

Mass spectrometry



PRODUCT SPECIFICATIONS

TSQ 9610 triple quadrupole GC-MS/MS system

Unstoppable confidence in GC-MS/MS analysis

Keywords: TSQ 9610, triple quadrupole, GC-MS/MS, Advanced Electron Ionization (AEI), ExtractaBrite, NeverVent technology, SmartTune, Vacuum Probe Interlock

Performance benefits

- Detect low traces of target compounds/chemicals in difficult matrices or relieve matrix pressure on the analytical system with the Advanced Electron Ionization (AEI) source, available in dedicated configurations.
- Remove tuning complexity with SmartTune, a simplified tuning tool.
- Boost instrument productivity to unprecedented levels with the patented NeverVent™ technology.
- Select from base to advanced configurations, to increase flexibility and performance anytime you need it.
- Allow method consolidation and increase instrument uptime with an extended-dynamic-range and long-lifetime detector.

Analytical testing laboratories working in food, environmental, forensic/toxicology and pharma analysis need to ensure that they can meet regulatory requirements with confidence with every analysis. These labs need to be certain the instrument is always producing results and their workflows are not interrupted so that they can achieve a rapid return on their investment. In short, they need unstoppable confidence in their analytical systems.

The Thermo Scientific™ TSQ™ 9610 GC-MS/MS system is a GC triple quadrupole platform designed to revolutionize laboratory productivity by delivering unprecedented levels of performance, ease-of-use and uptime, with the ultimate goal of facilitating the reduction of cost-per-sample in the high-throughput environment.

Unlike other systems, the TSQ 9610 GC-MS/MS system offers laboratories the opportunity to select best-in-class SRM performance, even for high capacity methods, whilst still benefiting from increased analytical robustness.

The TSQ 9610 GC-MS/MS system offers performance that addresses increasingly challenging regulatory requirements, as well as providing effective ease-of-use tools to deliver consistent, class leading results, by both experienced and newer users.

TSQ 9610 triple quadrupole GC-MS/MS system specifications

Modes

- Electron Ionization (EI), with full-scan (FS), SIM, and FS/SIM simultaneous within sample injection, timed acquisition (t-SIM), and FS/t-SIM
- Multiple/Selected Reaction Monitoring (MRM/SRM), timed acquisition (t-SRM), combined SRM/FS, combined t-SRM/FS, product ion scan, precursor ion scan, neutral loss scan
- Ability to convert timed acquisition method (t-SIM/t-SRM) into general mode (segmented) method

Ion source types

- Thermo Scientific™ ExtractaBrite™ Electron Ionization (EI) source with dual filaments in all ionization modes, programmable to 350 °C
- Thermo Scientific™ Advanced Electron Ionization (AEI) source programmable to 350 °C
- Chemical Ionization (CI) with Positive Ion Chemical Ionization (PCI) and Negative Ion Chemical Ionization (NCI) source and Combination EI/PCI/NCI source (optional), available with the ExtractaBrite ion source

NeverVent technology

- Now available on the ExtractaBrite and AEI source configurations. Using the vacuum probe interlock (VPI) and the V-Lock source plug, planned maintenance such as column exchange and source cleaning can be performed without venting the mass spectrometer.
- On the TSQ 9610 VPICI source, ionization modes can be switched.
- On the new NeverVent AEI system, the filament can be exchanged without the need to break instrument vacuum. These unique features mean that you will have unstoppable confidence that your instrument is always productive.

Software features

- Automated SRM Development (AutoSRM)
- SIM Bridge—a tool used to import SIM and SRM acquisition tables in comma-separated-values (CSV) formats into AutoSRM and instrument method
- Automated acquisition window adjustment based on retention time
- Compound based acquisition method setup
- Customizable automated tuning
- Retention Time Alignment—this tool uses void time and retention time of a reference substance to provide a new column length and internal diameter (or corrected pressure or flow value) to realign retention times of all the peaks of the chromatograms
- SmartTune—an intelligent and simple tuning tool
- Instrument health and monitoring:
 - Local PC utilization counters, historical trendlines and notifications
 - Remote preventative and corrective action notifications via Almanac

Mass analyzer

- Heated, off-axis ion guide (Quadrupole pre-filter, Q0), for noise reduction and solid, homogeneous, non-coated, maintenance-free quadrupole rods
- Fast quadrupole scanning, up to 20,000 u/s

Mass resolution and mass stability

- Automatic tuning down to 0.4 u and manual tuning

- Selectable SRM resolution settings in method at autotune preset values of 0.7 u, 1.5 u and 2.5 u or custom tune from 0.7–1.5 u
- Mass stability better than 0.1 u/48 hours/ $\Delta T \leq 2$ K

Collision energy range

- 0–60 eV

Mass range

- 1.2–1,100 u with unit mass resolution

Detector

- Thermo Scientific™ XLXR™ detection system, with off-axis 10 kV dynode, discrete dynode electron multiplier and electrometer, linear range of $>10^7$ (0–110 μ A)
- Electronic dynamic range $>10^9$

Scan speed and acquisition rate

- Up to 20,000 u/s
- Ability to acquire more than 97 scans/s in FS when scanning over a range of 125 u
- 0.5 ms minimum SRM dwell times
- Up to 800 SRM transitions/s

Pumping systems

- High-capacity (>300 L/s), dual-stage turbomolecular pump
- Mechanical rotary vane 3.3 m³/h oil pump
- Foreline convection gauge
- Optional oil-free scroll pump
- Ion gauge (optional)

Electron energy

- Adjustable up to 150 eV dependent on ion source type

Emission current

- Up to 350 μ A

Transfer line temperature

- Up to 400 °C

Microfluidics options for Thermo Scientific™ TRACE™ 1600/1610 GC system

Dual-column, dual-detector or heart-cut 2D-GC configurations are achieved with highly inert microfluidic connectors based on the Thermo Scientific™ SilFlow™ technology featuring FingerTite metal ferrules for easy-to-install, zero-dead volume, and leak-free connections.

- Compatible with capillary columns in the range of 0.32–0.1 mm I.D.
- Software assistant is available to support heart-cut 2D-GC method setup

Direct sample probe system option (VPCI enabled systems only)

- Switch to probe in <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 1,600 °C) or slower volatilization Direct-Insertion Probe (DIP, capable of accommodating powders and solid samples in a quartz or aluminum crucible) up to 450 °C

Data system software and options

- Thermo Scientific™ Chromeleon™ Chromatography Data System (CDS) software for chromatographers using MS, a common platform for GC, GC-MS, LC, LC-MS, IC, and IC-MS quantification
- Thermo Scientific™ TraceFinder™ software, a common platform for routine GC, GC-MS, LC, and LC-MS quantification
 - TraceFinder software for Environmental and Food Safety, with Compound Data Base of over 1,300 pesticide SRM transitions
 - TraceFinder software for Clinical Research
 - TraceFinder software for Forensic/Toxicology
- Retention Time Alignment tool to easily and quickly maintain retention time during routine operation
- Instrument control and data connection via Ethernet
- Virtual instrument interface for TRACE 1600 Series GC systems (optional)
- Computer supplied with instrument equipped with three Ethernet (8P8C RJ-45) ports
- Commercial mass spectral library (latest edition) options, including:
 - NIST Mass Spectral Library with RI and MS/MS
 - Wiley Mass Spectral Library
 - Maurer/Pfleger/Weber Mass Spectral Library for Drugs, Poisons, Pesticides, Pollutants and their metabolites

Performance specifications

GC triple quadrupole mass spectrometers are most frequently applied to trace quantitative analysis in complex matrix. This means that the ability of the system to select against matrix (reduce chemical noise) is a critical performance factor to be taken into consideration. To get an accurate representation of instrument performance, instrument detection limits (IDLs) can be used to demonstrate low level precision and provide the complete performance picture.

AEI installation specifications

In SRM mode, with He carrier gas and either the Thermo Scientific™ AI/AS 1610 Series Autosampler, Thermo Scientific™ TriPlus™ 100 LS Liquid Autosampler, or TriPlus™ RSH Autosampler[§] (required and configured for

liquid injections), eight sequential 1 fg OFN splitless injections monitored for SRM 272/222 produce the following instrument detection limit (IDL), calculated from the chromatographic peak area with 99% confidence interval: IDL ≤0.3 fg[†].

Installation specifications

TSQ configuration	Source	IDL specification
TSQ 9610 No VPI AEI	AEI	≤0.3 fg**
TSQ 9610 NeverVent AEI	NeverVent AEI	≤0.3 fg**
TSQ 9610 VPI with EI and CI	ExtractaBrite	≤2 fg**
TSQ 9610 Medium Turbo	ExtractaBrite	≤4 fg*

* Eight sequential 5 fg OFN splitless injections

** Eight sequential 1 fg OFN splitless injections

Standard installation and factory specifications* for the TSQ 9610 GC-MS/MS system

Ion source/concentration	He [†]	H ₂ [†]
With AEI, 1 µL of 1 fg/µL OFN will produce the following minimum S/N for transition <i>m/z</i> 272 to <i>m/z</i> 222	300:1	NA
With ExtractaBrite EI, 1 µL of 100 fg/µL OFN will produce the following minimum S/N for transition from <i>m/z</i> 272 to <i>m/z</i> 222	16,500:1	4,000:1 [‡]
In PCI mode, 1 µL of 5 pg/µL benzophenone will produce the following minimum S/N for transition from <i>m/z</i> 183 to <i>m/z</i> 105	2,500:1	800:1 [‡]
In NCI mode, 1 µL of 1 pg/µL OFN will produce the following minimum S/N for <i>m/z</i> 272	10,000:1 [‡]	3,300:1 [‡]

* He (H₂) standard specifications are performed using a 15 (30) m × 0.25 mm ID × 0.25 µm System Qualification Column (SQC). The installation specifications are performed with either He or H₂ but not both.

[†] IDL and S/N vary based on configuration purchased, the most sensitive TSQ 9610 configuration can yield this IDL and S/N.

[‡] Not always tested as an installation, these are factory specifications for reference.

[§] In the case that an autosampler is not present at install, a single injection of 1 fg OFN will be run to demonstrate the S/N install spec

System dimensions/weights

Equipment	Dimensions	Weight
Mass Spectrometer	44 × 40 × 89 cm (17.5 × 16 × 35 in)	61 kg (135 lbs)
Trace 1600 GC	45 × 44 × 60 cm (18 × 17 × 24 in)	35 kg (77 lbs)
Trace 1610 GC	45 × 44 × 67 cm (18 × 17 × 26 in)	35 kg (77 lbs)

Instrument configurations

Instrument	Source option	Extended dynamic range and lifetime detector	Vent free source exchange	Vent free column exchange	Vent free filament exchange	Use of direct probes
TSQ 9610 Medium turbo	EI ExtractaBrite	✓	×	×	×	×
TSQ 9610 Advance electron ionization (AEI)	Advanced electron ionization (AEI) source	✓	×	×	×	×
TSQ 9610 NeverVent AEI	NeverVent AEI source	✓	✓	✓	✓	×
TSQ 9610 Vacuum probe interlock (VPI)	EI ExtractaBrite/ CI ExtractaBrite	✓	✓	✓	×	✓

 Learn more at thermofisher.com/TSQ9610

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