

## Mass spectrometry

# Orbitrap Exploris 120 Mass Spectrometer

## Productivity redefined

### Introduction

The Thermo Scientific™ Orbitrap Exploris™ 120 mass spectrometer is a Thermo Scientific™ quadrupole-Orbitrap™ mass spectrometer which is based on proven hardware and instrument control software designs of next-generation Thermo Scientific™ mass spectrometers and incorporates extensive customer and service engineer feedback.<sup>1</sup> Built on the guiding principle of ease-of-use and reliable hardware, robust system performance boosts sample throughput. Soundness of data is assured with high-resolution accurate-mass (HRAM) selectivity, high-scan speed and best-in-class mass spectral quality, all within a compact footprint to conserve bench space.

The Orbitrap Exploris 120 mass spectrometer extends the Thermo Scientific Orbitrap Exploris mass spectrometer portfolio, with productivity made easy and rugged for laboratories performing high-throughput targeted screening and quantitation. HRAM capability provides the fast path to accurate results in a solution with everyday operational usability and consistent performance.

### Benefits

- Keep your laboratory running seamlessly with maximum mass accuracy using built-in Thermo Scientific™ EASY-IC™ ion source internal reference mass
- Focus on your science, not on instrument set up with single click calibrations, drag-and-drop method setup, and predefined experiments driven by next-generation software
- Analyze more samples with improved scan speed and fast polarity switching
- Improve space utilization and deliver maximum business value with compact footprint when bench-top space is limited
- High quantitative and qualitative performance with the fast-scanning High-Field Thermo Scientific™ Orbitrap™ mass analyzer
- Automated sample profiling with optional Thermo Scientific™ AcquireX™ data acquisition workflow



### Hardware features

#### Ion source

#### Thermo Scientific™ OptaMax™ NG ion source

- Ultimate sensitivity with an efficient, heated electrospray ionization (H-ESI) sprayer to deliver maximum performance with minimal optimization
- Additional non-heated low-flow calibrant sprayer for optimal mass and system calibration
- Flow rates from 1–1,000  $\mu\text{L}/\text{min}$ :
  - low flow needle 1–10  $\mu\text{L}/\text{min}$
  - high flow needle 10–1,000  $\mu\text{L}/\text{min}$
- Enhanced system ruggedness and reduced chemical noise with sweep gas

## Ion optics

The atmospheric pressure ionization (API) interface consists of:

### **Round bore transfer tube**

- Removable, heated ion transfer tube
- Vent-free maintenance

### **Stacked-ring ion guide (S-lens)**

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 active beam guide (AABG)**

- Reduces noise by preventing neutrals and high-velocity clusters from entering the quadrupole mass filter using a double bent design geometry
- Axial field along the length of the rods improves ion transfer robustness

### **Advanced quadrupole technology (AQT)**

- Segmented quadrupole mass filter for precursor ion selection with variable precursor isolation width from 0.4 to 2,000 Da
- MS/MS precursor ion selection with high transmission from  $m/z$  40 to 2,500

### **Ion-routing multipole (IRM)**

- Robust ion trapping for MS scans and higher energy collisional dissociation (HCD)
- Nitrogen collision gas

### **Automatic gain control (AGC)**

Reliable AGC measurements for controlled injection of the number of ions is ensured by the novel Independent Charge Detector

### **Thermo Scientific™ Orbitrap™ mass analyzer**

- High-field Orbitrap mass analyzer with 4 kV central electrode voltage
- Low-noise-detection pre-amplifier

### **Vacuum system**

- A compact single six-stage turbomolecular pump design regulates the vacuum in six stages for the aluminum high-vacuum analyzer chambers
- Advanced vacuum technology reduces pressure in the ultra-high vacuum regions, enhancing transmission of ions to the Orbitrap mass analyzer

### **Thermo Scientific™ EASY-IC™ ion source**

- Provides <1 ppm RMS mass accuracy under defined conditions with minimum effort for at least five days
- Generates optional internal reference ions for real-time mass correction of spectra in both positive and negative ionization mode

### **Optional hardware**

#### **APCI/APPI probe for OptaMax NG ion source**

- Compatible with flow rates from 50–1,000  $\mu\text{L}/\text{min}$  without splitting
- The APCI probe can be upgraded to APPI

#### **Thermo Scientific™ FAIMS Pro Duo interface**

- The FAIMS Pro Duo interface (high-field asymmetric ion mobility spectrometry) augments analytical selectivity, enabling identification and quantitation of more proteins while reducing time-consuming sample preparation
- Performs online gas-phase fractionation based on differential ion mobility
- Optimized for 0.1–1,000  $\mu\text{L}/\text{min}$  flow rates
- CV switching time of 40 ms

### **Data acquisition system**

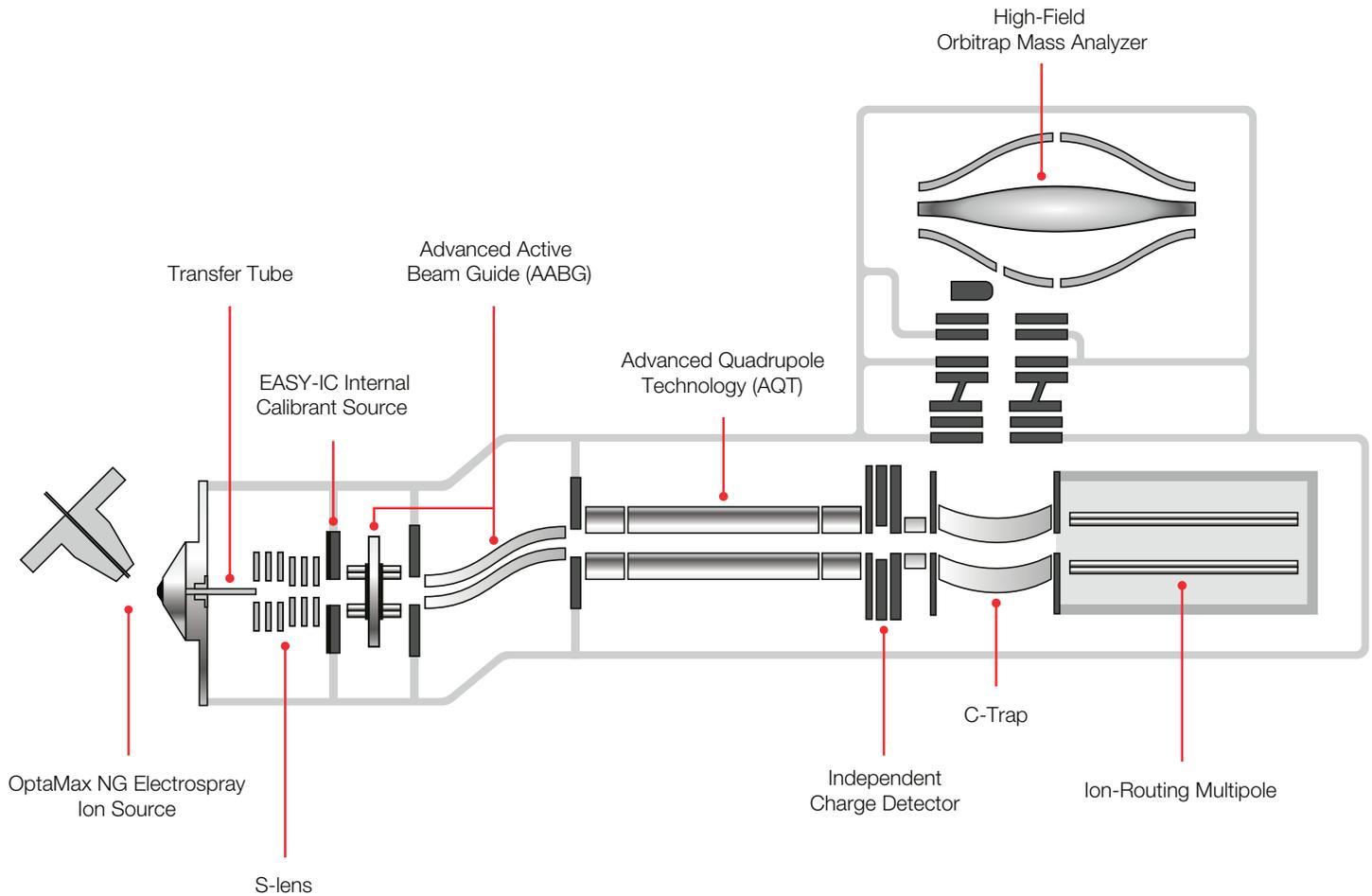
#### **Data system**

- High-speed real-time data acquisition and instrument control
- High-performance PC with Intel® microprocessor
- High-resolution LED color monitor
- Microsoft® Windows® 10 Enterprise (Long Term Servicing Channel) operating system

#### **Thermo Scientific™ Orbitrap Exploris™ instrument control software**

- Tune application for instrument mass and system calibrations and checks, diagnostics, and manual data acquisition
- Method Editor with a comprehensive application-specific template library, method setup supported by tooltips, and a drag-and-drop user interface to facilitate method development
- Consistent instrument control software whether using Xcalibur software, Thermo Scientific™ Chromeleon™ Chromatography Data Systems (CDS) or Thermo Scientific™ TraceFinder™ software for data acquisition

## Orbitrap Exploris 120 mass spectrometer ion path



## Performance specifications

Mass range	Standard mass range $m/z$ 40–3,000
Orbitrap mass analyzer resolution	Up to 120,000 at $m/z$ 200
Scan rate*	Up to 22 Hz at resolution setting at 15,000
Mass accuracy*	External calibration achieves <3 ppm RMS drift over 24 hours; 1-point calibration achieves <3 ppm RMS drift over at least 4 weeks; Internal lock mass calibration achieves <1 ppm RMS drift over 24 hours; EASY-IC achieves <1 ppm RMS drift for at least 5 days
Instrument detection limit	Full Scan: < 3.0 fg reserpine on column tMS2: < 3.0 fg reserpine on column tSIM: < 1.5 fg reserpine on column
Sensitivity	MS/MS: 200 fg reserpine on column S/N 100:1 tSIM: 200 fg reserpine on column S/N 250:1
Dynamic range*	>5,000 within a single Orbitrap mass analyzer spectrum
Polarity switching	One Full Scan cycle** <700 ms equals >1.4 Hz One tSIM Scan cycle** <600 ms equals >1.6 Hz
Multiplexing	Up to 20 precursor ions per scan in tMS <sup>2</sup> and up to 20 compounds per scan for tSIM
Analog inputs	Channel 1 analog input ( $\pm 10$ V), Channel 2 analog input ( $\pm 10$ V)

\* Under defined conditions

\*\* One cycle consists of acquiring one Full Scan in positive mode and one Full Scan in negative mode at resolution setting 60,000  
one tSIM Scan in positive mode and one tSIM Scan in negative mode at resolution setting 60,000

## Thermo Scientific™ Xcalibur™ software

- Xcalibur software is the acquisition software for the next-generation Thermo Scientific mass spectrometer portfolio
- Accelerates familiarization and reduces training needs

### Operation modes

#### Resolution settings

Ranging from 15,000 to 120,000 at  $m/z$  200

#### Application-specific system templates

Sets optimal default instrument parameters and manages application-specific system templates for easy method development and execution.

#### General

- Up to five (timed) experiments can be set up within one method
- One experiment can contain combinations of multiple scans, e.g. Full MS and ddMS<sup>2</sup> with Targeted Mass Filter
- 'Mild Trapping' can be applied optionally for particularly labile compounds; it is a global setting and applies to the entire run
- 'Collision Energy Type' can be selected: 'Normalized (NCE)' and 'Absolute (CE)'
- 'Collision Energy Mode' can be selected: 'Fixed' and 'Stepped'

#### Scan functions

Unique scan types are available

- Full MS scan
- AIF
- tSIM
- DIA
- tMS<sup>2</sup>

and combinable within a single experiment, such as:

- Full Scan ddMS<sup>2</sup>
- tSIM ddMS<sup>2</sup>

Both with 'Number of Scans' (= Top 1–4)

In addition, multiple experiments can be created combining all of the above listed scan types.

## Filters

Filters guide data-dependent (discovery and confirmation) decisions on the fly and in real time. To achieve optimum results when applying application- and sample-dependent filter settings, the user is guided with appropriate application-dependent parameter settings and tool tips with tailored recommendations and detailed 'learn more' sections.

Filters can be selected as follows:

- Dynamic Exclusion
- Intensity
- Charge State (for singly charged precursors and precursors with undetermined charge state)
- Targeted Mass
- Targeted Mass Exclusion
- Apex Detection
- Isotope Exclusion

## Optional data acquisition and analysis software

### Thermo Scientific Chromeleon Chromatography Data System (CDS)

Streamlined chromatographic and MS screening and quantitative workflows within an enterprise and compliance-ready single software application

### Thermo Scientific TraceFinder software

Acquire and process your high-throughput screening and quantitation with built-in intelligence, drives productivity gains from data acquisition and processing to reporting.

### Thermo Scientific AcquireX Intelligent Data Acquisition Workflow

AcquireX data acquisition workflows provide comprehensive small molecule sample profiling on an LC timescale using automated, logic-based sample re-injection with inter-run inclusion and exclusion lists.

### Thermo Scientific™ Compound Discoverer™ software

Streamlines small-molecule unknown identification, determination of real differences between samples, and elucidation of biological pathways with an integrated suite of data analysis tools.

## Installation requirements

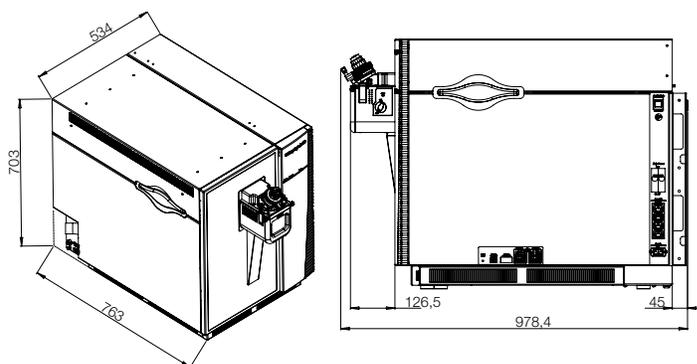
### Power

- 2×208–240 Vac single phase, 15 A, 50/60 Hz, with earth ground for instrument and source vacuum pump
- 208–240 Vac single phase, 15 A, 50/60 Hz, with earth ground for the data system

### Gas

- Source gas: high-purity nitrogen gas supply (>99% pure at  $600 \pm 50$  kPa [ $6.0 \pm 0.5$  bar,  $87 \pm 7$  psi])
- A pre-regulator might be required to keep the source gas pressure stable within the required limits
- HCD collision gas: ultra-high-purity nitrogen (UHP > 99.999% pure<sup>†</sup>) at  $600 \pm 50$  kPa [ $6.0 \pm 0.5$  bar]
- For EASY-IC: ultra-high-purity nitrogen (UHP > 99.999% pure<sup>†</sup>) at  $600 \pm 50$  kPa [ $6.0 \pm 0.5$  bar]

<sup>†</sup> with less than one ppm each water and oxygen



### Dimensions (w, d, h)

- 534 × 763 × 703 mm (21 × 30 × 27.7 in)

### Weight

- 120 kg (265 lb) without data system, vacuum rough pumps, and optional items

### Environment

- System averages 3,440 W (11,730 Btu/h) output when considering air conditioning needs
- Operating environment must be 18–27 °C (64–81 °F). Relative humidity must be 20–80% with no condensation
- Designed for indoor use at an altitude of up to 3,000 m (10,000 ft) above sea level

Learn more at [thermofisher.com/OrbitrapExploris120](https://thermofisher.com/OrbitrapExploris120)