm$  10 psig)
- Sheath/aux/sweep gas: 99% pure Nitrogen
- Sheath/aux/sweep gas supply pressure: 690  $\pm$  140 kPa (100  $\pm$  20 psig)
- Maximum gas consumption:  $\sim$ 20 L/min

## Environment

- Functional temperature range: 15–27 °C (59–81 °F)
- Optimal temperature range: 18–21 °C (65–70 °F)
- Heat output: 1,550 W (5,400 Btu/h)
- Total system heat output: 4,420 W (15,380 Btu/h)
- Particulate matter: <3,500,000 particles per cubic meter of air (<100,000 particles of >5  $\mu$ m diameter per cubic foot of air)
- Relative humidity: 20% to 80%, without condensation
- Floors must be free of vibration

## Dimensions

### Size

- TSQ Altis MS: 680  $\times$  760  $\times$  840 mm (h, w, d – 27  $\times$  30  $\times$  33 in)
- 2 Oerlikon® SV 65 forepumps: 270  $\times$  320  $\times$  489 mm (h, w, d – 10  $\times$  13  $\times$  19 in)

### Weight

- TSQ Altis MS: 125 kg (275 lb)
- 2 Oerlikon® SV 65 forepumps: 104 kg (230 lb)

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

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