



Q Exactive UHMR Hybrid Quadrupole-Orbitrap mass spectrometer

# Delivering unmatched identification and characterization

## Keywords

[Orbitrap technology](#), Q Exactive family, accurate mass, high resolution, native ms, ultra-high mass range

## Benefits

- Ultra-high mass range up to  $m/z$  80,000
- Quadrupole isolation up to  $m/z$  25,000 for Selected Ion Monitoring (SIM), MS/MS and pseudo-MS<sup>3</sup> experiments
- Resolution up to 200,000 (FWHM) at  $m/z$  400
- In-source trapping for higher transmission and better desolvation
- Advanced Quadrupole Technology (AQT) for superior precursor isolation
- Advanced Active Beam Guide (AABG) for greater sensitivity and maximum robustness

The [Thermo Scientific™ Q Exactive™ UHMR hybrid Quadrupole-Orbitrap™](#) mass spectrometer combines in-source trapping, high performance quadrupole precursor ion selection, a higher-energy collisional dissociation (HCD) cell, and a high-resolution, accurate-mass (HRAM) Orbitrap mass analyzer, with optimized RF voltages for improved high mass ion transmission to provide unrivaled sensitivity and resolution in the ultra-high mass range.

The Q Exactive UHMR MS delivers unmatched identification and characterization of large proteins and protein complexes using native MS and native top-down analysis.

The Q Exactive UHMR MS provides best-in-class performance for the analysis of megadalton non-covalent protein complexes at higher resolution and sensitivity along with the ability to perform highest quality native MS and native top-down experiments for structural biology research. The Q Exactive UHMR mass spectrometer enables new insights into native protein structure and protein interactions for deeper understanding of biological processes, and provides a key element in analyzing complex biotherapeutics in biopharmaceutical industry research.

With the ultra-high mass range, high mass quadrupole selection and improved ion transmission for sensitive detection, the Q Exactive UHMR instrument enables structure characterization of highly engineered biotherapeutics.

## Hardware specifications

### Thermo Scientific Ion Max API source

- H-ESI II probe with dual desolvation zone technology
- Enhanced sensitivity and ruggedness
- Sweep gas to reduce chemical noise
- 60° interchangeable ion probe orientation

### 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.

### In-source trapping

- In-source trapping (IST) in the injection flatapole region provides controllable desolvation and fragmentation, but also focusing of the ion cloud for improved transmission

### Low frequency ion guides

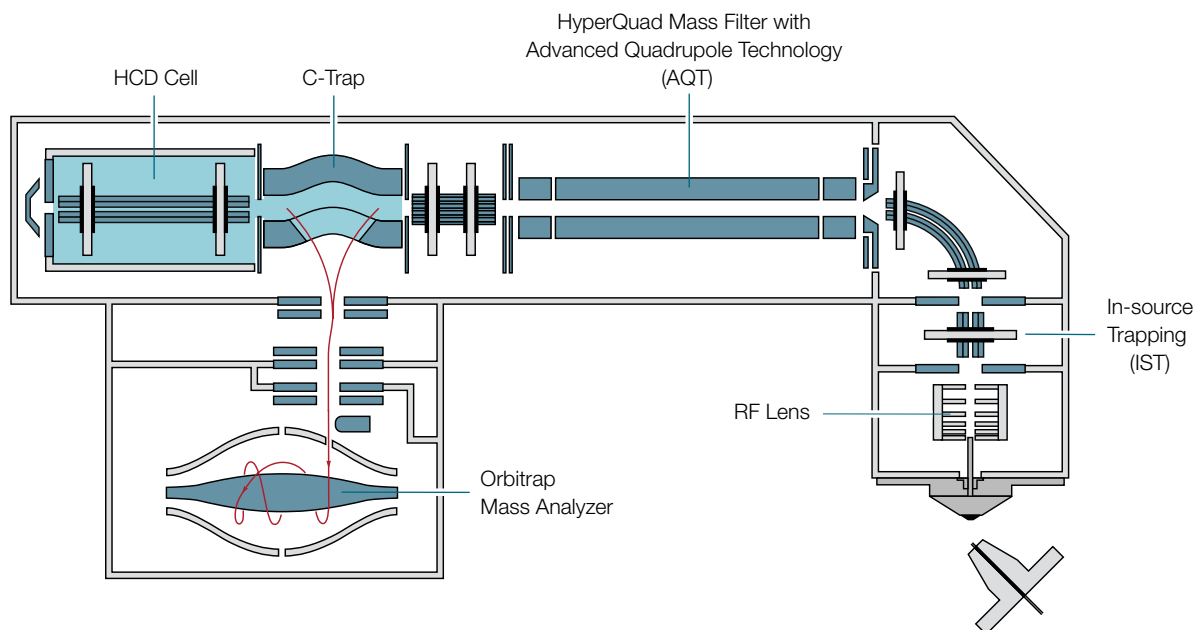
- Reduced frequencies of RF voltages applied to all RF ion guides and quadrupole mass filter for improved transmission in the ultra-high mass range

### Quadrupole mass filter

- Advanced Quadrupole Technology (AQT) featuring a segmented Thermo Scientific™ HyperQuad™ mass filter provides increased ion transmission and superior isolation window shape

### Vacuum system

- Differentially pumped vacuum system with final vacuum  $<1 \times 10^{-9}$  mbar
- Tunable pressure control in the HCD region
- Two split-flow turbomolecular pumps and one rotary vane pumps
- Seven vacuum regions



Schematic diagram of Q Exactive UHMR mass spectrometer.



**Q Exactive UHMR mass spectrometer with H-ESI II ion source and Thermo Scientific™ Vanquish™ UHPLC system.**

### Orbitrap mass analyzer

- Nitrogen-filled combo C-Trap and HCD collision cell with an applied axial field with improved fragment ion extraction and trapping capabilities
- Highly efficient ion transfer to the Orbitrap mass analyzer
- Voltage ramp rate adjustment on the central Orbitrap electrode for enhanced transmission of high mass ions from the C-Trap into the Orbitrap analyzer
- Orbitrap mass analyzer with 5 kV central electrode voltage
- Low-noise image current preamplifier for high mass ions
- 16-bit signal digitalization

### Data acquisition

- Ultra-fast real-time data acquisition and instrument control system
- Fully automated system calibration via instrument control software

### Performance characteristics

Resolution:	200,000 @ $m/z$ 400
Mass range:	$m/z$ 350 to 80,000
Quad mass selection	Up to $m/z$ 25,000
Scan rate:	12 Hz at resolution setting of 12,500 @ $m/z$ 400
Mass accuracy:*	Internal: <1 ppm RMS External: <3 ppm RMS
Dynamic range:	>5000:1
Analog inputs:	One (1) analog input (0–1 V) One (1) analog (0–10 V)

\* For CsI cluster ions under defined conditions

### Options

- Thermo Scientific™ Nanospray Flex™ ion source with static and dynamic nanospray interchangeable probe design offers ultimate nanospray flexibility with excellent spray stability and efficiency
- ESI probe compatible with liquid flow rates of <math><1 \mu\text{L}/\text{min}</math> to 1 mL/min without splitting
- Metal needle kits for high and low-flow analyses

### Software features

#### Data system

- High-performance PC with Intel® microprocessor
- High-resolution LCD color monitor
- Microsoft® Windows® 10 operating system
- Thermo Scientific™ Xcalibur™ instrument control and data processing software
- Workflow-based Exactive Series Method Editor and Tune software

### Operation modes

- Full MS with high-resolution, accurate-mass detection
- SIM with high-resolution, accurate-mass detection
- All Ion Fragmentation (AIF) using in-source CID, in-source trapping or HCD
- MS/MS and pseudo-MS<sup>3</sup> of isolated ions with high-resolution, accurate-mass detection
- On-the-fly data dependent decision making

## Exclusive technologies

- In-source trapping
- High-performance HCD cell for highest quality MS/MS and pseudo-MS<sup>3</sup> data
- Advanced Precursor Determination (APD)
- Advanced signal processing
- Interleaved operation

## Installation requirements

### Power

- 2 × 230 VAC ± 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

- Source gas (minimum requirement): High-purity nitrogen gas supply (99% pure at 800 ± 30 kPa ((8.0 ± 0.3 bar, 116 ± 4 psi))
- HCD gas (recommended): High-purity nitrogen gas supply (99.999% pure at 800 ± 30 kPa (8 ± 0.3 bar))
- HCD gas: High-purity SF<sub>6</sub> gas supply (99.995% pure at 800 ± 30 kPa (8 ± 0.3 bar))

### Environment

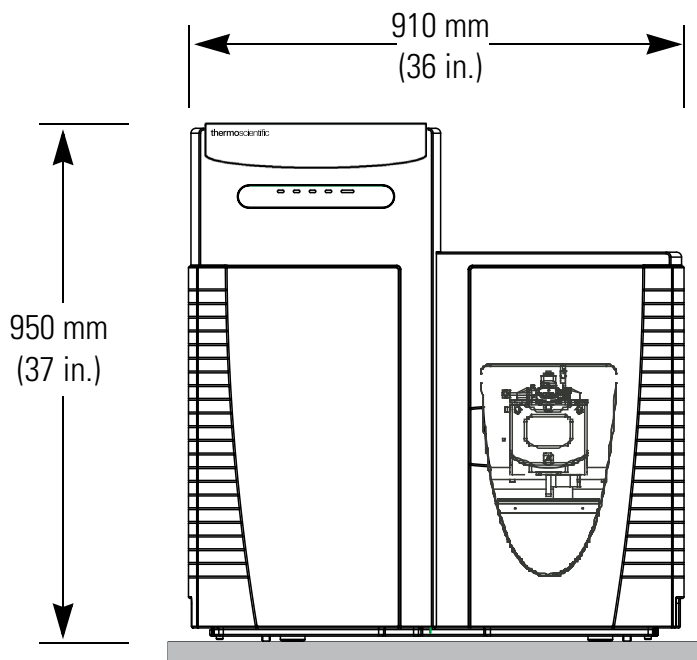
- System averages 2,800 W (~10,000 Btu/h) output when considering air conditioning needs
- Operating environment must be 15–26 °C (59–78 °F) with relative humidity between 40–70% with no condensation
- Designed for indoor use at an altitude of up to 2,000 m (6,500 ft) above sea level

## Weight

- Q Exactive UHMR mass spectrometer: 182 kg (400 lbs) without forevacuum pumps
- Forevacuum pumps: 62 kg (136 lbs)

## Dimensions

- Q Exactive UHMR mass spectrometer: (h × d × w) 950 × 830 × 910 mm (37 × 33 × 36 in.)



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

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