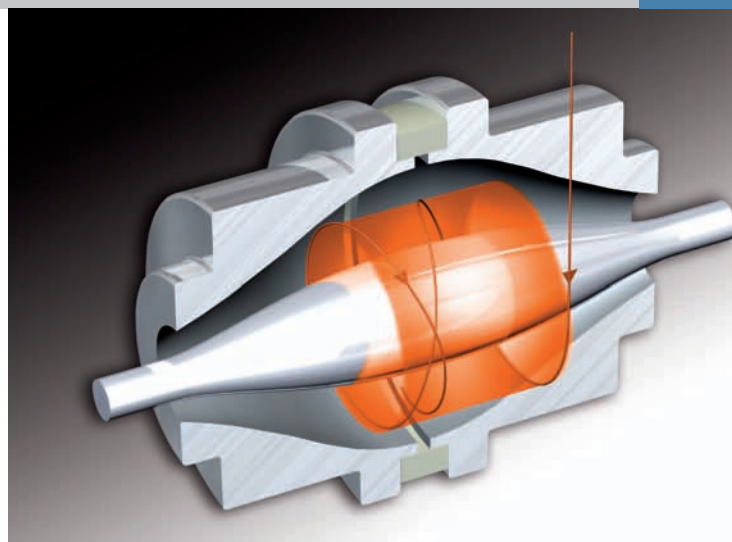


Thermo Scientific LTQ Orbitrap XL

Hybrid FT Mass Spectrometer

Unrivaled Performance and Flexibility



- Routine FT mass accuracy
- Resolving power > 100,000
- Wide dynamic range
- Parallel MS and MSⁿ analysis
- Multiple dissociation techniques: CID, PQD and HCD
- ETD upgradeable

Combining patented Orbitrap™ technology with the most successful linear ion trap, Thermo Scientific LTQ XL, the LTQ Orbitrap XL™ hybrid FT mass spectrometer provides fast, sensitive, and reliable detection and identifications of compounds in complex mixtures.

The new collision cell adds more flexibility to any MS/MS experiment. Outstanding mass accuracy, resolving power and high sensitivity MSⁿ performance make the LTQ Orbitrap XL mass spectrometer a superior alternative to Q-TOF systems.

The Thermo Scientific LTQ Orbitrap XL hybrid FT mass spectrometer supports a wide range of applications, from routine compound identification to the most demanding analysis of trace levels components in complex mixtures.



The Thermo Scientific LTQ Orbitrap received the R&D 100 Award in 2006 and the Pittcon Editor's Gold Award at Pittcon 2006.

Hardware Specifications

LTQ XL Linear Ion Trap

Ion Max™ API Source

- Enhanced sensitivity and ruggedness
- Sweep Gas™ option reduces chemical noise
- 60° interchangeable ion probe orientation
- Removable metal ion capillary tube provides vent-free maintenance

Transfer Ion Optics

- Advanced ion guides
- High stability and ion transmission efficiency

Linear Quadrupole Ion Trap Mass Spectrometer

- Optimized analyzer dimensions
- Regulated helium flow for stable performance
- Automatic system calibration
- High-efficiency radial ion ejection

Vacuum System

- Differentially-pumped vacuum system to 10⁻⁵ Torr
- Split-flow turbomolecular pump controlling vacuum in three regions
- Dual rotary vacuum pump configuration
- High-vacuum aluminum analyzer chamber

Detection System

- Patented dual conversion dynode detector
- Two off-axis continuous dynode electron multipliers with extended dynamic range
- Digital electronic noise discrimination

Orbitrap Mass Analyzer

- Gas-free multipole ion transfer optics
- New improved gas (nitrogen) filled C-Trap
- Improved ion transfer optics to Orbitrap analyzer
- Straight multipole collision cell for HCD
- Orbital trap
- Active temperature control using a Peltier element
- Differentially pumped vacuum system with:
 - Rotary vane pumps as fore vacuum pumps, one water cooled 60 L turbomolecular pump, and two water-cooled 210 L turbomolecular pumps
 - Final vacuum under operating conditions < 8 x 10⁻¹⁰ Torr
 - Vacuum control by active Pirani gauge and cold ion gauge
- Low noise detect amplifiers
- 14-bit signal digitization
- Ultra fast real-time data acquisition and instrument control system
- Automatic calibration of all transfer and Orbitrap parameters via instrument control software

Performance Characteristics

PERFORMANCE CHARACTERISTICS

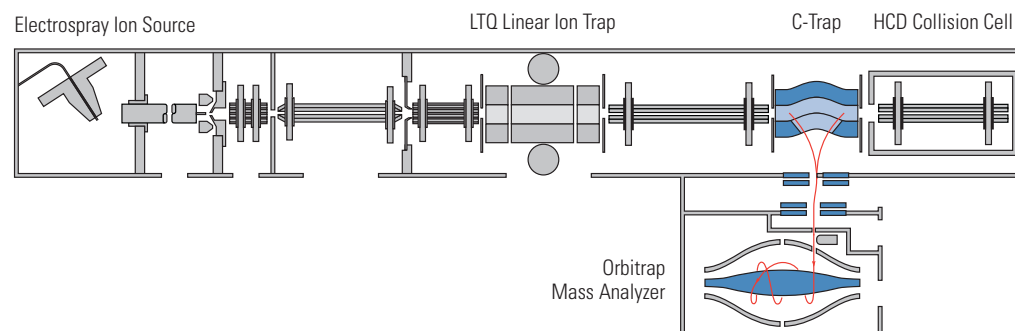
Mass Range	m/z 50-2000, m/z 200-4000
Resolution	60,000 at m/z 400 at a scan rate of 1 Hz, minimum resolution 7,500 maximum resolution >100,000 at m/z 400
Mass Accuracy	< 3 ppm with external calibration, < 1 ppm using internal calibration
Sensitivity	sub-femtomol range for peptides
Dynamic Range	> 4,000 within a single scan guaranteeing specified mass accuracy
MS Scan Power	MS ⁿ , for n = 1 through 10
Analog Inputs	One (1) analog input (0-1 V), One (1) analog (0-10 V)

Options

- ESI probe compatible with liquid flow rates of < 1 µL/min to 1 mL/min without splitting (required)
- Nanospray source supports static packed tip and dynamic nanospray experiments, compatible with liquid flow rates of 50 nL/min to 2 µL/min*
- APCI source compatible with liquid flow rates of 50 µL/min to 2 mL/min without splitting
- APCI/APPI source compatible with liquid flow rates of 50 µL/min to 2 mL/min without splitting
- Metal needle option for high- and low-flow analyses

*Lower limit is dependent on gauge of needle used

Schematic of the LTQ Orbitrap XL Hybrid FT Mass Spectrometer



Software Features

Data System

- High performance PC with Intel® Pentium® microprocessor
- High resolution LCD color monitor
- Microsoft Windows® XP operating system
- Microsoft Office XP software package
- Thermo Scientific Xcalibur processing and instrument control software
- FT-Programs software tools: ProteinCalculator and Recalibrate Offline

Operation Modes

- High resolution accurate mass scans at high repetition rates
- Precursor ion isolation and fragmentation in the linear ion trap (CID) with high resolution accurate mass MS/MS and MSⁿ data acquisition in the Orbitrap mass analyzer
- Thermo Scientific Data Dependent scans using both the linear ion trap and the Orbitrap mass analyzer
- Data Dependent™ MS/MS with parallel acquisition of multiple MSⁿ scan in the linear ion trap while acquiring a high resolution full scan MS spectrum in the Orbitrap mass analyzer
- Ion Mapping, Neutral Loss Ion Mapping, Parent Ion Mapping, user selectable Dynamic Exclusion™, Nth order Triple Play experiment, Data Dependent Ion Tree experiment, Total Ion Map experiment

Optional Thermo Scientific Application-Specific Software

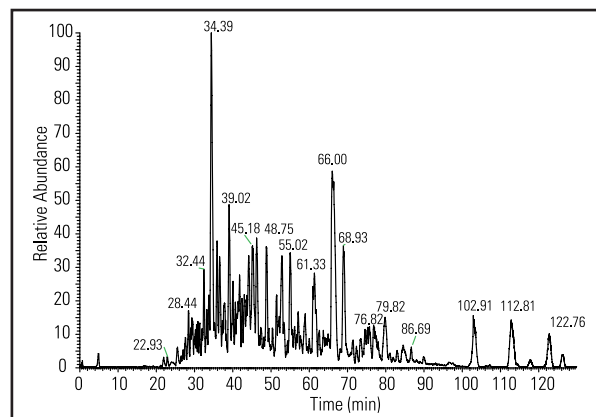
- Proteome Discoverer – Mass informatics platform for protein scientists
- ProSight PC - Top down identification and characterization of proteins incl. PTMs
- MetWorks™ – automated metabolite identification using spectral trees and accurate mass data
- Mass Frontier™ – predictive fragmentation software for spectral interpretation and classification software to identify unknowns
- PEAKS™ – powerful, easy *de novo* sequencing
- SIEVE™ – automated differential expression analysis in proteomics or metabolomics applications
- ProMass™ Deconvolution – intact protein analysis

Exclusive Technologies

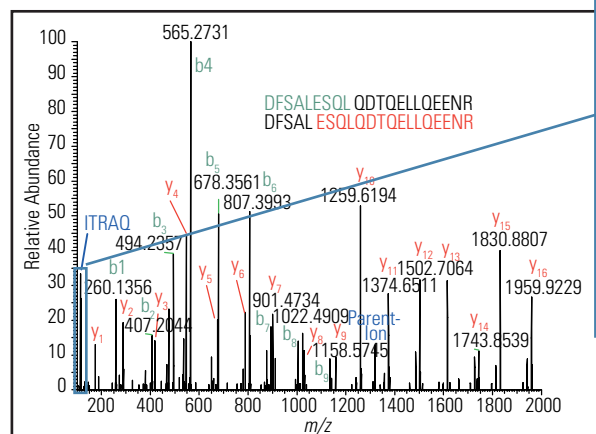
- Precursor ion selection in the linear ion trap and fragmentation in the new collision cell (HCD) with high resolution accurate mass detection in the Orbitrap mass analyzer
- Pulsed Q Collision Induced Dissociation (PQD) enables trapping of low mass fragment ions
- Unique, patented Automatic Gain Control (AGC™) ensures that the ion trap is always filled with the optimum number of ions for any scan type
- Dynamic Exclusion allows acquisition of MS/MS and MSⁿ spectra from lower intensity ion species
- WideBand Activation™ generates more structurally informative spectra
- Normalized Collision Energy™ for multiple fragmentation techniques (CID and HCD) providing reproducible data from instrument to instrument
- Stepped Normalized Collision Energy (CID and HCD) allows for the variation of the collision energies in MS/MS experiments
- Multistage Activation (MSA) generates combination of MS/MS spectra and MS³ spectra based on a user defined neutral loss

Advanced Data Dependent Experiments

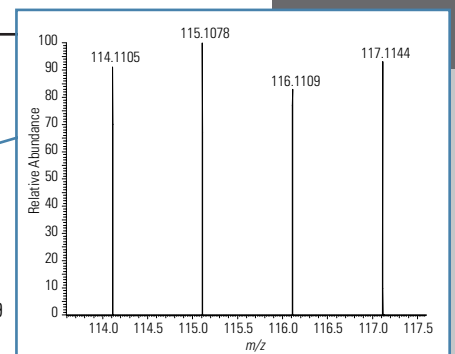
- Data Dependent features trigger acquisition of MSⁿ spectra only when a compound of interest is detected
- Isotopic Data Dependent scanning software triggers MS/MS scanning only when a specified isotopic pattern is detected
- Ion Mapping automatically generates a 3-dimensional MS/MS map, yielding product ion, precursor ion, and neutral loss information
- Ion Mapping Browser software displays data generated by Ion Mapping experiments
- Data Dependent Ion Tree performs MSⁿ experiments on up to 25 species
- MSⁿ Browser software displays data generated by Data Dependent Ion Tree and Ion Mapping experiments
- Monoisotopic precursor selection for Data Dependent MS/MS experiments
- Data Dependent (accurate) Neutral Loss - Trigger MS³ scans on only the MS/MS product ions with a pre-defined neutral loss



Base peak chromatogram of nano LC-MS and MS/MS analysis.



HCD spectrum for FSALESQ LQDTQELLQEEENR (MYH9_MOUSE, Myosin-9) in mouse cell line digest derivatized with four iTRAQ™ reagents.



iTRAQ reporter ions.

Installation Requirements

Power

- 230 Vac \pm 10% 3 phase, 16 Amps, 50/60 Hz, with earth ground for the instrument
- 120 or 230 Vac single phase with earth ground for the data system
- 120 or 230 Vac single phase, 15 Amps, with earth ground for the water chiller

Gas

Helium

Ultra-high purity (99.999%) with less than 1 ppm each of water, oxygen and total hydrocarbons

Nitrogen

High purity (99.5% pure, flow rate 15 L / min) nitrogen gas supply for the API source and the C-Trap

Environment

- System averages 2800 W (10,000 Btu/hr) 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
- Optimum operating temperature is 18 - 21 °C (65 - 70 °F)

Weight

MS: ~600 kg

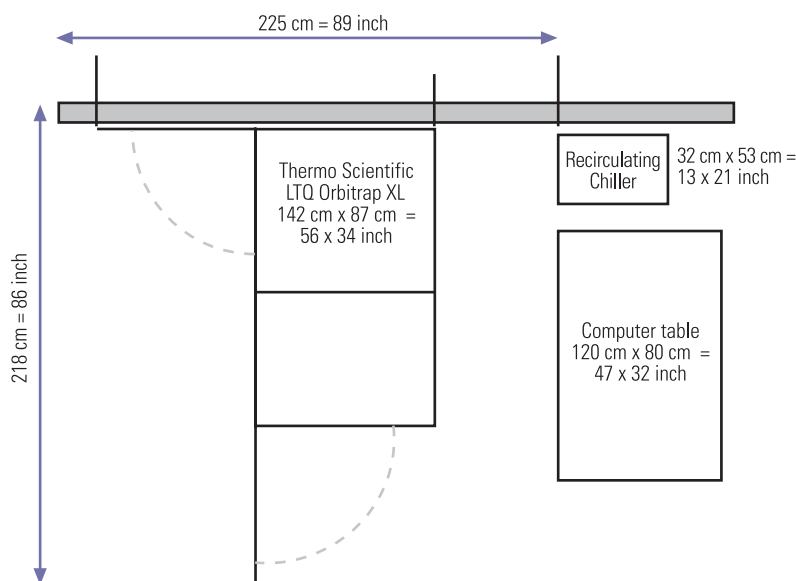
Dimensions

MS: (h x w x d)

141.4 cm x 87 cm x 146.3 cm

Water Cooler

Provided with the instrument



www.thermoscientific.com

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Austria +43 1 333 50 34 0	Finland/Norway/Sweden +46 8 556 468 00	Japan +81 45 453 9100	Spain +34 914 845 965
Belgium +32 53 73 42 41	France +33 1 60 92 48 00	Latin America +1 561 688 8700	Switzerland +41 61 716 77 00
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