

Agilent 5977C GC/MSD System

The Agilent 8890/5977C Series gas chromatograph/mass selective detector (GC/MSD) builds on a tradition of leadership in GC and MS technology, with the world's most competitive performance and productivity features.

Agilent GC/MSD system features

Agilent 5977C GC/MSD – the most sensitive and robust MSD provides:

- Four EI source options including the revolutionary high-efficiency source (HES), which offers the industry's lowest instrument detection limit (IDL) and best signal-to-noise ratio (S/N) and a HydroInert source for H₂ carrier gas applications.
- A heated monolithic quartz gold quadrupole (heatable up to 200 °C) for rapid elimination of contamination to keep the analyzer clean.
- A second-generation triple-axis detector (TAD) for eliminating neutral noise.
- Scan speeds up to 20,000 u/sec (extractor ion source and HES).
- An optional oil-free IDP-3 roughing pump: a cleaner, quieter, and greener alternative (for use with turbo molecular pump systems).

10-Year value promise

Support is guaranteed for 10 years from the date of purchase, or Agilent will provide credit for the residual value of the system toward a model upgrade.

Installation checkout specifications

Agilent verifies GC/MSD system performance at the customer site. IDL is a statistically based metric that more accurately confirms system performance than an S/N measurement. Test specifications are based on splitless injection into an Agilent J&W HP-5ms Ultra Inert 30 m × 0.25 mm, 0.25 µm column for helium and a 20 m × 0.18 mm, 0.18 µm column for HydroInert with hydrogen. IDL analyses use lab helium (hydrogen for HydroInert) with GC gas filters installed. See more about the IDL test at <http://www.chem.agilent.com/Library/technicaloverviews/Public/5990-8341EN.pdf>

Instrument Detection Limit (IDL)
The industry's most rigorous performance metric
Based on eight consecutive injections and their statistical analysis of precision (%RSD)
Measured at an amount near the detection limit
Accurate assessment of the true detection limit and lower limit of quantification (LLOQ)
IDL tested and proved at installation for applicable configurations

IDL Specifications			
Instrument	IDL* (Helium Carrier Gas)	IDL* (Hydrogen Carrier Gas)	Source
Installation Specifications			
Agilent 5977C HES MSD	1.5 fg	–	HES
Agilent 5977C EI/CI MSD	10 fg	–	Extractor for EI
Agilent 5977C Inert Plus EI MSD	10 fg	–	Extractor
Agilent 5977C EI MSD	20 fg	–	Stainless steel
Agilent 5977C EI MSD with Agilent 8860 GC	40 fg	–	Stainless steel
Agilent 5977C HydroInert MSD	–	50 fg	HydroInert source for H ₂ carrier gas
Reference Specifications			
Agilent 5977C HES MSD	1.0 fg	10 fg	HES
Agilent 5977C EI/CI MSD	–	50 fg	Extractor for EI
Agilent 5977C Inert Plus EI MSD	–	50 fg	Extractor
Agilent 5977C EI MSD	–	70 fg	Stainless steel

- * IDL was statistically derived at 99% confidence level from the area precision of eight sequential splitless injections of OFN (octafluoronaphthalene). Demonstration of IDL specifications require a compatible system configuration, including a liquid autosampler with a 5 µL syringe.
- HES IDL was measured using 10 fg injection, 1 µL injection.
 - Other IDLs were measured using 100 fg, 1 µL injection.
 - A 30 m column was used for helium IDL checkout; a 20 m column was used for hydrogen IDL checkout.
 - Helium carrier gas for Installation Specifications of the HES, Extractor, and Stainless steel sources; hydrogen carrier gas for Installation Specification of the HydroInert source only.
 - Reference IDL specifications from the above table will be confirmed only when purchased as an additional service with a compatible new system (GC and MS) installation.

Signal-to-noise (S/N) specifications

S/N Reference Specifications ^a							
Instrument Configuration	Source	EI Scan S/N ^b (Helium)	EI Scan S/N ^b (Hydrogen)	Sample Concentration (1 µL Injection)	PCI Scan S/N ^c	NCI Scan S/N ^d	High Vacuum System
Agilent 5977C HES MSD	HES	2,000:1	1,000:1	0.1 pg/µL OFN			Turbo molecular pump
Agilent 5977C EI/CI MSD	Extractor for EI; Agilent CI source for CI	5,000:1 (EI)	–	1 pg/µL OFN	1,200:1	2,000:1	Turbo molecular pump
Agilent 5977C Inert Plus EI MSD	Extractor	5,000:1	2,500:1	1 pg/µL OFN			Turbo molecular pump
Agilent 5977C HydroInert MSD	HydroInert	–	2,500:1	1 pg/µL OFN			Turbo molecular pump
Agilent 5977C EI MSD	Stainless steel	600:1	300:1	1 pg/µL OFN			Turbo molecular pump or diffusion pump
Agilent 5977C with Agilent 8860 GC	Stainless steel	250:1	–	1 pg/µL OFN			Turbo molecular pump or diffusion pump

^a S/N checkout is performed only if there is no compatible autosampler (which is required for IDL checkout). Helium carrier gas, manual injection using a 30 m × 0.25 mm, 0.25 µm column and in scan mode. Hydrogen carrier gas, manual injection using 20 m × 0.18 mm, 0.18 µm column and in scan mode. When the autosampler (ALS) is present, these specifications are a reference of the performance. Reference S/N specifications from the above table will not be confirmed at installation or introduction for ALS equipped systems.

^b Standard scanning from 50 to 300 u at nominal 272.0 u ion.

^c 1 µL injection of 100 pg/µL benzophenone (BZP) standard, 80 to 230 u scan at nominal 183 u ion, using methane reagent gas.

^d 2 µL injection of 100 fg/µL OFN standard scanning from 50 to 300 u at nominal 272 u ion, using methane reagent gas.

Agilent 5977C Series GC/MSD System Specifications	
Ionization Mode (Standard)	EI
Ionization Modes (Optional)	PCI, NCI, EI acquisition with CI source
EI Ion Source Type	Five supported sources: stainless steel, inert, extractor, Hydrolnert, HES
Electron Energy	5 to 241.5 eV
Emission Current	0 to 315 μ A
CI Gases	Dual gas inlet
Filaments	Dual for EI, single for CI
Transfer Line Temperature	100 to 350 °C
Ion Source Temperature	150 to 350 °C
Quadrupole Temperature	106 to 200 °C
Mass Filter	Heated monolithic hyperbolic quadrupole
Ion Source – Mass Filter Interface	Dynamically rampable entrance lens
Mass Range	0.6 to 1,091 u
Mass Resolution	Unit mass
Mass Accuracy	1 μ L injection of a 100 pg/ μ L OFN standard scanning from 50 to 300 u will give its monoisotope at m/z 271.987 \pm 0.005 ^a
Spectral Accuracy	1 μ L injection of a 100 pg/ μ L OFN standard scanning from 50 to 300 u will give 99.0% spectral accuracy ^a
Mass Axis Stability	Better than 0.10 u/48 hours
Detector	Series II triple-axis detector with high energy dynode and long-life electron multiplier (EM)
Dynamic Range (Electronic)	10 ⁶
Scan Rate ^b	Agilent 5977C Inert Plus (extractor source and Hydrolnert source) and Agilent 5977C HES up to 20,000 u/sec; Agilent 5977C (SS source) up to 12,500 u/sec
SIM	60 ions \times 100 groups
Pumping System (Helium)	65 L/s diffusion pump (available only with the 5977C EI MSD) and 255 L/s turbo pump with 2.5 m ³ /hr mechanical pump
Maximum Recommended Analytical Gas Flow	1.5 mL/min (diffusion pump) 4 mL/min (turbo pump)
Recommended Maximum Sustained Column Flow to MS ^c	3 mL/min (diffusion pump) 50 mL/min (turbo pump)
Instrument Control	Agilent MassHunter data system or OpenLab CDS
Maintenance Accessibility	Source (including filaments, lenses), mass filter ^d , and detector on removable plate for easy access
Maintenance Scheduling	Early maintenance feedback (EMF) for GC and MSD, user-defined maintenance schedule, with display of current status
Source cleaning	Automated and vent-free with proprietary JetClean option
Direct/Real-time sample analysis or probe	QuickProbe when added to the GC/MSD, enables direct analysis in real time of samples and liquids with minimal-to-no sample preparation, in under 1 minute.
Support Life	Guaranteed 10 years useable life with support for seven years

^a Only applicable with optional Accurate Mass software package. Scan mode only. Not verified during installation.

^b As scan rate increases, sensitivity will decrease, and resolution may degrade.

^c A high flow rate into a fixed ion source will cause a loss in sensitivity.

^d The heated quadrupole mass filter should not require maintenance, but if maintenance is required, it should be performed by an Agilent service engineer.

GC (Agilent 8890, 8860 and Intuvo 9000 GC)	
GC	Intuvo 9000 GC, 8890 GC and 8860 GC – see www.agilent.com for details.
Sample Introduction	Agilent 7693A automatic liquid sampler, 7650A automatic liquid sampler, CTC PAL3, 8697A headspace sampler, 7697A headspace sampler, thermal desorption, headspace, purge and trap, and other third party devices
Liner Replacement	Compatible with turn-top system
Inlet (Up to Two)	Split-splitless inlet (standard), multimode inlet (MMI) (on the 8890 and Intuvo GC), cool on column (COC) inlet, and others (optional)
Oven Temperature	8890 and Intuvo GC: Ambient +4 to 450 °C 8860 GC: Ambient +8 to 425 °C
Oven Ramps/Plateaus	20/21 with negative ramps allowed Max Heating Ramp: 8890 GC: 120 C/min 8860 GC: 75 C/min Intuvo 9000 GC: 250 C/min
Carrier Gases	helium, hydrogen, nitrogen
Electronic Pneumatic Control (EPC)	EPC split/splitless, septum purge and auxiliary EPC modules
Carrier Gas Control Modes	Constant flow, constant pressure, programmable flow and programmable pressure
Pressure Range	8890 GC and Intuvo 9000 GC: 0 to 100 psi (standard), 0 to 150 psi (optional) with 0.001 psi resolution 8860 GC: 0 to 100 psi with 0.01 psi resolution
Flow Control	8890 GC and Intuvo 9000 GC: Compatible with optional capillary flow device controller (not supported with 8860 GC)
Retention-Time Locking	RTL-ready

Ease of Maintenance	
Turn top inlet sealing system is built in standard with each 8890 and 8860 GC S/SL inlet (and 8890 multimode inlet) for quick, easy injector liner changes. ^a	
A glass window shows ion source type, filament operation, and ion source connections.	
The source (including filaments and lenses) and electron multiplier can be removed from the instrument in less than one minute after venting.	
The optional micro ion gauge ^b can be replaced without removal of the mass spectrometer covers.	

^a Inlet temperature should be cool enough to touch when performing maintenance.

^b A micro ion gauge is shipped standard for the CI system, and is available optionally for EI systems.

Data System	
Acquisition Software	Agilent MassHunter GC/MS Acquisition and OpenLab CDS Acquisition
Simultaneous MS and GC Signals	Up to two MSD signals (SIM/scan) and four GC detector signals per instrument
Instrument Connections (Agilent MassHunter Acquisition)	Four instruments total: up to two GC/MSDs or four GCs
SIM/scan	Automated SIM setup and synchronous SIM/scan operation; CI optimization in both PCI and NCI modes for common reagent gases
Chemical ionization Setup	Electronic mass flow control of reagent gases
High-Mass Confirmation	Verification test kit (optional)
Tune Options	Autotune (Atune.U), Extraction source tune (Etune.U), BFB Autotune (BFB_Atune.U), Standard Spectra Tune (Stune.U), DFTPP (target tune for USEPA semivolatiles method 8270), BFB (target tune for VOC analysis)
Data Analysis Software	Agilent MassHunter and classic Agilent MSD ChemStation or Agilent OpenLab CDS (version 2.0 or greater)
Application Reports	Environmental, drugs-of-abuse, aromatics in gasoline
Custom Reporting	Agilent MassHunter: Microsoft Excel, classic Agilent MSD ChemStation: custom reporting
Spectral Libraries (optional)	NIST, Wiley/NIST, Maurer/Pfleger/Weber Drug
Agilent Retention Time Locked Mass Spectral Libraries (Optional)	Pesticides and endocrine disrupter databases, volatiles, PCBs, toxicology, hazardous chemicals, indoor air toxics, Japan Positive List, forensic toxicology, environment semivolatiles, metabolomics (Fiehn method)
Target Deconvolution	Integrated deconvolution and spectral matching for identification and quantitation of low-level targets in complex matrices
Security	Data and result security and tamper detection
21CFR11 Compliance	Agilent MassHunter Quantitative Analysis and Agilent MassHunter GC/MS Acquisition tools or Agilent OpenLab CDS (version 2.0 or greater)
Multivariate Analysis (Optional)	Agilent Mass Profiler Professional
Sample Class Prediction (Optional)	Sample Class Predictor or Agilent Mass Profiler Professional
Other Capabilities (Optional)	Deconvolution reporting software linked with RTL database for classic MSD ChemStation Accurate mass data with Cerno MassWorks Software

Safety, Regulatory Compliance, and Operational Conditions

This instrument is manufactured and distributed under a quality system certified to ISO9001. It complies with international regulatory, safety, and electromagnetic compatibility requirements. In addition, further testing was performed according to Agilent standards, to ensure operation after delivery and long-term usage.

Safety	Canadian Standards Association (CSA): CAN/CSA-C22.2 No. 61010-1 CSA/Nationally Recognized Test Laboratory (NRTL): UL 61010-1 International Electrotechnical Commission (IEC): 61010-1 EuroNorm (EN): 61010-1
Electromagnetic Compatibility	CISPR11/EN55011:Group1, Class A EN61326-1
Sound Emission	ISO 7779 and ISO 3744- sound pressure Lp For noisy lab space: L _{PA} max. = 65 dB operator, 70 dB bystander
Power	120 V, 50/60 Hz, 1,100 VA; 200 V, 50/60 Hz, 1,100 VA; 220 to 240 V, 50/60 Hz, 1,100 VA
Operating Environment	Operational: 15 to 35 °C, 20 to 80%, relative humidity – noncondensing Storage: –40 °C to +70 °C, 0 to 95%, relative humidity – noncondensing
Operating Altitude	Turbo models: to 15,000 ft (4,572 m) Diffusion pump models: 12,000 ft (3,658 m)
Nonoperating Storage	Turbo and diffusion pump models: 30,000 ft (9,144 m)

Physical Requirements with the 8890 and 8860 GC

Dimensions (GC/MS)	88 cm (w), 56 cm (d), 50 cm (h) Additional space should be added for the auto injector, sample tray, data system, and printer.
Weight (GC/MS)	81 to 112 kg (depending on configuration)

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