

# Thermo Scientific Exactive Plus & Exactive Plus EMR

Benchtop Full-Scan Orbitrap  
Mass Spectrometers

- Routine sub-ppm mass accuracy
- Resolving power of up to 140,000 (FWHM) at  $m/z$  200
- Maximum scan speed of 12 Hz
- Intrascan dynamic range of > 5,000:1
- Mass range of 50 to 6,000  $m/z$  (standard mode) or 350 to 20,000  $m/z$  (EMR mode)
- Full-scan MS analysis
- All-ion fragmentation with multiple dissociation techniques:
  - In-source CID (collision-induced dissociation)
  - HCD (higher-energy collisional dissociation, optional)
- S-Lens for increased sensitivity
- Onsite upgradable from Exactive Plus mass spectrometer to Q Exactive mass spectrometer



The Thermo Scientific™ Exactive™ Plus benchtop LC-MS provides high-resolution, accurate-mass (HR/AM) full-scan mass spectra using proven Thermo Scientific™ Orbitrap™ technology. Advanced signal processing allows scan speeds up to 12 Hz for screening and quantitative analyses compatible with fast UHPLC chromatography. Mass resolution up to 140,000 (FWHM) at  $m/z$  200 distinguishes target compounds from interferences, enabling analysis of demanding samples in complex matrices.

The Exactive Plus mass spectrometer is the ultimate solution for screening applications, from routine compound identification to the most challenging analysis of trace-level compounds in complex mixtures. Fast polarity switching between positive and negative scan modes saves time by allowing complete screening analyses to be completed in a single run. True high mass resolution data avoids false positives and reduces the need to reanalyze samples.

The optional HCD collision cell adds additional functionality to the benchtop system by providing all-ion fragmentation (AIF) for compound confirmation, while maintaining high-resolution, accurate-mass performance at high sensitivity.

The Exactive Plus benchtop system with full-scan and AIF modes is ideally suited for food safety and environmental analysis, forensic toxicology and clinical research, as well as drug metabolism studies.

With an optional extended mass range (EMR) of up to  $m/z$  20,000 and improved detection of high-mass ions, the Exactive Plus EMR system is an outstanding platform for biopharmaceutical and biological research requiring analysis of monoclonal antibodies, antibody drug conjugates, protein assemblies, and other proteins in their native states.



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## Hardware Specification

### Thermo Scientific Ion Max API Source

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

### Ion Optics

- S-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 ion guides for high sensitivity and ruggedness
- High stability and ion transmission efficiency

### Vacuum System

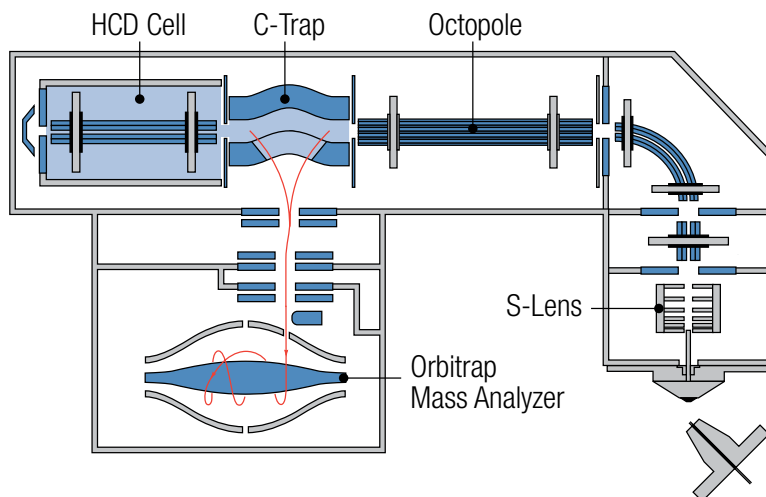
- Differentially pumped vacuum system with final vacuum  $<1 \times 10^{-9}$  mbar
- Two split-flow turbomolecular pumps and one rotary vane pump
- Seven vacuum regions

### Orbitrap Mass Analyzer

- Nitrogen- filled curved linear trap (C-Trap)
- Highly efficient ion transfer to Orbitrap analyzer
- Orbitrap analyzer with 5 kV central electrode voltage
- Low-noise image current pre-amplifier
- 16-bit signal digitalization

### Data Acquisition

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



Schematic of the Thermo Scientific Exactive Plus and Exactive Plus EMR Benchtop LC-MS systems

## Performance Characteristics

Mass range	
Standard mode	$m/z$ 50–6,000
EMR mode	$m/z$ 350–20,000
Resolving power	Up to 140,000 (FWHM) @ $m/z$ 200
Max scan rate	Up to 12 Hz at mass resolution setting of 17,500 @ $m/z$ 200
Mass accuracy <sup>1</sup>	
Standard	Internal: <1 ppm RMS External: <3 ppm RMS
EMR mode	External: <3 ppm RMS for $m/z$ 350–6000 External: <5 ppm RMS for $m/z$ 6001–10,000 External: <10 ppm RMS for $m/z$ 10,001–15,000
Sensitivity	In full-scan MS mode: 500 fg buspirone on-column S/N 100:1 acquired with H-ESI II probe
Dynamic range	>5000:1 in single scan, intrascan dynamic range
Polarity switching	One full cycle in <1 sec (one full positive mode scan and one full negative mode scan at mass resolution setting of 35,000 @ $m/z$ 200)

### Analog inputs

- One analog input (0–1 V)
- One analog input (0–10 V)

<sup>1</sup> Under defined conditions

### Options

- Axial higher-energy collisional dissociation (HCD) cell
- Extended mass range (EMR) of 350–20,000  $m/z$  with software control of HCD collision gas pressure for enhanced analysis of native-state proteins
- Thermo Scientific Nanospray Flex ion source – single set-up for all online nanoflow applications
- ESI probe compatible with liquid flow rates of <1  $\mu$ L/min to 1 mL/min without splitting
- APCI source compatible with liquid flow rates of 50  $\mu$ L/min to 2 mL/min without splitting
- APCI/APPI source compatible with liquid flow rates of 50  $\mu$ L/min to 2 mL/min without splitting
- The Exactive Plus MS is upgradable to Q Exactive MS on site

## Software Features

### Data System

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

### Data Processing Software

- Thermo Scientific™ TraceFinder™ processing software for routine targeted and general unknown compound screening, quantitation and identification, with compound database and spectra library
- Thermo Scientific™ MetQuest™ software, automated processing software for quan/qual drug metabolic screening and pharmacokinetic analyses
- Thermo Scientific™ MetWorks™ software, metabolite identification processing software for the study of biotransformations
- Thermo Scientific™ SIEVE™ software, differential analysis software for the study of metabolomics
- Thermo Scientific™ LCQUAN™ processing software for quantitative analysis of compounds supporting LC/MS data management activities within a 21 CFR Part 11 compliant environment
- Mass Frontier™ software, chemically intelligent mass spectral interpretation software for metabolite identification and structural elucidation
- Thermo Scientific™ Protein Deconvolution software for deconvolution of both isotopically resolved and unresolved spectra. Ideal for characterization of proteins, monoclonal antibodies, and similar molecules in their native (intact) states

### Operation Modes

- Full-scan MS with high-resolution accurate-mass detection
- All-ion fragmentation (AIF) in the HCD collision cell with high-resolution accurate-mass detection (optional)
- Source fragmentation of all ions in the source region
- Positive/negative ion switching on chromatographic timescale
- On-the-fly data-dependent AIF
- Optional extended mass range full-scan MS and extended mass range AIF

### Exclusive Technologies

- Optimum number of ions for all scans
- High-performance HCD collision cell for highest-performance AIF fragmentation (optional)
- Collision energy profiling using different collision energies for HCD fragmentation
- Advanced signal processing
- Interleaved operation



Exactive Plus mass spectrometer with Thermo Scientific™ Dionex™ UltiMate™ 3000 Rapid Separation LC system

## Installation Requirement

### Power

- 2 x 230 VAC  $\pm$  10% single phase, 15 Ampere, 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

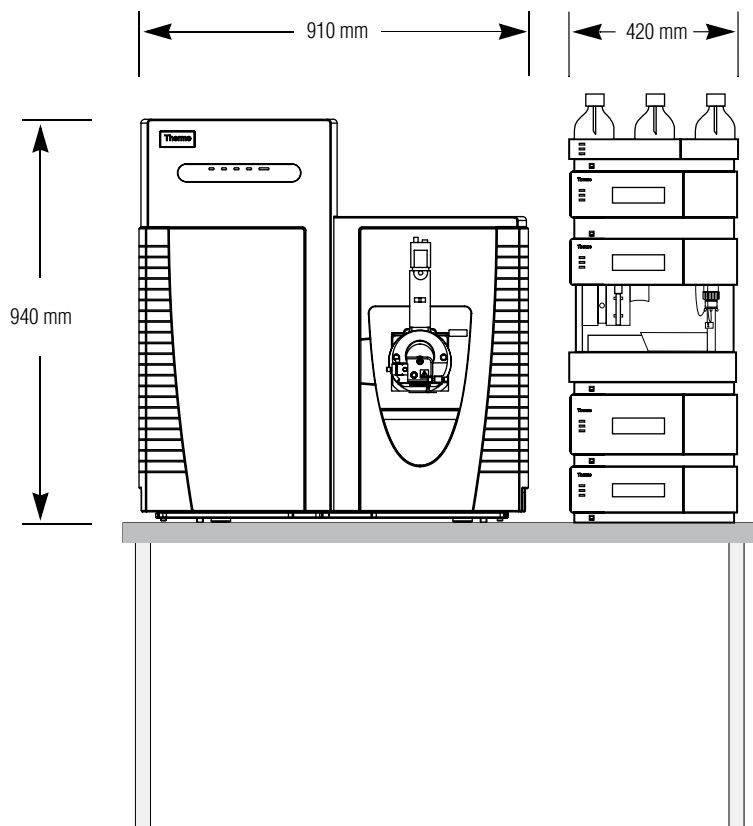
- System averages 2,500 W (~9,000 Btu/h) output when considering air conditioning needs
- Operating environment must be 15–26 °C (59–78 °F) and relative humidity must be 40–70% with no condensation

### Weight

- Exactive Plus (EMR) mass spectrometer without rotary vane forepump: 175 kg (385 pounds)
- Forepump: 62 kg (136 pounds)

### Dimensions

- Exactive Plus (EMR) mass spectrometer:  
(h x d x w) 940 x 830 x 910 mm  
(37 x 33 x 36 inches)



### For Research Use Only.

Not for use in diagnostic procedures.



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