

Agilent Intuvo 9000 Gas Chromatograph System



The Agilent Intuvo 9000 GC System is a new breed of GC from the industry leader in GC innovation. Intuvo accomplishes GC in a completely new way, and clears a completely new path to productivity.

Intuvo brings you a suite of enabling technologies unavailable elsewhere:

- Direct heating, shorter cycle times – Planar column design
- Fast, confident column changes – Click and run connections
- An end to column trimming – Intuvo Guard Chip technology
- Critical instrument information instantly – Intuitive touch screen
- More free lab space – Half the footprint of a conventional oven GC

Visit www.agilent.com/chem/intuvo, and discover just how much innovation Agilent has managed to pack into such a small box.

Chromatographic performance*

- Retention time repeatability <0.008% or <0.0008 minutes
- Area repeatability <1% RSD

System capabilities

- Supports:
 - Inlets: SSL, MMI
 - Detectors: FID, TCD, ECD, NPD, FPD, SCD/NCD, Mass Spec (single and triple quad)
 - Four detector signals
- State-of-the-art detector electronics and the full-range digital data path enable peaks to be quantified over the entire concentration range of the detector (10^7 for the FID) in a single run.
- Full EPC is available for all inlets and detectors. Control range and resolution are optimized for the specific inlet or detector module.
- Pressure setpoint and control precision to 0.001 psi provides more retention time locking precision for low-pressure applications.
- EPC provides four column flow control modes: constant pressure, ramped pressure (three ramps), constant flow, or ramped flow (three ramps). Column average linear velocity is calculated.
- Atmospheric pressure and temperature compensation is standard, so results do not change, even when the laboratory environment changes.

- Automatic leak checking can be enabled by user for every run or run any time during maintenance or diagnostic tasks. System alerts the user when a leak is detected so immediate action can be taken to correct and minimize downtime.
- A run time deviation log is created for each analysis to ensure that all method parameters were achieved and maintained.
- Automatic Liquid Sampling is fully integrated into GC control.
- Display of all GC and ALS setpoints at the GC or data system.
- Built-in context sensitive help available on color touchscreen interface.
- Web interface available to view status, user information, and monitor runs.

GC color touchscreen interface

Available in English, Chinese, or Japanese

Column oven

- Accommodates up to two 30 m × 0.320 mm id capillary columns or one 60 m × 0.320 mm id capillary column
- Support columns 0.150 mm to 0.320 mm id
- Operating temperature range suitable for all columns and chromatographic separations. Ambient temperature +10 °C to 450 °C
- Temperature setpoint resolution: 0.1 °C
- Supports 20 oven ramps with 21 plateaus. Negative ramps are allowed.
- Maximum achievable temperature ramp rate: 250 °C/min

- Maximum run time: 999.99 minutes (16.7 hours)
- Oven cool down (22 °C ambient) 450 to 50 °C in less than 3 minutes

Electronic pneumatics control (EPC)

- Compensation for barometric pressure and ambient temperature changes is standard.
- Pressure has typical control of 0.001 psi for the range of 0 to 150 psi. Pressure setpoints may be adjusted in increments of 0.001 for the range 0.000 to 99.999 psi; 0.01 psi for the range 100.00 to 150.00 psi.
- User may select pressure units as psi, kPa, or bar.
- Pressure/flow ramps: Three maximum.
- Carrier and makeup gas settings selectable for He, H₂, N₂, and argon/methane.
- Flow or pressure setpoints for each inlet or detector parameter with both Agilent Intuvo 9000 and Agilent data system software.
- Constant flow mode is available when capillary column dimensions are loaded from the installed column(s) through the Agilent Intuvo Smart ID Key, or manually entered.
- Split/splitless and Multimode inlets have flow sensors for the control of split ratio.
- Inlet modules

Pressure sensors

Accuracy	<±2% full scale
Repeatability	<±0.05 psi
Temperature coefficient	<±0.01 psi/°C
Drift	<±0.1 psi/6 months

* Using an Agilent Intuvo 9000 with EPC (splitless), ALS, and Agilent Data System for analysis of tetradecane (2 ng to the column). Results may vary with other samples and conditions.

Flow sensors

Accuracy	<±5% depending on carrier gas
Repeatability	<±0.35% of setpoint
Temperature coefficient	<±0.20 mL/min (NTP)* per °C for He or H ₂ ; <±0.05 mL/min NTP per °C for N ₂ or Ar/CH ₄

* NTP = 25 °C and 1 atmosphere

Detector modules

Accuracy	<±3 mL/min NTP or 7% or setpoint
Repeatability	<±0.35 % or setpoint

Inlets

- Maximum of one inlet installed
- EPC compensated for atmospheric pressure and temperature variation

S/SL

- Split ratios up to 12,500:1 to avoid column overload. Setting split ratios (particularly low split ratios) is limited by column parameters and control of system flows (particularly low system flows).
 - Splitless mode for trace analysis. Pressure-pulsed splitless is easily accessible for best performance.
 - Maximum temperature: 400 °C.
 - EPC available in two pressure ranges: 0 to 100 psig (0 to 680 kPa) for best control for columns ≥0.200 mm diameter; 0 to 150 psig for columns <0.200 mm diameter.
 - Gas saver mode to reduce gas consumption without compromising performance.
 - Electronic septum purge flow control to eliminate ghost peaks.
 - Total flow setting range:
 - 0 to 500 mL/min N₂
 - 0 to 1,250 mL/min H₂ or He
- Turn top inlet sealing system is built in standard with each Agilent Intuvo 9000 S/SL inlet for quick, easy, injector liner changes.
 - Optional inert S/SL inlet includes chemical deactivation process for weldment and weldment insert.

MMI

- Provides the flexibility of a standard Agilent split/splitless inlet, combined with temperature programmable capabilities, which allow for large volume injection.
- Temperature control: LCO₂ (to -70 °C), air cooling (to ambient +10 °C with oven temperature <50 °C) (due to high consumption, air cooling with cylinders is not advised). Temperature programming of up to 10 ramps at up to 900 °C/min. Maximum temperature: 450 °C.
- Injection modes:
 - Hot or cold split/splitless
 - Pulsed split/splitless
 - Solvent vent
 - Direct
- Suitable for all capillary columns that Intuvo supports.
- EPC pressure range (psig): 0 to 100 psig
- Split ratio: up to 12,500 to 1 to avoid column overload. Setting split ratios (particularly low split ratios) is limited by column parameters and control of system flows (particularly low system flows).
- Splitless mode for trace analysis. Pressure pulsed splitless is easily accessible for improved performance.
- Electronic septum purge flow control
- Compatible with Merlin Microseal septum

- Setup of parameters facilitated with Agilent Solvent Elimination Calculator
- Total flow setting range:
 - 0 to 500 mL/min N₂
 - 0 to 1,250 mL/min H₂ or He
- Turn-top inlet sealing system is built in standard with each Agilent Intuvo 9000 Multimode inlet for quick, easy injector liner changes.

Detectors

- Electronic pneumatics control and electronic on/off for all detector gases
- EPC compensated for atmospheric pressure and temperature variation

Flame ionization detector (FID)

- FID that responds to most organic compounds
- Minimum detectable level (for tridecane): <1.4 pg C/s
- Linear dynamic range: >10⁷ (±10%). Full-range digital data path enables peaks to be quantified over the entire 10⁷ concentration range in a single run.
- Data rates up to 1,000 Hz accommodate peaks as narrow as 10 msec at half height.
- Standard electronic pneumatic control for three gases:
 - Air: 0 to 800 mL/min
 - H₂: 0 to 100 mL/min
 - Makeup gas (N₂ or He): 0 to 100 mL/min
- Capillary only configuration
- Flameout detection and automatic re-ignition
- 450 °C maximum operating temperature

Thermal conductivity detector (TCD)

- A universal detector that responds to all compounds, excluding the carrier gas.
- Minimum detectable level: 400 pg tridecane/mL with He carrier. (This value may be affected by laboratory environment).
- Linear dynamic range: $>10^5 \pm 5\%$
- Unique fluidic switching design provides rapid stabilization from turn-on, low-drift performance.
- Signal polarity can be run-programmed for components having higher thermal conductivity than the carrier gas.
- Maximum temperature: 400 °C
- Standard EPC for two gases (He, H₂, or N₂ matched to carrier gas type)
- Makeup gas: 0 to 12 mL/min
- Reference gas: 5 to 100 mL/min

Micro-ECD

- Micro-electron capture detector (micro-ECD), a very sensitive detector for electrophilic compounds such as halogenated organic compounds.
- Minimum detectable level: <4.4 fg/mL lindane At standard checkout conditions, with a detector temperature of 300 °C and flow to the detector (makeup plus column) of 30 mL/min N₂, this is equivalent to 4.5 fg/sec.
- Proprietary signal linearization Linear dynamic range: $>5 \times 10^4$ with lindane
- Data acquisition rate: up to 500 Hz
- Uses β emission of <15 mCi ⁶³Ni as the electron source.
- Unique micro-cell design minimizes contamination and optimizes sensitivity.

- Maximum temperature: 400 °C
- Standard EPC makeup gas types: argon/5% methane or nitrogen; 0 to 200 mL/min

Nitrogen-phosphorus detector (NPD)

- NPD with Bloss (glass) bead, a detector specific to nitrogen or phosphorus-containing compounds.
- With azobenzene/malathion/octadecane mixture:
 - MDL of <0.08 pg N/sec
 - MDL of <0.01 pg P/sec
 - Dynamic range $>10^5$ for Nitrogen
 - Dynamic range $>10^5$ for Phosphorus
 - Selectivity of >25,000 to 1 (g N/g C)
 - Selectivity of >200,000 to 1 (g P/g C)
- Data rates from 0.1 to 1,000 Hz
- Air flow settable from 0 to 200 mL/min
- Hydrogen flow settable from 0 to 20 mL/min
- Makeup gas (He or N₂) flow settable from 0 to 100 mL/min
- Maximum temperature: 400 °C

Flame photometric detector (FPD) + (Plus)

- Single-wavelength FPD, a sensitive, specific detector to sulfur- or phosphorus-containing compounds.
- With methyl parathion:
 - MDL <45 fg P/sec
 - MDL <2.5 pg S/sec
 - Dynamic range of $>10^3$ S
 - Dynamic range of $>10^4$ P
 - Selectivity of 10⁶ g S/g C
 - Selectivity of 10⁶ g P/g C

- Data rates from 0.1 to 500 Hz
- Air flow settable from 0 to 200 mL/min
- H₂ flow settable from 0 to 250 mL/min
- Makeup gas (N₂) flow settable from 0 to 130 mL/min
- Maximum transfer line temperature of 400 °C

SCD (Model 8355)

- Highest sensitivity and selectivity for sulfur-containing compounds
- MDL: Typical <0.5 pg/s, dimethyl sulfide in toluene
- Linear dynamic range: $>10^4$
- Selectivity: $>2 \times 10^7$ g S/g C

NCD (Model 8255)

- High selectivity for nitrogen containing compounds.
- MDL: <3 pg N/s, in both N and nitrosamine modes, 25 ppm N as nitrobenzene in toluene
- Linear dynamic range: $>10^4$
- Selectivity: $>2 \times 10^7$ g N/g C (selectivity in nitrosamine mode is matrix-dependent)

See Agilent Sulfur Chemiluminescence Detector and Nitrogen Chemiluminescence Detector Specification Guide for additional information regarding performance and physical and environmental specifications.

Mass spectrometers

- See Agilent 5977 Series MSD specifications.
- See Agilent 7000/7010 Triple Quadrupole GC/MS specifications.

Data communications

- LAN
- Two analog output channels
- (1 mV, 1 V, and 10 V output available) as standard
- Remote start/stop
- Binary-coded decimal input for a stream selection valve

Maintenance and support services

Integrated early maintenance counters allows planned maintenance and helps eliminate unnecessary downtime.

- Instrument events or shutdowns displayed on keyboard display or Data System
- Remote diagnostics
- Performance verification services
- Easy parts identification and part number finder software (standalone software, does not require Agilent CDS)

Dimensions and weight

Height	51 cm (20 in)
Width	27 cm (10.7 in)
Depth	69 cm (27.2 in)
Weight	31.8 kg (70 lbs)

Environmental conditions

- Ambient operating temperature: 15 to 35 °C
- Ambient operating humidity: 5% to 90% (noncondensing)
- Storage extremes: -40 to 70 °C
- Power requirements: Line voltage:
 - 120 VAC and 200 to 240 VAC ±10% of nominal
 - Frequency: 50/60 Hz

Safety and regulatory certification

Conforms to the following safety standards:

- Canadian Standards Association (CSA) C22.2 No. 60101-1
- Nationally Recognized Test Laboratory (NRTL): ANSI/UL61010-1
- International Electrotechnical Commission (IEC): 61010-1, 60101-2-010, 60101-2-081
- EuroNorm (EN): 61010-1

Conforms to the following regulations on Electromagnetic Compatibility (EMC) and Radio Frequency Interference (RFI):

- CISPR 11/EN 55011: Group 1 Class A
- IEC/EN 61326
- AUS/NZ CISPR11
- This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme à la norme NMB-001 du Canada.
- Designed and manufactured under a quality system registered to ISO9001, Declaration of Conformity available.

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