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PRODUCT SPECIFICATIONS

Exactive GC mass spectrometer with TriPlus RSH autosampler

The frontier of routine GC-MS

Performance benefits

- Resolving power of up to 50,000 (FWHM) at *m/z* 272
- Routine sub ppm mass accuracy
- <6 fg OFN Instrument Detection Limit
- Electron Ionization/Chemical Ionization (EI/CI) Thermo Scientific™ ExtractaBrite™ ion source removable under vacuum through vacuum interlock
- Vent-free column exchange with source plug
- Variable electron voltage (VeV) technology for softer EI

Keywords
Exactive GC-MS, Orbitrap™ GC-MS System

The power of multi-award winning Orbitrap GC-MS technology has so far allowed research scientists to break new ground in gaining a broader and deeper understanding of their samples through the use of high-resolution, accurate-mass (HRAM) analysis. The introduction of the Thermo Scientific™ Exactive™ GC Orbitrap™ GC-MS system brings that power into the routine environment for the first time. This system allows scientists working in fields like food safety, environmental, industrial, forensics and anti-doping to revolutionize their workflows by taking their analytical capability to the next level.

The Exactive GC system is an easy-to-use, dedicated GC-MS that provides an unprecedented level of highly sensitive, routine grade performance for both targeted and non-targeted analysis, along with high confidence quantitation for the ultimate sample analysis workflow. This is achieved through the superior resolving power, mass accuracy, linear dynamic range and sensitivity that only Orbitrap technology can deliver, combined with the intelligent data processing workflows provided by Thermo Scientific™ TraceFinder™ software.

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Hardware specifications

Ion source

- Thermo Scientific ExtractaBrite Electron Ionization (EI) source
- Ion source includes ion volume, repeller, source lenses, RF lens and dual filaments in all ionization modes, programmable from 50 °C to 350 °C
- Chemical Ionization (CI) source for acquisition with Positive Ion Chemical Ionization (PCI) and Negative Ion Chemical Ionization (NCI)
- Remove entire ion source or change to CI source in under 2 minutes without venting
- Vent-free column exchange with new, patented source plug
- Combination EI/PCI/NCI ion volume can be used without need for source interchange

MS ion optics

- Advanced pre-filtering and axial field bent flatapole ion guide reduces noise by eliminating neutrals

Vacuum system

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

Orbitrap mass analyzer

- Nitrogen-filled C-Trap
- Highly efficient ion transfer to Orbitrap mass analyzer
- Low-noise image current preamplifier
- 16-bit signal digitalization

Data acquisition

- Ultra-fast real-time data acquisition and instrument control system
- Fully-automated tune and calibration via instrument control software
- Variable electron voltage (VeV) tuning – Automatically optimizes acquisition at electron energies ranging from 12 to 150 eV
- Automatic gain control

EI Full MS installation specifications

- 1 µL of 100 fg/µL octafluoronaphthalene (OFN) will produce a minimum signal-to-noise of 10,000:1 at a minimum resolution of 50,000 (FWHM) and a mass error of less than 1 part per million (ppm) while scanning from *m/z* 50 to *m/z* 300
- The area precision of eight sequential injections of 1 µL, 10 fg/µL OFN will result in an instrument detection limit (IDL) of 6 fg or less (OFN) derived at the 99% confidence level*

**Demonstrated at installation with purchase of the Thermo Scientific™ TriPlus™ RSH Autosampler and the Exactive GC system IQ/OQ. Otherwise, a signal-to-noise of greater than 1000:1 will be demonstrated on a single 1 µL injection of a 10 fg/µL OFN Standard.*

PCI Full MS installation specifications

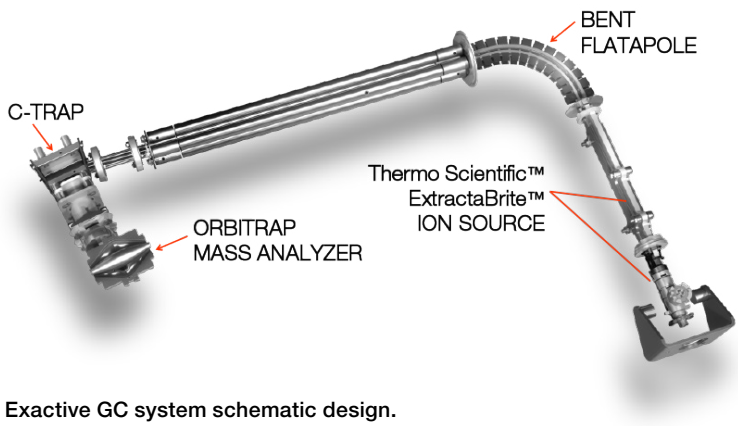
- 1 µL of 10 pg/µL benzophenone (BZP) will produce a minimum signal-to-noise of 150:1 while scanning from *m/z* 80 to *m/z* 230

Performance characteristics

Resolving Power:	50,000 @ *m/z* 272
Mass Range:	30 to 3,000 *m/z*
Scan Rate:*	Up to 18 Hz at resolution setting of 12,500 @ *m/z* 272
Mass Accuracy:**	Internal: <1 ppm RMS External: <3 ppm RMS
Quantitative Dynamic Range:*	>10^6
In-Spectrum Dynamic Range:*	>5000:1

**Under defined conditions*

***Under conditions defined in 1 µL, 100 fg/µL octafluoronaphthalene EI Full MS installation specification*



Exactive GC system schematic design.

Software features

Data system

- High-performance PC with Intel® microprocessor
- High-resolution LCD color monitor
- Microsoft® Windows® 7 operating system
- Thermo Scientific™ Xcalibur™ instrument control and data processing software
- Workflow-based method editor
- TraceFinder software for quantitation, targeted screening, and high-resolution spectral deconvolution with accurate mass library search and retention index scoring
- NIST spectral library included
- Thermo Scientific™ Orbitrap™ GC-MS Contaminants Library (Option)
- Thermo Scientific™ Orbitrap™ GC-MS HRAM Metabolomics Library (Option)

Direct sample probe system option

- Switch to probe <3 min with GC undisturbed
- Available in two styles: rapid heating filament Direct-Exposure Probe (DEP, capable of flash vaporization or pyrolysis at up to 1600 °C) or slower volatilization Direct-Insertion Probe (DIP, capable of accommodating powder and solid samples in a quartz or aluminum crucible) up to 450 °C

Gas chromatograph

Thermo Scientific™ TRACE™ 1310 GC system: Complete icon-driven touch screen user interface for direct local instrument control

GC mainframe included with system. Injectors, detectors, autosampler, and other options are sold separately.

- User-installable injector or detector assembly can be installed in less than 2 minutes
- 0.001–1000 kPa digitally controlled carrier gas with gas saver and septum purge
- Split/Splitless (S/SL) injector with optional large volume kit for injections up to 50 µL
- Multi-mode programmed temperature vaporization (PTV) injector including on-column capabilities and large volume injection up to 250 µL
- Integrated backflush optional for both S/SL and PTV
- 1000 kPa digitally controlled carrier gas with gas saver and septum purge
- Detector fast data acquisition rate: up to 300 Hz

Oven temperature

- Operating temperature range: ambient + 3 °C to 450 °C
- Operating temperature range with liquid N_2 Cryo: -100 °C to 450 °C
- Operating temperature range with CO_2 Cryo: -50 °C to 450 °C

Oven performance

- Number of ramps/plateaus: 32/33
- Maximum heating rate: 125 °C/min
- Oven cool-down (22 °C ambient): 450 °C to 50 °C in <4 min

GC analytical performance

- Retention time repeatability: <0.0008 min
- Peak area repeatability: <0.5 % RSD
- Pressure set points minimum increments: 0.01 kPa–0.001 psi in all ranges

Operation modes

- Full MS with high-resolution, accurate-mass (HRAM) detection
- Selected Ion Monitoring (SIM) with high-resolution, accurate-mass detection
- Timed SIM for scheduled data acquisition of targets of interest
- Positive/negative ion switching on chromatographic timescale

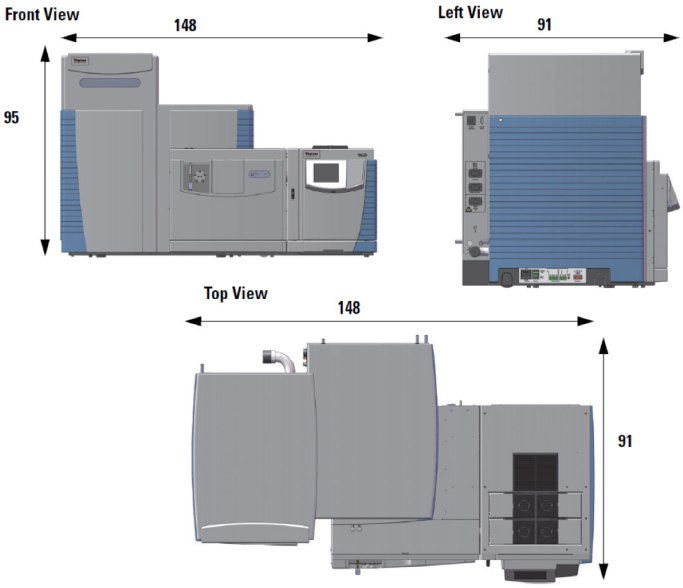
Exclusive technologies

- Automatic Gain Control (AGC) ensures that the Orbitrap mass analyzer is always filled with the optimum number of ions for all scans
- Advanced signal processing
- Interleaved operation
- Optional upgrades
  - Upgrade maximum resolution to 100,000 at *m/z* 272
  - Add HCD cell to allow Parallel Reaction Monitoring (PRM) and data dependent MS/MS experiments (Field upgrade only). Also includes maximum resolution upgrade to 100,000 at *m/z* 272

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



All dimensions in cm.

Gas

Helium

- High-purity helium gas supply (99.999% pure)
- Regulator output pressure adjustable from 300 to 1000 kPa (3 to 10 bar, 45 to 145 psi)

Methane (required for CI installation)

- High-purity methane gas supply (99.999% ultra-high purity)
- Regulator output pressure adjustable from 35 to 240 kPa (0.3 to 2.4 bar, 5 to 35 psi)

Nitrogen

- High-purity nitrogen gas supply (99.999% ultra-high purity)
- Regulator output pressure at 800 ± 30 kPa (8.0 ± 0.3 bar, 166 ± 4 psi)

Environment

- Air conditioning load for a typical Exactive GC system (with data system, GC, and autosampler) approximately 4.6 kW (16,000 BTU/h)
- Operating environment must be constant temperature between 15–26 °C (59–78 °F) and relative humidity must be 40–70% with no condensation

Weight

- Exactive GC mass spectrometer: 254 kg (560 pounds) with Exactive GC MS system, TRACE 1310 GC system, and TriPlus RSH autosampler without forevacuum pump
- Forevacuum pump: 24 kg (52 pounds)

Dimensions

- Exactive GC Orbitrap GC-MS system: (h × d × w) 95 × 91 × 148 cm (37 × 36 × 58 inches)

Find out more at **thermofisher.com/ExactiveGC**

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