

# Thermo Scientific Q Exactive Plus Orbitrap LC-MS/MS System

Characterize, quantify and confirm  
with unmatched confidence

- Advanced quadrupole technology (AQT) for superior precursor isolation
- Advanced active beam guide for greater sensitivity and maximum robustness
- Multiple approaches to quantitation including selected ion monitoring (SIM), parallel reaction monitoring (PRM), and data-independent acquisition (DIA)
- Routine ppm mass accuracy
- Resolving power of up to 140,000 (FWHM) at  $m/z$  200 with optional enhanced resolution to 280,000 (FWHM) at  $m/z$  200
- Higher-energy collisional dissociation (HCD) fragmentation
- Enhanced analysis of native proteins and protein complexes with optional intact protein mode



The Thermo Scientific™ Q Exactive™ Plus benchtop LC-MS/MS combines high-performance quadrupole precursor selection with high-resolution, accurate-mass (HR/AM) Orbitrap™ detection to deliver high performance and tremendous versatility. It takes Quantification™ to a new level, making it possible to characterize, quantify, and confirm in a single analysis with a single instrument.

Technical enhancements to the original Q Exactive instrument maximize performance and reliability for large- and small-molecule applications. Advanced

quadrupole technology optimizes precursor selection and transmission, improving quantitation of low-abundance ions in the most complex matrices. Sophisticated parallel reaction monitoring and data-independent analysis provide reproducible quantitation results while delivering complete qualitative confidence. An optional intact protein mode enhances analysis of intact proteins through sophisticated ion beam control and easy collision pressure adjustment, while optional 280,000 maximum resolving power ensures superior ID confidence in top-down and lipidomics applications.

## Hardware Specification

### Thermo Scientific Ion Max API Source

- H-ESI II probe with dual desolvation zone technology
- Enhanced sensitivity and ruggedness
- Sweep gas reduces chemical noise
- 60° interchangeable ion probe orientation
- Removable metal ion transfer capillary provides vent-free maintenance

### Ion Optics

- RF lens stacked-ring radio frequency (RF) ion guide captures and efficiently focuses the ions into a tight beam. Large variable spacing between electrodes allows for better pumping efficiency and improved ruggedness.
- Advanced axial beam guide (AABG) with prefiltering and second-generation axial field bent flatapole ion guide reduces noise by preventing neutrals and high-velocity clusters from entering the quadrupole

### Quadrupole Mass Filter

- Advanced quadrupole technology (AQT) featuring a segmented Thermo Scientific™ HyperQuad™ mass filter provides increased ion transmission and superior isolation window shape
- Variable precursor isolation width selection from 0.4 Da to full mass range

### Vacuum System

- Differentially pumped vacuum system with final vacuum  $<1 \times 10^{-9}$  mbar
- Two split-flow turbomolecular pumps and one rotary vane pump
- Seven vacuum regions

### Orbitrap Mass Analyzer

- Nitrogen-filled C-Trap
- Highly efficient ion transfer to Orbitrap mass analyzer
- Straight multipole collision cell for HCD
- Orbitrap mass analyzer with 5 kV central electrode voltage
- Low-noise image current preamplifier
- 16-bit signal digitalization

### Data Acquisition

- Ultrafast real-time data acquisition and instrument control system
- Fully automated calibration via instrument control software
- Automatic gain control

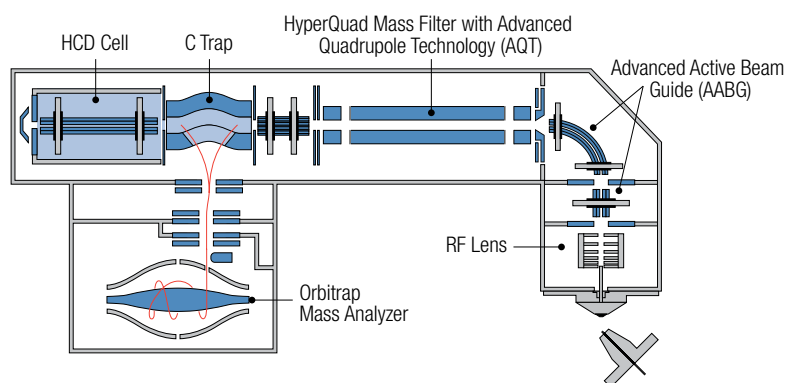
## Performance Characteristics

Resolving power	140,000 @ $m/z$ 200
Optional	280,000 @ $m/z$ 200
Mass range	50 to 6,000 $m/z$
Scan rate*	Up to 12 Hz at resolution setting of 17,500 @ $m/z$ 200
Mass accuracy *	Internal: <1 ppm RMS External: <3 ppm RMS
Sensitivity	Full MS: 500 fg buspirone on column S/N 100:1 SIM: 30 fg buspirone on column S/N 100:1
Dynamic range	>5000:1
Polarity switching	One full cycle in <1 sec (one full positive mode scan and one full negative mode scan at a resolution setting of 35,000)
Multiplexity	Up to 10 precursors/scan
Analog inputs	One (1) analog input (0–1 V) One (1) analog (0–10 V)

\*Under defined conditions

## Options

- Thermo Scientific™ EASY-Spray™ ion source offers state-of-the-art performance from an effortless and robust plug-and-spray solution.
- Thermo Scientific Nanospray Flex ion source offers ultimate nanospray flexibility, with excellent spray stability and efficiency for the widest range of nanoflow columns
- ESI probe compatible with liquid flow rates of <1  $\mu\text{L}/\text{min}$  to 1 mL/min without splitting
- APCI source compatible with liquid flow rates of 50  $\mu\text{L}/\text{min}$  to 2 mL/min without splitting
- APCI/APPI source compatible with liquid flow rates of 50  $\mu\text{L}/\text{min}$  to 2 mL/min without splitting
- Metal needle kits for high- and low-flow analyses



Q Exactive Plus ion optics

## Software Features

### Data System

- High-performance PC with Intel® microprocessor
- High-resolution LCD color monitor
- Microsoft Windows 7® operating system
- Microsoft Office® software package
- Thermo Scientific™ Xcalibur™ instrument control and data processing software
- Workflow-based method editor

### Operation Modes

- Full MS with high-resolution accurate-mass detection
- Selected ion monitoring (SIM) with high-resolution accurate-mass detection
- Parallel reaction monitoring (PRM) for improved screening and quantitative confidence
- All-ion fragmentation (AIF) in the HCD collision cell with high-resolution accurate-mass detection
- In-source fragmentation of all ions
- Positive/negative ion switching on chromatographic timescale
- On-the-fly data-dependent decision making
- Timed SIM for scheduled data acquisition of the targets of interest

## Exclusive Technologies

- Automatic gain control (AGC) ensures that the Orbitrap mass analyzer is always filled with the optimum number of ions for all scans
- High-performance HCD collision cell for highest performance MS/MS fragmentation
- Collision energy profiling using different collision energies for HCD fragmentation
- Advanced signal processing
- Interleaved operation
- Spectrum multiplexing for simultaneous detection of up to 10 precursor ions in the Orbitrap mass analyzer



Q Exactive Plus mass spectrometer with Nanospray Flex ion source and Thermo Scientific™ EASY-nLC™ 1000 liquid chromatograph

## Installation Requirements

### Power

- 2 x 230 VAC  $\pm$  10% single phase, 15 A, 50/60 Hz, with earth ground for the instrument
- 120 or 230 VAC single phase with earth ground for the data system

### Gas

#### Nitrogen

High-purity nitrogen gas supply (99% pure at  $800 \pm 30$  kPa ( $8.0 \pm 0.3$  bar,  $116 \pm 4$  psi))

### Environment

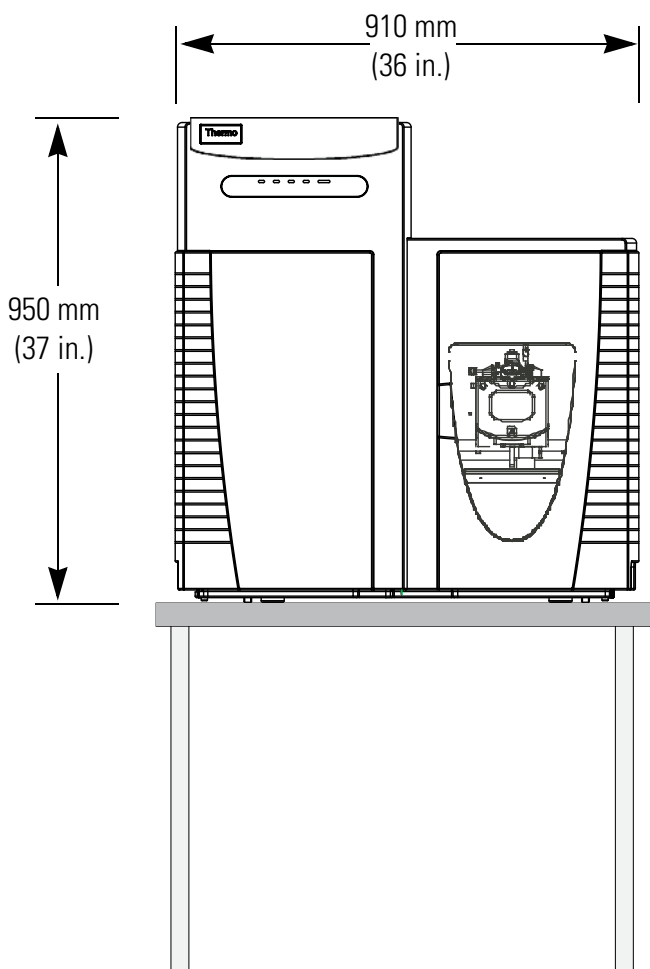
- System averages 2,500 W (~9,000 Btu/h) output when considering air conditioning needs
- Operating environment must be 15–26 °C (59–78 °F) and relative humidity must be 40–70% with no condensation

### Weight

- Q Exactive Plus mass spectrometer: 182 kg (400 pounds) without forevacuum pump
- Forevacuum pump: 62 kg (136 pounds)

### Dimensions

- Q Exactive Plus mass spectrometer: (h  $\times$  d  $\times$  w) 950  $\times$  830  $\times$  910 mm (37  $\times$  33  $\times$  36 inches)



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**Not for use in diagnostic procedures.**

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