

Specifications for Gas Chromatography

Chromatographic Performance:

Retention time performance Retention time repeatability - < 0.008% or < 0.0008 min
Area repeatability - < 1% RSD, using 2ng tetradecane

System Capabilities:

GC Configuration Must support simultaneously:
- two inlets
- three detectors
(third detector as TCD,)
- four detector signals
Note: 1 – 3rd detector can alternately be an MSD.

EPC Modules / EPC Channels Must be able to install up to six EPC modules, providing control of up to
16 channels of EPC

Leak tests Must provide preprogrammed leak tests available from keyboard or
monitoring software

Column Oven:

Oven ramps / plateaus Oven must support 20 oven ramps with 21 plateaus. Negative ramps are
allowed.

Oven cool down Oven cool down (22 °C ambient) 450 to 50 °C in 4.0 min (3.5 min with
oven insert accessory).

Oven power safety Oven power must turn-off automatically when the lid/door is opened.

Electronic pneumatic control:

Inlet Pneumatics Inlet must have Electronic pneumatic control of carrier, split and septum
purge gases, including electronic ON/OFF

Pressure set point precision and control Pressure set points must be able to be adjusted by increments of 0.001
psi, with typical control \pm 0.001 for the range 0.000 to 99.999 psi; 0.01
psi for the range 100.00 psi to 150.00 psi

Split / Split less Inlet:

Total flow range of SSL Must be able to set total flow range:
0 to 200 mL/min N₂
0 to 1,250 mL/min H₂ or He

Inlet maintenance of SSL Inlet sealing system is built in standard with each S/SL inlet for quick,
easy, injector liner changes in less than 30 seconds.

Purged packed Inlet:

Direct injection	Must be able to direct inject onto packed and wide-bore capillary columns.
Flame Ionization detector:	
Sensitivity	Minimum detectable level (for tridecane): < 1.8 pg C/s
Linear Dynamic Range	Linear dynamic range: >10 ⁷ (± 10%).
Linear Dynamic Range	Full-range digital data path enables peaks to be quantified over the entire 10 ⁷ concentration range in a single run, without the need to set a switch or software setting to obtain this full range of data.
Data rate of FID	Must be able to set data rate up to 500 Hz
Thermal conductivity detector:	
Sensitivity of TCD	Minimum detectable level: 400 pg tridecane/mL with He carrier.
Linear Dynamic Range of TCD	Linear dynamic range: > 10 ⁵ ± 5%, entire range available simultaneously in the digital data path (to the chemstation, eg)
Fluidic switching design	Fluidic switching design
Software:	
Compatible with Latest Windows operating system with seamless integration & control of all the GC parameters.	
Software -Monitoring & Diagnostic Software:	<p>The GC (even multiple GC's) must be able to interface to a (optional) comprehensive real-time monitoring and diagnostic software which includes all of the following items:</p> <ul style="list-style-type: none"> • Real time notification via advisories and indicators, • Counters, • Chromatographic attributes, • Instrument diagnostics, including leak tests, • Access to maintenance, run and even logs, • Access to maintenance information, such as manuals and videos, • Provides a link to optional, Web-enabled Agilent Intelligent Services to back up your internal service and support resources.
Software -Retention Time-Locking software:	The GC data system must have an integrated retention time - locking module for analyzing target compounds in complex matrices.
Columns: One general purpose J & W DB-5 MS Capillary column 0.32 mm id.	

Specifications for Mass Spectrometer

The following are specifications for a Mass Spectrometer, which is to be interfaced in a gas chromatograph, auto sampler and data system.

Detector Type	The Mass Spectrometer's detector shall be a Triple-Axis HED-EM, which places the HED-EM doubly off-axis from the axis of the transmission quadrupole
Gain Normalization Auto tune	The Mass Spectrometer must have a Gain Normalized Auto tune which optimizes the EM's gain to ensure the optimal balance between ion count, linearity and EM life expectancy.
Helium (He) Electron Impact Sensitivity SCAN mode:	1 pg OFN gives > 400:1 S/N scanning from 50-300 μ at nominal m/z 272 ion demonstrated at install
He Electron Impact Sensitivity	SIM mode: 20 fg OFN gives > 10:1 S/N at nominal m/z 272
High Vacuum Pumping Speed	The high-vacuum region must utilize an air-cooled high-vacuum turbo pump with a minimum pumping speed of 262 Liters/second with 2.5 to 2.9 (50-60 Hz) m ³ /hr rotary vane rough pump or with 3.0 to 3.8 m ³ /hr oil free pump.
Max Flow (for optimal chromatography and sensitivity flow should be between 1 and 2 ml/min in EI)	6 ml/min
Scan Rate	The Mass Spectrometer shall have an <u>electronic</u> scan rate of 12,500 μ /sec.
Scan increment	Scanning at the increments of 0.1 u for better mass resolution
<u>Monolithic</u> quartz structure, hyperbolic form quadrupole	Mass Spectrometer must utilize a Quadrupole Mass Filter consisting of a <u>monolithic</u> quartz structure. A quadrupole consisting of 4 separate rods is NOT acceptable. The rods must have a true hyperbolic shape in keeping with quadrupole theory. The Quadrupole is to be independently heated and its temperature is to be user-selectable from 100 – 200° C.
Mass Range	The instrument must scan from 1.6 to 1050 μ .
Inert ion source	The mass spectrometer must use an ion source where the metallic parts are constructed from inert material. Stainless steel is NOT acceptable nor is coating the metallic parts with an inert material.
Programmable source up to 350°C	The ion source of the mass spectrometer must be able to reach 350 ° C in a programmable way.
Entrance Lens (not a prefilter)	Entrance Lens for ion source.

SIM Capacity	The mass spectrometer shall have the capability to create 100 SIM ion groups with up to 60 ions per group.
SIM speed	Down to 0.1 msec.
High Performance Synchronous SIM/Scan	The mass spectrometer's electronics must have the efficiency to support synchronous SIM/Scan. Synchronous SIM/Scan is a mode of operation that enables collection of both SIM data and full scan data in the same acquisition cycle. The fast electronics of the GC/MS system provides very fast and flexible SIM and Scan. SIM dwell times can be set in 1 msec increments from higher than 100 msec to as low as 1 msec dwell, allowing rapid analysis with more compounds and more samples.
Automatic setup of SIM/scan method	The system must be able to automatically set up a SIM/scan method from an injected standard.
Local User Interface	The Mass Spectrometer is to have a Local User Interface (LUSI) so that local control of the instrument can be achieved while the mass spectrometer's data system is remotely located.
EI run with CI source	Autotune of CI source for EI mode
Automated SIM setup	The mass spectrometer must have an automated SIM setup that can convert a full scan method to a SIM or SIM/Scan method. The software must automatically configure the number of SIM groups, SIM cycles across the peak, and the ions added to each group.
Multiple instrument and detector control and acquisition	The MS data system must be capable of controlling 2 complete GC/MSD systems and 2 additional GC's with one detector each simultaneously from a single PC data system.
Retention Time-Locking software	The mass spectrometer data system must have an integrated retention time-locking module for analyzing target compounds in complex matrices. The software module must provide the creation of custom compound databases as well as the utilization of vendor provided databases. Vendor databases include: pesticides and endocrine disruptors, PCB's, VOC's, Fatty Acid Methyl Esters, Drugs of Abuse, and Flavors and Fragrances.
Ambient temperature and pressure compensation	The Gas Chromatograph must have ambient temperature and pressure compensation feedback for electronic pneumatic control for all inlets and detectors.
Auxiliary EPC modules	The Gas Chromatograph must have an Optional 3 channel module of auxiliary EPC to be used for flow control of external sampling devices such as a thermal <u>desorber</u> shall be available.
Factory performance verification and single system shipment	The Gas Chromatograph and Mass Spectrometer must be factory tested in the configuration that will be installed in the customer's site. All parts of the system should be included in the shipment.

10-Year Value Guarantee

System shall have a ten year value guarantee such that vendor shall have ten years' guaranteed parts and comprehensive service available or give residual value credit for replacement.