# Agilent Intuvo 9000 Gas Chromatograph System

## Data Sheet


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 0.100 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, $H_2$, $N_2$, 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.

*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.

- 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 |

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 7,500:1 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 $N_2$
  - 0 to 1,250 mL/min $H_2$ 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: $LCO_2$ (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 7,500 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 $N_2$
  - 0 to 1,250 mL/min $H_2$ 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: $>10^7$ (±10 %). Full-range digital data path enables peaks to be quantified over the entire $10^7$ 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
  - $H_2$: 0 to 100 mL/min
  - Makeup gas ($N_2$ 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 2 gases (He, $H_2$, or $N_2$ matched to carrier gas type)
- Make-up gas: 0 to 12 mL/min
- Reference gas: 0 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 $N_2$, 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 50 Hz
- Uses β emission of < 15 mCi $^{63}$Ni 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 150 mL/min

## Nitrogen-phosphorus detector (NPD)

- NPD with Blos (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 $N_2$) 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 $10^6$ g S/g C
  - Selectivity of $10^6$ g P/g C
- Data rates from 0.1 to 200 Hz
- Air flow settable from 0 to 200 mL/min
- $H_2$ flow settable from 0 to 250 mL/min
- Makeup gas ($N_2$) 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 °C to 35 °C
- Ambient operating humidity: 5 % to 95 % (noncondensing)
- Storage extremes: –40 °C to 70 °C
- Power requirements:
  Line voltage:
  - 120/200/220/230/240 Volts ±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.

## For More Information

For more information on our products and services, visit our Web site at www.agilent.com/chem.

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