

The Thermo Scientific™ LTQ XL™ linear ion trap mass spectrometer

## Everyday affordability with MS<sup>n</sup>

### Keywords

LTQ XL linear ion trap mass spectrometer, MS<sup>n</sup> (CRM) capabilities, proteomics, metabolite identification, forensic analysis, clinical research, teaching

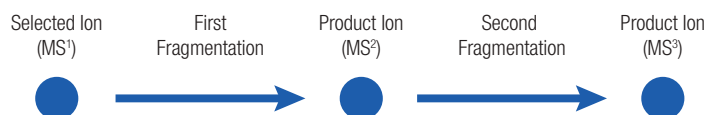
The LTQ XL linear ion trap mass spectrometer delivers high sensitivity full scan MS along with in-depth MS<sup>n</sup> (CRM) capabilities.

If you are in the market for an *extremely affordable* general-purpose mass spectrometer, look no further than the LTQ XL.

Applications include proteomics, metabolite identification, forensic analysis, clinical research and teaching.

General purpose utility extends to users in academia, industry and government alike. Now includes updated software with Windows 10 compatibility enabling full support today and into the future

A single quadrupole offers no more than Selected Ion Monitoring (SIM). A triple quadrupole adds Selected Reaction Monitoring (SRM) where a selected ion can be fragmented into a product ion. A linear ion trap goes further by enabling Consecutive Reaction Monitoring (CRM) where a selected ion is fragmented into a product ion and the resulting product ion further fragmented in additional consecutive steps (MS<sup>n</sup>). Each additional fragmentation step makes compound identification more certain and facilitates structural characterization.



## Powerful tools for structural characterization

### Collision Induced Dissociation (CID)

- Resonance excitation of precursor at low  $q$ ; low energy collisions with He
- Universal, no tuning required, high efficiency

Included

### Pulsed “ $q$ ” Dissociation (PQD)

- Short resonant excitation of precursor at high  $q$ , rapid shift to very low  $q$ , high energy collisions with He
- Selective, no low mass cutoff, low noise
- Tuning required, low efficiency

Included

### Hardware features

#### Thermo Scientific™ Ion Max™ API source

- With ESI, HESI, APCI and APPI options
- Sweep gas 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

#### 2D 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

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

#### Integrated liquid delivery

- Fully-automated data system control enables user to divert the solvent front, gradient end point and any other portion of the HPLC run to waste
- Syringe Pump allows automated infusion under data system control

## Data system features

### Hardware

- High performance PC
- 27 inch LED Monitor with 1920 x 1080 resolution

### Operating system

- Microsoft Windows® 10 x 64 enterprise IoT LTSB 2016

### Thermo Scientific™ software

- LTQ Instrument Control Software
- Thermo Scientific™ Xcalibur™ software for method setup, data acquisition, data processing, and reporting
- Thermo Scientific™ FreeStyle™ software to view and analyze data

### Scan functions

- Predictive Automatic Gain Control (AGC) delivers up to 10 Hz data dependent MS/MS acquisition
- Full-scan mass spectra for sensitive analyses and rapid screening of unknown compounds
- Full-scan product ion spectra at sensitivities higher than any ion trap mass spectrometer
- Selected Reaction Monitoring (SRM) for traditional LC/MS/MS quantitative analytical experiments
- MS<sup>n</sup> for multi-stage MS experiments to probe the structure of ions
- ZoomScan, a high-resolution, full-range scan to resolve isotopic envelopes often used for charge state determination
- Ultra ZoomScan for ultimate resolution
- TurboScan an ultra-fast scan to improve signal-to-noise and sampling rate
- Unique 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 MS<sup>n</sup> spectra from lower intensity ion species
- WideBand Activation generates more structurally informative spectras
- Normalized Collision Energy provide reproducible data from instrument to instrument

## System specifications

### MS/MS sensitivity

*Heated Electrospray ionization (HESI)* – A loop injection of 2 µL of a 125 fg/µL solution of reserpine (250 femtograms total sample) at a flow of 400 µL/min will produce a minimum signal-to-noise ratio of 100:1, for the transition of the isolated protonated molecular ion at  $m/z$  609 to the largest two product ions, 397 and 448, when the mass spectrometer is operated at unit resolution in the full-scan MS/MS mode, scanning the product ion spectrum from  $m/z$  165–650.

### *Atmospheric pressure chemical ionization (APCI)* –

A loop injection of 2 µL of a 125 fg/µL solution of reserpine (250 femtograms total sample) at a flow of 400 µL/min will produce a minimum signal-to-noise ratio of 100:1, for the transition of the isolated protonated molecular ion at  $m/z$  609 to the largest two product ions, 397 and 448, when the mass spectrometer is operated at unit resolution in the full-scan MS/MS mode, scanning the product ion spectrum from  $m/z$  165–650.

### MS<sup>n</sup> sensitivity

*Heated Electrospray Ionization (HESI)* – A loop injection of 2 µL of a 125 fg/µL solution of reserpine (250 femtograms total sample) at a flow of 400 µL/min will produce a minimum signal-to-noise ratio of 25:1, for the transition of the unit isolated protonated molecular ion at  $m/z$  609 to the product ion at  $m/z$  397 which is further fragmented to the product ion at  $m/z$  365, when the mass spectrometer is operated at unit resolution in the full-scan MS/MS mode, scanning the product ion spectrum from  $m/z$  165–650

## Installation requirements

### Power

- One 230 Vac ±10.0%, 15 Amps, 50/60 Hz, single phase, with earth ground dedicated to the instrument
- 120 or 230 Vac single phase, with earth ground for the data system

## Gas

- One high-purity (99% pure, flow rate 15 L/min) nitrogen gas supply for the API source
- One ultra high-purity helium gas supply (99.998% pure) with less than 1 ppm each of water, oxygen, and total hydrocarbons for the mass analyzer

## Environment

- System averages 2300 W (8000 Btu/h) output when considering air conditioning needs
- Operating environment must be 15–27 °C (59–80 °F) and relative humidity must be 40–80% with no condensation
- Optimum operating temperature is 18–21 °C (65–70 °F)

## Dimensions/weight

- MS: 56 × 79 × 59 cm (h × w × d)
- MS: ~120 kg
- Two roughing pumps: 38.6 kg each

## Performance specifications

### Mass range

- $m/z$  15–200
- $m/z$  50–2000
- $m/z$  200–4000

### Linear dynamic range

- Under typical experimental conditions, at least four and a half (4.5) orders of magnitude

### Polarity switching

- 100 msec between positive and negative

### MS scan power

- $MS^n$ , for  $n = 1$  through 10

### Contact closure

- Start In/Out
- Start Out is programmable

### Analog Inputs

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

Scan Type	Mass Accuracy (Da)	Peak Width (FWHM)	Scan Rate (Da/Sec)
Turbo	1.5	3	125,000
Normal	0.15	0.7	16,667
Enhanced	0.15	0.45	5,000
Zoom	0.15	0.3	1,111
Ultrazoom	0.15	0.15	28

Find out more at [www.thermofisher.com/iontraps](http://www.thermofisher.com/iontraps)

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