Data Sheet

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Agilent 8890B Gas Chromatograph

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The Agilent 8890B GC delivers high-performance gas chromatography through advanced electronic pneumatic control, precise oven temperature management, and Agilent capillary flow technology, which provides reliable, leak-free, in-oven connections and supports flexible system configurations with minimal method development time.

An upgrade, more responsive 7-inch capacitive touchscreen and a full Agilent GC Assist interface, offer real-time status, configuration, signal monitoring, and remote access for setup, troubleshooting, leak checking, maintenance, and method management across devices.

Sustainability features include programmable sleep and wake modes to reduce resource consumption, along with gas and power usage calculators that track method-level efficiency.

Known for reliability and long life, Agilent GC systems are supported by a 10-year use guarantee to ensure a low cost of ownership.

GC system capabilities

Retention time repeatability: < 0.008% or < 0.0008 minutes

Area repeatability: < 0.5% RSD

- Built-in intelligence autonomously monitors the health of the system, alerts the user of potential issues before they affect chromatographic performance, and offers helpful step-by-step guides to resolve issues.
- The 7-inch touch screen gives a visual report of the system configuration, letting you update the active method, perform maintenance routines, and check GC instrument status.
- The GC Assist interface provides remote connectivity enabling you to monitor your smart GC system, check system logs, and perform diagnostics tests, from inside or outside the laboratory.
- Maintenance and service modes, including autonomous leak checks, are easily accessed from the touchscreen and browser interface.
- Atmospheric pressure and temperature compensation are built into every system, so results do not change, even when the laboratory environment does.
- Automatic liquid sampling is fully integrated into mainframe control and includes up to 3-layer sandwich injections and sample preparation capabilities such as heating, mixing, standard addition, and derivatizations.

Simultaneously supports

- Two inlets
- Five detectors
- Four detectors (with additional large valve oven option)
- Support for up to 10 valves
- Six GC column Smart Key ports

Instrument dimensions

- **Height:** 49 cm (19.2 in)
- **Width:** 58 cm (22.9 in) with EPC inlet and detectors; 68 cm (26.8 in) with detector as TCD or with certain valving options mounted on the left side of the GC
- **Depth:** 51 cm (20.2 in)
- **Typical weight:** 49 kg (108 lb)

Maintenance and support services

- Integrated early maintenance counters that allow planned maintenance and help 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)

Sustainability

- Programmable eco-friendly sleep and wake modes reduce power and gas consumption during periods of inactivity.
- The gas and power usage tracker calculates resource consumption by analytical method.
- Built-in intelligence autonomously monitors the health of the system, alerts the user of potential issues before they affect chromatographic performance, and offers helpful step-by-step guides to resolve issues.
- Helium conservation module, gas saver, and alternative carrier gas solutions can dramatically reduce the amount of helium used (up to 50%), offering flexibility and cost savings.

Table 1. Typical 8890B GC power consumption.

Typical Power Consumption	Operating Conditions (kWh)	Sleep/Idle Conditions (kWh)
8890B	0.856	0.140

Column oven

- Oven light feature with user-controlled brightness illuminates entire oven, simplifying maintenance tasks
- Column oven dimensions: 28 × 31 × 16 cm
  - Accommodates up to two 105 m × 0.530 mm id capillary columns, or two 10-ft glass-packed columns (9 in coil diameter, 1/4 in od), or two 20-ft stainless steel packed columns (1/8 in od)
- Operating temperature range suitable for all columns and chromatographic separations. Ambient temperature +4 to 450 °C
  - With LN_2 cryogenic cooling: –80 to 450 °C
  - With CO_2 cryogenic cooling: –40 to 450 °C
- Temperature setpoint resolution: 0.1 °C
- Supports 32 oven ramps with 33 plateaus. Negative ramps are allowed.
- Maximum run time: 999.99 minutes (16.7 hours)
- Ambient rejection: < 0.01 °C per 1 °C
- See Table 2 for full oven ramp and cool-down rates

Table 2. Typical 8890B GC oven ramp and cool-down rates.

Temperature Range (°C)	120 V Oven* Rates (°C/min)	Faster Ramp Rates** (°C/min)	
		Dual-Channel	Single-Channel***
50 to 70	100	135	135
70 to 115	65	100	125
115 to 175	45	80	115
175 to 300	30	50	85
300 to 450	20	35	65
Oven Cool Down (min)**			
Without Rapid Cooling Fan	3.4	3.4	2.5
With Rapid Cooling Fan	**2.8**	**2.8**	**2.0**

* Results obtained with line voltage maintained at 120 V.
** Fast ramp rates require power > 200 volts at >15 amps.
*** Requires G2646-60500 oven insert accessory.
**** Cool-down rates for 120 V and > 200 V GC mainframe.

Electronic pneumatics control (EPC)

- Up to eight EPC modules can be installed, providing control of up to 19 channels of EPC.
- Compensation for barometric pressure and ambient temperature changes is standard.
- Carrier and makeup gas settings selectable for He, H_2, N_2, argon, and methane.
- 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, and 0.01 for the range 100.00 to 150.00 psi. See Table 3 for module specifications.

Table 3. EPC module specifications.

	Inlet Modules	Flow Modules	Detector Modules
Accuracy	< ±1% full scale	< ±3% all gases	< ±3 mL/min or 7% of setpoint
Repeatability	< ±0.0125 psi (half of 0.025 pressure hysteresis)	< ±0.2% of setpoint	< ±0.124% of setpoint
Temperature Coefficient	< ±0.002 psi/°C offset ±0.005 psi/°C spa	< ±0.008 mL/min (NTP) per °C for all gases	N/A

NTP = 25 °C and 1 atmosphere
N/A = Not applicable

Inlets

Supported inlets (see Table 4 for specifications)

- Split/splitless (S/SL)
- Multimode inlet (MMI)
- Programmable temperature vaporizer (PTV)
- Temperature-programmable cool on-column injection (PCOC)
- Purged packed injection port (PPIP)
- Volatiles inlet (VI)

Table 4. Supported inlets.

	S/SL	MMI	PCOC	PPIP	PTV	VI
Supported Columns	Suitable for all capillary columns (50 to 530 µm id)	Suitable for all capillary columns (50 to 530 µm id)	Suitable for all capillary columns (50 to 530 µm id)	Packed, wide-bore capillary 1/8-in. packed columns and 0.530 mm capillary	Suitable for all capillary columns (50 to 530 µm id)	Suitable for all capillary columns (50 to 530 µm id)
Electronic Septum Purge	Included	Included	Included	Included	Included	Included
Gas Saver Mode	Available	Available	N/A	N/A	Available	Available
Total Flow Setting	0 to 600 mL/min N_2 0 to 1,350 mL/min H_2 or He 0 to 300 mL/min argon/CH_4	0 to 600 mL/min N_2 0 to 1,350 mL/min H_2 or He 0 to 300 mL/min argon/CH_4	0 to 200 mL/min He, H_2, N_2, Ar, and Me	0.0 to 200.0 mL/min	0 to 600 mL/min N_2 0 to 1,350 mL/min H_2 or He 0 to 300 mL/min argon/CH_4	100 mL/min He and H_2
Injection Mode	Split/splitless, Pulsed split/splitless, Direct	Hot or cold Split/splitless, Large volume, Pulsed split/splitless, Solvent vent, Direct	Direct	Direct	Hot or cold Split/splitless, Large volume	Split/splitless Direct
Split Ratio	13,500:1	13,500:1	N/A	N/A	13,500:1	Up to 100:1 split ratio
Pressure Range	0 to 100 psig (0 to 680 kPa) for columns ≥ 0.200 mm diameter 0 to 150 psig for columns < 0.200 mm diameter	0 to 100 psig	0 to 100 psig	0 to 100 psig	0 to 100 psig	H_2 or He carrier, 0.00 to 100 psig pressure control, 0.0 to 100 mL/min flow control
Max. Operating Temperature (and Temperature Ranges)	400 °C	450 °C LN_2 (to −160 °C) LCO_2 (to −70 °C) Air (to ambient +10 °C with oven temperature < 50 °C)	450 °C Sub-ambient control to −40 °C is optional	400 °C	450 °C LN_2 (to −160 °C) LCO_2 (to −65 °C)	400 °C
Programable Temperature Ramps	N/A	10	3	N/A	3	N/A
Heating Rate	N/A	900 °C/min	N/A	N/A	720 °C/min	N/A

N/A = Not applicable

Detectors

Flame ionization detector (FID)

- Responds to most organic compounds
- Available in two versions: capillary and packed column optimized. 1/8 in and 1/4 in adapters are available.

Minimum Detectable Level	< 1.0 pg C/s
Linear Dynamic Range	> 10^7 (±10%)
Max Acquisition Rate	1,000 Hz*
Max Operating Temperature	450 °C
Flameout Detection and Automatic Reignition	Defualt
Configurations	FID can be mounted as an additional detector on the left side of the GC
Flow Rate Settings	Air: 0 to 800 mL/min H_2: 0 to 100 mL/min Make-up gas (N_2 or He): 0 to 100 mL/min

* Accommodates peaks as narrow as 5 ms at half height.

Thermal conductivity detector (TCD)

- Universal detector that responds to all compounds, excluding the carrier gas.
- Unique fluidic switching design provides rapid stabilization from turn-on, low-drift performance.
- Signal polarity can be runprogrammed for components having higher thermal conductivity than the carrier gas.

Minimum Detectable Level	400 pg tridecane/mL with He carrier
Linear Dynamic Range	> 10^5 ±5%
Max Operating Temperature	400 °C
Configurations	TCD can be mounted as an additional detector on side or as aux detector on top of GC
Flow Rate Settings	Make-up gas: 0 to 12 mL/min Reference gas: 5 to 100 mL/min

Electron capture detector (ECD)

- A very sensitive detector for electrophilic compounds such as halogenated organic compounds
- Unique micro-cell design minimizes contamination and optimizes sensitivity
- Uses β emission of < 15 mCi ^{63}Ni as the electron source
- Proprietary signal linearization

Minimum Detectable Level	< 3.8 fg/mL lindane
Linear Dynamic Range	> 5 × 10^4 with lindane
Max Operating Temperature	400 °C
Max Acquisition Rate	500 Hz
Configurations	ECD can be mounted as third detector on side of the GC
EPC Makeup Gas Types	Argon/5% methane or nitrogen; 0 to 200 mL/min

Nitrogen–phosphorous detector (NPD)

- A detector specific to nitrogen- or phosphorus-containing compounds
- NPD available - Blos (glass) bead offering:
  - Longer lifetime
  - More stable operation during the bead's lifetime
- Available for capillary columns only, with adapters available

Minimum Detectable Level	< 0.08 pg N/s, < 0.01 pg P/s with azobenzene/malathion/octadecane mixture
Linear Dynamic Range	> 10^5 N, > 10^5 P with azobenzene/malathion mixture
Selectivity	25,000 to 1 g N/g C, 200,000 to 1 g P/g C with azobenzene/malathion/octadecane mixture
Max Operating Temperature	400 °C
Max Acquisition Rate	Up to 1,000 Hz
Configurations	The NPD can be mounted as a third detector on the left side of the GC
EPC Gases	Air: 0 to 200 mL/min H_2: 0 to 20 mL/min Make-up gas: 0 to 100 mL/min

Flame photometric detector (FPD+)

- Class-leading single-wavelength FPD+, or dual-wavelength flame photometric detector (DFPD)—a sensitive, specific detector for sulfur- or phosphorus-containing compounds.
- Available in single- or dual-wavelength versions.

Minimum Detectable Level	< 45 fg P/s, < 2.5 pg S/s with methylparathion
Linear Dynamic Range	> 10^3 S, 10^4 P with methylparathion
Selectivity	106 g S/g C, 106 g P/g C
Max Operating Temperature	400 °C
Max Acquisition Rate	Up to 500 Hz
Configurations	The FPD+ can be mounted as an auxiliary detector on top of the GC
EPC Gases	Air: 0 to 200 mL/min H_2: 0 to 250 mL/min Make-up gas: 0 to 130 mL/min

Sulfur chemiluminescence detector (SCD) (Model 8355)

- Highest sensitivity and selectivity for sulfur-containing compounds

MDL	Typical < 0.5 pg(S)/sec
MDL (SCD/FID Tandem)	Typical < 5.0 pg(S)/sec
Selectivity	> 2 × 10^7 (g S/g C^2)
Linearity	> 10^4
Repeatability	< 2% RSD 2 hours < 5% RSD 24 hours

Nitrogen chemiluminesence detector (NCD) (Model 8255)

High selectivity for nitrogen-containing compounds

MDL	Typical < 3 pg(N)/sec
MDL (NCD/FID Tandem)	Typical < 30 pg(N)/sec
Selectivity	> 2×10^7 (g N/g C)
Linearity	> 10^4
Repeatibility	< 1.5% RSD 8 hours < 2% RSD 18 hours

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

Mass spectrometer

See specifications for:

- 5977 Series MSD
- 7000 triple quadrupole GC/MS
- 7010 series triple quadrupole GC/MS
- 7250 Q-TOF

Other detectors:

Specialized detectors are available through Agilent Channel Partners, including: atomic emission, pulsed flame photometric (PFPD), photoionization (PID), electrolytic conductivity (ELCD), halogen specific (XSD), oxygen-flame ionization (O-FID), and pulsed discharge helium ionization (PDHID).

Capillary flow technology

Proprietary Agilent capillary flow technology provides devices with reliable, leak-free, in-oven capillary connections to help analyze complex samples and provide gains in productivity. Devices feature:

- Photolithographic chemical milling for low-dead-volume flow pathways
- Diffusion bonding to form a single flow plate
- "Credit card" profile for fast thermal response
- Projection-welded connections for leak-tight fittings
- Deactivation of all internal surfaces in the sample path for inertness

All of the following purged capillary flow devices require one channel from an auxiliary EPC, PCM, or PSD module. Purged capillary flow devices, such as the Deans switch, purged effluent splitters, and purged ultimate unions introduce an additional flow into the sample stream. For detectors that operate at low flow rates, such as the MSD and TCD, some decrease in sensitivity will occur.

Deans switch

Deans switching provides additional selectivity using two-dimensional GC analysis. Peaks of interest that may be coeluting on one column are diverted to a separate column of different stationary phase. This technique can also reduce maintenance costs by having troublesome solvents or other components bypass detectors or columns.

Purged effluent splitters

A three-way purged effluent splitter sends column effluent to three detectors. More information can be obtained in a single run to help locate target peaks in unknowns. A two-way purged effluent splitter version is also available.

Backflush

An Agilent Purged Ultimate Union, or any of the above purged capillary flow devices, also provides the ability to backflush. An auxiliary EPC or PCM can be used for backflushing, but a PSD module is preferred. By reversing column flow immediately after the last compound of interest has eluted, you can eliminate long bake-out times for highly retained (or high-boiling) contaminants, thereby shortening cycle times and protecting the column and detector. As backflush occurs after peaks of interest have eluted, the chromatographic method for peaks of interest does not need to change. Backflush is available when the column is attached to a split/splitless, volatiles interface, multimode, or PTV inlet.

The 8890 GC firmware has been optimized for backflush operation:

- Displays positive and negative flows
- Inlet/outlet pressures settable to the limits of the controlling EPC devices
- EPC can be introduced at any column or restrictor connection
- Capillary flow configuration of up to six columns/restrictors

Backflush Wizard software works with Agilent Chemstation and Agilent MassHunter software to provide a step-by-step procedure for configuring the backflush hardware and column plumbing. The chromatogram must have three well separated peaks. See backflush brochure for additional system requirements.

Auxiliary EPC devices

The 8890B GC has four positions for auxiliary EPC devices located on the back of the GC. Each position can be any combination of auxiliary EPC or pneumatics control module. Two of the positions also accommodate detectors.

Note: The communication for a third detector such as a TCD or ECD EPC module (located on the left side of the GC) interfaces through one of these auxiliary EPC module positions. If a third detector (TCD or ECD) is installed, one of these auxiliary positions is taken. Two of these positions are also compatible with a top-mounted or side-mounted detector.

Auxiliary EPC module

- Three channels of pressure control
- EPC compensated for atmospheric pressure and temperature variation when connected to a user-defined capillary column
- Psig (gauge) pressure control
- Forward pressure regulated
- Maximum of three auxiliary EPC modules per GC

Pneumatics control module (PCM)

- Two channels for operation
- EPC compensated for atmospheric pressure and temperature variation when connected to a user-defined capillary column

  First channel:

  - Pressure or flow control
  - Psig (gauge) pressure control
  - Forward pressure regulated

  Second channel:

  - Pressure control
  - Psig (gauge) and psia (absolute) pressure control
  - Forward pressure or back pressure regulated
  - PCM can be located in either/both inlet EPC positions, and any auxiliary position on the back of the 8890 GC
  - Maximum of four PCMs/PSDs per GC

Pneumatics switching device (PSD)

- EPC compensated for atmospheric pressure and temperature variation when connected to a user-defined capillary column
- The PSD is a pneumatic module specifically designed for backflush
- First channel: same as PCM; engineered bleed restrictor built in

Additional specifications

Automated sample injectors and samplers

- The 7693A ALS interface on the 8890B provides power and communications for up to two 7693A automatic injectors, one automatic sampler tray, and one heater/mixer/bar code reader. Injectors and tray install easily without the need for alignment.
- Agilent PAL injector on 8890B. Specialized software controls available on OpenLab CDS ChemStation and EzChrom editions, MassHunter, and MSD Productivity ChemStation.
- The 7650A ALS interface on the 8890B provides power and communications for one 7650 automatic injector. It is also compatible with one additional 7693A mounted on the back inlet. The injector installs easily without the need for alignment.

Data communications

- LAN
- Two analog output channels (1 V and 10 V output available) as standard
- Remote start/stop
- Touchscreen control of the Agilent automatic liquid sampler (ALS)
- Binary-coded decimal input for a stream selection valve
- Serial port interface for Remote Advisor

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: 120/200/220/230/240 volts ±10% of nominal
  - Frequency: 50/60 Hz ±5%
- Operating altitude: 4,600 m

Safety and regulatory certifications

Conforms to the following safety standards:

- Canadian Standards Association (CSA) C22.2 No. 61010-1
- Nationally Recognized Test Laboratory (NRTL): ANSI/UL 61010-1
- International Electrotechnical Commission (IEC): 61010-1, 61010-2-010, 61010-2-081
- 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 61326-1
- AS/NZS CISPR 11
- This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme à la norme NMB-001 du Canada. ISM 1-A
- Designed and manufactured under a quality system registered to ISO 9001; Declaration of Conformity available

Other specifications

- Four internal 24-volt connections (up to 150 mA)
- Two external 24-volt connections (up to 150 mA)
- Two on/off contact closures (48 V, 250 mA max)
- 550 Timed events through a data system
- Support for up to 10 valves:
  - Valves 1 to 6, 12 V DC, 13 watts in a heated valve box
  - Valves 7 and 8, externally powered as a remote event from separate contact closure
  - Valves 9 to 10, 24 V DC, 100 mA unheated, for low-power valve applications
- Independent heated zones, not including oven: Eight (two inlets, three detectors, and three auxiliary). Third/fourth detector can use any available zone from inlet or auxiliary zones.
- Maximum operating temperatures for auxiliary zones: 400 °C
- Six GC column Smart Key ports

References

1. A Guide to Interpreting Detector Specifications for Gas Chromatography. *Agilent Technologies*, publication number 5989-3423EN, **2005**.
2. The Importance of Area and Retention Time Precision in Gas Chromatography. *Agilent Technologies*, publication number 5989-3425EN, **2012**.

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