

Agilent G2350A Atomic Emission Detector (AED)

Specifications



Elements Specifications

Group	Element(s)	Wavelength (nm)	Minimum Detectable Level (pg/sec)	Selectivity Over Carbon	Dynamic Range	Measurement Compound
1	Carbon	193	1	—	1 x E4	t-Butyl disulfide
	Sulfur	181	2	10000	1 x E4	t-Butyl disulfide
	Nitrogen	174	30	2500	2 x E4	Nitrobenzene
2	Hydrogen	486	4	—	5 x E3	t-Butyl disulfide
	Chlorine	479	30	3000	1 x E4	1,2,4-Trichlorobenzene
3	Phosphorus	178	2	5000	1 x E3	Triethyl phosphate
4	Oxygen	171 ¹	150	5000	5 x E3	Nitrobenzene

¹Uses molecular band instead of atomic emission line

Experimental Conditions

GC Injection Port	Split/splitless			
GC Injector Temperature	250 °C			
GC Column	Part no. 19091Z-012, HP-1, 25 m x 320 mm x 0.17 µm			
GC Inlet Conditions	Nominal pressure = 20 psi, nominal split flow = 100 mL/min			
GC Temperature Program	60 °C to 180 °C at 30 °C/min			
Injected Volume	1 µL			
Checkout Sample	Part no. 8500-5067			
AED Reagent Gas(es)	Group 1 O ₂ and H ₂	Group 2 O ₂	Group 3 H ₂	Group 4 H ₂ and auxiliary gas (10% CH ₄ /90% N ₂)
AED Spectrometer Purge	0.5 L/min			
AED Transfer Line Temperature	250 °C			
AED Cavity Temperature	250 °C			
AED Data Rate	5 Hz			
Ambient Temperature	25 °C (Recommended ambient temperature 15 °C to 35 °C)			

Instrument performance for minimum detectable level and selectivity for the above elements is verified at installation using a checkout sample containing the above compounds. Detection of the above elements can be done in a sequence using four separate injections.



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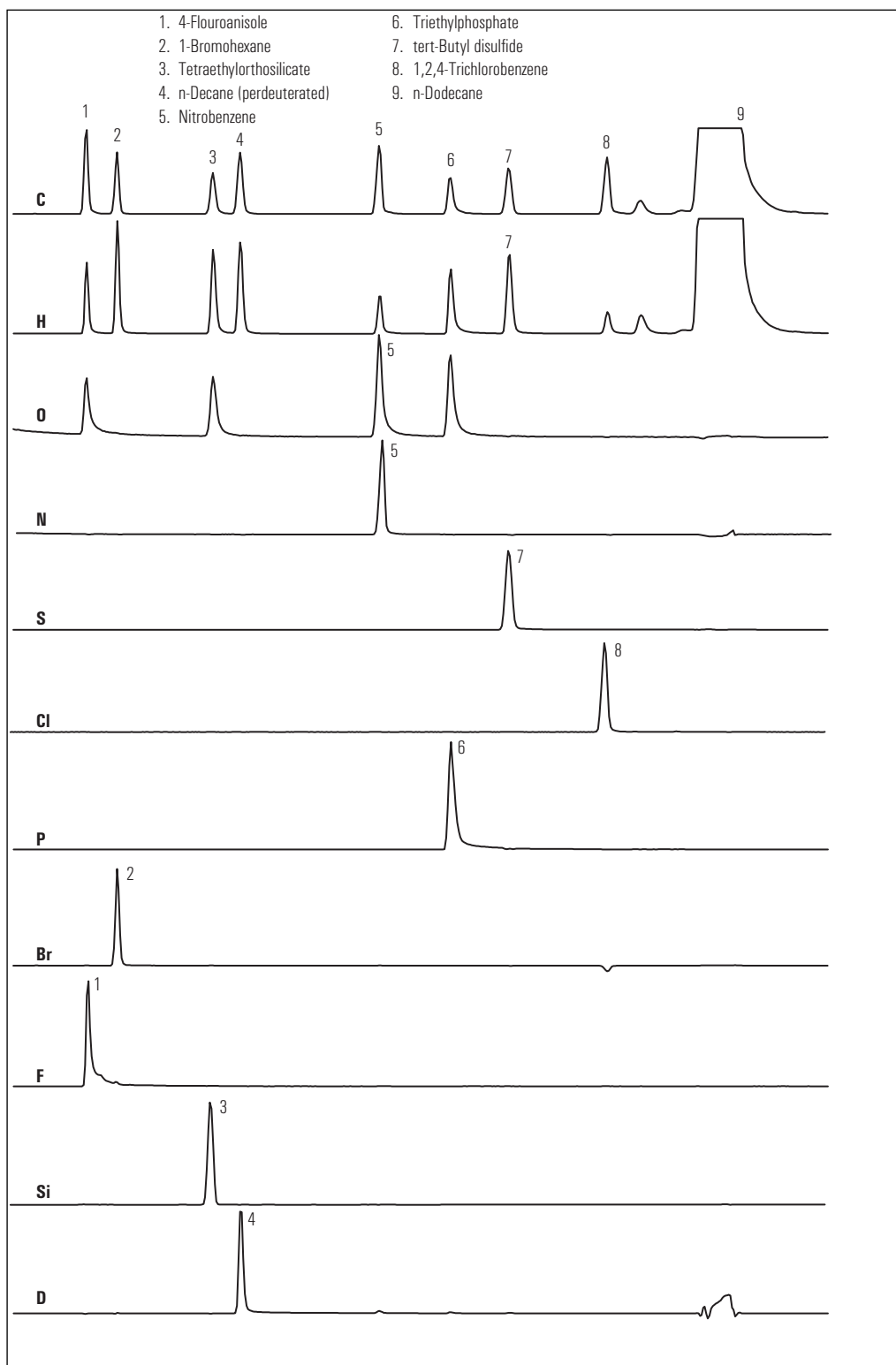


Figure 1. Multielement analysis of the AED checkout sample (part no. 8500-5067). Instrument performance can be verified at installation for elements C, H, O, N, S, Cl, and P using four sequential injections. Element chromatograms for Br, F, Si, and deuterium, which require three additional injections, are also shown but are not included as part of instrument verification at installation.

G2350A AED Element Groupings

The Agilent G2360AA gas chromatograph-atomic emission detector (GC-AED) Agilent ChemStation software allows for the following element groupings (elements that can be detected simultaneously) for the G2350A AED. Each grouping represents a specific combination of the light spectrum region detected and the reagent gas(es) used. Other elements and element groupings may be possible. Contact Agilent Technologies, Inc. to inquire regarding any updated capabilities.

Group	Element(s) or Isotope	Wavelength (nm)	Reagent Gas(es)	
1	Carbon	193	O ₂ and H ₂	
	Iodine	183		
	Sulfur	181		
	Carbon	179 ¹		
	Nitrogen	174		
2	Carbon	496	O ₂	
	Hydrogen	486		
	Chlorine	479		
	Bromine	478		
4	Phosphorus	178	H ₂	He High Flow ²
	Oxygen	1711	H ₂ and 10% CH ₄ /90% N ₂	
5	Nitrogen	388 ¹	O ₂ , H ₂ , and Methane	He High Flow ²
6	Fluorine	690	H ₂	
7	Iodine	206	O ₂ and H ₂	
8	Chlorine	837	O ₂	
	Carbon	834		
	Bromine	827		
9	Boron	250	O ₂	He High Flow ²
10	Selenium	196	H ₂	He High Flow ²
	Carbon	193 ³		
	Arsenic	189		
	Phosphorus	186		
	Sulfur	181 ³		
11	Phosphorus	178 ³	O ₂ and H ₂	He High Flow ²
	Germanium	265		
	Lead	261		
	Manganese	259		
	Mercury	254		
	Silicon	252		
12	Carbon	248	O ₂ and H ₂	He High Flow ²
	Tin	271		
	Germanium	265		
	Carbon	264 ¹		
	Lead	261		
	Manganese	259		
	Mercury	254		
13	Silicon	252	O ₂ and H ₂	He High Flow ²
	Tin	303		
	Iron	302		
	Nickel	301		
	Tin	301		
14	Vanadium	292	O ₂ and H ₂	He High Flow ²
	Tin	326		
15	Lead	406	O ₂ and H ₂	He High Flow ²
16	Carbon-12	177 ¹	O ₂ and H ₂	
	Carbon-13	177 ¹		
17	Nitrogen-14	421 ¹	O ₂ , H ₂ , and Methane	
	Nitrogen-15	420 ¹		
18	Hydrogen	656	O ₂	He High Flow ²
	Deuterium	656		

¹ Uses molecular band instead of atomic emission line.

² "He High Flow" – For certain element groupings, additional helium carrier makeup gas flow is added.

³ Performance for elements offered in multiple groups may vary depending on the reagent gas(es) used.

G2350A AED Characteristics

GC-AED Interface

A heated, insulated, and thermostated tube contains fused silica tubing to carry effluent from the gas chromatograph (GC) to the microwave cavity.

Maximum temperature: 450 °C

Microwave Generator

- Frequency: 2,450 MHz
- Power level: 70 watts
- Power tube: 2M211 magnetron
- Tuning: None required
- Stray emission: <5 mW/cm² at 5 cm
- Coupling to cavity: 75 ´ 36 mm

Microwave Plasma

- Cavity: Reentrant design
- Discharge tube: Water-cooled, walls, 0.1-mm thick
- Ignition: Automatic
- Exhaust: From discharge tube into a purged chamber to prevent air diffusion

Spectrometer

- Type: 0.25-m Czerny-Turner
- Wavelengths: 171 to 837 nm

All wavelength regions are calibrated automatically for position and focus at initial turn-on and whenever excessive drift is detected. The current wavelength setting is fine-tuned at the start of each run.

Signal Processing

Raw data consists of 330 simultaneous outputs from a photodiode array (PDA). This data can be read at a rate of up to 10 times per second (10 Hz), although G2350A AED performance specifications are only valid at the data rate of 5 Hz. The G2360AA GC-AED ChemStation software can display, in real time, this spectral data collected by the PDA as well as the element chromatograms generated from this data. For the elements selected, chromatographic data is saved for evaluation. The spectral data may also be saved and examined later at a particular chromatographic peak retention time.

The G2360AA GC-AED ChemStation software provides data acquisition, control, and data evaluation for a single GC-AED system. Data acquisition, control, and data evaluation of additional instruments using add-on software are not supported.

Environmental

Operating Extremes

10 °C to 40 °C.

Maximum relative humidity 80% for temperatures up to 31 °C, decreasing linearly to 50% relative humidity at 40 °C.

Storage Extremes

–40 °C to 65 °C.

(Cooling water must be drained from the AED if below 0 °C.)

Radiated Emissions

CE-mark with emissions level A.

Safety Certifications

CSA certified, NRTL listed, self-certified in accordance with IEC 1010-1.

Instrument Dimensions and Weight

The Agilent G2350A AED weighs 37 kg (80 lb) and measures 52 cm wide × 57 cm deep × 41 cm high (21 × 23 × 17 in.).

At least 12 cm (5 in.) must be allowed for the transfer line between the GC and AED.

Space considerations for a complete AED system must take into account the injector/sampler, GC, data system, printer, and clearances for maintenance. Allow 340 cm width × 87 cm depth × 100 cm height (132 × 35 × 37 in.). Total system weight is about 159 kg (350 lb).

At least 29 cm (12 in.) must be allowed behind the GC to dissipate oven exhaust air and provide access for maintenance.

Power

Systems with 220/240 Vac power require one 15-A circuit for the G2350A AED plus one or more 10-A circuits for computer and peripherals, which must be dedicated to the system. Systems with 100/120 Vac power require one 20-A circuit for the G2350A AED plus one or more 10-A circuits for computer and peripherals, which must be dedicated to the system. Consult the GC and automatic liquid sampler documentation for their power requirements.

Voltage requirements are +5%, –10%, 50 to 65 Hz (2,200 VA maximum), seven outlets (minimum).

Gas Requirements

Name	Purity	Description
Helium	99.9999%	For GC carrier and AED plasma. This purity can be achieved using 99.999% gas with a gas purifier. The flow rate required is about 100 mL/min. Some elements require a higher flow rate of about 240 mL/min.
Nitrogen	99.99%	Spectrometer purge gas (must be dry). The user is advised to provide a hydrocarbon and a moisture trap. The purge gas flow requirements are nominally 0.5 L/min.
Hydrogen	99.997%	AED reagent gas
Oxygen	99.997%	AED reagent gas
10% CH ₄ /90% N ₂ Mixture	99.99%	AED reagent gas—typically used for oxygen analysis. Purity requirement is on original gases for reagent gas mixture.
Methane	99.99%	AED reagent gas—typically used for nitrogen (388 nm only) and nitrogen-15 analysis

Note: The G2350A AED can only be plumbed for three reagent gases. Each reagent gas flows in typically 20 mL/min. The user must decide whether to plumb for 10% CH₄/90% N₂ (to detect oxygen 171) or methane (to detect nitrogen 388 nm and nitrogen-15).

Cooling Water Requirements

Approximately 600 mL of distilled water is required for a closed, self-contained cooling water system. It requires periodic refilling.

- Data system (IBM-compatible ISA or EISA PC) with a minimum configuration of Pentium 133, 48 MB of RAM, 3.5-in. floppy disk drive, 420-MB hard disk drive, CD-ROM, Super VGA or Ultra VGA monitor
- GPIB data communications for all AED system components

GC-AED System Requirements

A functional GC-AED system requires:

- G2350A AED
- G2360AA GC-AED ChemStation software and Microsoft® Windows NT® 4.0
- Agilent 6890 Series, or 6890 Plus GC or 5890 Series II, with:
 - Split/splitless inlet
 - GC-AED interface
- Other Agilent GC options may also be ordered, including (but not limited to):
 - One other inlet
 - Up to two standard Agilent GC detectors (coexecution with MSD not supported)

Note: Any customer-supplied GC must be clean, leak-free, and in good working order. A 5890 Series II GC must have ROM part no. 05890-80300 or higher.

Although not required, a fully automated GC-AED system typically includes:

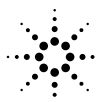
- Automatic liquid sampler
- Printer

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