

TSQ Fortis Plus triple quadrupole mass spectrometer

Robust quantitation made simple

Benefits

- Robust performance is achieved through enhanced Thermo Scientific™ Active Ion Management (AIM+) technology
- Ultra-fast selected-reaction monitoring enables quantitation of more compounds in shorter analysis times
- Gives industry-leading polarity switching times that include signal stabilization
- Seamless integration with application-specific software ensures ease-of-use and productivity
- User-friendly tools for simplified method setup: automated compound optimization, method templates
- Access to the comprehensive Thermo Scientific™ mzCloud™ compound database

For a fast path to quantitative productivity, the Thermo Scientific™ TSQ Fortis™ Plus triple quadrupole mass spectrometer combines enhanced acquisition speed, sensitivity, and simplicity with proven robustness and reliability to deliver next-level performance and value for high-throughput analyses. Simplified operation enables users of all skill levels to obtain confident, reproducible quantitative results.

Hardware features

Active Ion Management

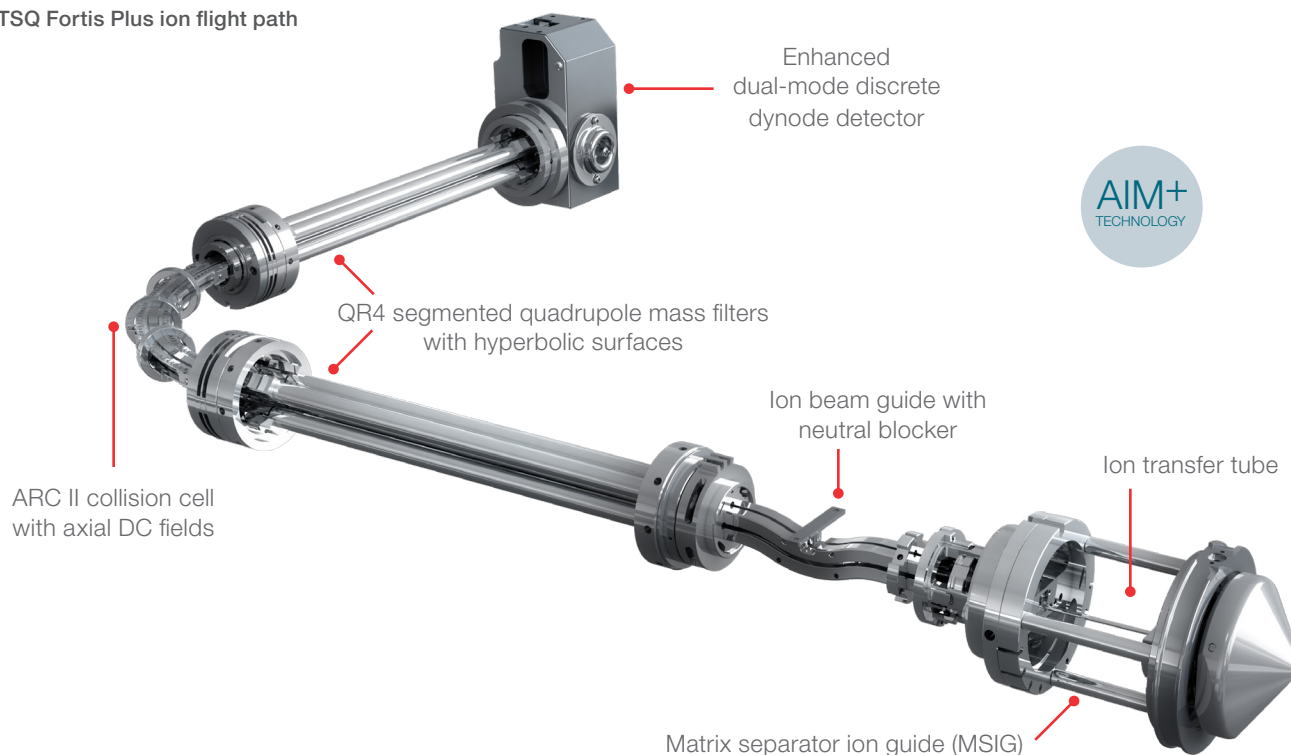
AIM+ technology maximizes ion transmission, from inception to detection, with novel hardware designs to precisely manage electrical fields and remove sources of noise to achieve unprecedented levels of quantitative performance.



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
- Dedicated mass calibration probe

TSQ Fortis Plus ion flight path



Ion optics

Matrix Separator Ion Guide

The Matrix Separator Ion Guide (MSIG) efficiently transmits the ion beam from atmosphere to vacuum, while eliminating neutrals.

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 and increasing sensitivity and robustness.

QR4 segmented quadrupole mass filter with hyperbolic surfaces (Q1 and Q3)

Segmented hyperbolic surface quadrupole mass filters with 4.0 mm field radius deliver industry-leading ion transmission across the mass range at resolutions up to 0.4 FWHM for the ultimate in sensitivity at all masses and resolutions.

Active Reaction Collision Cell II (ARC II)

The 90-degree high-pressure argon-filled collision cell produces efficient fragmentation for high sensitivity while guiding ions away from neutral to reduce noise. The new design improves stability and transmission of low-mass product ions as well as product ions generated from large m/z differences between precursor and product ions, critical for key applications. 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
- Greater than five 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
- Single-stage, oil-sealed Rotary Vane vacuum pump configuration
- Environmentally friendly 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 of the solvent front, gradient end point, or any portion of the HPLC run to waste.

Optional ion sources

- Thermo Scientific™ EASY-Spray™ ion source is designed for maximum nanoelectrospray performance with no need for adjustments
- Thermo Scientific™ Nanospray Flex™ ion source is designed for ultimate nanoelectrospray performance with complete flexibility of column selection
- Thermo Scientific™ OptaMax™ Duet NG API ion source enables HESI and APCI functionality without manual changes in the hardware configuration
- Thermo Scientific™ VeriSpray™ PaperSpray™ ion source enables seamless integration of paper spray technology for direct MS-based ionization

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
- Thermo Scientific™ FreeStyle™ processing software
- Tune editor for system calibration, diagnostics, and manual data acquisition
- Fully automated loop injection or infusion-based compound optimization directly incorporated into the instrument method.
- Method editor with comprehensive application-specific template library and intuitive user interface to facilitate method development
- Thermo Scientific™ mzCloud™ database access allowing importation of compound name, SRM transitions, and collision energies

- Dwell time weighting factor for optimizing efficient SRM acquisition
- Visual display of relationship between chromatographic peak width and data points per peak to determine optimum quantitative performance
- Integration with multiple vendors' LC systems and autosampler configurations through Xcalibur software

Scan functions

- Highly sensitive full-scan MS
- Selected-ion monitoring (SIM)
- SRM with up to 30,000 SRMs definable and up to 600 SRMs/sec and timed SRMs
- High-resolution (0.4 Da) selected-reaction monitoring (H-SRM)
- Product ion scan
- Precursor ion scan
- Neutral-loss scan
- Reverse energy ramp (RER) MS/MS spectra gives information-rich MS/MS spectra for solid 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™ Chromeleon™ Chromatography Data System (CDS) software unifies workflows for routine quantitative MS analysis
- Thermo Scientific™ TraceFinder™ software simplifies method development and routine analysis in food safety, environmental, clinical research, and forensic toxicology laboratories
- Supports the use of Skyline software (MacCoss Lab, University of Washington)
- mzCloud database integration allows access to more than 19,000 compounds

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 150,000:1 for the transition of the protonated molecule at m/z 609.3 to the fragment ion at m/z 195.1 when operated in SRM mode with Q1 and Q3 resolution set to 0.4 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 20,000:1 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 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 150,000:1 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 SRM with Q1 and Q3 resolution set to 0.7 Da FWHM.

Mass range

m/z 2–3,000

Resolution

Q1 adjustable to 0.4 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 0.4 through 2.0 FWHM)
- Polarity Switching: 5 msec electronic switching time that includes signal stabilization

Mass stability

Mass assignment will be within ± 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

- Two 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

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: ~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 with oil-sealed pump: 3050 W (10,407 Btu/h)
- Total system heat output with dry pump: 2700 W (9,050 Btu/h)
- Particulate matter: <3,500,000 particles per cubic meter of air (<100,000 particles of >5 µm diameter per cubic foot of air)
- Relative humidity: 20% to 80%, without condensation
- Floors must be free of vibration

*The signal-to-noise ratio is a manufacturing specification only. The signal-to-noise ratio specifies the minimum system response expected in accordance to the performance test for Reserpine and Chloramphenicol evaluated under the Thermo Fisher Scientific guidelines. The specified signal-to-noise ratio in the product specification sheet does not represent the limit of detection or limit of quantitation of the mass spectrometer or any assay. TSQ Fortis Plus system is tested and installed according to TSQ Fortis Plus MS installation Work Instructions.

Dimensions

Size

- TSQ Fortis Plus MS: 680 × 760 × 840 mm
(h, w, d – 26.75 × 30 × 33 in)
- Oerlikon® SV 65 forepump: 270 × 320 × 489 mm
(h, w, d – 10.6 × 12.5 × 19.25 in)
- Leybold EcoDry™ 65 Plus forepump: 298 × 320 × 623 mm
(h, w, d – 11.7 × 12.6 × 24.5 in)

Weight

- TSQ Fortis Plus MS: 125 kg (275 lb)
- Oerlikon® SV 65 forepump: 52 kg (115 lb)
- Leybold EcoDry™ 65 Plus forepump: 43 kg (95 lbs)

 Learn more at thermofisher.com/FortisPlus

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