



WASSON•ECE
INSTRUMENTATION
Engineered Solutions, Guaranteed Results.

Engineered Solutions, Guaranteed Results.

Monomer Analysis

Analysis by Gas Chromatography

Polymer Grade Monomer Analysis

High-purity monomers are used to make polyethylene, polypropylene, and other polymers. High purity monomers are the polymeric building blocks for a variety of plastics. Competition in the monomer market is fierce and demand for high quality monomers are increasing. Numerous potential monomer impurities reduce the quality and value of product by interfering with the subsequent production costs of the resulting polymer. Hydrocarbon impurities in a monomer can insert themselves into the target polymer resulting in undesired material properties. Contaminants such as oxygenates, sulfurs and metal hydrides (like arsine and phosphine) have significant impacts on the metallocene catalyst required to produce polyethylene.

Polymeric catalysts can be poisoned by even trace levels of common monomer impurities, such as hydrogen sulfide (H_2S), acid gases and methanol (CH_3OH). This poisoning reduces catalyst efficiency, resulting in lower polymer yields per reaction. Catalyst bed poisoning also necessitates increased maintenance events and associated plant downtime, and, eventually, significant catalyst replacement costs. For these reasons, polymer producers demand high purity monomer feedstocks. Careful monitoring of process streams is required for early detection and remediation of contaminants to meet product specifications.

Monomer Solutions

Wasson-ECE provides turn-key solutions for the following monomers:

- Ethylene
- Propylene
- 1-Butene
- Isobutylene
- 1,3-Butadiene
- Vinyl chloride monomer
- Styrene

All of our systems are built to order so that we can meet your specific analytical needs.

Monomer Solutions



GC/MS/PDHID
Solutions



SCD/NCD
Solutions



Dual FID
Solutions

Monomer Solutions by Application Number

Application Number	253	260-262	265	410	460/460B	462/462B	660	670
Description	Oxygenates Analysis	Impurities in High Purity Ethylene and Propylene	Impurities in 1,3-Butadiene	Fixed Gases by PDHID	Impurities in High Purity Ethylene and Propylene by MSD	Impurities in High Purity Ethylene and Propylene by MSD/PDHID	Sulfur Speciation	Ammonia Analysis in High Purity Ethylene/Propylene
Detectors	FID	FID/FID	FID/FID	PDHID	MSD	MSD/PDHID	SCD	NCD
Runtime	30 min	15 min	40 min	10 min	40 min	40 min	40 min	15 min
Matrix								
Ethylene	●	●		●	●	●	●	●
Propylene	●	●		●	●	●	●	●
1,3-Butadiene	●		●					
Other matrix analyses available as custom quotes: Isobutylene, 1-Butene, 1,3-Butadiene, Vinyl Chloride Monomer, Styrene								
Analytes								
C ₁ -C ₅ Hydrocarbons		●						
C ₂ -C ₈ Hydrocarbons			●					
Trace CO/CO ₂ by Methanizer		●						
Oxygenates	●				●	●		
Sulfurs					●	●	●	
Fixed Gases (H ₂ , N ₂ , O ₂ /Ar, CO, CO ₂) by PDHID				●		●		
Arsine/Phosphine					●	●		
Ammonia								●
Optional Additional Upgrades								
Halogenates					●	●		
MSD upgrade to HES source					●	●		
Methods Covered								
ASTM D8098				●		●		
ASTM 7423	●							
UOP 960	●							
ASTM D2505 ¹		●						
ASTM D2504 (compliance for CO only) ²		●						
ASTM D2712		●						
ASTM D6159 ¹		●						
UOP 1015					●	●		
UOP 1021					●	●		
UOP 1022					●	●		
UOP 1023					●	●		
UOP 1024				●		●		

1 Wasson-ECE solutions use an alternate configuration to improve analysis

2 Wasson-ECE performs fixed gas analysis by PDHID instead of TCD



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Monomer Applications

Wasson-ECE provides a standard suite of analyzers to address the full range of impurities in monomers.

260-262 Application Series – Dual FID Analysis

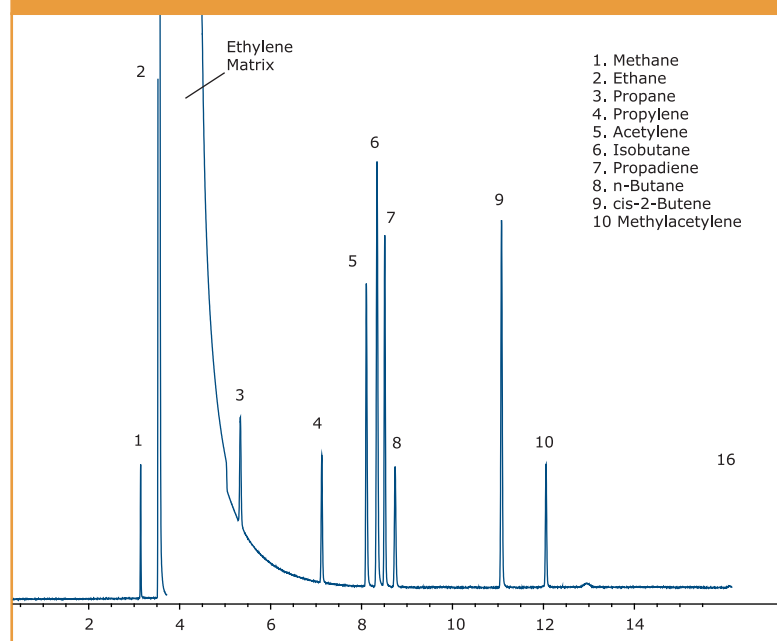
Wasson-ECE 260-262 systems are configured with dual flame ionization detectors (FID/FID) to provide simultaneous analyses of trace hydrocarbons and carbon oxides in ethylene and/or propylene.

Features:

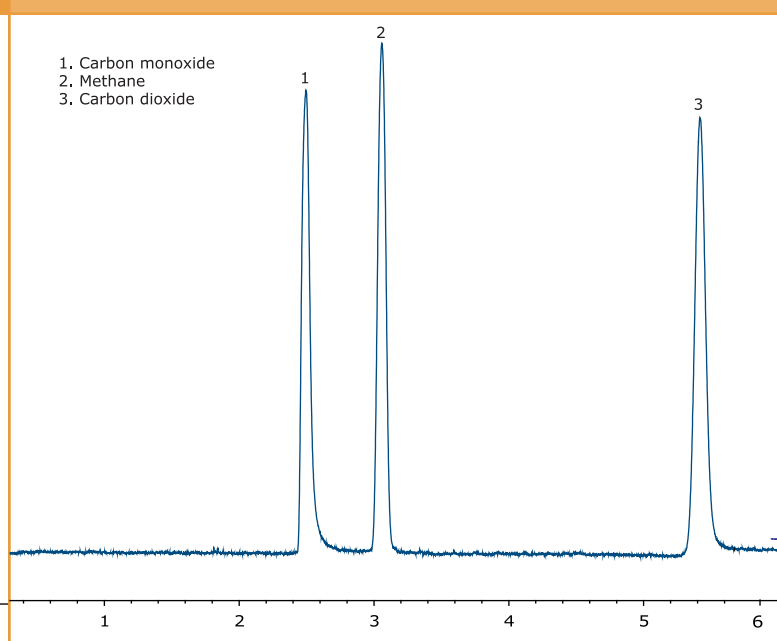
- C₁-C₅ hydrocarbon analysis with a lower detection limit (LDL) of 2 ppm
- Methanizer for CO/CO₂ analysis with an LDL of 0.1 ppm
- Additional valves to improve analysis of components eluting on the tail of the matrix peak
- Specialized valving techniques to prevent cross-contamination when analyzing both ethylene and propylene matrices on the same analyzer
- On-board vaporizer for propylene samples
- Complies with ASTM methods D6159 and D2712



App 260: Hydrocarbons



App 260: FID/Methanizer



253 Application - Oxygenates by FID

The Wasson-ECE 253 applications provides trace oxygenate analysis by FID in ethylene, propylene, butanes/butenes, gasoline, and naptha.

Features:

- C₁-C₅ oxygenate analysis with an LDL of 0.5 ppm
- Specially passivated sample path to prevent adsorption of oxygenates
- Complies with ASTM D7423

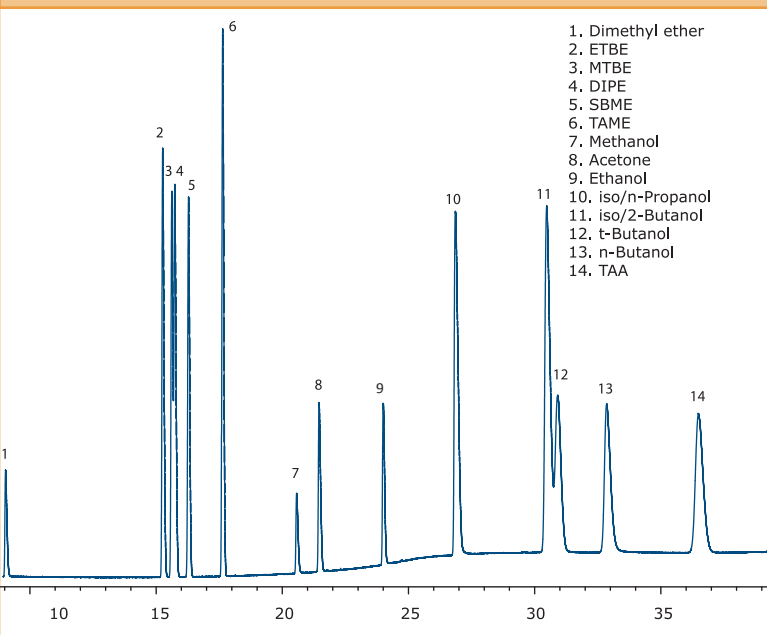
410 Application - Permanent Gases by PDHID

The Wasson-ECE 410 application is configured with a Valco Pulsed Discharge Helium Ionization Detector (PDHID), a highly sensitive universal detector, to perform the analysis of permanent gas impurities.

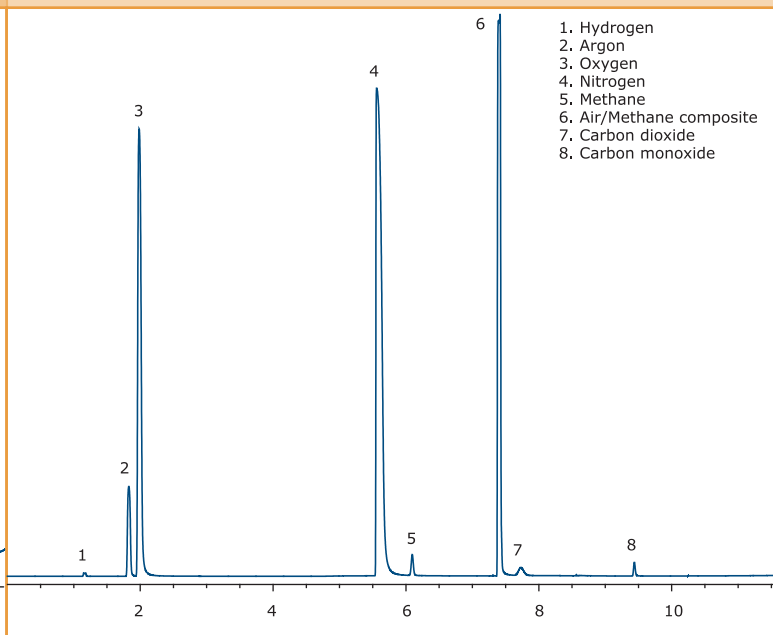
Features:

- Oxygen analysis with an LDL of 1 ppm
- Permanent gas analysis with an LDL of 50 ppb for components other than oxygen
- Diaphragm valves to minimize air contamination
- Specially passivated sample path to prevent oxygen adsorption
- On-board vaporizer for propylene samples
- Complies with ASTM D8098

App 253: Oxygenates



App 410: PDHID



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Monomer Applications

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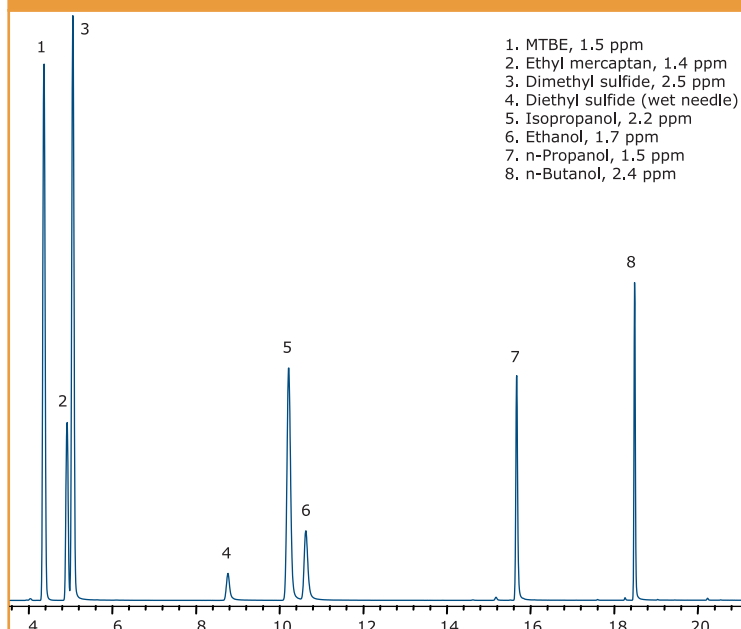
460-462 Application Series – MSD/PHDID

The 460-462 series applications allow the user to identify a large variety of monomer impurities on one instrument. The 460 series of applications combine the Agilent 5977C Mass Selective Detector (MSD) with the Valco PDHID to provide even greater analysis power. Multiple methods are configured to cover the range of analytes.

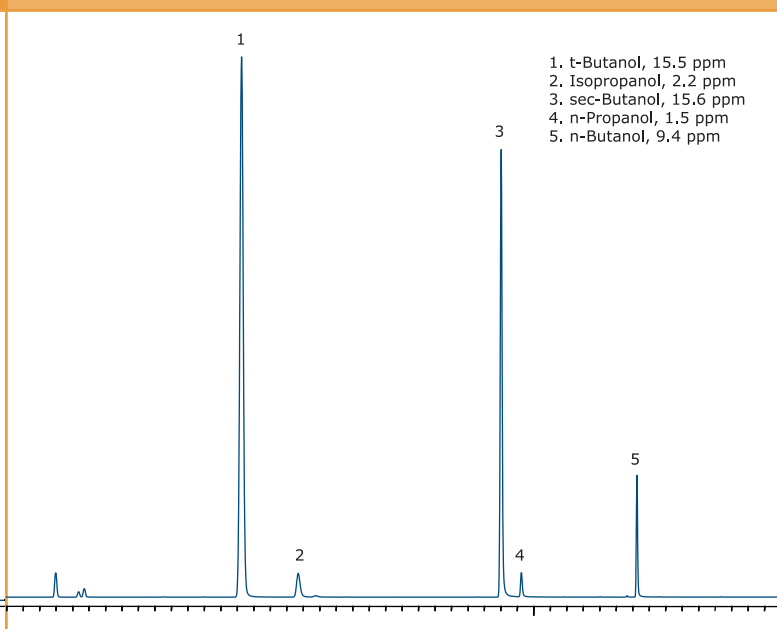
Features:

- Analysis of C₁-C₄ oxygenates with an LDL of 50 ppb
- Analysis of arsine and phosphine with an LDL of 50 ppb
- Oxygen analysis with an LDL of 1 ppm
- Permanent gas analysis with LDL of 50 ppb for components other than oxygen
- Diaphragm valves to minimize air contamination on PDHID
- Specially passivated sample path for reactive components
- On-board vaporizer for propylene samples
- Complies with ASTM D8098, UOP1015, UOP1021, UOP1022, UOP1023, and UOP1024

App 460-462: Sulfurs and Oxygenates MSD

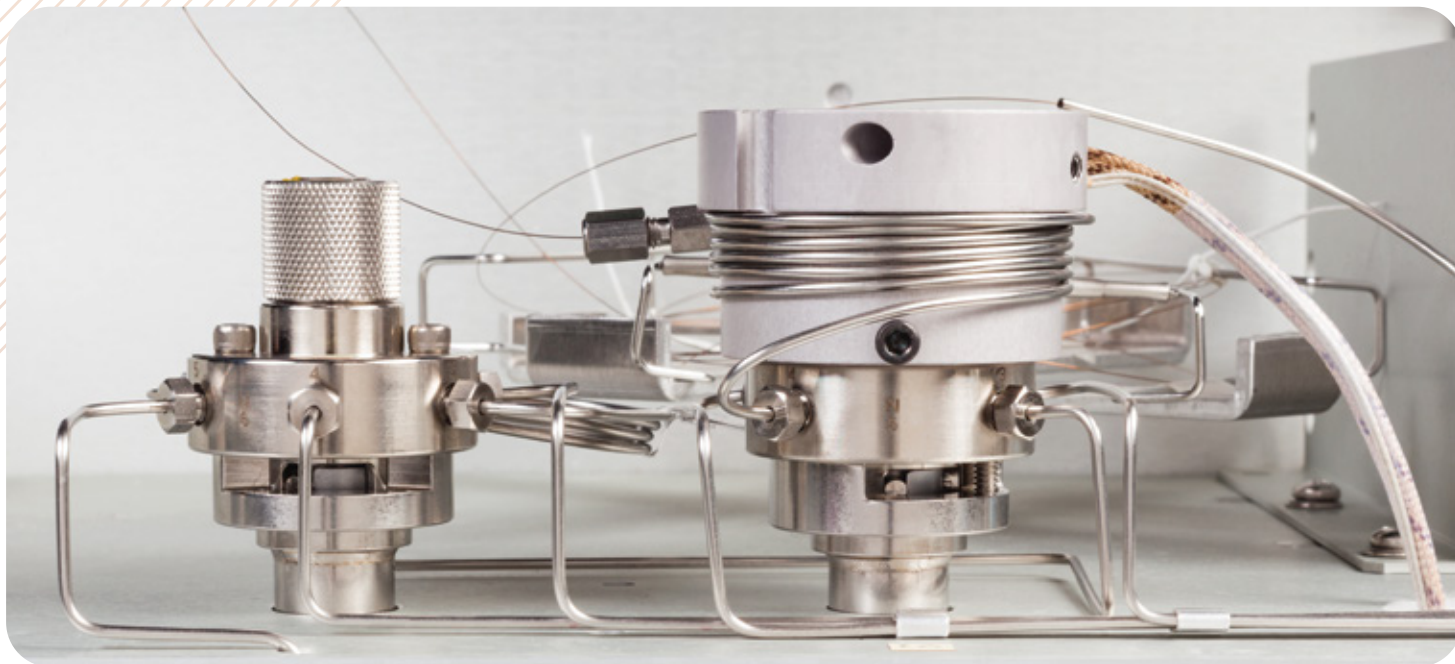


App 460-462: Oxygenates MSD

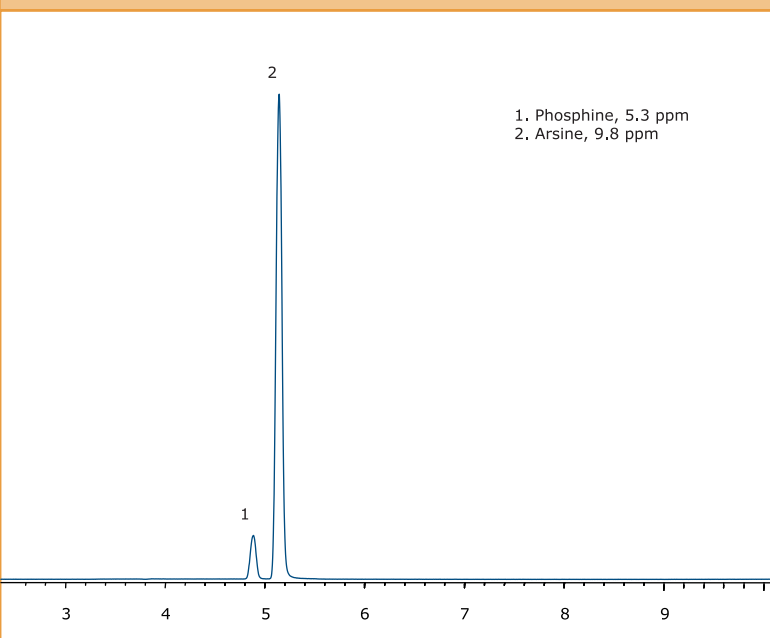


On-Board Vaporizer

Converts propylene liquid to the gas phase prior to injection.



App 460-462: Arsine/Phosphine



Selective Ion Mode

Maximizes Sensitivity!



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Monomer Applications

Wasson-ECE provides a standard suite of analyzers to address the full range of impurities in monomers.

460-462 Application Series (cont.) – Light sulfurs analysis by MSD

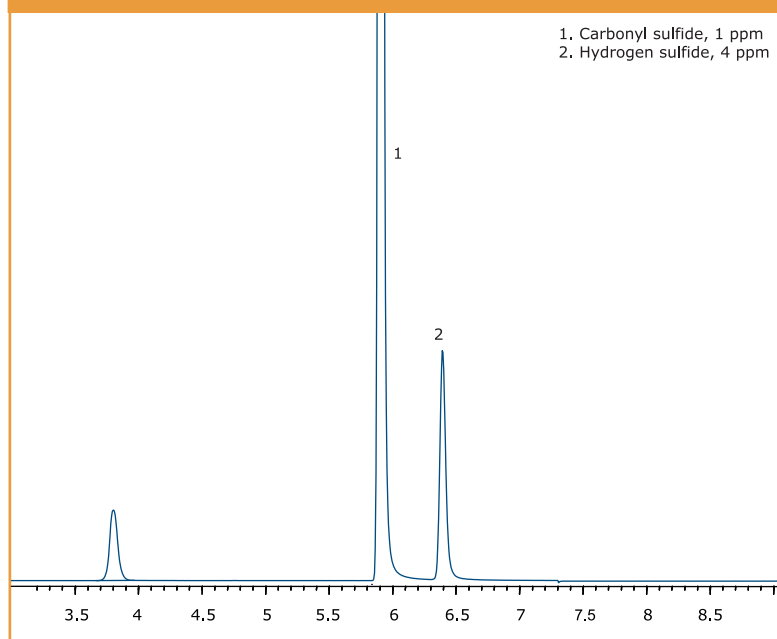
The Wasson-ECE 460-462 applications include multiple analytical columns to provide the best analytical performance. Light sulfur analysis (up to C₂ mercaptans) is performed on a separate column from heavier components. The MSD is configured in selective ion mode to provide high sensitivity and positive identification of targeted sulfurs.

Features:

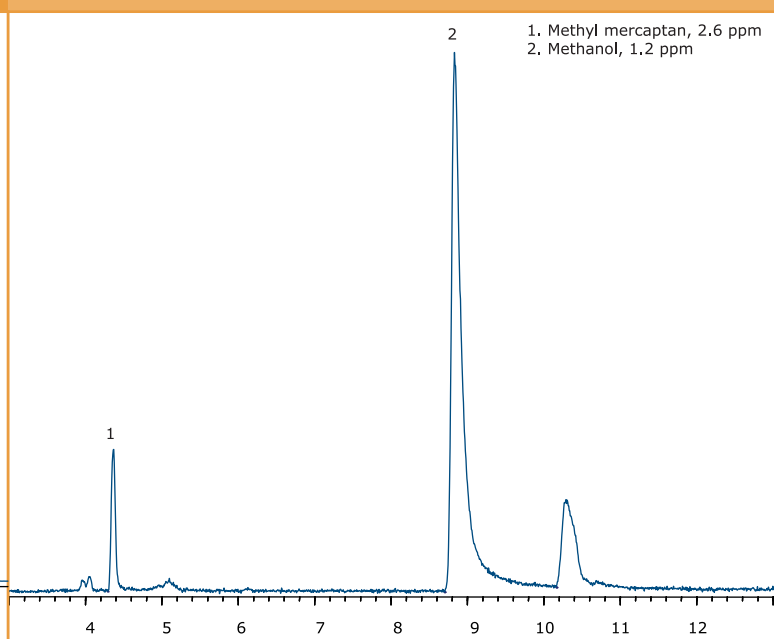
- Analysis of H₂S, COS and C₁/C₂ Mercaptans with an LDL of 50 ppb
- Specially passivated sample path for reactive components



App 460-462: Light Sulfurs



App 460-462: MeSH and MeOH



660/670 Applications – Chemiluminescence Detector

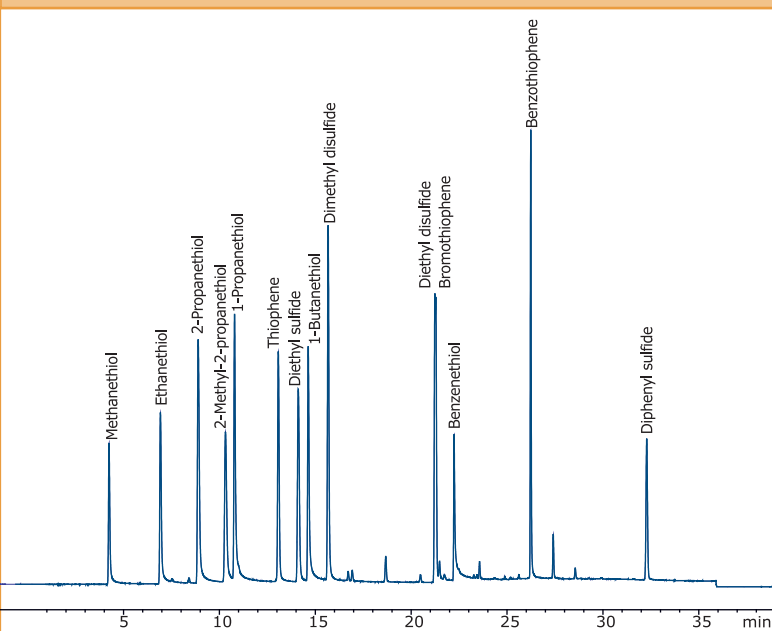
The 660/670 applications provide sulfur or nitrogen specific analyses, avoiding the problem of hydrocarbon interference experienced by other types of detectors.

Features:

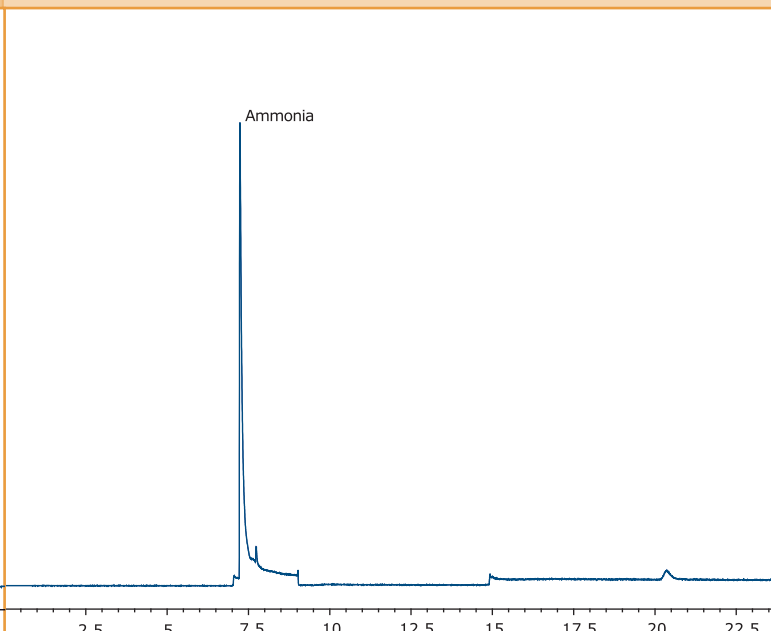
- Sulfur chemiluminescence detector (SCD) provides equimolar analysis of sulfurs with a lower detection limit of 20-50 ppb in ethylene (component dependent) and 0.1 ppm in propylene
- Nitrogen chemiluminescence detector (NCD) analyzes ammonia to a lower detection limit of 0.1 ppm



App 660: Sulfur Detection



App 670: Ammonia Detection



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Calibration

The Wasson-ECE Dynamic Blender provides reliable point-of-use calibration blends.

Gas chromatographic analysis often requires that samples or standards be diluted to low levels. Some analytes are quite expensive or difficult to purchase at low levels due to reactivity, adsorption, or large molecular weight.

The Dynamic Blender allows one certified standard with concentrations at the upper limit of the desired calibration curve to be diluted to a lower level (>2 orders of magnitude lower) to create a full calibration curve from just one standard. An inert flow path and heated bridge eliminate adsorption and condensation problems when blending gas standards that include sulfur, nitrogen, and other reactive compounds. The samples are fed directly to a gas chromatograph, eliminating the need to store multiple gas standards.

There is no need to purchase several concentrations of the same mixture and no need to find storage in the laboratory for the cylinders. The Dynamic Blender provides an easy and cost-effective solution for gas phase calibration needs.



Model DB302

Dynamic Blender

Dilute to desired levels at the instrument by simply varying flows

Reduce the number of cylinders purchased and stored at your lab

Minimize problems with large molecular weight samples in vapor phase

Performance of Dynamic Blender:

C ₁ Flow	Total Flow	Methane Concentration
1.23	1.23	100%
1.23	2.71	45.39%
1.2	28.9	4.3%
1.23	228	0.54%
1.23	389	0.32%
1.23	583	0.21%
1.23	1200	100 ppm
0.45	556	81 ppm
0.05	618	8.1 ppm



The Turn-key Analytical Concept

The analyzer is completely developed including valves, additional heated zones, and analytical columns.

The chromatography is tested using certified calibration blends.

A service engineer comes to the customer's site to perform installation and familiarization.

The instrument guarantee covers all parts and analytical performance during the first year.



Wasson-ECE Instrumentation

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Wasson-ECE Instrumentation specializes in configuring and modifying new or existing gas chromatographs exclusively from Agilent Technologies to provide guaranteed, turn-key analytical systems.

Our customers describe their objectives and their samples: analytes, concentration ranges, phases, temperature, throughput, and any special needs. From this dialog we configure a task-specific instrument. We add extra ovens, valves, plumbing, flow control, columns, electronics, and software to yield a complete solution. This saves our clients valuable time and delivers instruments that are state-of-the-art and ready for use upon installation.

The complete analytical method is developed, tested, and documented utilizing our experience working with numerous companies that have similar needs and goals. The resulting chromatograms and reports are inspected by our application chemists and customers to ensure system performance and design quality.

Our field engineers then install each system and provide training. After installation, and throughout the life of the chromatograph, our support chemists are ready to help. We can assist with application details, questions, training, calibration, maintenance, and on-site service. Wasson-ECE brings experience and efficiency to your project, giving you confidence in the quality of your results.



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