

Analyzer Solutions Guide for the Energy and Chemical Industry

GENERATE ACCURATE, RELIABLE DATA TO ENSURE QUALITY AND PRODUCTIVITY

The Measure of Confidence



Agilent Technologies

INTRODUCTION



Agilent energy and chemical analyzers reflect industry standards and a stringent quality control process.

Before Installation:

- ✓ Factory configuration and chemical check-out to “pre-test” analytical performance
- ✓ Field installation and performance verification by factory-trained Agilent or Channel Partner Engineers

Following installation:

- ✓ Continued support by our application development and design teams as you work through your analytical challenges

Implement new GC technologies when your company is ready for them

Your business helps fuel the global economy by meeting the demand for petroleum, natural gas, and biofuel. Success depends upon safe, reliable, and efficient processes to ensure that consumers receive a consistent flow of these products.

For decades, Agilent has provided reliable analytical solutions to help researchers, process managers, and line analysts meet their measurement challenges. From characterizing raw crude and natural gas... to monitoring the production of refined chemicals... to determining the quality of alternative fuels... Agilent and our Channel Partners supply the most complete portfolio of Analyzers to the energy and chemical industry.

Agilent’s energy and chemical analyzers build on our reputation for hardware excellence and technical expertise.

Our solutions range from basic system modifications – such as using chemically inert materials and specialty columns in systems that quantitate trace contaminants in petrochemical streams – to complex, multi-valve analyzers that let you characterize a sample’s diverse components.

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Customized to get you
on the **FAST TRACK**

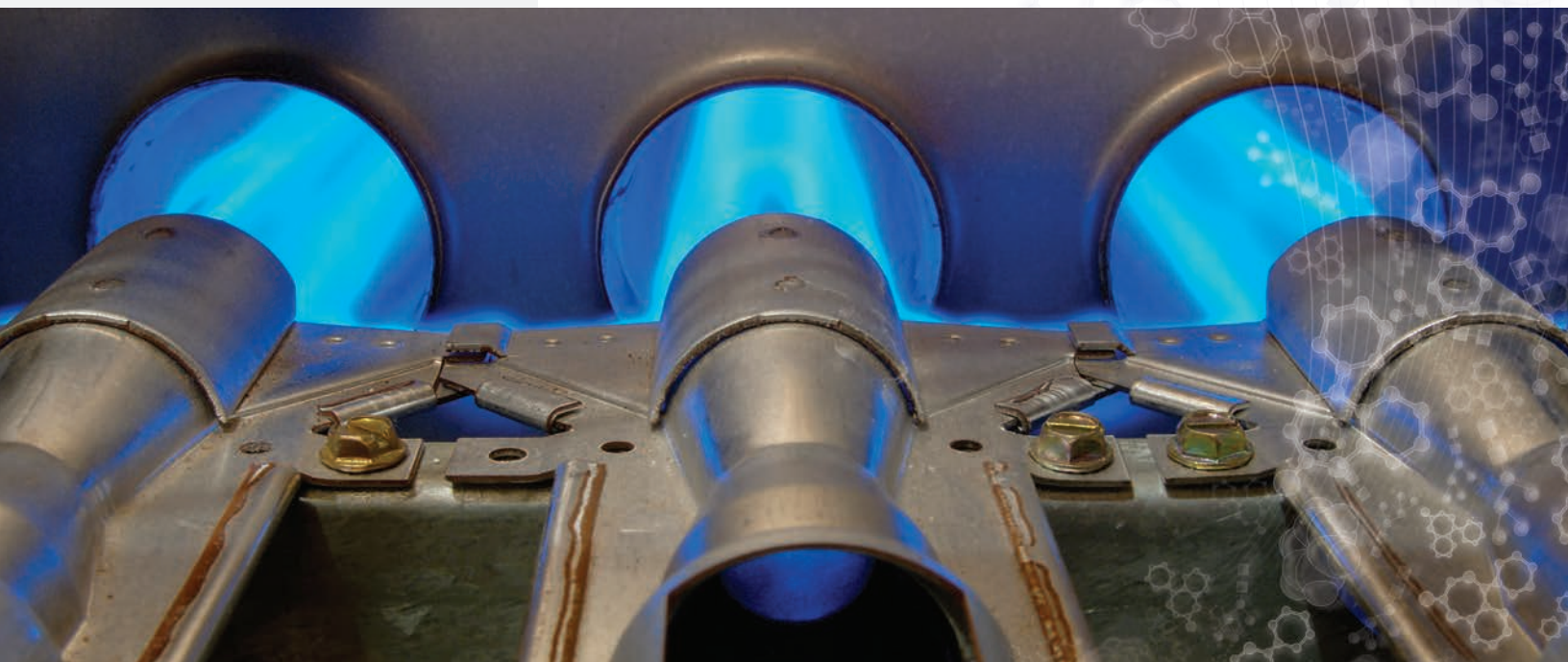


On the following pages, you will find Agilent's complete energy and chemical analyzer portfolio, including:

- **More than 100 factory tested, ready-to-use GC analytical solutions** developed to meet industry standards such as ASTM, UOP, EN, and GPA*
- **Custom analyzer systems** configured and tested to *your* application's pre-determined specifications
- **Specific instruments and tools** designed, delivered, and supported by Agilent Channel Partners

Whether you need a ready-to-go configuration or a custom analyzer, Agilent can help you and your team spend *less time* on analytical setup and *more time* producing outstanding results!

*This guide reports typical quantitation limits for each system configuration. These values may differ from the absolute reporting limit required by the method.



Learn more about Analyzer solutions for the energy and chemical industry at
[agilent.com/chem/energy](https://www.agilent.com/chem/energy)

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ANALYZER BY REFERENCE

Natural Gas

Analyzer Part Number	Analyzer Description	Configured per Published Method(s)
G3445 Series #542/7890-0042	Natural Gas Analyzer	ASTM D1945, GPA 2261 (H ₂ and He are not included)
G3445 Series #544/7890-0192	Natural Gas Analyzer	ASTM D1945, GPA 2261
G3445 Series #543/7890-0100	Natural Gas Analyzer	ASTM D1945, GPA 2261
G3445 Series #541/7890-0171	Extended Natural Gas Analyzer to C-12	GPA 2286 (calculation without bridge compounds iC ₅ and nC ₅)
G3445 Series #549/7890-0577	Extended Natural Gas with H ₂ S Analyzer (Varian Legacy)	GPA 2286 (calculation without bridge components iC ₅ and nC ₅)
G3445 Series #548/7890-0344	Extended Natural Gas Analyzer	GPA 2286 (calculation with bridge compounds iC ₅ and nC ₅)
G3445 Series #547/7890-0323	3-Channel Natural Gas Analyzer with Extended HC Analysis	ASTM D1945, GPA 2261
G3445 Series #545/7890-0012	Natural Gas Analyzer	GPA 2261 (H ₂ and He is not included, without separation of O ₂ and N ₂)
G3582A#120	Natural Gas Analyzer A: 2-Channel Micro GC	ASTM D3588-98, GPA 2177, GPA 2172, ISO 6974-6
G3582A#121	Natural Gas Analyzer A Extended: 3-Channel Micro GC	ASTM D3588-98, GPA 2177, GPA 2172, ISO 6974-6
G3582A#122	Natural Gas Analyzer B with H ₂ S: 2-Channel Micro GC	ASTM D3588-98, GPA 2177, GPA 2172, ISO 6974-6
G3582A#123	Natural Gas Analyzer B Extended with H ₂ S: 3-Channel Micro GC	ASTM D3588-98, GPA 2261, GPA 2177, GPA 2172, ISO 6974-6, ASTM D1945
7890-0611	Natural Gas Analyzer: Permanent Gas and Extended Hydrocarbons	
7890-0263	Extended Liquefied Natural Gas Analyzer	GPA 2186
7890-0110	Liquefied Natural Gas Analyzer	GPA 2177

Refinery Gas

Analyzer Part Number	Analyzer Description	Configured per Published Method(s)
G3445 Series #529	3-Channel Fast Refinery Gas including H ₂ S and O ₂ with the External Oven	ASTM D1945, ASTM D1946, UOP 539
G3445 Series #521/7890-0322	3-Channel Fast Refinery Gas Analyzer	ASTM D1945, D1946, UOP 539
G3445 Series #522/7890-0338	3-Channel Fast Refinery Gas Analyzer – H ₂ S and COS	ASTM D1945, D1946, UOP 539
G3445 Series #523/7890-0169	Extended Refinery Gas Analyzer	
G3445 Series #524/7890-0166	Refinery Gas Analyzer with Nickel Columns	ASTM D1945, D1946, UOP 539
G3445 Series #526/7890-0004	Refinery Gas Analyzer	UOP 539, ASTM D1946, D1945
CONTACT AGILENT	Refinery Gas Analyzer: 4-Channel Micro GC	UOP 59, DIN-51666, ASTM D2163
7890-0541	High Resolution RGA Analyzer (Varian Legacy)	UOP 539, ASTM D2163
7890-0378	3-Channel Fast Refinery Gas Analyzer without C ₆₊ backflush	ASTM D1946, ASTM D1945 and UOP 539 (partly, no C ₆₊ backflush)
7890-0339	2-Channel Fast Refinery Gas Analyzer with H ₂ S	ASTM D2163, D1946
7890-0337	Fast Refinery Gas Analyzer, 2-Channel	ASTM D2163, D1946
7890-0226	Refinery Gas Analyzer with High H ₂ and H ₂ S Content	
7890-0107/7890-0316	Extended Refinery Gas Analyzer	

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Permanent Gas

Analyzer Part Number	Analyzer Description	Configured per Published Method(s)
G3445 Series #586/7890-0573	Permanent Gas/Hydrogen Analyzer (Varian Legacy)	
G3445 Series #585/7890-0538	Permanent Gas Analyzer (Varian Legacy)	
7890-0610	Permanent Gases and Hydrocarbons in Natural Gas Analyzer	

Liquefied Petroleum Gas (LPG)

Analyzer Part Number	Analyzer Description	Configured per Published Method(s)
7890-0397	Hydrocarbons in LPG Analyzer	ASTM D2163
7890-0188	Commercial Propane and Butane LPG Analyzer	ASTM D2163, ISO 7941, EN 27941, and IP 405
7890-0138	LPG Composition Analyzer	ASTM D2163, ASTM D2593, ASTM D2712, ASTM D4424

Trace Impurities

Analyzer Part Number	Analyzer Description	Configured per Published Method(s)
G3445 Series #646/7890-0282	Low CO and CO ₂ in Process Gases Containing High CH ₄ Analyzer	
G3445 Series #647/7890-0304	Low CO and CO ₂ in Process Gas Analyzer	
7890-0409	Impurities in Ethylene/Propylene Analyzer by PDHID	
7890-0366	Trace CO and CO ₂ in Hydrogen and Light Gaseous Hydrocarbon Analyzer	UOP 603
7890-0355	Low CO and CO ₂ in Process Gases with Nicat Bypass to Detector	
7890-0305	Inert Impurities in Crude Chlorine Analyzer	
7890-0341	Trace Oxygenate and Hydrocarbons in Ethylene Analyzer	
7890-0237	Impurities in Monomers Analyzer by PDHID	
7890-0219	Trace Impurities in Helium Analyzer by PDHID	
7890-0191	2-Channel Inert Impurities in Pure Chlorine Analyzer	

Transformer Oil Gas

Analyzer Part Number	Analyzer Description	Configured per Published Method(s)
G3445 Series #571/7890-0261	Transformer Oil Gas Analyzer (TOGA)	ASTM D3612-C
7890-0552	Transformer Oil Gas Analyzer (TOGA)	ASTM D3612-C
7890-0047	Transformer Oil Gas Analyzer (TOGA)	ASTM D3612-A

Reformulated Fuel

Analyzer Part Number	Analyzer Description	Configured per Published Method(s)
G3445 Series #611/7890-0183	Single Channel Oxygenates and Aromatics in Fuel Analyzer	ASTM D4815, ASTM D5580
G3445 Series #612/7890-0291	Dual Parallel Channel Oxygenates and Aromatics in Fuel Analyzer	ASTM D4815, ASTM D5580
G3445 Series #614/7890-0049	Oxygenates in Fuel Analyzer	ASTM D4815
G3445 Series #615/7890-0198	Benzene in Gasoline Analyzer	ASTM D3606
G3445 Series #616/7890-0106	Aromatics in Fuel Analyzer	ASTM D5580
G3445 Series #617/7890-0098	Oxygenates and Aromatics in Gasoline by Deans Switch Analyzer	EN 13132, EN 12177
G3445 Series #618/7890-0178	Low Level Oxygenates in Light Hydrocarbons by Capillary Flow Technology micro volume tee	ASTM D7423
G3445 Series #482/7890-0606	FAME Contamination in Jet Fuel Analyzer by GC/MS	IP 585
7890-0308	Oxygenates, Aromatics, and Benzene in Fuel Analyzer	ASTM D4815, ASTM D5580, ASTM D3606
7890-0340	Trace Oxygenates in Reformulated Gasoline Analyzer	ASTM D7754
7890-0549	Gasohol Analyzer (Varian Legacy)	ASTM D3606, ASTM D4815 (partial)
7890-0589	Low Level Oxygenates Analyzer (Varian Legacy)	

Sulfur and Nitrosamine

Analyzer Part Number	Analyzer Description	Configured per Published Method(s)
G3445 Series #662/7890-0365	Sulfur Analyzer by SCD	ASTM D5623, UOP 791
G3445 Series #661/7890-0375	Sulfur Analyzer by SCD	ASTM D5504
7890-0148/7890-0167	Volatile Sulfur Analysis	ASTM D6228
7890-0460	Nitrosamine in Liquids Analyzer (by NCD)	

Biodiesel/Renewable Fuel

Analyzer Part Number	Analyzer Description	Configured per Published Method(s)
G3445 Series #634/7890-0297	Biodiesel Analyzer per EN 14105:2011	EN 14105:2011
G3445 Series #633/7890-0300	FAME Content in Biodiesel Analyzer	EN 14103:2011
G3445 Series #632/7890-0427	Five-in-One Biodiesel Analyzer	ASTM D6584, EN 14105:2011, EN 14103:2003, EN 14110:2003, EN 14106:2003
G3445 Series #631/7890-0294	Glycerin in Biodiesel Analyzer	ASTM D6584
G3582A#110	Biogas Analyzer: 2-Channel Micro GC	
G3582A#111	Biogas Analyzer: 3-Channel Micro GC	
7890-0520	Fuel Ethanol Analyzer	ASTM D5501
7890-0307*	FAME Content in Biodiesel Blends Analyzer	EN 14331:2004
7890-0295	Methanol in Biodiesel Analyzer	EN 14100:2003

* SP1 7890-0307 analysis based on EN14331:2004; configuration with Dean's Switch simplifies sample preparation.

Simulated Distillation

Analyzer Part Number	Analyzer Description	Configured per Published Method(s)
G3445 Series #655/7890-0462	Simulated Distillation Analyzer: Boiling Range from 174 °C to 700 °C	ASTM D6352
G3445 Series #654/7890-0461	Simulated Distillation Analyzer: Boiling Range from 100 °C to 615 °C	ASTM D7213 (D2887 extended)
G3440 Series Option 653	Simulated Distillation Analyzer: Boiling Range from 55 °C to 538 °C	ASTM D2887

Greenhouse Gas

Analyzer Part Number	Analyzer Description	Configured per Published Method(s)
G3445 Series #561/7890-0468	Greenhouse Gas Analyzer	
G3445 Series #563/7890-0505	Greenhouse Gas Analyzer	
G3445 Series #562/7890-0467	Greenhouse Gas Analyzer	
7890-0542	Fast Greenhouse Gas Analyzer (Varian Legacy)	
7890-0504	Greenhouse Gas Analyzer	
7890-0469	Greenhouse Gas Analyzer	

Miscellaneous

Analyzer Part Number	Analyzer Description	Configured per Published Method(s)
G3445 Series #699/7890-0376	Analyzer checkout with EZChrom software	
7890-0455	Analyzer for Low Sulfur Compounds in Hydrocarbon Matrices with Deans Switch Backflush System	
7890-0496	Prefractionator for Analysis of Light Ends of Crude Oil Analyzer	
7890-0377	Analyzer with Parallel Splitter for Liquefied and Gas Samples through Tandem SCD-FID	
7890-0084/7890-0130	Gas Blender	
7890-0326, 0190, 0067, 0037, 0005	SP1 for Stream Selection Valve - Type SC	
7890-0244, 0204, 0145, 0064, 0063, 0048, 0030, 0010, 0007	SP1 for Stream Selection Valve - Type SD	
7890-0287, 0077, 0057, 0055, 0034	SP1 for Stream Selection Valve - Type SF	
7890-0301, 0299, 0090, 0089, 0088, 0080	SP1 for Stream Selection Valve - Type ST	
7890-0076, 0075	SP1 for Stream Selection Valve - Type STF	
7890-0082, 0103, 0239, 0240, 0243, 0313, 0382, 0381, 0407, 0406	Special Passivation with Sulfinert™	

ANALYZER BY COMPLIANCE METHOD

ASTM Method Configurations

Analyzer Group	Analyzer Part Number	Comments
ASTM D1945		
Natural Gas Analyzer	G3445 Series #542/7890-0042	
Natural Gas Analyzer	G3445 Series #544/7890-0192	
Natural Gas Analyzer	G3445 Series #543/7890-0100	
3-Channel Natural Gas Analyzer with Extended HC Analysis	G3445 Series #547/7890-0323	
Natural Gas Analyzer B with H ₂ S: 3-Channel Micro GC	G3582A#123	
3-Channel Fast Refinery Gas Analyzer	G3445 Series #521/7890-0322	
3-Channel Fast Refinery Gas Analyzer - H ₂ S and COS	G3445 Series #522/7890-0338	
3-Channel Fast Refinery Gas Analyzer without C ₆₊ backflush	7890-0378	
Refinery Gas Analyzer	G3445 Series #526/7890-0004	
Refinery Gas Analyzer with Nickel Columns	G3445 Series #524/7890-0166	
3-Channel Fast Refinery Gas including H ₂ S and O ₂ with the External Oven	G3445 Series #529	
ASTM D1946		
3-Channel Fast Refinery Gas Analyzer	G3445 Series #521/7890-0322	
3-Channel Fast Refinery Gas Analyzer - H ₂ S and COS	G3445 Series #522/7890-0338	
Fast Refinery Gas Analyzer, 2-Channel	7890-0337	
2-Channel Fast Refinery Gas Analyzer with H ₂ S	7890-0339	
3-Channel Fast Refinery Gas Analyzer without C ₆₊ backflush	7890-0378	
Refinery Gas Analyzer	G3445 Series #526/7890-0004	
Refinery Gas Analyzer with Nickel Columns	G3445 Series #524/7890-0166	
3-Channel Fast Refinery Gas including H ₂ S and O ₂ with the External Oven	G3445 Series #529	

Analyzer Group	Analyzer Part Number	Comments
ASTM D2163		
Commercial Propane and Butane LPG Analyzer	7890-0188	
LPG Composition Analyzer	7890-0138	
Hydrocarbons in LPG Analyzer	7890-0397	
Fast Refinery Gas Analyzer, 2-Channel	7890-0337	
2-Channel Fast Refinery Gas Analyzer with H ₂ S	7890-0339	
High Resolution RGA Analyzer (Varian Legacy)	7890-0541	
Refinery Gas Analyzer: 4-Channel Micro GC	CONTACT AGILENT	
ASTM D2887		
Simulated Distillation Analyzer: Boiling Range from 55 °C to 538 °C	G3440 Series Option 653	
ASTM D3588-98		
Natural Gas Analyzer A: 2-Channel Micro GC	G3582A#120	
Natural Gas Analyzer A Extended: 3-Channel Micro GC	G3582A#121	
Natural Gas Analyzer B with H ₂ S: 2-Channel Micro GC	G3582A#122	
Natural Gas Analyzer B Extended with H ₂ S: 3-Channel Micro GC	G3582A#123	
ASTM D3606		
Benzene in Gasoline Analyzer	G3445 Series #615/7890-0198	
Oxygenates, Aromatics, and Benzene in Fuel Analyzer	7890-0308	
Gasohol Analyzer (Varian Legacy)	7890-0549	
ASTM D3612-A		
Transformer Oil Gas Analyzer	7890-0047	

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ASTM Method Configurations

Analyzer Group	Analyzer Part Number	Comments
ASTM D3612-C		
Enhanced Transformer Oil Gas Analyzer (TOGA)	G3445 Series #571/7890-0261	
Transformer Oil Gas Analyzer	7890-0552	
ASTM D4815		
Oxygenates in Fuel Analyzer	G3445 Series #614/7890-0049	
Single Channel Oxygenates and Aromatics in Fuel Analyzer	G3445 Series #611/7890-0183	
Dual Parallel Channel Oxygenates and Aromatics in Fuel Analyzer	G3445 Series #612/7890-0291	
Oxygenates, Aromatics, and Benzene in Fuel Analyzer	7890-0308	
Gasohol Analyzer (Varian Legacy)	7890-0549	Partially meets D4815
ASTM D5501		
Fuel Ethanol Analyzer	7890-0520	
ASTM D5504		
Sulfur Analyzer by SCD	G3445 Series #661/7890-0375	
ASTM D5580		
Single Channel Oxygenates and Aromatics in Fuel Analyzer	G3445 Series #611/7890-0183	
Dual Parallel Channel Oxygenates and Aromatics in Fuel Analyzer	G3445 Series #612/7890-0291	
Aromatics in Fuel Analyzer	G3445 Series #616/7890-0106	
Oxygenates, Aromatics, and Benzene in Fuel Analyzer	7890-0308	

Analyzer Group	Analyzer Part Number	Comments
ASTM D5623		
Sulfur Analyzer for SCD	G3445 Series #662/7890-0365	
ASTM D6228		
Volatile Sulfur Analysis	7890-0148/7890-0167	
ASTM D6352		
Simulated Distillation Analyzer: Boiling Range from 174 °C to 700 °C	G3445 Series #655/7890-0462	
ASTM D6584		
Glycerin in Biodiesel Analyzer	G3445 Series #631/7890-0294	
Five-in-One Biodiesel Analyzer	G3445 Series #632/7890-0427	
ASTM D7213		
Simulated Distillation Analyzer: Boiling Range from 100 °C to 615 °C	G3445 Series #654/7890-0461	Extended 2887
ASTM D7423		
Low Level Oxygenates in Light Hydrocarbons Analyzer	G3445 Series #618/7890-0178	
ASTM D7754		
Trace Oxygenates in Reformulated Gasoline Analyzer	7890-0340	

DIN Method Configurations

Analyzer Group	Analyzer Part Number	Comments
DIN-51666		
Refinery Gas Analyzer: 4-Channel Micro GC	CONTACT AGILENT	

EN Method Configurations

Analyzer Group	Analyzer Part Number	Comments
EN 12177		
Oxygenates and Aromatics in Gasoline by Deans Switch Analyzer	G3445 Series #617/7890-0098	
EN 13132		
Oxygenates and Aromatics in Gasoline by Deans Switch Analyzer	G3445 Series #617/7890-0098	
EN 14103:2003		
Five-in-One Biodiesel Analyzer	G3445 Series #632/7890-0427	
EN 14103:2011		
FAME Content in Biodiesel Analyzer	G3445 Series #633/7890-0300	
EN 14105:2011		
Biodiesel Analyzer per EN 14105:2011	G3445 Series #634/7890-0297	
Five-in-One Biodiesel Analyzer	G3445 Series #632/7890-0427	
EN 14106:2003		
Five-in-One Biodiesel Analyzer	G3445 Series #632/7890-0427	
EN 14110:2003		
Five-in-One Biodiesel Analyzer	G3445 Series #632/7890-0427	
Methanol in Biodiesel Analyzer	7890-0295	
EN 27941		
Commercial Propane and Butane LPG Analyzer	7890-0188	

GPA Method Configurations

Analyzer Group	Analyzer Part No.	Comments
GPA 2172		
Natural Gas Analyzer A: 2-Channel Micro GC	G3582A#120	
Natural Gas Analyzer A Extended: 3-Channel Micro GC	G3582A#121	
Natural Gas Analyzer B with H ₂ S: 2-Channel Micro GC	G3582A#122	
Natural Gas Analyzer B Extended with H ₂ S: 3-Channel Micro GC	G3582A#123	
GPA 2177		
Liquefied Natural Gas Analyzer	7890-0110	
Natural Gas Analyzer A: 2-Channel Micro GC	G3582A#120	
Natural Gas Analyzer A Extended: 3-Channel Micro GC	G3582A#121	
Natural Gas Analyzer B with H ₂ S: 2-Channel Micro GC	G3582A#122	
Natural Gas Analyzer B Extended with H ₂ S: 3-Channel Micro GC	G3582A#123	
GPA 2186		
Extended Liquefied Natural Gas Analyzer	7890-0263	
GPA 2261		
Natural Gas Analyzer	G3445 Series #542/7890-0042	
Natural Gas Analyzer	G3445 Series #544/7890-0192	
Natural Gas Analyzer	G3445 Series #543/7890-0100	
Natural Gas Analyzer	G3445 Series #545/7890-0012	
3-Channel Natural Gas Analyzer with Extended HC Analysis	G3445 Series #547/7890-0323	
Natural Gas Analyzer B Extended with H ₂ S: 3-Channel Micro GC	G3582A#123	
GPA 2286		
Extended Natural Gas Analyzer to C-12	G3445 Series #541/7890-0171	Calculation without bridge compounds iC ₅ and nC ₅
Extended Natural Gas Analyzer	G3445 Series #548/7890-0344	Calculation with bridge compounds iC ₅ and nC ₅
Extended Natural Gas Analyzer with H ₂ S Analyzer (Varian Legacy)	G3445 Series #549/7890-0577	Calculation without bridge components iC ₅ and nC ₅

IP Method Configurations

Analyzer Group	Analyzer Part Number	Comments
IP 585		
Low Level Oxygenates Analyzer (Varian Legacy)	7890-0589	
IP 405		
Commercial Propane and Butane LPG Analyzer	7890-0188	

ISO Method Configurations

Analyzer Group	Analyzer Part Number	Comments
ISO 6974-6		
Natural Gas Analyzer A: 2-Channel Micro GC	G3582A#120	
Natural Gas Analyzer A Extended: 3-Channel Micro GC	G3582A#121	
Natural Gas Analyzer B with H ₂ S: 2-Channel Micro GC	G3582A#122	
Natural Gas Analyzer B Extended with H ₂ S: 3-Channel Micro GC	G3582A#123	
ISO 7941		
Commercial Propane and Butane LPG Analyzer	7890-0188	

UOP Method Configurations

Analyzer Group	Analyzer Part Number	Comments
UOP 539		
3-Channel Fast Refinery Gas Analyzer	G3445 Series #521/7890-0322	
3-Channel Fast Refinery Gas Analyzer - H ₂ S and COS	G3445 Series #522/7890-0338	
Refinery Gas Analyzer	G3445 Series #526/7890-0004	
High Resolution RGA Analyzer (Varian Legacy)	7890-0541	
Refinery Gas Analyzer with Nickel Columns	G3445 Series #524/7890-0166	
3-Channel Fast Refinery Gas including H ₂ S and O ₂ with the External Oven	G3445 Series #529	
3-Channel Fast Refinery Gas Analyzer without C ₆₊ backflush	7890-0378	Partially meets UOP 539, no C ₆₊ backflush
UOP 603		
Trace CO and CO ₂ in Hydrogen and Light Gaseous Hydrocarbons Analyzer	7890-0366	
UOP 59		
Refinery Gas Analyzer: 4-Channel Micro GC	CONTACT AGILENT	

SOLUTIONS FOR NATURAL GAS



Quickly and reliably determine composition and calorific value

Natural gas is widely used for heating buildings, generating electricity, and providing needed power for industrial processes.

This naturally occurring mixture of gaseous hydrocarbons consists primarily of methane, but can also include other hydrocarbons (C_1 - C_4 chain length), as well as small amounts of impurities, such as O_2 , N_2 , CO_2 , H_2 , He, and sulfur-containing hydrocarbons.

Before it can be sold, natural gas must meet specifications for calorific value and purity; accordingly, collection, processing, transmitting, and distribution demands an array of analytical capabilities. Production by-products – such as ethane, propane, butanes, pentanes and hydrogen sulfide – must also be characterized prior to use in downstream processes.

Agilent Natural Gas Analyzers measure permanent gases and hydrocarbon content (C_1 - C_5 with C_{6+} as backflush), and perform extended analysis of hydrocarbons in natural gas to C_{14} . These factory-configured, chemically tested GC analyzers help you evaluate the chemical composition of natural gas, natural gas liquids, and by-products that result from processing.

Learn more about Analyzer solutions for the energy and chemical industry at
[agilent.com/chem/energy](https://www.agilent.com/chem/energy)

Solutions for Natural Gas

Analyzer/SP1 Number	Extended hydrocarbon analysis to C ₁₂ /C ₁₄	Full-range capacity for H ₂	Separates air (O ₂ and N ₂)	High level of H ₂ S	Handles liquefied samples
G3445 Series #542/7890-0042	No	No	Yes	No	No
G3445 Series #544/7890-0192	No	No	Yes	Yes	No
G3445 Series #543/7890-0100	No	Yes	Yes	No	No
G3445 Series #541/7890-0171	Yes	No	Yes	No	No
G3445 Series #549/7890-0577	Yes	No	No	Yes	Yes
G3445 Series #548/7890-0344	Yes	No	Yes	No	No
G3445 Series #547/7890-0323	No	Yes	Yes	No	No
G3445 Series #545/7890-0012	No	No	No	No	No
G3582A#120	Yes	No	No	No	Optional
G3582A#121	Yes	No	No	No	Optional
G3582A#122	No	No	No	Yes	Optional
G3582A#123	No	No	Yes	Yes	Optional
7890-0611	Yes	No	Yes	No	Yes (with optional LSV)
7890-0263	Yes	No	No	No	Yes
7890-0110	No	No	No	No	Yes

Reference Methods for Natural Gas: Quantitation Ranges for Compounds of Interest

Compound	ASTM D1945 mol %	ASTM D1946 mol %	ASTM D2163 mol %	UOP 539 mol %	GPA 2186	GPA 2286	ISO 6974-6
H ₂ S	0.3 to 30		–	0.1 to 25	–	0.1 to 100	–
O ₂	0.01 to 20		–	0.1 to 99.9%	–	0.005 to 20	0.007 to 5
N ₂	0.01 to 100	–	–		0.005 to 5	0.005 to 100	0.007 to 40
CH ₄	0.01 to 100	–	–		0.001 to 5	0.001 to 100	40 to 100
CO		–	–		–	–	0.001 to 1
CO ₂	0.01 to 20	–	–		0.005 to 5	0.005 to 100	0.001 to 10
He	0.01 to 10	–	–		–	–	0.002 to 0.5
H ₂	0.01 to 10	–	–		–	–	0.001 to 0.5
Ethane	0.01 to 100	–	0.1% and above	0.1 to 99.9%	0.001 to 95	0.001 to 100	0.002 to 15
Propane	0.01 to 100	–	0.1% and above		0.001 to 100	0.001 to 100	0.001 to 5
C ₄ isomers	0.01 to 10	–	0.1% and above		0.001 to 100	0.001 to 10	0.0001 to 1
C ₅ isomers	0.01 to 2	–	0.1% and above		0.001 to 50	0.001 to 5	0.0001 to 0.5
C ₆ isomers	0.01 to 2	–	–	–	0.001 to 30	0.001 to 5	0.0001 to 0.5
C ₆₊	–	–	–	0.1 to 99.9%	–	–	–
C ₇₊	0.01 to 1	–	–	–	0.001 to 30	–	–
C ₇ -C ₈	–	–	–	–	–	0.001 to 2	0.0001 to 0.5
C ₉	–	–	–	–	–	0.001 to 2	–
C ₁₀ -C ₁₄	–	–	–	–	–	0.001 to 1	–

* This guide reports typical quantitation limits for each system configuration. These values may differ from the absolute reporting limit required by the method. Note: In the table above the symbol "–" indicates that this parameter was not specified.

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Natural Gas Analyzer (G3445 Series #542/7890-0042)

Analyzer Description

Configuration:

- 3-valve/4-column (packed column)/TCD

Sample type:

- Natural gas and similar gaseous mixtures

Compounds analyzed*:

- C₁-C₅ (methane, ethane, propane, iso-Butane, n-Butane, iso-Pentane, and n-Pentane)
- C₆₊ as backflush,
- O₂, N₂, CO₂, and CO

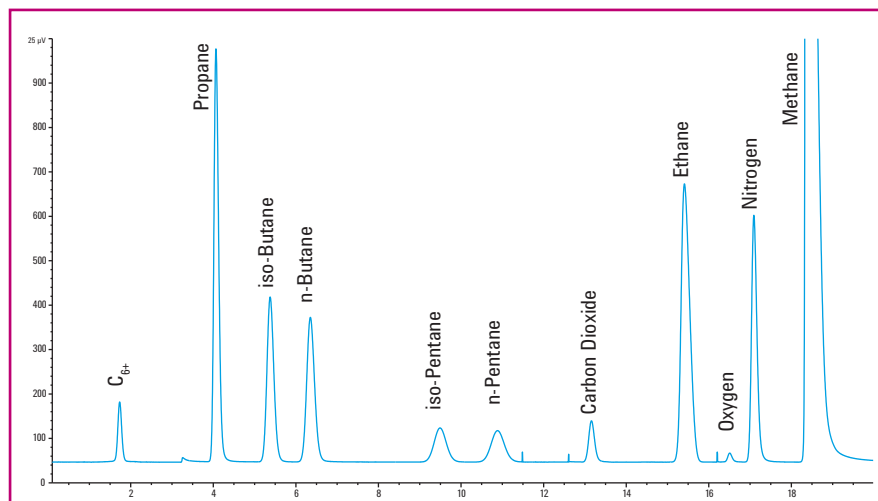
Typical quantification range:

- 0.01 Mol% for all components

Configured per method:

- ASTM D1945, GPA 2261 (H₂ and He are not included)

*To include H₂S analysis please order Agilent P/N 7890-0192



► KEY BENEFITS AND FEATURES

- Single TCD channel
- Rugged packed columns
- 20 minute analysis time
- Software provided for natural gas calculations per GPA 2261

Natural Gas Analyzer (G3445 Series #544/7890-0192)

Analyzer Description

Configuration:

- 3-valve/4-column (packed column)/TCD

Sample type:

- Natural gas and similar gaseous mixtures

Compounds analyzed:

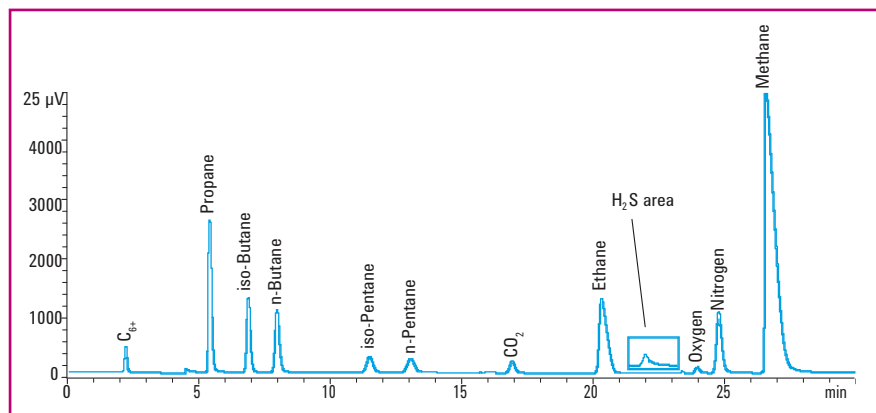
- C₁-C₅ (methane, ethane, propane, iso-Butane, n-Butane, iso-Pentane, and n-Pentane),
- C₆₊ as backflush,
- O₂, N₂, H₂S, CO₂, and CO

Typical quantification range:

- 0.01 Mol% for all components except H₂S, 500 ppm for H₂S

Configured per method:

- ASTM D1945, GPA 2261



► KEY BENEFITS AND FEATURES

- Single TCD channel
- Rugged packed columns
- 30-minute analysis time
- Software provided for natural gas calculations per GPA 2261
- System G3445 Series #544/7890-0192 has the same hardware configuration as G3445 Series #542/7890-0042 but uses nickel columns, Hastelloy valve, sample inlet line, and frit to facilitate analysis of natural gas containing high concentrations of H₂S

Natural Gas Analyzer (G3445 Series #543/7890-0100)

Analyzer Description

Configuration:

- 4-valve/6-column (packed column)/2-TCD

Sample type:

- Natural gas and similar gaseous mixtures

Compounds analyzed:

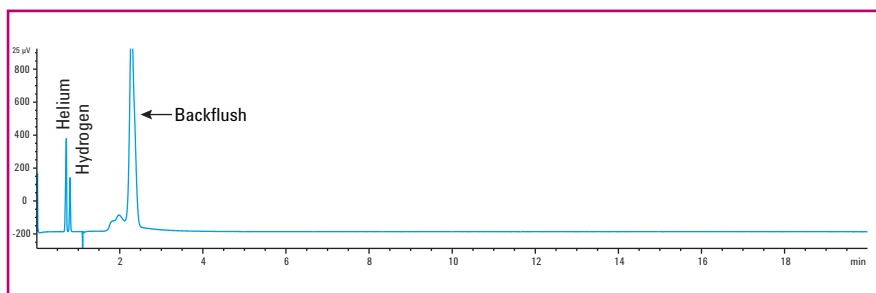
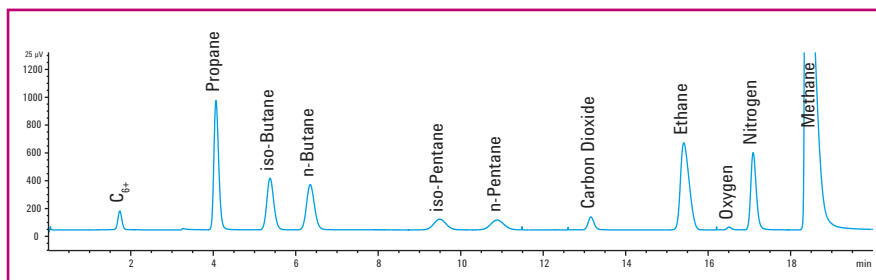
- C₁-C₅, C₆₊
- H₂, He, O₂, N₂, CO₂, and CO

Typical quantification range:

- 0.01 Mol% for all components

Configured per method:

- ASTM D1945, GPA 2261



► KEY BENEFITS AND FEATURES

- Dual TCD channels
- Rugged packed columns
- 20 minute analysis time
- Dedicated channel for H₂ and He analysis

Extended Natural Gas Analyzer to C-12 (G3445 Series #541/7890-0171)

Analyzer Description

Configuration:

- 3-valve/4-column (capillary and packed column)/TCD/FID

Sample type:

- Natural gas and similar gaseous mixtures

Compounds analyzed:

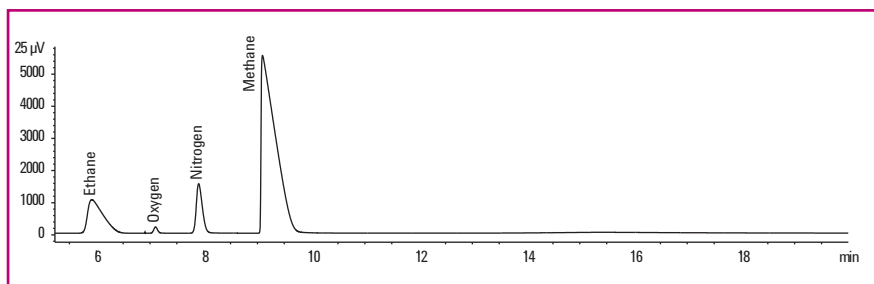
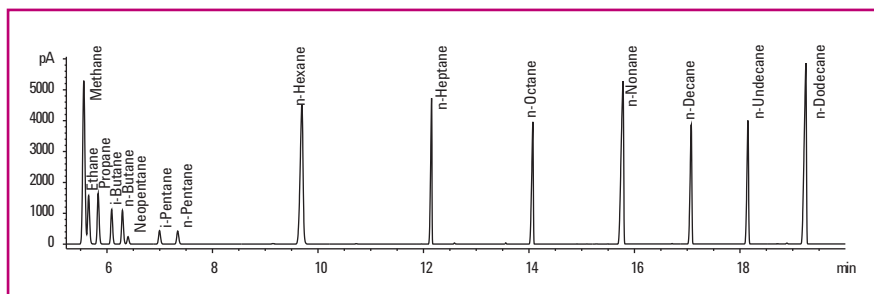
- C₁-C₁₂, O₂, N₂, CO₂, and CO

Typical quantification range:

- 50 ppm for permanent gases and C₁-C₂ hydrocarbons on TCD, 10 ppm for C₃-C₁₂ hydrocarbons (FID)

Configured per method:

- Results per GPA 2286, but calculation without bridge components iC₅ and nC₅



► KEY BENEFITS AND FEATURES

- Dual channels with TCD and FID detectors
- TCD channel with packed column for C₁-C₂, O₂, N₂, CO₂ analysis
- C₃-C₁₂ hydrocarbons separated on PONA column and measured on FID
- Adapt to liquefied natural gas by adding additional liquid sampling valve

Extended Natural Gas with H₂S Analyzer: Varian Legacy (G3445 Series #549/7890-0577)

Analyzer Description

Configuration:

- 2-Valve/2-LSV/3-Columns /TCD/
FID/Hastelloy valve/Nickel tubing

Sample type:

- Natural gas and similar
gaseous mixtures

Compounds analyzed:

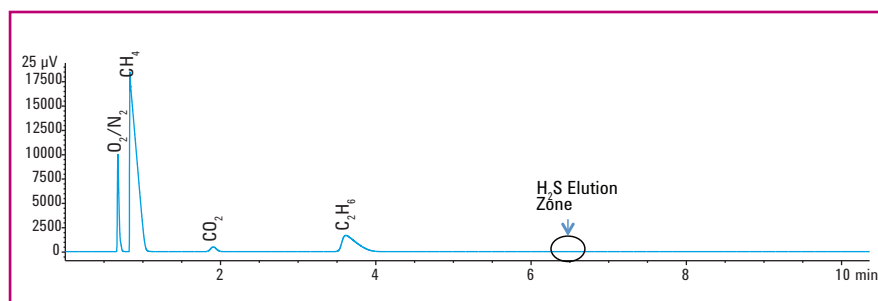
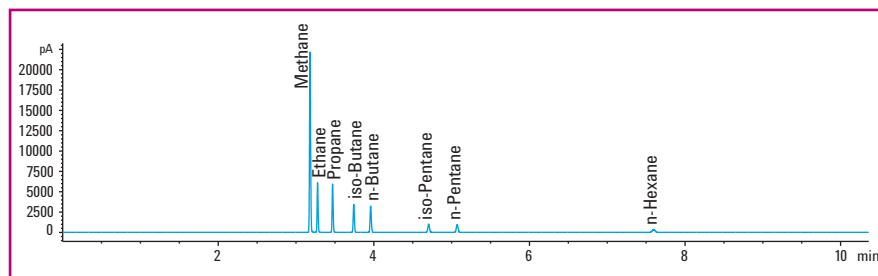
- C₁-C₁₄, Ar/O₂/N₂, CO₂, H₂S

Typical quantification range:

- 50 ppm for permanent gases and
C₁-C₂ hydrocarbons (TCD)
- 10 ppm for C₃-C₁₄ hydrocarbons
(FID)
- 500 ppm for H₂S

Configured per method:

- GPA 2286 (calculation without
bridge components: iC₅ and nC₅)



► KEY BENEFITS AND FEATURES

- Dual channels with TCD and FID detectors for extended liquefied NGA with H₂S
- TCD channel with packed column for O₂/Ar/N₂ (composite peak), CH₄, CO₂, C₂H₆ and H₂S analysis
- Hydrocarbons analysis are extended up to C₁₄ with CP-Sil 5 CB column and FID
- Liquid sampling valve can be used for liquefied natural gas
- Hastelloy valve, sample inlet line, and frit for high concentrations of H₂S containing natural gas

Extended Natural Gas Analyzer (G3445 Series #548/7890-0344)

Analyzer Description

Configuration:

- 4-valve/3-column (capillary and packed column with one 'composite' column consisting of three special package columns interconnected/TCD/FID)

Sample type:

- Natural gas and similar gaseous mixtures

Compounds analyzed:

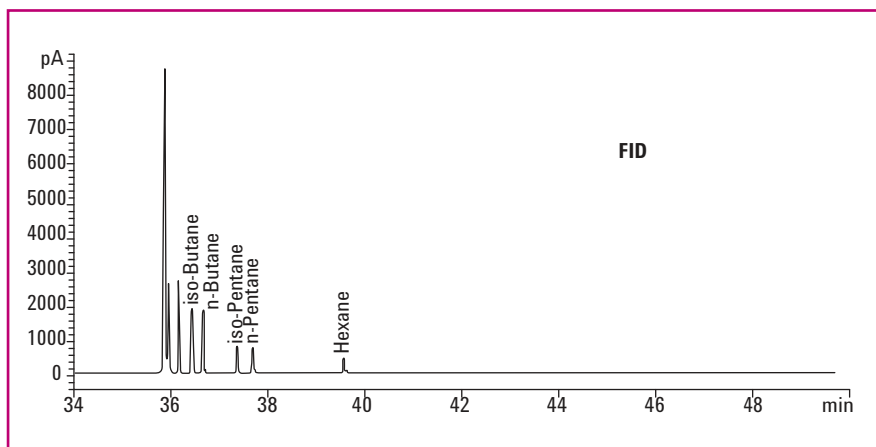
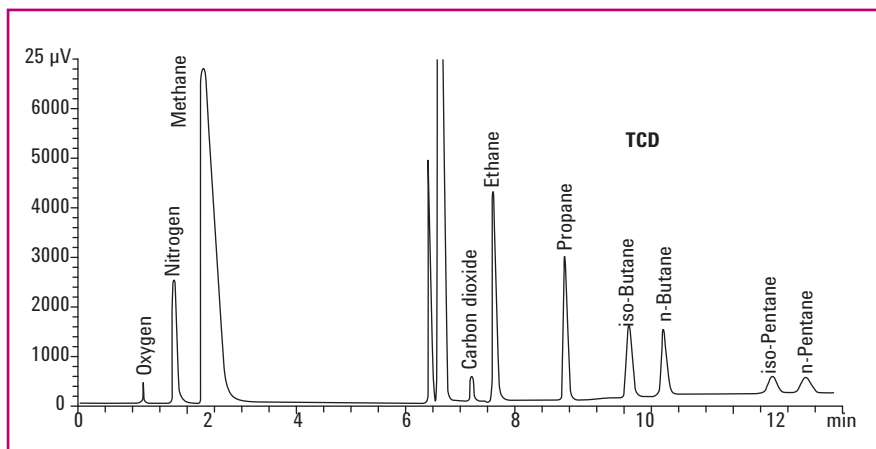
- C₁-C₁₄
- O₂, N₂, and CO₂

Typical quantification range:

- 50 ppm for permanent gases and C₁-C₅ hydrocarbons (TCD)
- 10 ppm for C₅-C₆ hydrocarbons (FID)

Configured per method:

- GPA 2286 (calculation uses bridge components: iC₅ and nC₅ as required by GPA 2286)



► KEY BENEFITS AND FEATURES

- Two-channel with TCD and FID detectors
- Fixed gases and hydrocarbons up to C₅ on packed columns and thermal conductivity detector
- Hydrocarbons from C₅ to C₁₄ are analyzed on a capillary column and a flame ionization detector
- The pentanes are used as 'bridging' compounds for calculations per GPA 2286
- Software supplied to generate a data report per GPA 2286

3-Channel Natural Gas Analyzer with Extended HC Analysis (G3445 Series #547/7890-0323)

Analyzer Description

Configuration:

- 4-valve/6-column (packed column)/2-TCD/FID

Sample type:

- Natural gas and similar gaseous mixtures

Compounds analyzed:

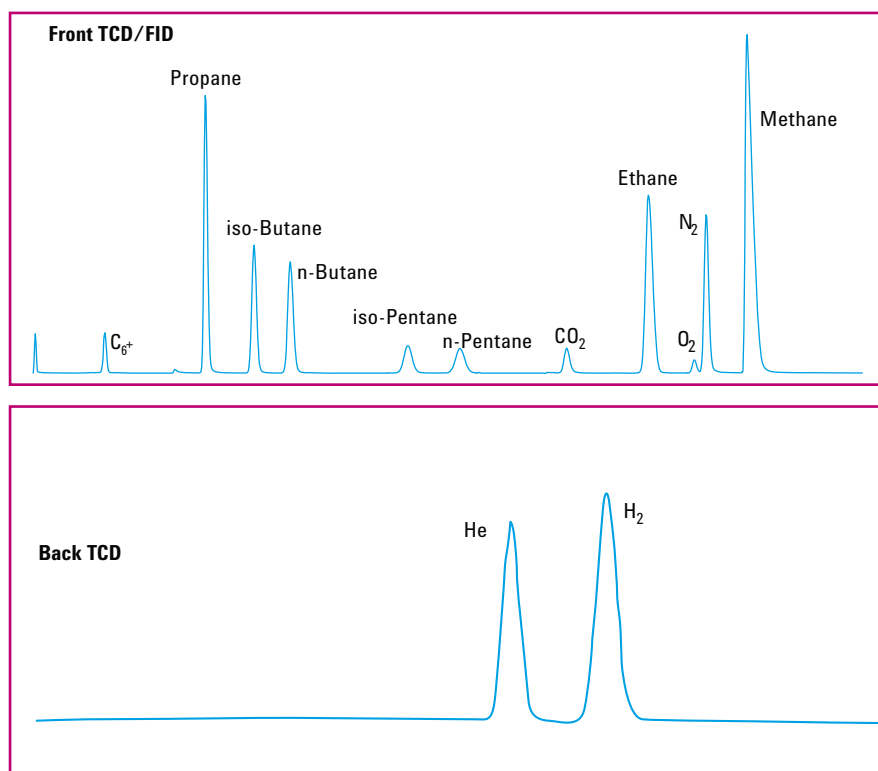
- C_1 - C_5 , C_{6+}
- H_2 , He, O_2 , N_2 , CO_2 , and CO

Typical quantification range:

- 10 ppm for hydrocarbons (FID),
0.01 Mol% for all permanent gases

Configured per method:

- ASTM D1945, GPA 2261



► KEY BENEFITS AND FEATURES

- Dual-TCD and FID system is basically the same as 7890-0100 with additional FID installed series with first TCD to increase sensitivity for hydrocarbon detection
- Rugged packed columns
- 20 minute analysis time (C_1 - C_5 , C_{6+})
- Dedicated channel for H_2 and He analysis

Natural Gas Analyzer (G3445 Series #545/7890-0012)

Analyzer Description

Configuration:

- 1-valve/2-column (packed column)/TCD

Sample type:

- Natural gas and similar gaseous mixtures

Compounds analyzed:

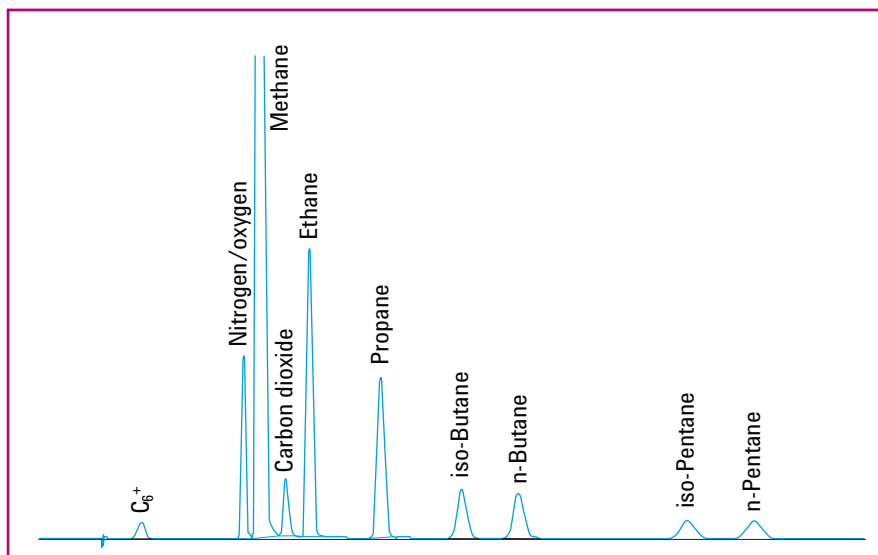
- C₁-C₅ (methane, ethane, propane, iso-Butane, n-Butane, iso-Pentane, and n-Pentane)
- C₆₊ as backflush
- Air composite
- CO₂

Typical quantification range:

- 0.01 Mol% for all components

Configured per method:

- GPA 2261 (H₂ and He is not included, without separation of O₂ and N₂)



► KEY BENEFITS AND FEATURES

- Single TCD channel
- Rugged packed columns
- Simple and low cost for light hydrocarbon analysis
- 13 minute analysis time

Natural Gas Analyzer A: 2-Channel Micro GC (G3582A#120)

Analyzer Description

Configuration:

- Two channel Micro GC
 - Channel 1: HayeSep A
 - Channel 2: CP-Sil 5 CB

Sample type:

- Natural gas and liquefied* natural gas

Compounds analyzed:

- Hydrocarbons C₁-C₉
- Carbon dioxide and Air

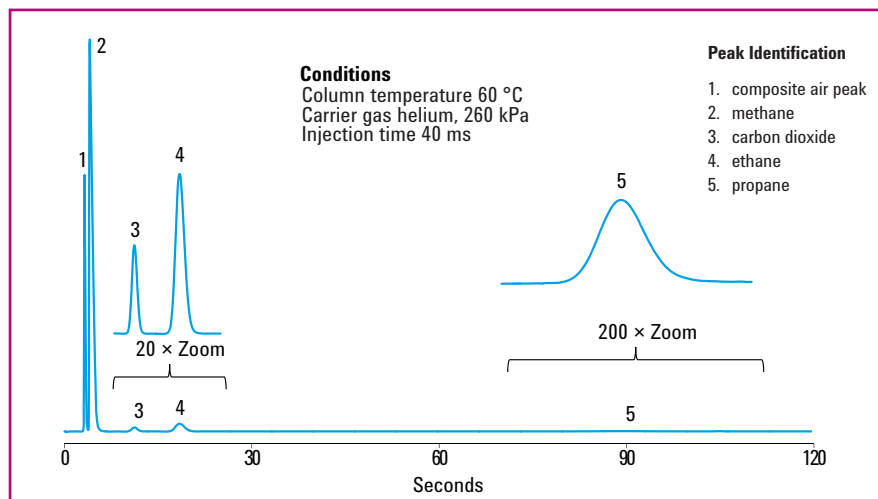
Typical quantification range:

- 1-10 ppm

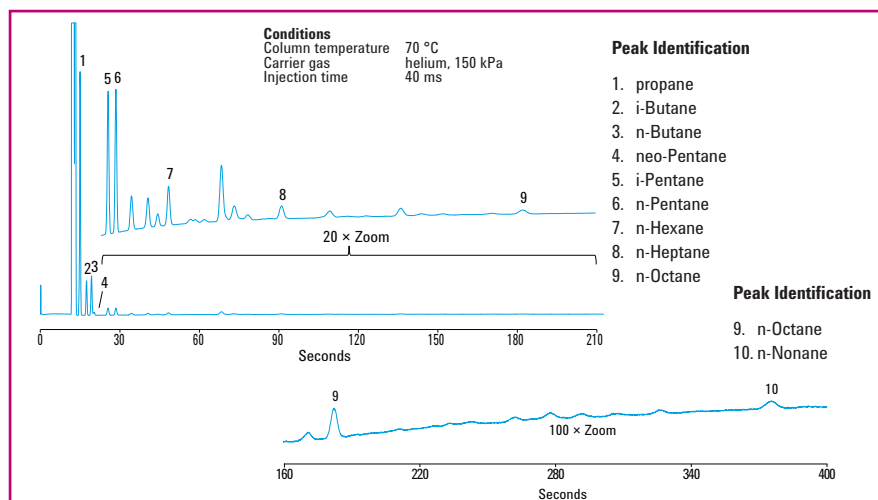
Configured per method:

- ASTM D3588-98, GPA 2177, GPA 2172, ISO 6974-6

* Injection of liquefied samples, e.g., LPG and LNG, requires use of a microgasifier



Channel 1: HayeSep A



Channel 2: CP-Sil 5 CB

► KEY BENEFITS AND FEATURES

- Optimized for the rapid analysis of natural gas composition in 210 seconds
 - Characterizes hydrocarbons C₁-C₉, carbon dioxide and air concentrations
- Preconfigured with analytical method
 - Injection parameters
 - Analytical parameters
- Excellent repeatability: RSD 0.5%

Natural Gas Analyzer A Extended: 3-Channel Micro GC (G3582A#121)

Analyzer Description

Configuration:

- Three channel Micro GC
 - Channel 1: HayeSep A with Backflush
 - Channel 2: CP-Sil 5 CB with Backflush
 - Channel 3: CP-Sil 5 CB

Sample type:

- Natural gas and liquefied natural gas

Compounds analyzed:

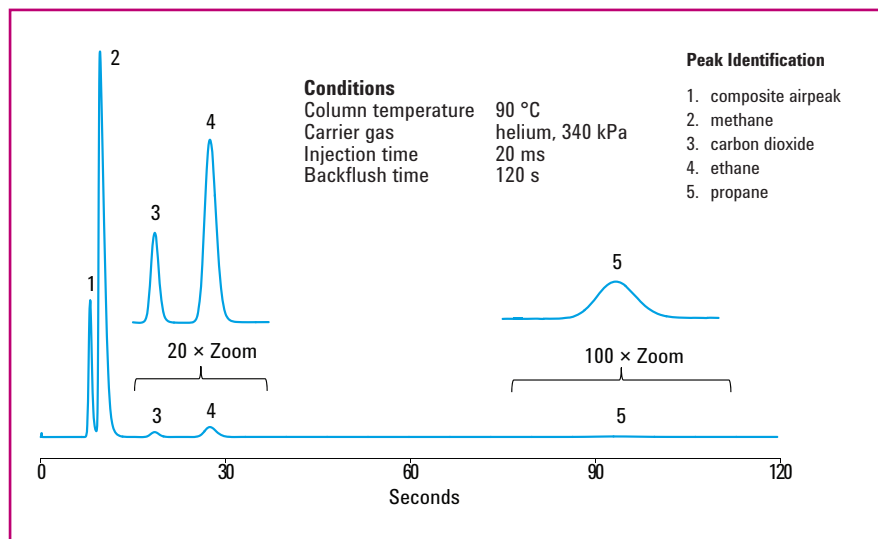
- Hydrocarbons C₁-C₁₂
- Carbon dioxide and air

Typical quantification range:

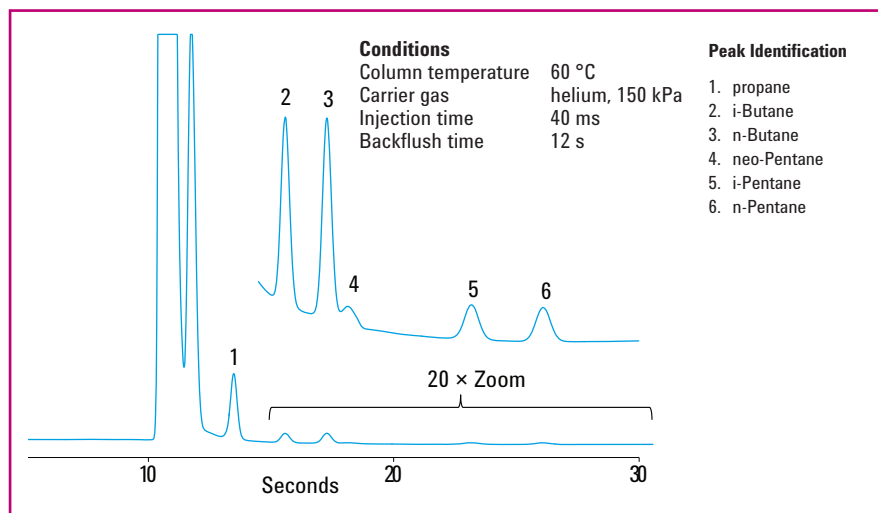
- 1-10 ppm

Configured per method:

- ASTM D3588-98, GPA 2177, GPA 2172, ISO 6974-6

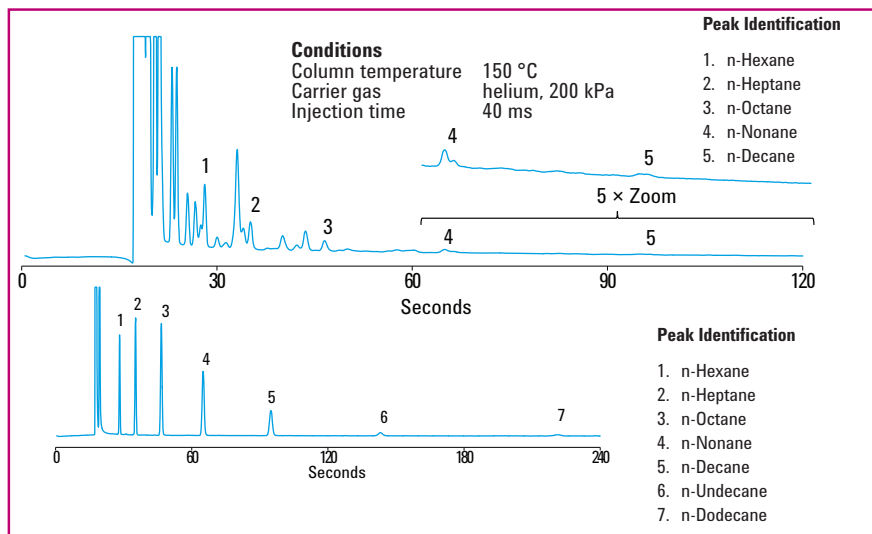


Channel 1: HayeSep A with Backflush



Channel 2: CP-Sil 5 CB with Backflush

(Continued)



Channel 3: CP-Sil 5 CB

► KEY BENEFITS AND FEATURES

- Optimized for the rapid analysis of natural gas composition in 240 seconds
 - Characterizes hydrocarbons C₁-C₁₂, carbon dioxide and air concentrations
- Preconfigured with analytical method
 - Injection parameters
 - Analytical parameters
- Excellent repeatability: RSD 0.5%



Robust and reliable:

Agilent lets you choose from more than 100 factory-tested GC instrument configurations and Analyzers – all application pre-tested to run according to industry standards such as ISO, ASTM, EPA, USP, CEN, UOP, and GPA.

Natural Gas Analyzer B with H₂S: 2-Channel Micro GC (G3582A#122)

Analyzer Description

Configuration:

- Two channel Micro GC
 - Channel 1: PoraPLOT U Backflush
 - Channel 2: CP-Sil 5 CB

Sample type:

- Natural gas and liquefied natural gas

Compounds analyzed:

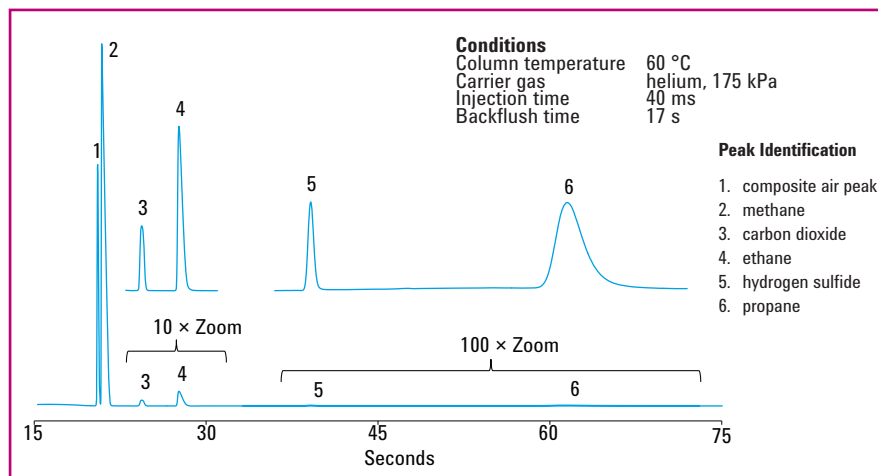
- Hydrocarbons C₁-C₉
- Carbon dioxide and Air
- H₂S

Typical quantification range:

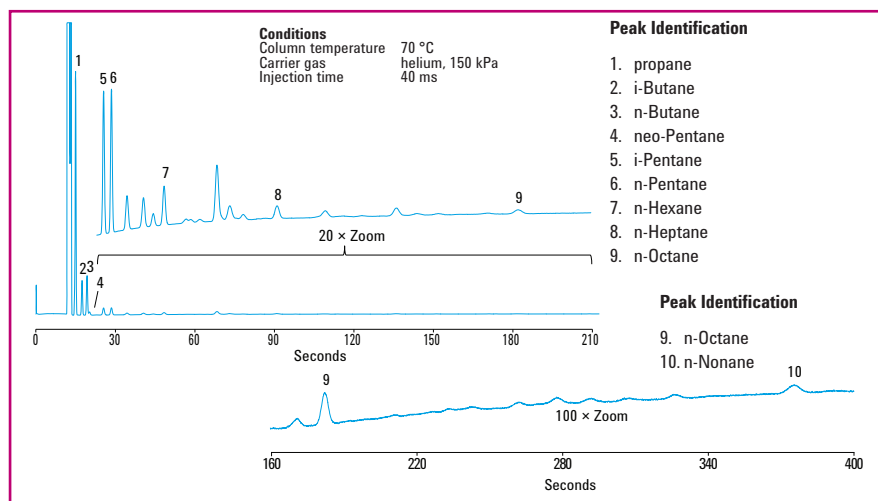
- 1-10 ppm

Configured per method:

- ASTM D3588-98, GPA 2177, GPA 2172, ISO 6974-6



Channel 1: PoraPLOT U Backflush



Channel 2: CP-Sil 5 CB

► KEY BENEFITS AND FEATURES

- Optimized for the rapid analysis of natural gas composition in 210 seconds
 - Characterizes hydrocarbons C₁-C₉, carbon dioxide and air concentrations
- Preconfigured with analytical method
 - Injection parameters
 - Analytical parameters
- Excellent repeatability: RSD 0.5%

Natural Gas Analyzer B Extended with H₂S: 3-Channel Micro GC (G3582A#123)

Analyzer Description

Configuration:

- Three channel Micro GC
 - Channel 1: CP-MolSieve 5Å Backflush
 - Channel 2: PoraPLOT U Backflush
 - Channel 3: CP-Sil 5 CB

Sample type:

- Natural gas and liquefied natural gas

Compounds analyzed:

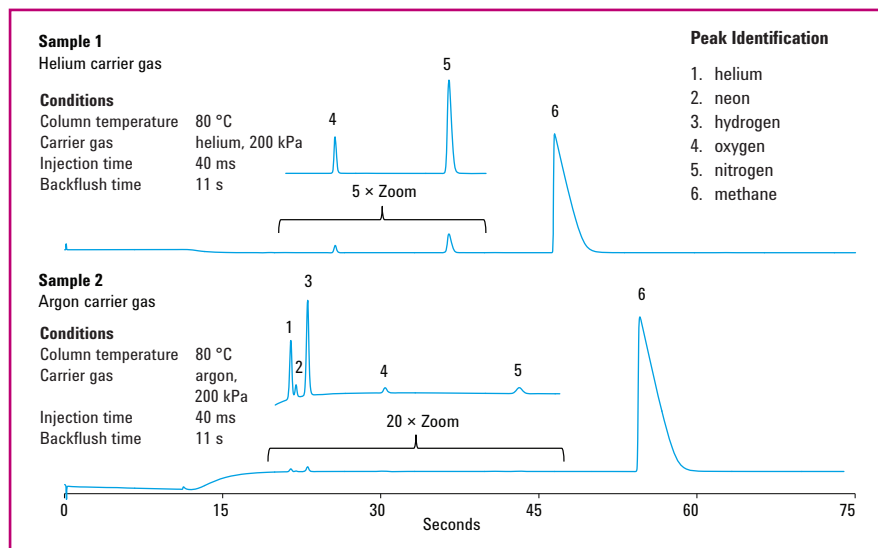
- Hydrocarbons C₁-C₉
- Carbon dioxide and Air
- H₂S
- N₂, O₂, He and H₂

Typical quantification range:

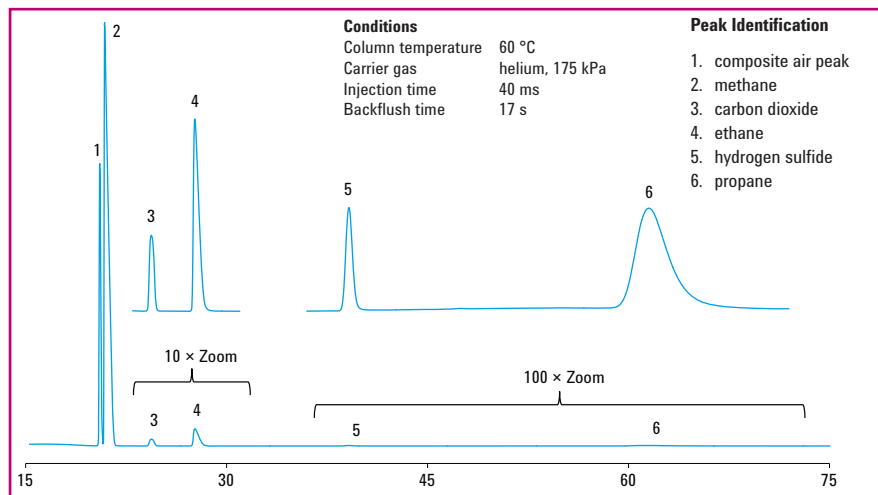
- 1-10 ppm

Configured per method:

- ASTM D3588-98, GPA 2261, GPA 2177, GPA 2172, ISO 6974-6, ASTM D1945

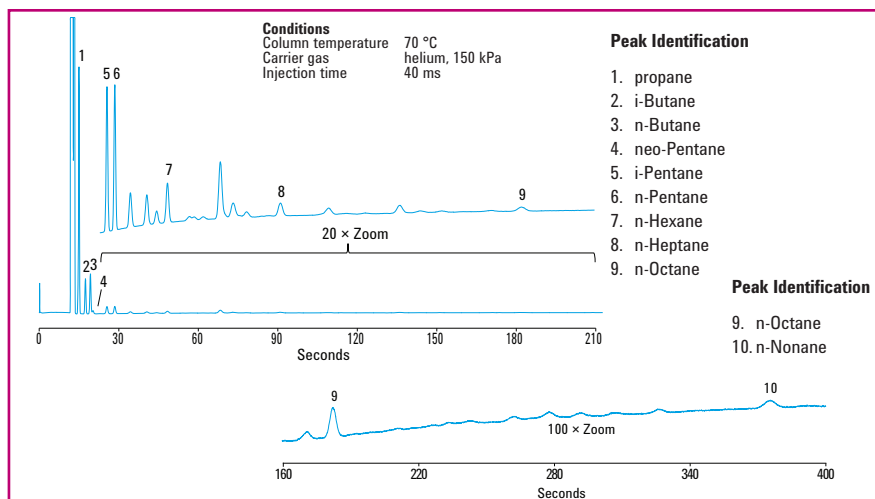


Channel 1: CP-MolSieve 5Å Backflush



Channel 2: PoraPLOT U Backflush

(Continued)



Channel 3: CP-Sil 5 CB

► KEY BENEFITS AND FEATURES

- Optimized for the rapid analysis of natural gas composition in 210 seconds
 - Characterizes hydrocarbons C₁-C₉, carbon dioxide and air concentrations
- Preconfigured with analytical method
 - Injection parameters
 - Analytical parameters
- Excellent repeatability: RSD 0.5%
- Optional report for calorific value

Agilent solutions significantly reduce your time from system arrival to final validation. With pre-configured hardware and method-specific separation tools, your analysts can focus on calibration and validation per your laboratory's SOPs.

Natural Gas Analyzer: Permanent Gas and Extended Hydrocarbons (7890-0611)

Analyzer Description

Configuration:

- 1-valve/3-column (packed column)/TCD (2)/FID

Sample type:

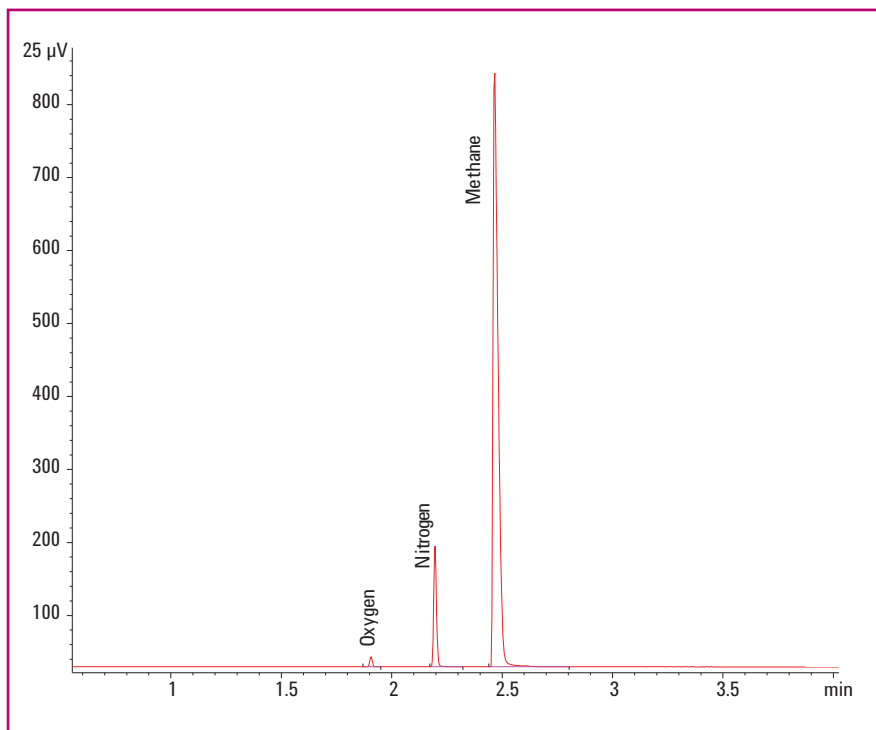
- Natural gas and similar process gas mixtures
- Liquefied Gas with optional LSV

Compounds analyzed:

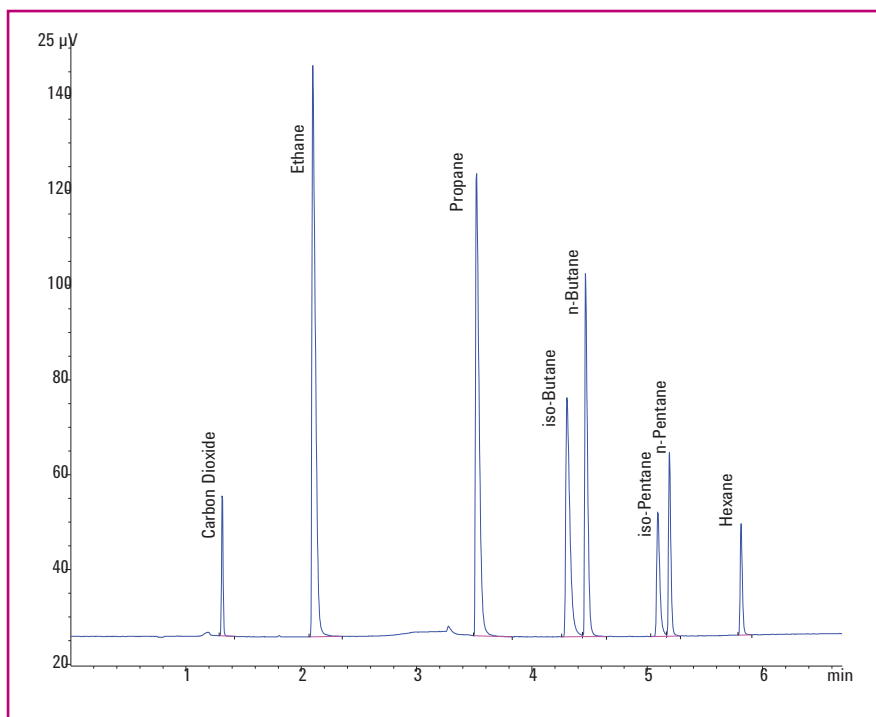
- C₁-C₁₅
- O₂, N₂, CO₂, CO and H₂S

Typical quantification range:

- 0.01 Mol% for all components except H₂S
- 0.05 Mol% except H₂S

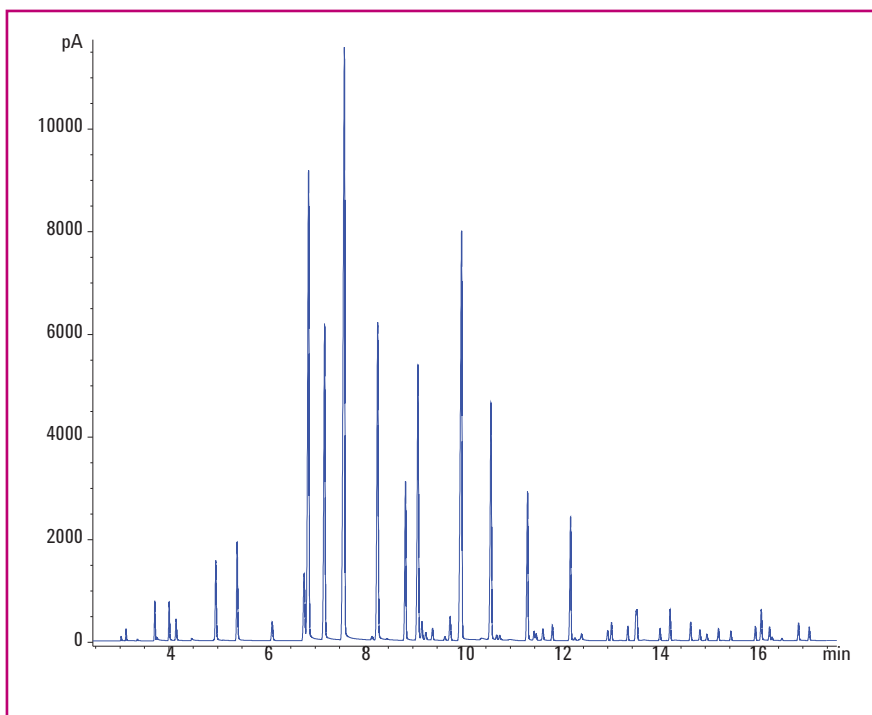


Permanent gases in natural gas



Hydrocarbons (to C6) in natural gas

(Continued)



Extended Hydrocarbons (to C_{15}) in real world liquefied gas sampled, peaks unlabeled

► KEY BENEFITS AND FEATURES

- Capillary Columns with Dean's Switch/Dual TCD/FID
- Easy maintenance
- 5-minute analysis time for permanent gases
- 20-minute analysis for hydrocarbons to C_{15}
- H_2S analysis
- O_2 and N_2 separation
- Handles gas and liquefied gases (with optional LSV)
- For permanent gases and hydrocarbons to C_6 in natural gas, please consider 7890-0610



Agilent analyzers help extend the analytical capabilities of your laboratory. Customization through the addition of a liquid sampling valve has expanded natural gas analyzers to include liquefied gas samples. To find out more, visit agilent.com/chem/energy

Extended Liquefied Natural Gas Analyzer (7890-0263)

Analyzer Description

Configuration:

- 2-valve/2-liquid valve/2-column (capillary and packed column)/TCD/FID

Sample type:

- Liquefied natural gas

Compounds analyzed:

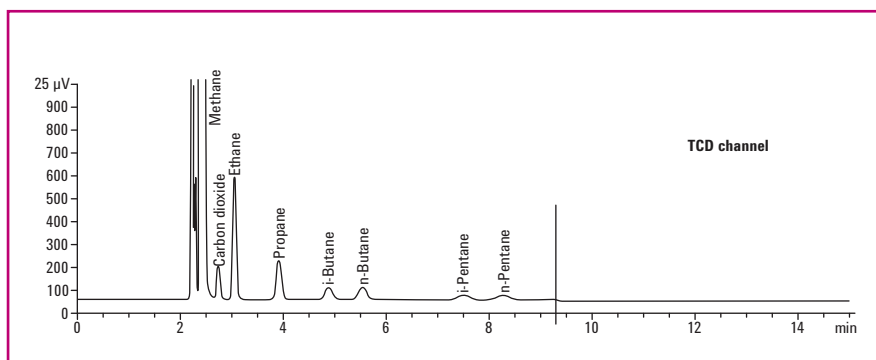
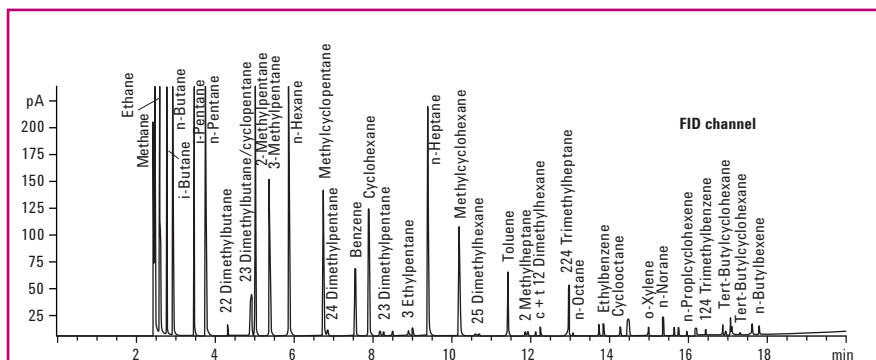
- C₁-C₁₄, Air and CO₂

Typical quantification range:

- 50 ppm for permanent gases and C₁-C₃ hydrocarbons (TCD)
- 10 ppm for C₄-C₁₄ hydrocarbons (FID)

Configured per method:

- GPA 2186



► KEY BENEFITS AND FEATURES

- Dual channels with TCD and FID detectors for extended liquefied NGA
- C₁-C₃, CO₂, and air composites are separated on packed column and measured on TCD
- C₄-C₁₄ hydrocarbons are separated on PONA capillary column and measured on FID
- Liquid valve for sample introduction
- Macro supplied for generation of GPA 2186 data report; requires Microsoft Excel

Liquefied Natural Gas Analyzer (7890-0110)

Analyzer Description

Configuration:

- 1-valve/1-liquid valve/2-column (packed column)/TCD

Sample type:

- Natural gas and similar gaseous mixtures; liquefied natural gas

Compounds analyzed:

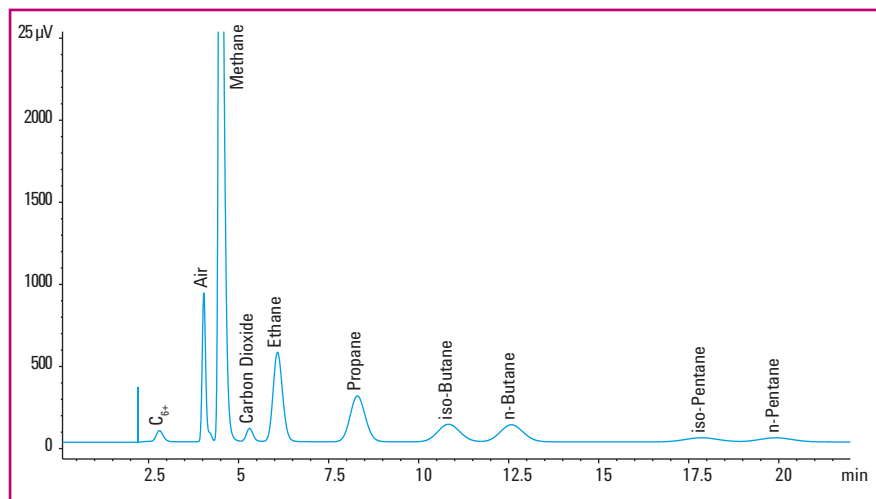
- C₁-C₅
- C₆₊ as backflush
- Air composite, CO₂

Typical quantification range:

- 0.01 Mol% for all components

Configured per method:

- GPA 2177



► KEY BENEFITS AND FEATURES

- Single TCD channel
- Rugged packed columns
- Simple and lowest cost
- Liquid sample valve for liquefied natural gas
- 22 minute analysis time

SOLUTIONS FOR REFINERY GAS



Apply the latest GC technologies without disrupting your application workflow

Refineries use distillation and chemical reactions to convert crude oil into fuel, lubricants, and feedstock for downstream processes. In recent years, supply-related performance requirements, together with environmental regulations for emissions and fuel composition, have rapidly driven new plant designs, as well as upgrades to existing refineries.

The composition of refinery gases, which arise from cracking and subsequent distillation, depends on their generating source. Typically, refinery gases contain saturated and unsaturated hydrocarbons (C_1 - C_5), H_2 , O_2 , N_2 , CO , and CO_2 . In some instances, C_6 or higher hydrocarbons and sulfur contaminants such as H_2S may also be present.

Confidently and precisely analyzing refinery gases is challenging, because the source and composition of each gas varies considerably. To succeed, refinery gas analyzers must be able to quickly separate complex mixtures from a broad range of samples found in refinery and petrochemical streams.

Agilent Refinery Gas Analyzers are *complete workflow solutions* that put the latest advances in reproducibility, speed, resolution, and retention into your hands without the hassles of setup, method development, and validation. Each arrives fully pre-configured and tested for applications such as fast and extended refinery gas analysis (RGA) of permanent gases, hydrocarbon content determination (C_1 - C_5 with C_{6+} as backflush), and the extended analysis of hydrocarbons in natural gas to C_{14} .

Learn more about Analyzer solutions for the energy and chemical industry at
[agilent.com/chem/energy](https://www.agilent.com/chem/energy)

Solutions for Refinery Gas

Analyzer/SP1 Number	Fast Analysis	Extended hydrocarbon analysis to C ₁₂ /C ₁₄	Full-range capacity for H ₂	High level of H ₂ S	Handles liquefied samples
G3445 Series #529	Yes	No	Yes	No	No
G3445 Series #521/7890-0322	Yes	No	Yes	No	No
G3445 Series #522/7890-0338	Yes	No	Yes	Yes	No
G3445 Series #523/7890-0169	No	Yes	Yes	No	No
G3445 Series #524/7890-0166	No	No	Yes	Yes	No
G3445 Series #526/7890-0004	No	No	Yes	No	No
Contact Agilent for P/N Info	Yes	No	Yes	Yes	Yes
7890-0541 (Varian Legacy)	No	No	Yes	No	Optional
7890-0378	Yes	No	Yes	No	No
7890-0339	Yes	No	No	Yes	Yes
7890-0337	Yes	No	No	No	Yes
7890-0226	No	No	No	No	Yes
7890-0107/7890-0316	No	No	Yes	No	No

Reference Methods for Refinery Gas: Quantitation Ranges for Compounds of Interest

Compound	ASTM D1945 mol %	ASTM D1946 mol %	ASTM D2163 mol %	UOP 539 mol %	GPA 2186	GPA 2286	ISO 6974-6
H ₂ S	0.3 to 30		–	0.1 to 25	–	0.1 to 100	–
O ₂	0.01 to 20		–	0.1 to 99.9%	–	0.005 to 20	0.007 to 5
N ₂	0.01 to 100	–	–		0.005 to 5	0.005 to 100	0.007 to 40
CH ₄	0.01 to 100	–	–		0.001 to 5	0.001 to 100	40 to 100
CO		–	–		–	–	0.001 to 1
CO ₂	0.01 to 20	–	–		0.005 to 5	0.005 to 100	0.001 to 10
He	0.01 to 10	–	–		–	–	0.002 to 0.5
H ₂	0.01 to 10	–	–		–	–	0.001 to 0.5
Ethane	0.01 to 100	–	0.1% and above	0.1 to 99.9%	0.001 to 95	0.001 to 100	0.002 to 15
Propane	0.01 to 100	–	0.1% and above		0.001 to 100	0.001 to 100	0.001 to 5
C ₄ isomers	0.01 to 10	–	0.1% and above		0.001 to 100	0.001 to 10	0.0001 to 1
C ₅ isomers	0.01 to 2	–	0.1% and above		0.001 to 50	0.001 to 5	0.0001 to 0.5
C ₆ isomers	0.01 to 2	–	–	–	0.001 to 30	0.001 to 5	0.0001 to 0.5
C ₆₊	–	–	–	0.1 to 99.9%	–	–	–
C ₇₊	0.01 to 1	–	–	–	0.001 to 30	–	–
C ₇ -C ₈	–	–	–	–	–	0.001 to 2	0.0001 to 0.5
C ₉	–	–	–	–	–	0.001 to 2	–
C ₁₀ -C ₁₄	–	–	–	–	–	0.001 to 1	–

* This guide reports typical quantitation limits for each system configuration. These values may differ from the absolute reporting limit required by the method.
Note: In the table above the symbol "–" indicates that this parameter was not specified.

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3-Channel Fast Refinery Gas including H₂S and O₂ with the External Oven (G3445 Series #529)

Analyzer Description

Configuration:

- 5-valve/1- Sample shut-off valve (optional)/external oven/7-column (PLOT, packed and micro-packed column)/2-TCD/FID

Sample type:

- Refinery gas such as atmospheric overhead, FCC overhead, fuel gas, recycle gas

Compounds analyzed:

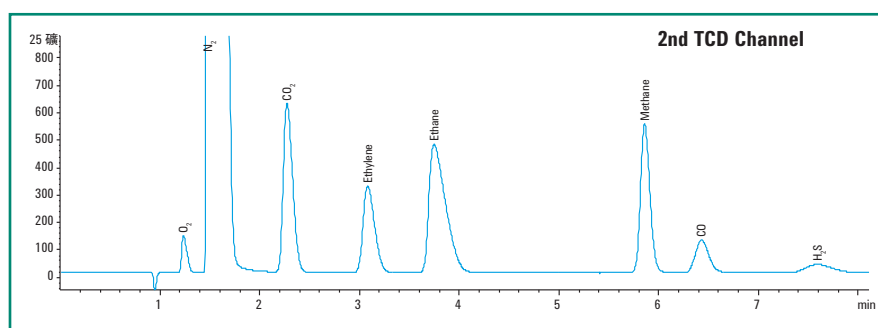
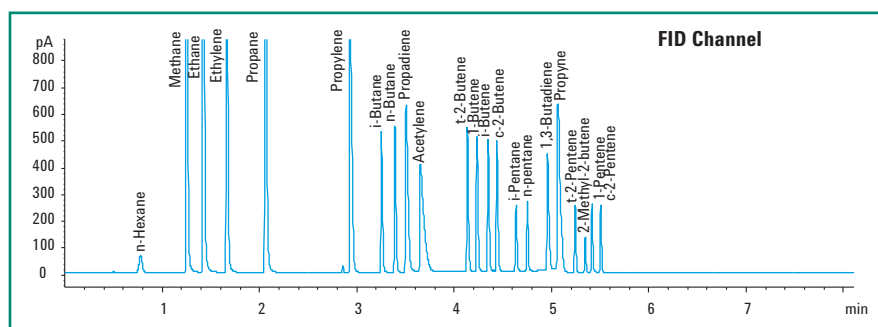
- C₁-C₅, C₆₊, H₂, He, O₂, N₂, CO₂, CO, H₂S

Typical detection limit:

- 0.01 Mol% for all above mentioned components except H₂S
- 500 ppm for H₂S

Configured per method:

- ASTM D1945, ASTM D1946, UOP 539



Note: the chromatogram for H₂ on 3rd TCD is not shown

► KEY BENEFITS AND FEATURES

- Three parallel channels with simultaneous detection provides a comprehensive, fast analysis of refinery gas with one injection in 8 minutes
- External oven is used for permanent gas analysis including H₂S and O₂ at isothermal temperature
- Sample shut-off valve (optional)

3-Channel Fast Refinery Gas Analyzer (G3445 Series #521/7890-0322)

Analyzer Description

Configuration:

- 5-valve/7-column (PLOT and packed column)/2-TCD/FID

Sample type:

- Refinery gas such as atmospheric overhead, FCC overhead, fuel gas, recycle gas

Compounds analyzed:

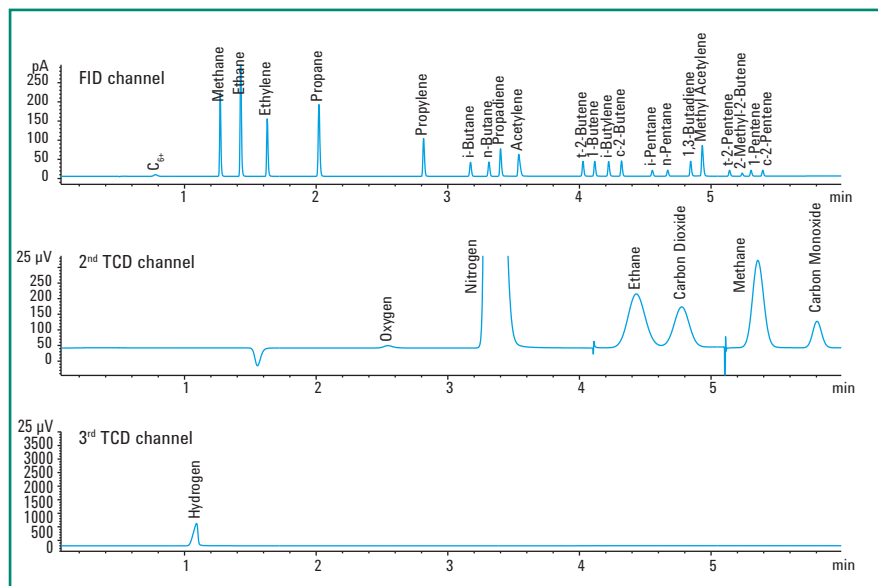
- C₁-C₅, C₆₊ as backflush, H₂, He, O₂, N₂, CO₂, CO

Typical quantification range:

- 0.01 Mol% for all above mentioned components

Configured per method:

- ASTM D1945, ASTM D1946, UOP 539



► KEY BENEFITS AND FEATURES

- Three parallel channels with simultaneous detection for complete refinery gas analysis within 6 minutes
- Columns optimized columns to allow for faster hydrocarbon and permanent gas analysis using the same oven temperature program
- Full-range capability for H₂ by third TCD using N₂ or argon carrier gas
- For H₂S and COS analysis, order G3445A Series #522/7890-0338

3-Channel Fast Refinery Gas Analyzer – H₂S and COS (G3445 Series #522/7890-0338)

Analyzer Description

Configuration:

- 5-valve/7-column (PLOT and packed column)/2-TCD/FID/nickel tubing packed column/Hastelloy valve

Sample type:

- Refinery gas, such as atmospheric overhead, desulfurizer off gas, FCC overhead, fuel gas, recycle gas

Compounds analyzed:

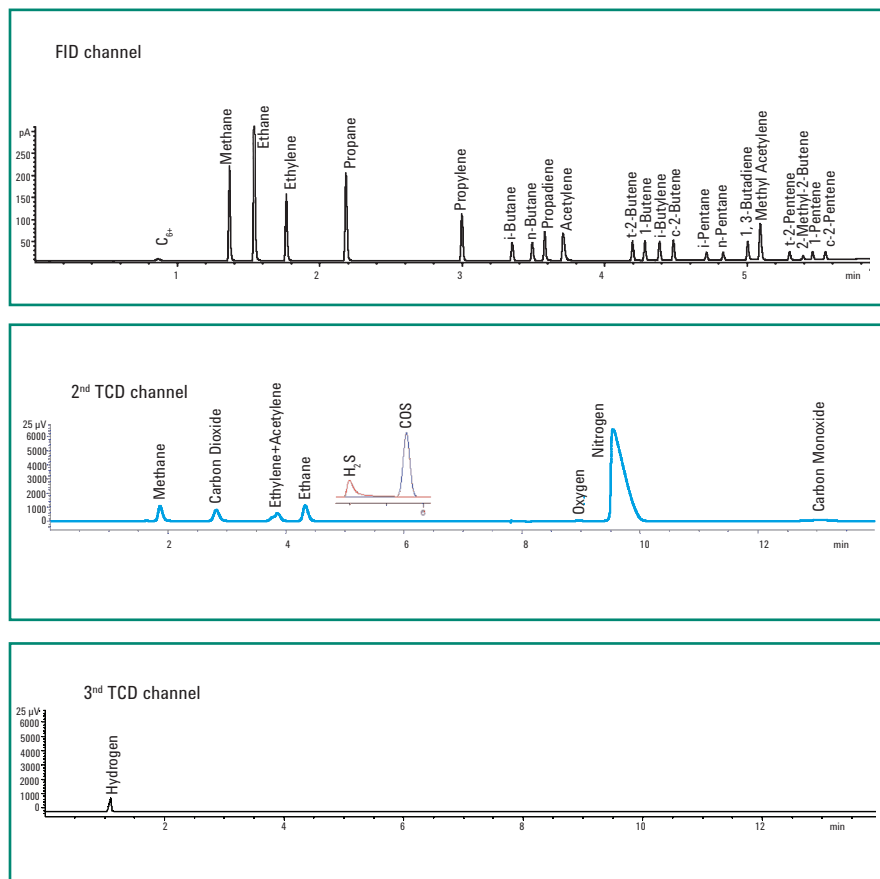
- C₁-C₅ and C₆₊ as backflush
- H₂, He, N₂, CO₂, CO, H₂S and COS

Typical quantification range:

- 0.01 Mol% for all above mentioned components except H₂S and COS
- 500 ppm for H₂S
- 300 ppm for COS

Configured per method:

- ASTM D1945, ASTM D1946, UOP 539



► KEY BENEFITS AND FEATURES

- Three parallel channels with simultaneous detection for complete RGA analysis within 10 minutes
- Optimized columns to allow faster hydrocarbon and permanent gas analysis using the same oven temperature program
- Full-range capability for H₂ by third TCD using N₂ or Ar as a carrier gas
- Nickel tubing packed column and Hastelloy valve for high H₂S analysis, O₂ may be present, but not for quantitation

Extended Refinery Gas Analyzer (G3445 Series #523/7890-0169)

Analyzer Description

Configuration:

- 4-valve/5-column (PLOT and packed column)/TCD/FID

Sample type:

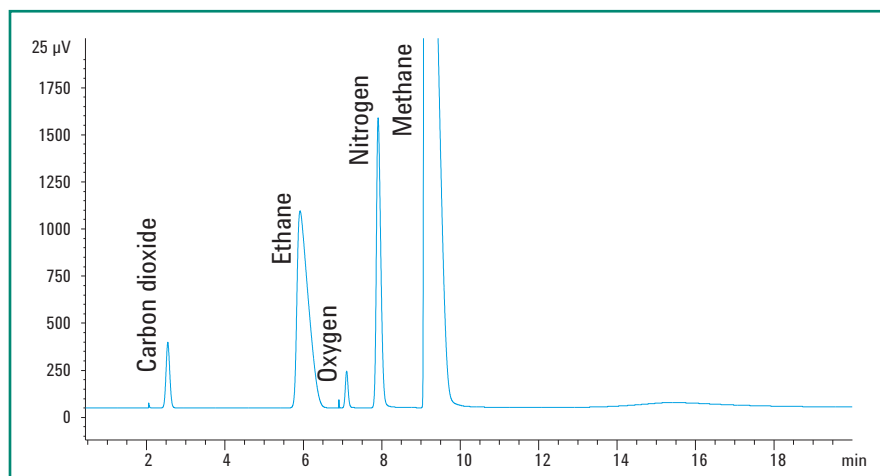
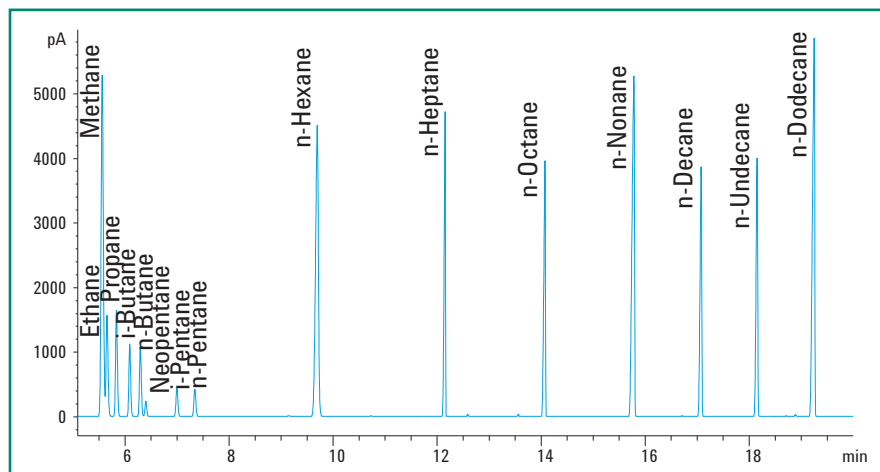
- Refinery gas such as atmospheric overhead, FCC overhead, fuel gas, recycle gas

Compounds analyzed:

- C_1 - C_{12}
- H_2 , He, O_2 , N_2 , CO_2 , and CO

Typical quantification range:

- 0.01 Mol% for all components



► KEY BENEFITS AND FEATURES

- PONA column provides extended RGA separation to C_{14}
- Achieve analysis of H_2 and He by switching carrier gases
- Argon or N_2 carrier used for H_2 analysis, use He carrier for remaining compounds
- For hydrocarbons up to C_{12} , approximately 25 minutes analysis time, depends on hydrocarbon range

Refinery Gas Analyzer with Nickel Columns (G3445 Series #524/7890-0166)

Analyzer Description

Configuration:

- 4-valve (Hastelloy)/5-column (packed column)/2-TCD/plumbed with sulfur-resistant material

Sample type:

- Refinery gas, such as atmospheric overhead, FCC overhead, fuel gas, recycle gas, sour gas

Compounds analyzed:

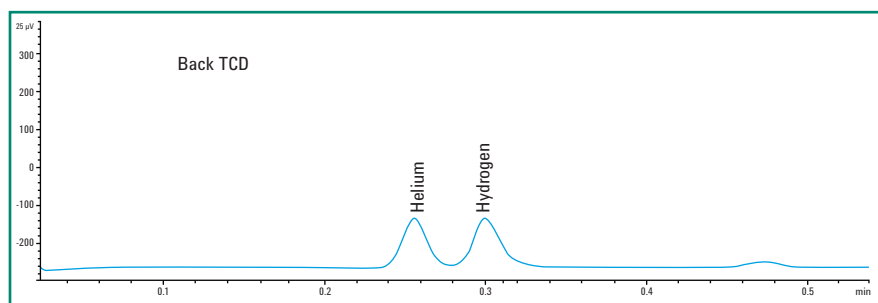
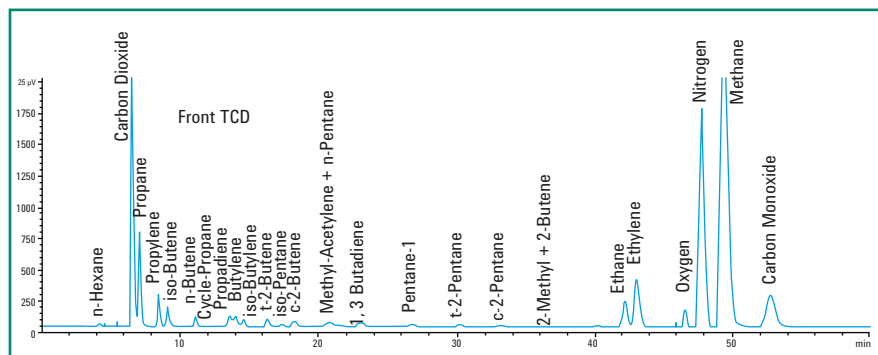
- C₁-C₅ and C₆₊
- H₂, He, O₂, N₂, CO₂, CO and H₂S

Typical quantification range:

- 0.01 Mol% for all components except H₂S
- 500 ppm for H₂S

Configured per method:

- ASTM D1945, ASTM D1946, GPA 2261



► KEY BENEFITS AND FEATURES

- Dual TCD channels
- Plumbed with sulfur-resistant material including nickel columns and plumbing and Hastelloy valves for sour gas analysis
- Rugged packed columns
- Dedicated channel for He and H₂
- Approximate 20 minute analysis time
- Hardware configuration same as G3445 Series #526/7890-0004

Refinery Gas Analyzer (G3445 Series #526/7890-0004)

Analyzer Description

Configuration:

- 4-valve/5-column (packed column)/2-TCD

Sample type:

- Refinery gas such as atmospheric overhead, FCC overhead, fuel gas, recycle gas

Compounds analyzed:

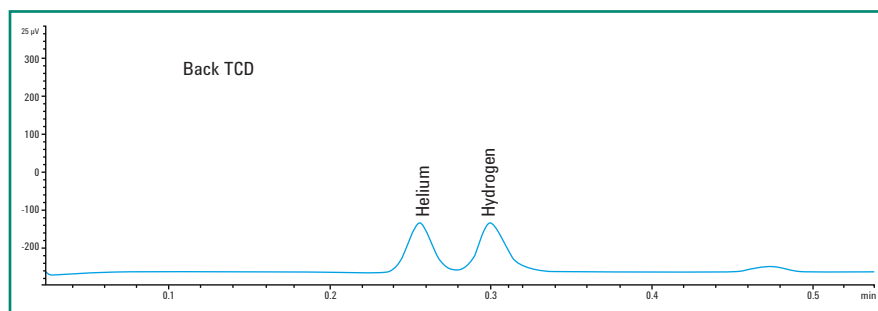
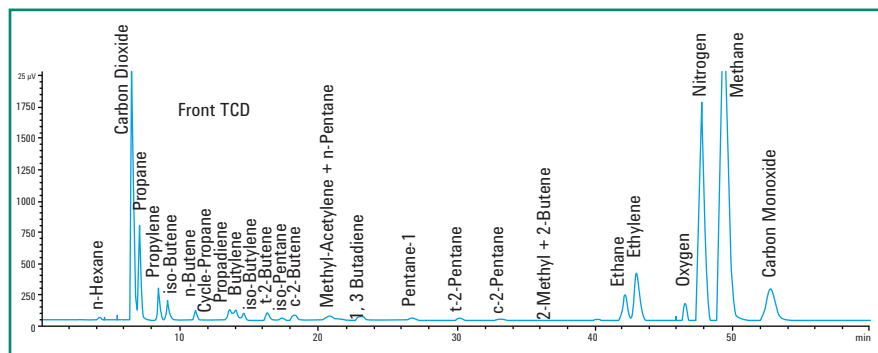
- C₁-C₅, C₆₊ as backflush
- H₂, He, O₂, N₂, CO₂, and CO

Typical quantification range:

- 0.01 Mol% for all components

Configured per method:

- UOP 539, ASTM D1946, and ASTM D1945



► KEY BENEFITS AND FEATURES

- Dual TCD channels
- Rugged packed columns
- Full-range capability for H₂ and He
- 55 minute analysis time
- To analyze samples containing high levels of H₂S, please order G3445 Series #524/7890-0166

Refinery Gas Analyzer: 4-Channel Micro GC (Contact Agilent)

Analyzer Description

Configuration:

- Four channel Micro GC
 - Channel 1: CP-Molsieve 5Å with backflush
 - Channel 2: CP-PoraPLOT U with backflush
 - Channel 3: Alumina oxide with backflush
 - Channel 4: CP-Sil 5 CB

Sample type:

- Refinery, high-pressure refinery, and liquefied refinery gases
 - Fluid coking overheads
 - Ethylene/propylene
 - Fuel gases
 - Stack gases
 - Off gases

Compounds analyzed:

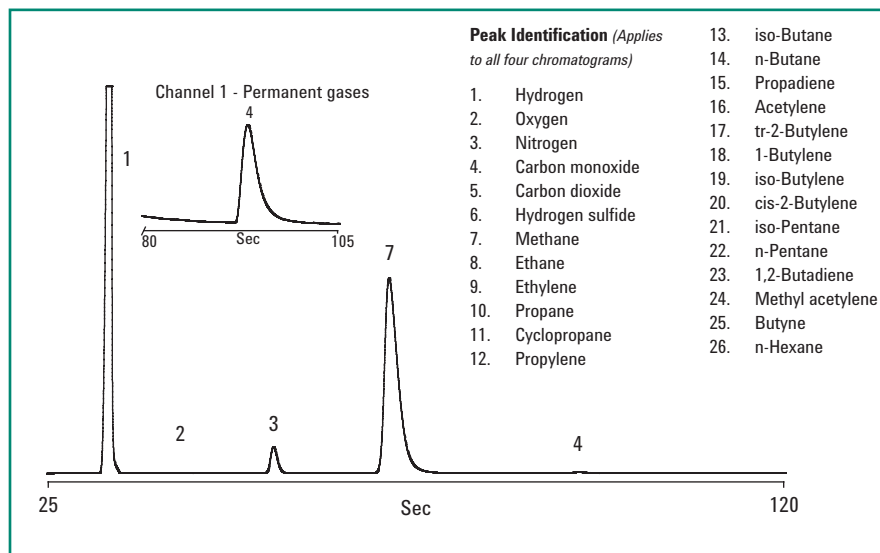
- Hydrocarbons C₁-C₅₊
- He, H₂, O₂, N₂, CO, CO₂

Typical quantification range:

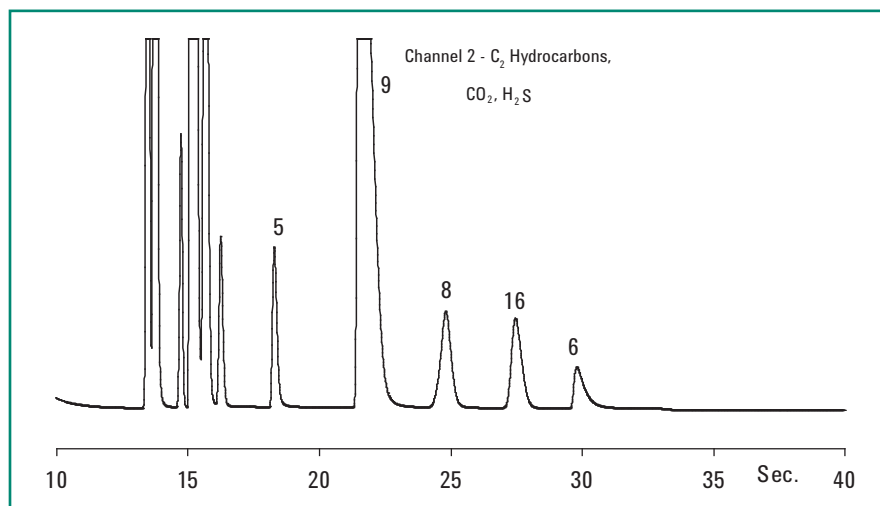
- 1-10 ppm

Configured per method:

- UOP 59, DIN-51666, ASTM D2163

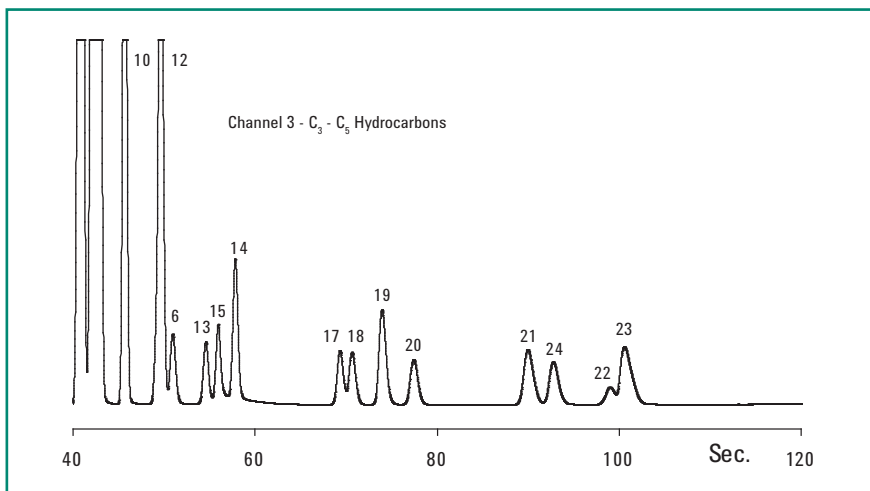


Channel 1: CP-Molsieve 5Å with backflush

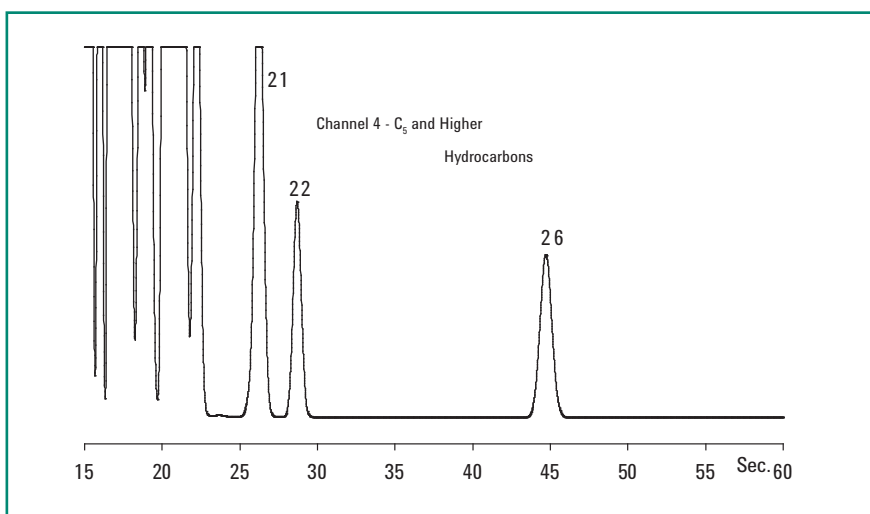


Channel 2: CP-PoraPLOT U with backflush

(Continued)



Channel 3: Alumina oxide with backflush



Channel 4: CP-Sil 5 CB

► KEY BENEFITS AND FEATURES

- Optimized for the rapid analysis of natural gas composition in 210 seconds
 - Characterizes hydrocarbons C_1 - C_9 , carbon dioxide and air concentrations
- Preconfigured with analytical method
 - Injection parameters
 - Analytical parameters
- Excellent repeatability: RSD 0.5%



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High Resolution RGA Analyzer: Varian Legacy (7890-0541)

Analyzer Description

Configuration:

- Split/Splitless inlet/4-valve/
8-Column /FID/2-TCD

Sample type:

- LPG (liquefied petroleum gases),
propane/propene mixture, Refinery
gas

Compounds analyzed:

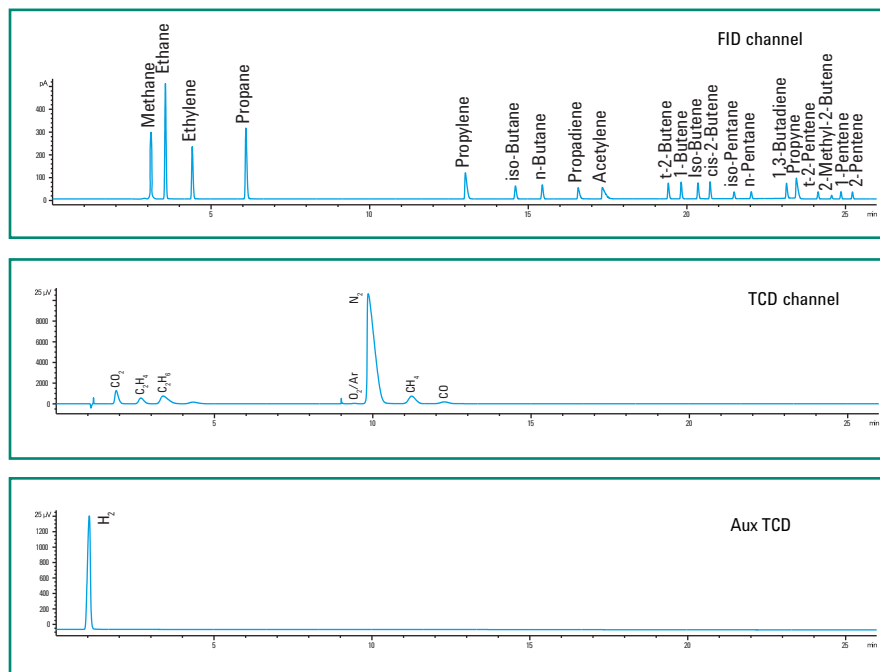
- H_2 , O_2 , N_2 , CO_2 , CO , H_2S
- C_1 - C_5 , C_{6+}

Typical quantification range:

- 0.01 Mol% for all above mentioned
components except H_2S
- 500 ppm for H_2S

Configured per method:

- UOP 539, ASTM D2163



► KEY BENEFITS AND FEATURES

- Three parallel channels with simultaneous detection for complete refinery gas analysis
- Full-range capability for H_2 by third TCD using N_2 or argon carrier gas

3-Channel Fast Refinery Gas Analyzer without C₆₊ backflush (7890-0378)

Analyzer Description

Configuration:

- 4-valve/6-column (PLOT and packed column)/2-TCD/FID

Sample type:

- Refinery gas such as atmospheric overhead, FCC overhead, fuel gas, recycle gas

Compounds analyzed:

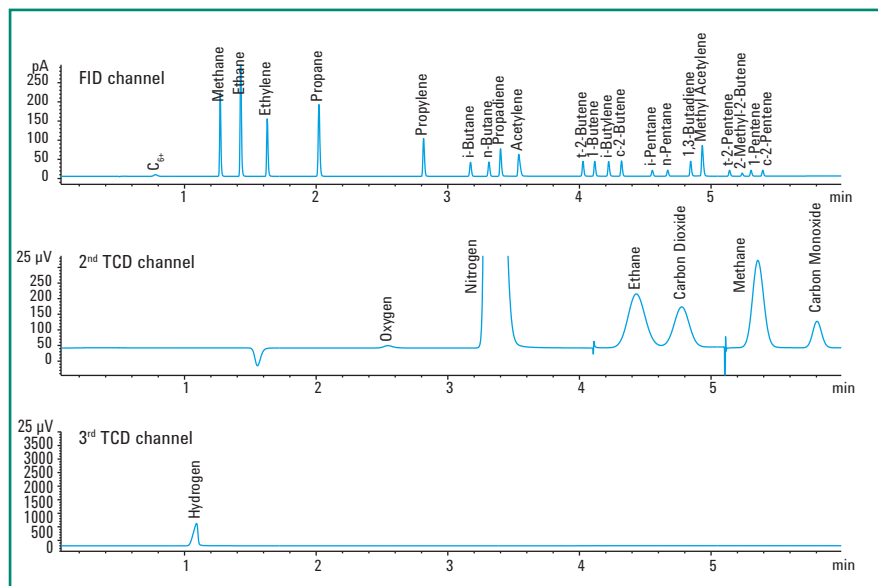
- C₁-C₆, H₂, He, O₂, N₂, CO₂, CO

Typical quantification range:

- 0.01 Mol% for all above mentioned components

Configured per method:

- ASTM D1946, ASTM D1945 and UOP 539 (partly, no C₆₊ backflush)



► KEY BENEFITS AND FEATURES

- Three parallel channels with simultaneous detection for complete refinery gas analysis within 6 minutes (up to Hexane, no backflush capability for C₆₊)
- Full-range capability for H₂ by third TCD using N₂ or argon carrier gas
- For H₂S and COS analysis order G3445A Series #522/7890-0338

2-Channel Fast Refinery Gas Analyzer with H₂S (7890-0339)

Analyzer Description

Configuration:

- 4-valve/LSV/5-column (PLOT and packed column)/TCD/FID/nickel tubing packed column/Hastelloy valve

Sample type:

- Refinery gas, liquid petroleum gas

Compounds analyzed:

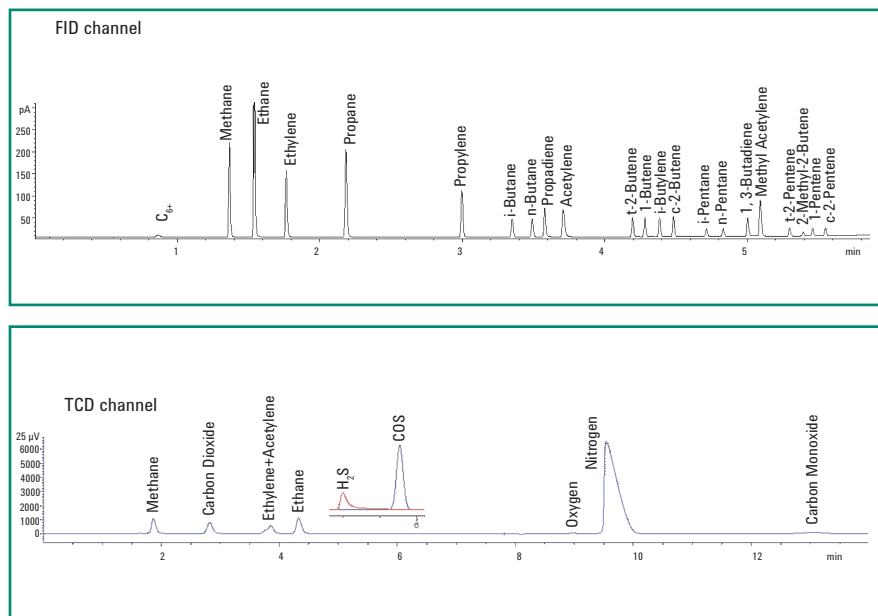
- C₁-C₅, C₆₊ as backflush
- N₂, CO₂, CO, H₂S and COS

Typical quantification range:

- 0.01 Mol% for all above mentioned components except H₂S and COS
- 500 ppm for H₂S
- 300 ppm for COS

Configured per method:

- ASTM D2163, ASTM D1946



► KEY BENEFITS AND FEATURES

- Dual channels with FID and TCD fast refinery gases system includes liquid petroleum gases analysis
- Nickel tubing packed column and Hastelloy valve for high H₂S analysis
- Typical Analysis time: 9 to 10 minutes
- Sample should not contain water
- For analysis of low concentration of H₂, please order G3445A Series #521/7890-0322

Fast Refinery Gas Analyzer, 2-Channel (7890-0337)

Analyzer Description

Configuration:

- 4-valve/LSV/5-column (PLOT and packed column)/TCD/FID

Sample type:

- Refinery gas and liquid petroleum gas

Compounds analyzed:

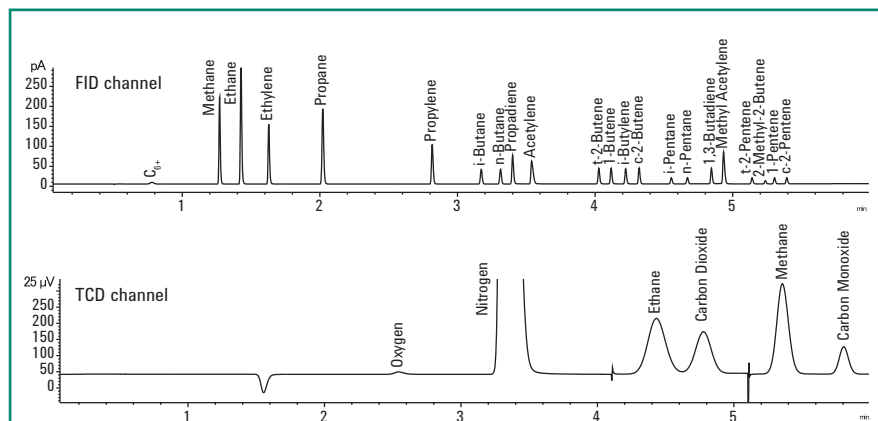
- C₁-C₅, C₆₊ as backflush
- O₂, N₂, CO₂ and CO

Typical quantification range:

- 0.01 Mol% for all above mentioned components

Configured per method:

- ASTM D2163, ASTM D1946



► KEY BENEFITS AND FEATURES

- Dual channels for fast refinery gases analysis, including liquid petroleum gases analysis
- LSV for liquid petroleum gases introduction
- Columns optimized for faster hydrocarbon and permanent gas analysis using the same oven temperature program
- 6 minute analysis time
- For analysis of samples requiring analysis of H₂ at low concentration, please order G3445A Series #521/7890-0322
- For the analysis of H₂S and COS, please order G3445A Series #522/7890-0338, or 7890-0339

Refinery Gas Analyzer with High H₂ and H₂S Content (7890-0226)

Analyzer Description

Configuration:

- 3-valve/liquid valve (optional)/ 4-column (PLOT and packed column – Sulfinert® treated)/FID/TCD
- Plumbed with sulfur-resistant material

Sample type:

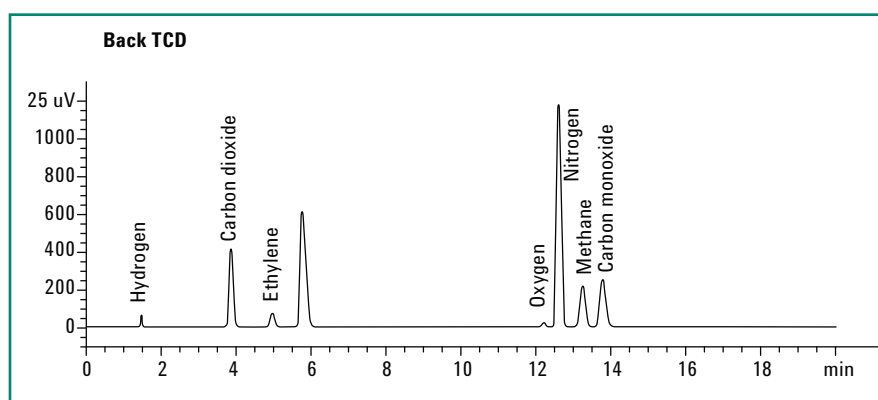
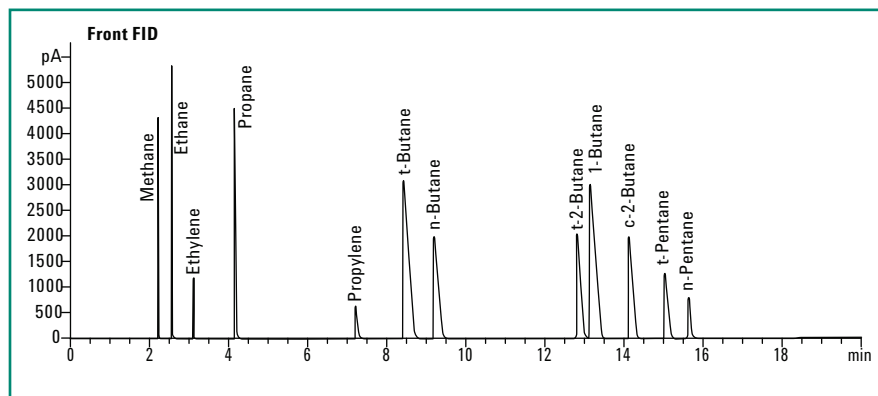
- Refinery gas with H₂S concentrations ranging from 500 ppm to 5%

Compounds analyzed:

- C₁-C₅, C₆+
- H₂, He, O₂, N₂, H₂S, CO₂, and CO

Typical quantification range:

- 0.01 Mol% for all above mentioned components except H₂S and H₂
- 500 ppm for H₂S
- >15 Vol% for H₂



► KEY BENEFITS AND FEATURES

- TCD/FID channels for hydrocarbons, permanent gas, and H₂S
- Special packed columns in Sulfinert®
- Spare set Sulfinert® -treated needle valve for H₂S in the range of 500 ppm to 5% on TCD

Extended Refinery Gas Analyzer (7890-0107/7890-0316)

Analyzer Description

Configuration:

- 4-valve/5-column (PLOT and packed column)/TCD/FID

Sample type:

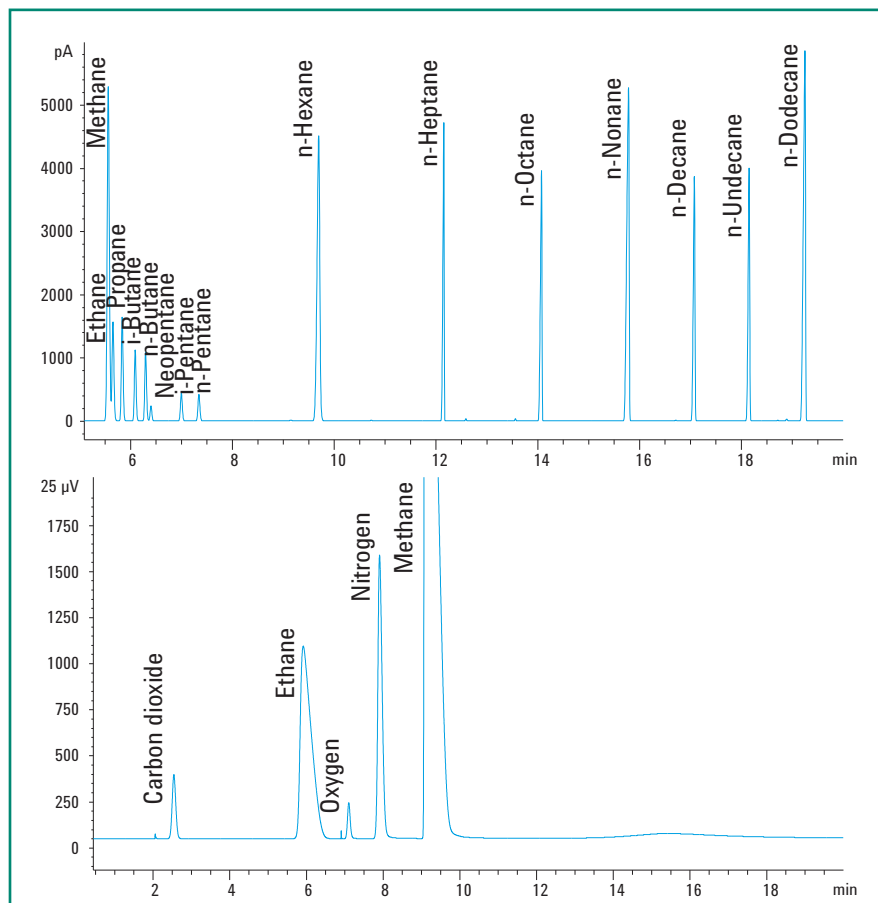
- Refinery gas such as atmospheric overhead, FCC overhead, fuel gas, recycle gas

Compounds analyzed:

- C_1 - C_9
- H_2 , He, O_2 , N_2 , CO_2 , and CO

Typical quantification range:

- 0.01 Mol% for all components



► KEY BENEFITS AND FEATURES

- Alumina column provides excellent separation of hydrocarbons from C_1 to C_9
- Achieve analysis of H_2 and He by switching carrier gases (Argon or N_2 used for H_2 analysis, use He for remaining compounds)
- For hydrocarbons up to C_5 approximately 15 minutes analysis time, depends on hydrocarbon range
- Use PLOT Q instead of alumina column when olefin resolution is not mandatory (7890-0316); extends RGA to C_9

SOLUTIONS FOR PERMANENT GAS



Control your manufacturing process and enhance the value of your products

Permanent gases – such as CO, CO₂, O₂, N₂, and methane – are common analytes in refinery gas, natural gas, fuel cell gas, and many other industrial processes. However, impurities such as CO and CO₂ in feedstocks can be deleterious to certain catalysts, resulting in disruption and increased production costs. Measuring the concentration of these components is critical to managing your manufacturing processes – and ultimately, creating an end product with high commercial value.

Agilent provides a family of factory-tested, ready-to-use GC analyzers for permanent gases. Select from standard or custom configurations that address your specific requirements.

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Solutions for Permanent Gas

Analyzer/SP1 Number	Configuration	Capability
G3445 Series #586/7890-0573	4-valve, 5-column (packed), 2-TCD	Separates H ₂ , O ₂ , N ₂ , CO, CO ₂ , CH ₄ , C ₂ isomers, and H ₂ S
G3445 Series #585/7890-0538	2-valve/3-column (packed)/TCD	Separates O ₂ , N ₂ , CO, CO ₂ , CH ₄ , C ₂ isomers, and H ₂ S
7890-0610	1-valve, 2-column (capillary), 2-TCD (LSV Optional)	Separates C ₁ -C ₈ , O ₂ , N ₂ , CO ₂ , CO and H ₂ S

Reference Methods for Permanent Gas: Quantitation Ranges for Compounds of Interest

Analyzer/SP1 Number	Fast Analysis	Extended Hydro-carbons to C ₁₂ /C ₁₄	Full-range Capacity for H ₂	High Level of H ₂ S	Handles Liquefied Samples
G3445 Series #586/7890-0573	No	No	Yes	No	No
G3445 Series #585/7890-0538	No	No	No	No	No
7890-0610	Yes	No	No	No	Yes

Permanent Gas/Hydrogen Analyzer: Varian Legacy (G3445 Series #586/7890-0573)

Analyzer Description

Configuration:

- 4-Valve/5-Column (packed column)/2-TCD

Sample type:

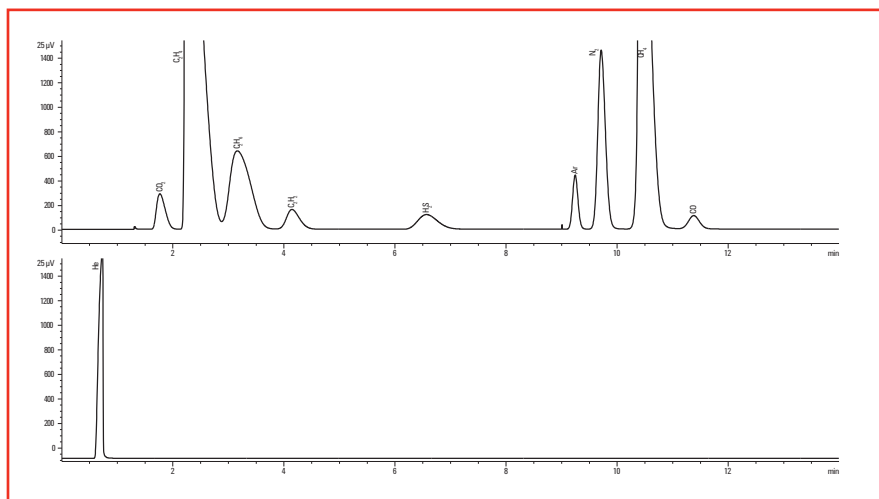
- Various gaseous samples such as refinery gases, natural gas or other streams

Compounds analyzed:

- H_2 , O_2 , N_2 , CO, CO_2 , CH_4 , C_2 isomers, and H_2S

Typical quantification range:

- 0.01 Mol% for H_2 , O_2 , N_2 , CO, CO_2 , CH_4 , C_2 isomers and H_2S



► KEY BENEFITS AND FEATURES

- Configured for analysis of various gaseous samples such as refinery gases, natural gas or other streams
- Full-range capability for H_2 by third TCD using N_2 or argon carrier gas
- Backflush of water and/or C_3 plus heavier hydrocarbons from Permanent Gas channel
- Backflush of all components higher than H_2 or He from the Hydrogen channel
- 12 minute analysis time

Permanent Gas Analyzer: Varian Legacy (G3445 Series #585/7890-0538)

Analyzer Description

Configuration:

- 2-Valve/3-Column (packed column)/TCD

Sample type:

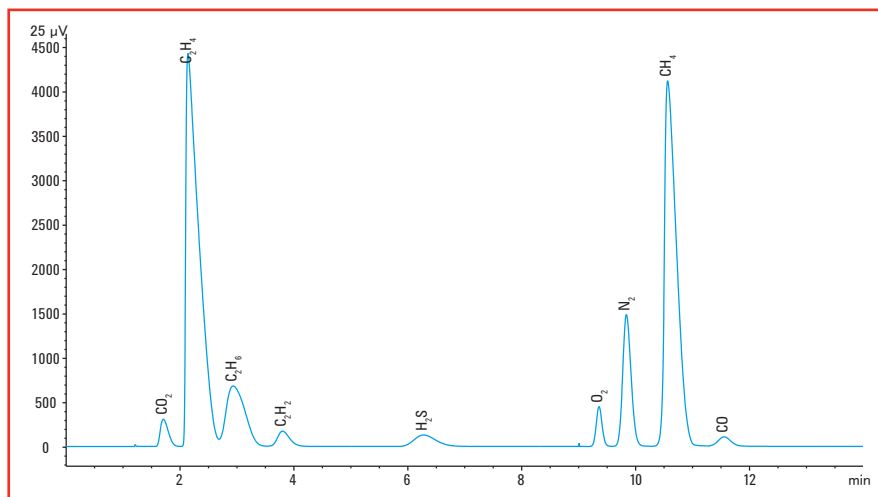
- Gaseous samples including refinery gas, natural gas or other gaseous streams

Compounds analyzed:

- O₂, N₂, CO, CO₂, CH₄, C₂ isomers and H₂S

Typical quantification range:

- 0.01 Mol% for O₂, N₂, CO, CO₂, CH₄, C₂ isomers and H₂S



► KEY BENEFITS AND FEATURES

- Single channel with packed columns
- Backflush of water and/or C₃ plus heavier hydrocarbons
- 12 minute analysis time

Permanent Gas and Hydrocarbons in Natural Gas Analyzer (7890-0610)

Analyzer Description

Configuration:

- 1-valve/2-column (capillary)/2-TCD (LSV optional)

Sample type:

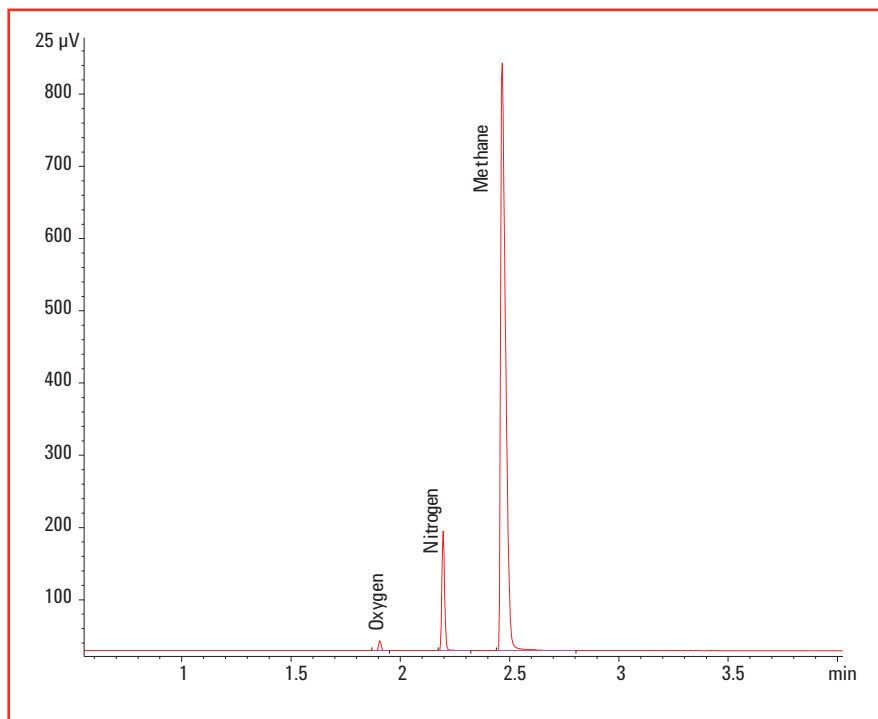
- Natural gas and similar process gas mixtures

Compounds analyzed:

- C₁-C₆
- O₂, N₂, CO₂, CO and H₂S

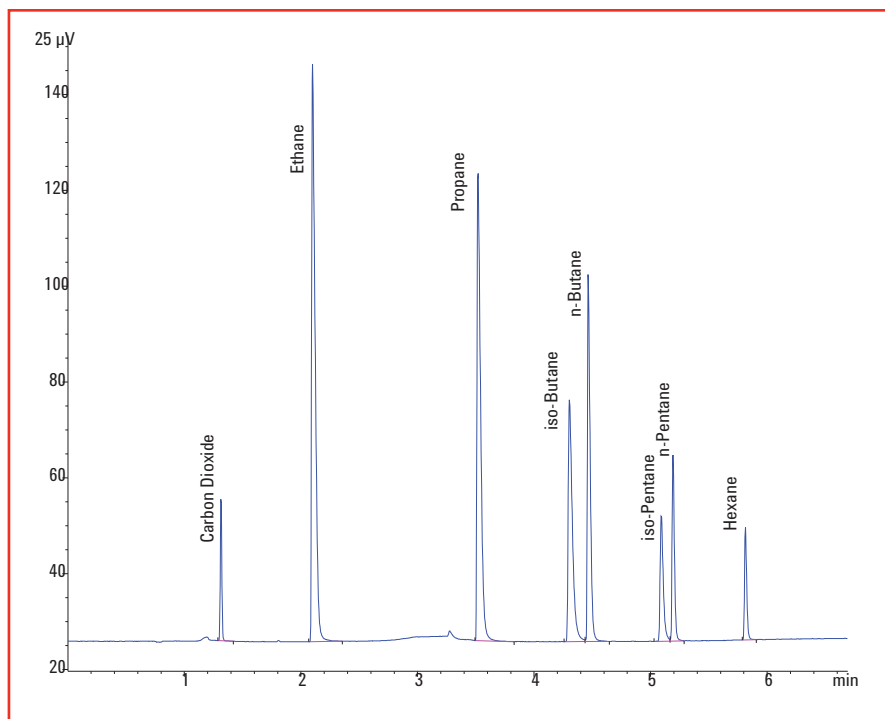
Typical quantification range:

- 0.01 Mol% for all components except H₂S
- 0.05 Mol% except H₂S



Permanent gases in natural gas

(Continued)



Hydrocarbons (to C₆) in natural gas



Does your team require higher sample throughput without deterioration of data quality? Agilent has the solutions to get you on the "Fast Track" to rapid, reproducible analysis.

► KEY BENEFITS AND FEATURES

- Capillary Columns with Dean's Switch and Dual TCD
- Easy maintenance
- 5-minute analysis time (610)
- H₂S analysis
- O₂ and N₂ separation
- Handles gas and liquefied gases (with optional LSV)
- For permanent gases and hydrocarbons to C₁₅ in natural gas, please consider 7890-0611

SOLUTIONS FOR LIQUEFIED PETROLEUM GAS



Accurately measure calorific value and cleanliness during consumption

Synthesized by refining petroleum (or natural gas) derived from fossil fuels, Liquefied Petroleum (LPG) is used to power vehicles and heating appliances.

LPG contains a flammable mixture of hydrocarbon gases – primarily propane, butane, or a mixture of the two. However, because LPG is usually odorless, low concentrations of sulfur are also added to facilitate leak detection.

Gas composition directly affects both the calorific value and burning cleanliness of LPG. **Agilent LPG Analyzers** conform to strict industry standards for determining LPG composition and performing fast analysis of hydrocarbon content from C₁-C₆ in LPG samples.

Learn more about Analyzer solutions for the energy and chemical industry at
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Solutions for Liquefied Petroleum Gas (LPG)

Analyzer/SP1 Number	Configuration	Factory checkout per method
7890-0397	Hydrocarbons in LPG Analyzer	ASTM D2163
7890-0188	Commercial Propane and Butane LPG Analyzer	ASTM D2163, ISO 7941, EN 27941, and IP 405
7890-0138	LPG Composition Analyzer	ASTM D2163, ASTM D2593, ASTM D2712, ASTM D4424

Reference Methods for LPG: Quantitation Ranges for Compounds of Interest

Compound	ASTM D1945 mol %	ASTM D1946 mol %	ASTM D2163 mol %	UOP 539 mol %	GPA 2186	GPA 2286	ISO 6974-6
H ₂ S	0.3 to 30		–	0.1 to 25	–	0.1 to 100	–
O ₂	0.01 to 20		–	0.1 to 99.9%	–	0.005 to 20	0.007 to 5
N ₂	0.01 to 100	–	–		0.005 to 5	0.005 to 100	0.007 to 40
CH ₄	0.01 to 100	–	–		0.001 to 5	0.001 to 100	40 to 100
CO	–	–	–		–	–	0.001 to 1
CO ₂	0.01 to 20	–	–		0.005 to 5	0.005 to 100	0.001 to 10
He	0.01 to 10	–	–		–	–	0.002 to 0.5
H ₂	0.01 to 10	–	–		–	–	0.001 to 0.5
Ethane	0.01 to 100	–	0.1% and above	0.1 to 99.9%	0.001 to 95	0.001 to 100	0.002 to 15
Propane	0.01 to 100	–	0.1% and above		0.001 to 100	0.001 to 100	0.001 to 5
C ₄ isomers	0.01 to 10	–	0.1% and above		0.001 to 100	0.001 to 10	0.0001 to 1
C ₅ isomers	0.01 to 2	–	0.1% and above		0.001 to 50	0.001 to 5	0.0001 to 0.5
C ₆ isomers	0.01 to 2	–	–	–	0.001 to 30	0.001 to 5	0.0001 to 0.5
C ₆₊	–	–	–	0.1 to 99.9%	–	–	–
C ₇₊	0.01 to 1	–	–	–	0.001 to 30	–	–
C ₇ -C ₈	–	–	–	–	–	0.001 to 2	0.0001 to 0.5
C ₉	–	–	–	–	–	0.001 to 2	–
C ₁₀ -C ₁₄	–	–	–	–	–	0.001 to 1	–

Note: In the table above the symbol “–” indicates that this parameter was not specified.

Hydrocarbons in LPG Analyzer (7890-0397)

Analyzer Description

Configuration:

- 1-liquid valve/2-valve/
2-Column /FID

Sample type:

- LPG (liquefied petroleum gases),
propane/propylene mixture

Compounds analyzed:

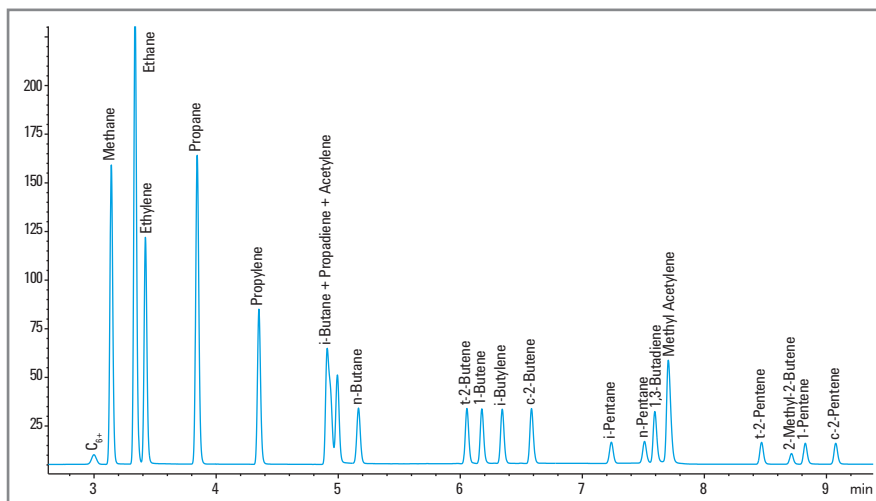
- C₁-C₅
- C₆₊ as backflush

Typical quantification range:

- 10 ppm for hydrocarbons

Configured per method:

- ASTM D2163



► KEY BENEFITS AND FEATURES

- Single channel with single LSV valve
- Configured to analyze liquefied petroleum gas, specifically propane and butane for commercial use

Commercial Propane and Butane LPG Analyzer (7890-0188)

Analyzer Description

Configuration:

- Liquid valve/1-column (packed column)/FID

Sample type:

- LPG, commercial propane and butane

Compounds analyzed:

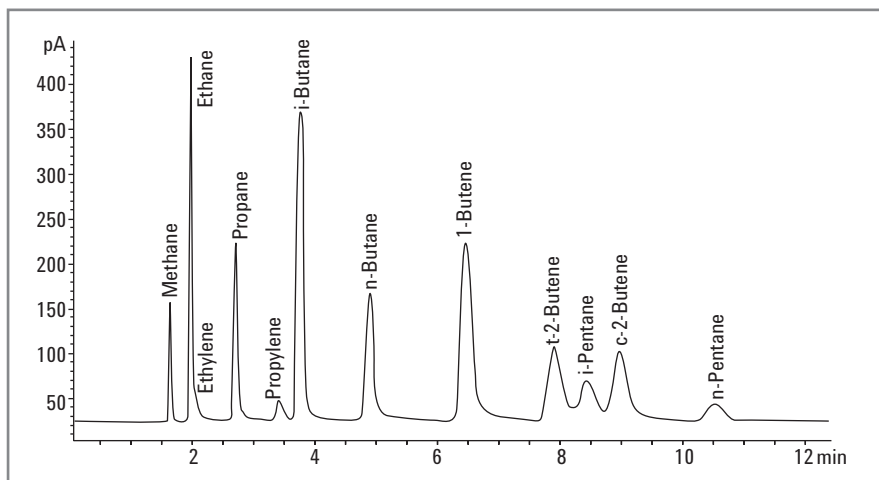
- C₁-C₆

Typical quantification range:

- 10 ppm for hydrocarbons

Configured per method:

- ASTM D2163, ISO 7941, EN 27941, and IP 405



► KEY BENEFITS AND FEATURES

- Single channel with single LSV
- Rugged packed column
- Configured to analyze liquefied petroleum gas, specifically propane and butane for commercial use

LPG Composition Analyzer (7890-0138)

Analyzer Description

Configuration:

- Liquid valve/1-column (PLOT Alumina)/FID

Sample type:

- LPG

Compounds analyzed:

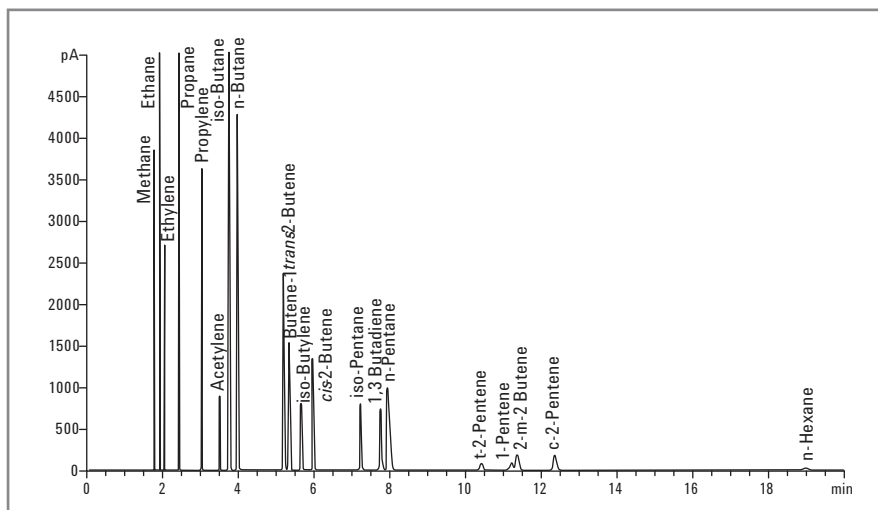
- C₁-C₆

Typical quantification range:

- 10 ppm for hydrocarbons

Configured per method:

- ASTM D2163, ASTM D2593, ASTM D2712, ASTM D4424



► KEY BENEFITS AND FEATURES

- Single channel with single LSV
- PLOT Alumina is ideal for separation of the C₁ to C₈ isomers; especially for separation of cyclopropane and propylene

SOLUTIONS FOR TRACE IMPURITIES



Meet the stringent demands of both regulators and customers

Accurately measuring feedstock impurities at increasingly lower concentrations is critical to process efficiency and profitability. For example, producers of high-purity monomers (such as ethylene and propylene) face stiff competition and tight customer specifications.

Purity is also a must for researchers and production operations in the food, pharmaceutical, chemical, and semi-conductor industries. Failure to fully characterize the impurity content of N, Ar, H₂, and CO₂ can render the gas unfit for a given application.

Trace contaminants also contribute to equipment corrosion and reduced polymer yields. Even worse, they can cause catalyst degradation, poisoning, and contamination, which can lead to costly, time-consuming catalyst bed replacement.

With their innovative hardware configurations, **Agilent Trace Impurities Analyzers** reliably confirm the purity of raw materials provided by your suppliers, so you can detect contaminants with confidence at trace (ppb) levels.

Learn more about Analyzer solutions for the energy and chemical industry at [agilent.com/chem/energy](https://www.agilent.com/chem/energy)

Solutions for Trace Impurities

Analyzer/SP1 Number	Configuration	Capability	
		Suitable for process gas containing high levels of CH ₄	Suitable for process gas containing O ₂
Solutions for trace CO/CO₂			
G3445 Series #646/7890-0282	2-valve/2-column/Methanizer/FID	Yes	No
G3445 Series #647/7890-0304	1-valve/2-column/Methanizer/FID	No	No
7890-0366	2-valve/2-column/Methanizer/FID	No	Yes • Separates O ₂ from CO
7890-0355	2-valve/2-column/Methanizer/FID	No	Yes • Separates O ₂ from CO with backflush • High level of O ₂ will not impact CO

Analyzer/SP1 Number	Configuration	Capability
Solutions for other trace impurities		
7890-0409	1-valve/2-column (packed column)/PDHID	H ₂ , O ₂ , N ₂ , CO, CH ₄ in Ethylene/Propylene
7890-0305	2-valve/3-column (packed column)/TCD/Hastelloy valve, inlet tubing, sample filter and nickel stripper	H ₂ , O ₂ , N ₂ , CH ₄ , CO ₂ , CO in Crude Chlorine Gas
7890-0341	1-valve/2-column (capillary/PLOT)/VI (Volatile Inlet)/Deans Switch/2-FID	C ₁ -C ₄ hydrocarbons and Methanol in Ethylene and Propylene
7890-0237	1-valve/2-column (packed column)/PDHID	H ₂ , O ₂ + N ₂ composite peak, CH ₄ , CO, CO ₂ in Monomer Gas
7890-0219	1-valve (GSV)/PDHID	H ₂ , O ₂ , N ₂ , CH ₄ , CO in Helium
7890-0191	3-valve/5-column (packed column)/2-TCD/Hastelloy valve, inlet tubing, sample filter and nickel stripper	H ₂ , O ₂ , N ₂ , CH ₄ , CO ₂ , and CO in pure Chlorine Gas

Reference Methods for CO/CO₂ Analysis: Quantitation Ranges for Compounds of Interest

UOP 603	
Component Gas	Concentration Range
CO/CO ₂	0.5 to 500 mol-ppm

Low CO and CO₂ in Process Gases Containing High CH₄ Analyzer (G3445 Series #646/7890-0282)

Analyzer Description

Configuration:

- 2-valve/2-column (packed column)/Methanizer/FID

Sample type:

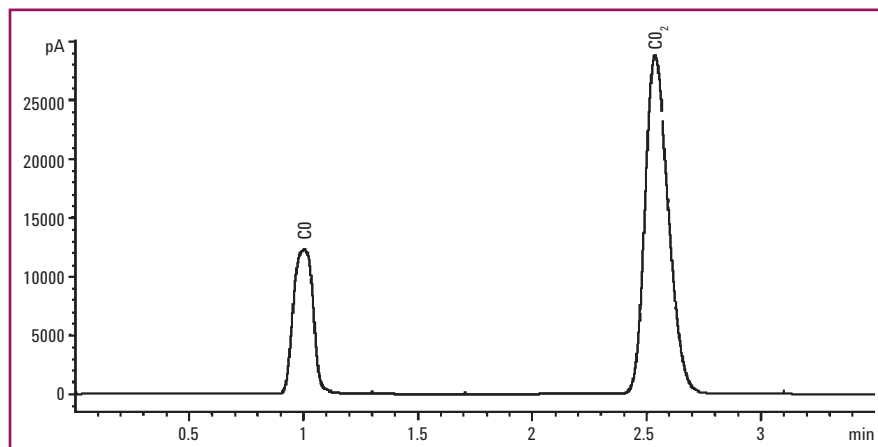
- Process gas containing high levels of methane, natural gas

Compounds analyzed:

- CO₂ and CO

Typical quantification range:

- 0.2 ppm for CO
- 0.4 ppm for CO₂



► KEY BENEFITS AND FEATURES

- Single channel with packed columns
- High concentration hydrocarbons cut on the pre-column; CH₄ vented during the analysis through use of a 4-port valve
- Trace levels of CO and CO₂ can be analyzed by conversion to CH₄ and detection with FID
- 3 minute analysis time

Low CO and CO₂ in Process Gas Analyzer (G3445 Series #647/7890-0304)

Analyzer Description

Configuration:

- 1-valve/2-column (packed column)/Methanizer/FID

Sample type:

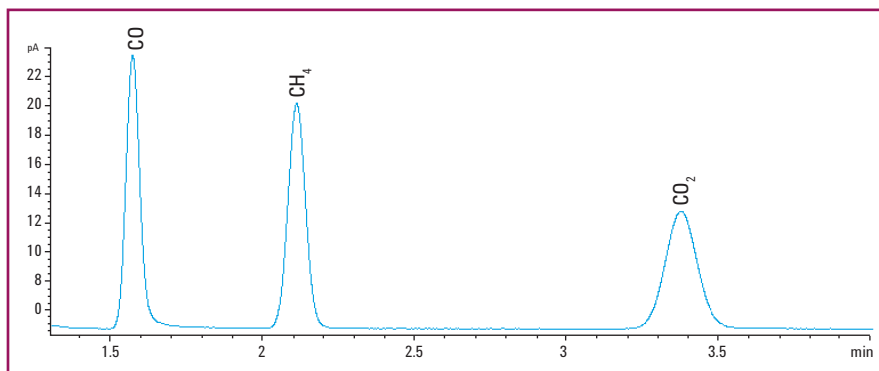
- Ethylene, propylene, or process gas streams containing low concentrations of methane

Compounds analyzed:

- CO₂ and CO

Typical quantification range:

- 0.2 ppm for CO
- 0.4 ppm for CO₂



► KEY BENEFITS AND FEATURES

- Single channel with packed columns
- Hydrocarbons cut on the pre-column while trace levels of CO and CO₂ pass through Methanizer for conversion to CH₄ and detection with FID
- 4 minute analysis time

Impurities in Ethylene/Propylene Analyzer by PDHID (7890-0409)

Analyzer Description

Configuration:

- Valve/2-column (packed column)/PDHID

Sample type:

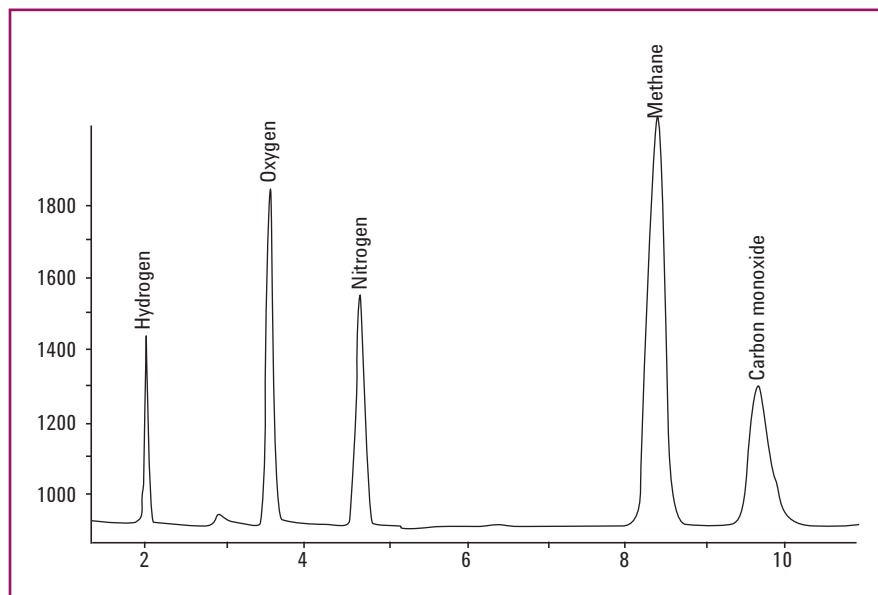
- Ethylene/Propylene

Compounds analyzed:

- H₂, O₂, N₂, CO, CH₄

Typical quantification range:

- H₂: 0.1-40 ppm
- N₂, CO: 0.1-10 ppm



► KEY BENEFITS AND FEATURES

- Single-valve, dual-column system using PDHID in helium ionization mode allows determination of impurities at 0.1 ppm level
- Use a 10-port, low-leakage valve
- Matrix effects are eliminated by “cutting out” the matrix on a packed pre-column
- Inert impurities including H₂, O₂, N₂, CO, CH₄ are separated on packed column and detected at 0.1 ppm and higher

Trace CO and CO₂ in Hydrogen and Light Gaseous Hydrocarbons Analyzer (7890-0366)

Analyzer Description

Configuration:

- 2-valve/2-column (packed column)/Methanizer/FID

Sample type:

- H₂/Light gaseous hydrocarbons

Compounds analyzed:

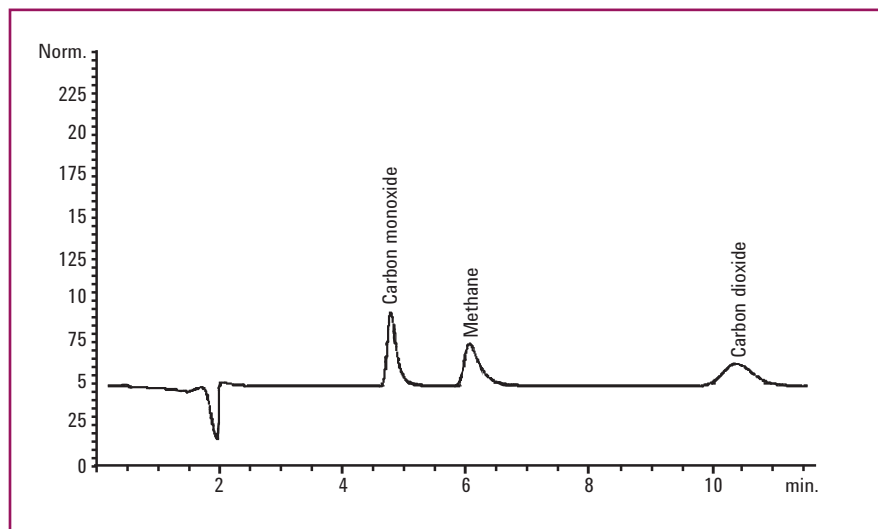
- CO, CO₂, and CH₄

Typical quantification range:

- 0.2 ppm for CO
- 0.4 ppm for CO₂

Configured per method:

- UOP 603



► KEY BENEFITS AND FEATURES

- Single channel with packed columns
- Trace levels of CO and CO₂ can be analyzed by conversion to CH₄ and detection with FID
- 12 minute analysis time

Low CO and CO₂ in Process Gases with Nicat Bypass to Detector (7890-0355)

Analyzer Description

Configuration:

- 2-valve/2-column (packed column)/Methanizer/FID

Sample type:

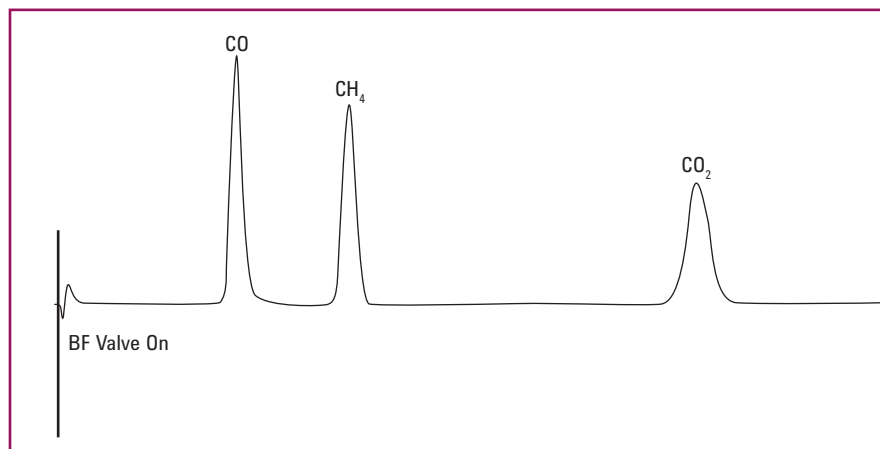
- Process gas containing air

Compounds analyzed:

- CO, CO₂

Typical quantification range:

- 0.2 ppm for CO
- 0.4 ppm for CO₂



► KEY BENEFITS AND FEATURES

- Single channel with packed columns
- Hydrocarbon components heavier than CO₂ are backflushed to vent
- Air or other non-backflushed gases can be by-passed to the FID without flowing through the nickel catalyst
- Trace levels of CO and CO₂ can be analyzed by conversion to CH₄ and detection with FID
- 6 minute analysis time

Inert Impurities in Crude Chlorine Analyzer (7890-0305)

Analyzer Description

Configuration:

- 2-valve/3-column (packed column)/TCD/Hastelloy valve, inlet tubing, sample filter and nickel stripper

Sample type:

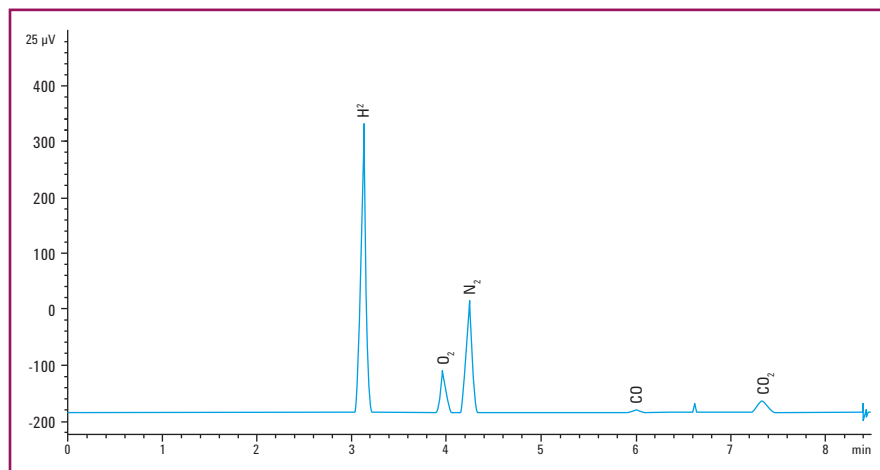
- Crude chlorine gas

Compounds analyzed:

- H_2 , O_2 , N_2 , CH_4 , CO_2 , CO

Typical quantification range:

- 50 ppm for fixed gases except H_2
- 3 Vol% for H_2 (for low concentrations of H_2 use 7890-0191)



► KEY BENEFITS AND FEATURES

- Single TCD channel with packed columns measures ppm levels of inert impurities (3% or higher for H_2) in crude and dry chlorine
- Chlorine is cut at sampling and vented in backflush
- Uses Hastelloy valve, inlet tubing, sample filter and nickel stripper to avoid corrosion

Trace Oxygenates and Hydrocarbons in Ethylene Analyzer (7890-0341)

Analyzer Description

Configuration:

- 1-valve/2-column (capillary/PLOT)/VI (Volatile Inlet)/Deans Switch/2-FID

Sample type:

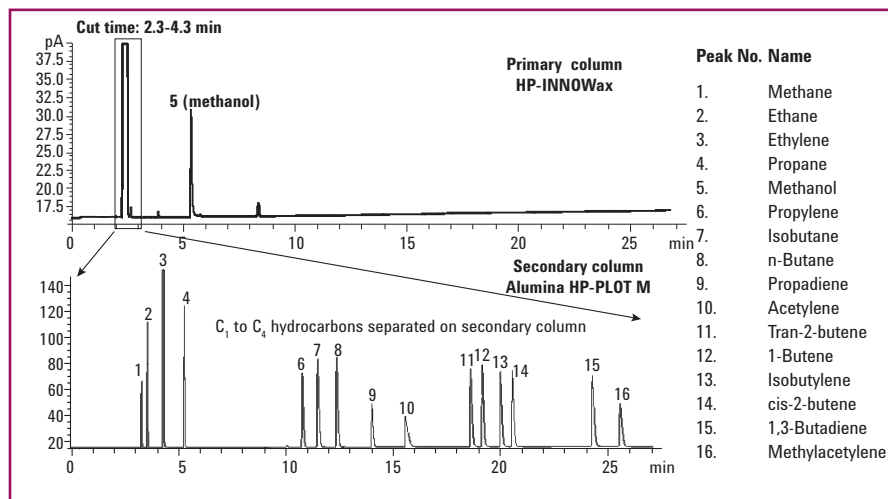
- Ethylene, propylene

Compounds analyzed:

- C₁-C₄ hydrocarbons
- Methanol

Typical quantification range:

- 2 ppm hydrocarbons, 10 ppm for methanol



► KEY BENEFITS AND FEATURES

- Use Deans Switch to enhance ASTM D6159 method, which allows determination of trace oxygenates and hydrocarbons in a single run
 - Primary column HP-INNOWax separates oxygenates and prevents polar oxygenates (water, alcohols) from damaging the sensitive stationary phase
 - Deans Switch selectively transfers only the hydrocarbons to alumina column
- Dynamic blending system (7890-0130) can be used for providing easy calibration and assisting with method development
- System applicable to trace oxygenate in propylene

Impurities in Monomers Analyzer by PDHID (7890-0237)

Analyzer Description

Configuration:

- 1-valve/2-column (packed column)/PDHID

Sample type:

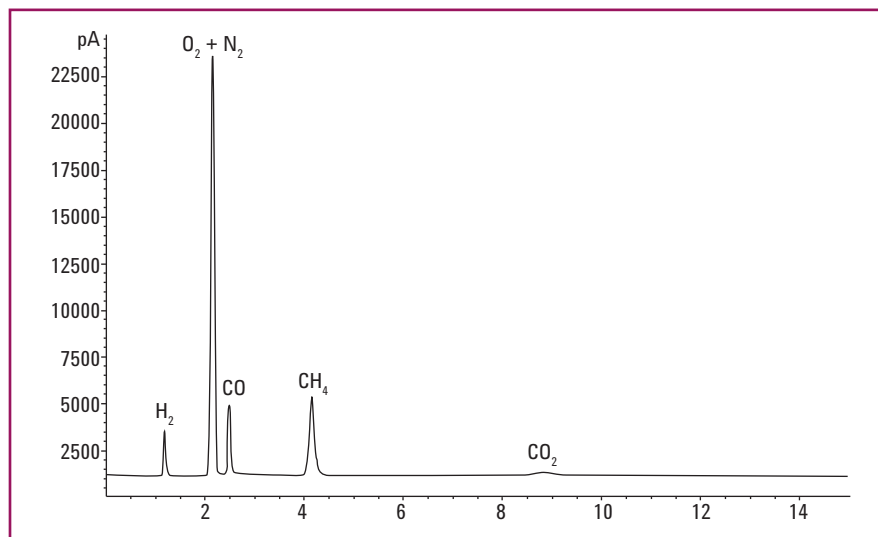
- Monomers (gas)

Compounds analyzed:

- H_2 , $O_2 + N_2$ composite peak, CH_4 , CO , CO_2

Typical quantification range:

- 1.5 ppm for $O_2 + N_2$ composite peak
- 0.1 ppm for H_2 , CO and CO_2



► KEY BENEFITS AND FEATURES

- Single-valve, dual-column system using PDHID in helium ionization mode allows determination of impurities at 0.1 ppm level
- Uses a 10-port, low-leakage valve
- Matrix effects are eliminated by “cutting out” the light components on a packed pre-column
- Inert impurities including H_2 , O_2+N_2 , CO , CH_4 , and CO_2 are separated on micro-packed column and detected at 0.1 ppm and higher

Trace Impurities in Helium Analyzer by PDHID (7890-0219)

Analyzer Description

Configuration:

- 1-valve/PDHID

Compounds separated:

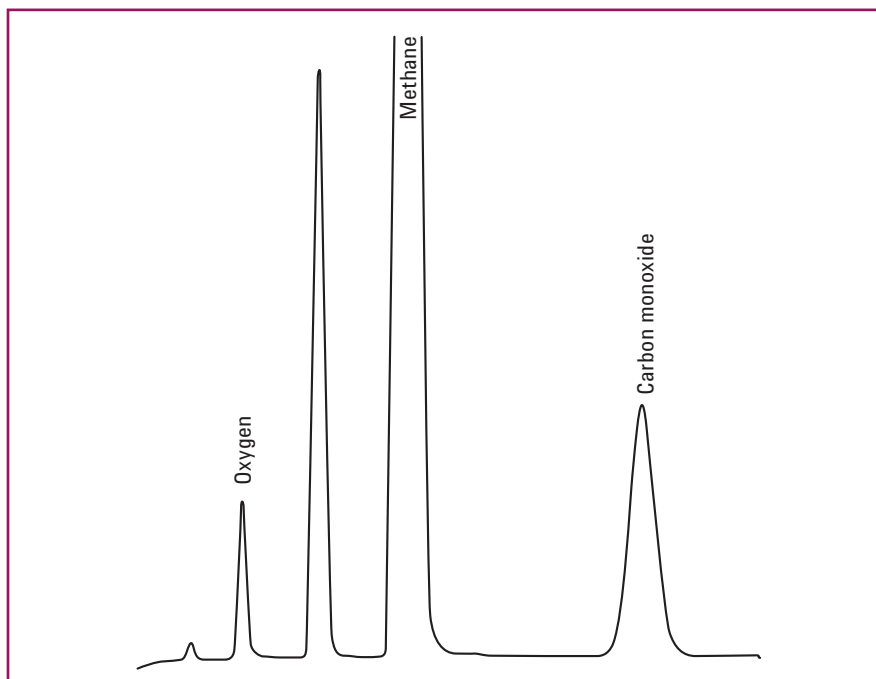
- H₂, O₂, N₂, CH₄, CO

Sample type:

- Bulk helium

Lowest quantification limit:

- 0.1 ppm



► KEY BENEFITS AND FEATURES

- Single-valve, single-column system using PDHID in helium ionization mode allows determination of impurities at 0.1 ppm level
- Use low-leakage GSV
- Universal in response means positive peaks for all components
- No need to change bias voltage to adjust peak polarity or sensitivity
- No dead volume inside the detector, quick recovery from bulk peaks

2-Channel Inert Impurities in Pure Chlorine Analyzer (7890-0191)

Analyzer Description

Configuration:

- 3-valve/5-column (packed column)/2-TCD/Hastelloy valve, inlet tubing, sample filter, nickel stripper

Sample type:

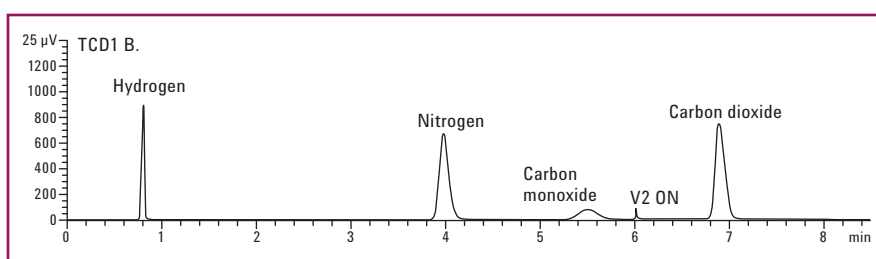
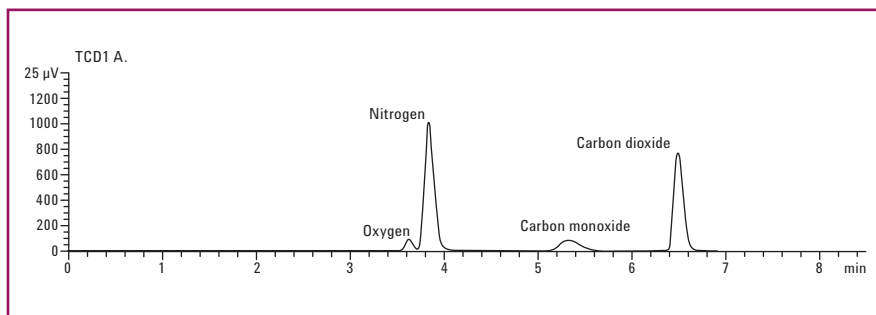
- Pure chlorine gas

Compounds analyzed:

- H_2 , O_2 , N_2 , CH_4 , CO_2 , and CO

Typical quantification range:

- 50 ppm for fixed gases



► KEY BENEFITS AND FEATURES

- Dual TCD channels with packed column system measures low levels of inert impurities in pure chlorine
- Chlorine is cut to the vent at the sampling
- Hastelloy valve, inlet tubing, sample filter, nickel stripper to avoid corrosion
- Full-range capability, including H_2 by the use of second TCD with argon carrier gas

SOLUTIONS FOR TRANSFORMER OIL GAS



Confirm oil integrity and prevent catastrophic failure

Electrical transformers, which literally *transform* voltage from one level to another, use oil as both an insulator and a coolant for internal components. Because transformer operation subjects the oil to electrical and mechanical stresses, the oil must be able to maintain its stability at high temperatures for extended periods of time.

Factors such as aging, oxidation, vaporization, electrolytic action, and decomposition can change the oil's chemical properties, resulting in gas formation. Information derived by analyzing these dissolved gases provides considerable diagnostic information about the transformer's current and future stability – helping operators determine whether a transformer should be decommissioned.

The following pages give you an in-depth look at **Agilent Transformer Oil Gas (TOGA) Analyzers**. Configured per ASTM standards, these analyzers harness advanced technologies such as headspace sampling, traditional packed columns, capillary columns, and TCD/FID detectors (following methanization) to deliver rugged, reliable TOGA analysis.

Learn more about Analyzer solutions for the energy and chemical industry at
[agilent.com/chem/energy](https://www.agilent.com/chem/energy)

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Solutions for Transformer Oil Gas (TOGA)

Analyzer/SP1 Number	Configuration	Capability
G3445 Series #571/7890-0261	1-valve/2-column/TCD/FID/Methanizer/Headspace	H ₂ , O ₂ , N ₂ , CH ₄ , CO and CO ₂ , C ₂ (ethane, ethylene, acetylene), C ₃ (propane, propylene), and C ₄ (1-butene) per ASTM D3612-C
7890-0552	3-valve/3-column/TCD/FID/Methanizer/Headspace	H ₂ , O ₂ , N ₂ , CH ₄ , CO, CO ₂ , C ₂ (ethane, ethylene, acetylene), C ₃ (propane, propylene), and C ₄ (1-butene) per ASTM D3612-C
7890-0047	2-valve/2-column/TCD/FID/Methanizer	H ₂ , O ₂ , N ₂ , CH ₄ , CO, CO ₂ , C ₂ (ethane, ethylene, acetylene), C ₃ (propane, propylene), and C ₄ (1-butene) per ASTM D3612-A

Reference Methods for TOGA: Quantitation Ranges for Compounds of Interest

Component Gas	ASTM D3612-A	ASTM D3612-C	
	Minimum Detection Limits for Gases Dissolved in Oil, ppm	Compound	Detection Limits, ppm (signal/noise = 3)
H ₂	5	H ₂	0.6
Hydrocarbons	1	O ₂	11.0*
CO ₂	25	N ₂	11.2
Atmospheric gases	50	CH ₄	0.06
		CO	0.09
		CO ₂	0.1
		C ₂ H ₂	0.05
		C ₂ H ₄	0.04
		C ₂ H ₆	0.04
		C ₃ H ₈	0.2

**Estimated from the H₂ response. The detection limits were obtained from the analysis of a dissolved gas standard of 1 ppm for all gases, except for O₂, N₂, CO, and CO₂ where the concentration was 17, 24, 1.6, and 8.8 ppm, respectively. These results were obtained with a headspace sampler coupled with a gas chromatograph of one commercial source; other devices can be used but the analytical performance may be somewhat different than that specified in Method C.*

Why spend time configuring hardware and developing methods?

Let Agilent implement the latest advances in GC to provide your team with the tools it requires to quickly analyze trace target compounds in complex matrices.



Transformer Oil Gas Analyzer (G3445 Series #571/7890-0261)

Analyzer Description

Configuration:

- 1-valve/2-column/TCD/FID/Methanizer/Headspace

Sample type:

- Gas

Compounds analyzed:

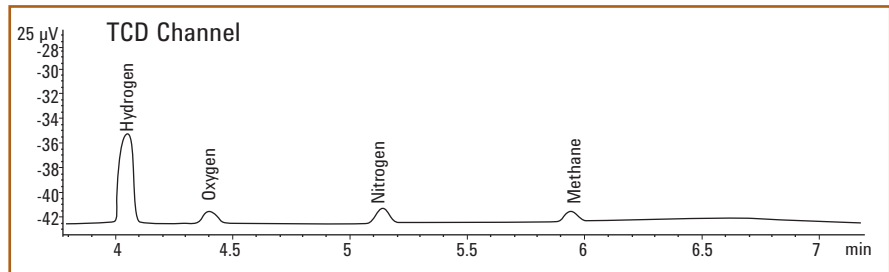
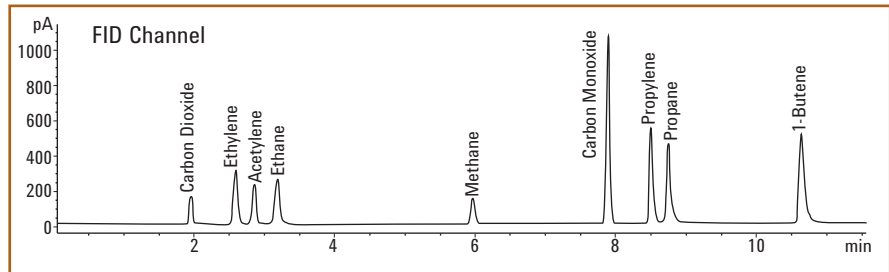
- H_2 , O_2 , N_2 , CH_4 , CO and CO_2 ,
- C_2 (ethane, ethylene, acetylene),
- C_3 (propane, propylene),
- C_4 (1-butene)

Typical quantification range:

- Meet the specifications listed in table 3 in ASTM D3612-C

Configured per method:

- ASTM D3612-C



► KEY BENEFITS AND FEATURES

- Single channel with PLOT columns
- Use direct transfer line to column connection
- Trace levels of CO and CO_2 can be analyzed by conversion to CH_4 and detection with FID
- 10 minute analysis time
- Improved precision through 7890 PCM backpressure regulation of headspace gas sampling valve loop

Transformer Oil Gas Analyzer (7890-0552)

Analyzer Description

Configuration:

- 3-Valve/3-Column/TCD/FID/
Methanizer/Headspace

Sample type:

- Gas

Compounds analyzed:

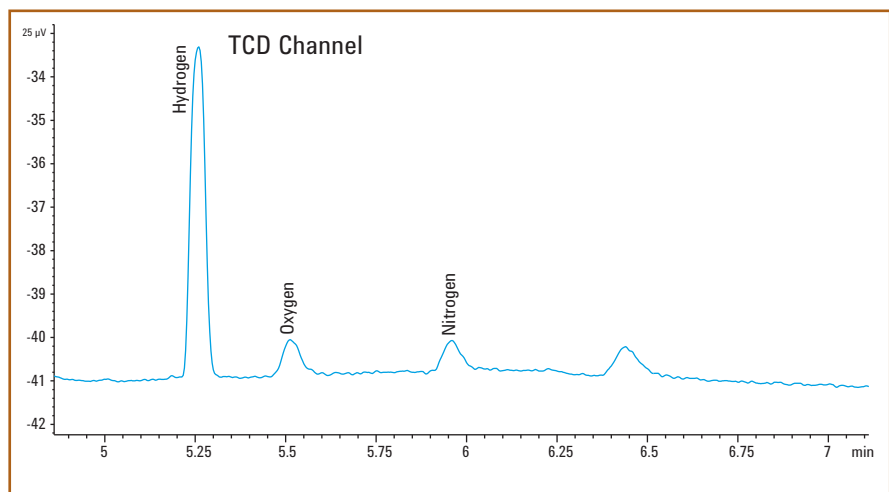
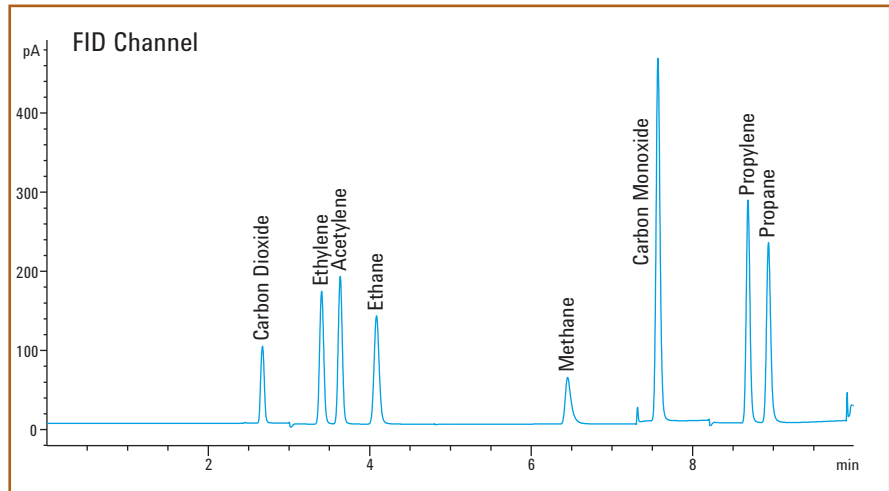
- H_2 , O_2 , N_2 , CH_4 , CO and CO_2
- C_2 (ethane, ethylene, acetylene),
 C_3 (propane, propylene),
 C_4 (1-butene)

Typical quantification range:

- Meet the specifications listed in
table 3 in ASTM D3612-C

Configured per method:

- ASTM D3612-C



► KEY BENEFITS AND FEATURES

- Trace levels of CO and CO_2 can be analyzed by conversion to CH_4 and detection with FID
- Backflush of C_{4+} hydrocarbons present through pre-column to shorten analysis time
- Through additional valve switching C_2 , C_3 , C_4 hydrocarbons bypass nickel catalyst for FID detection
- 10 minutes analysis time

Transformer Oil Gas Analyzer (7890-0047)

Analyzer Description

Configuration:

- 2-valve/2-column/TCD/FID/
Methanizer

Sample type:

- Gas

Compounds analyzed:

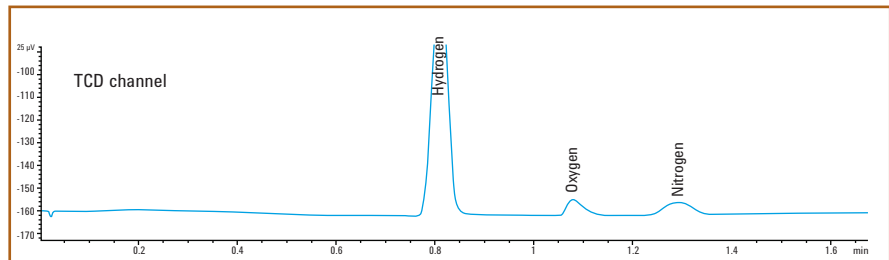
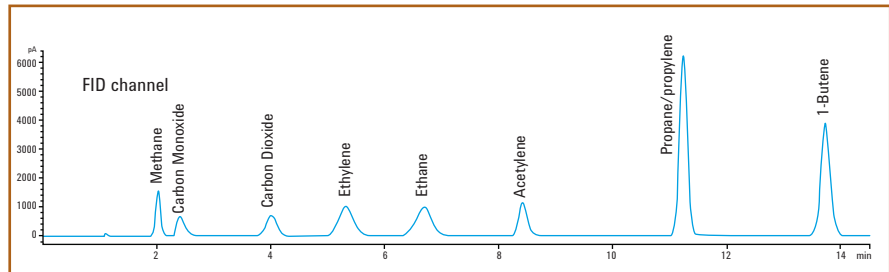
- H_2 , O_2 , N_2 , CH_4 , CO , CO_2
- C_2 (ethane, ethylene, acetylene),
- C_3 (propane, propylene),
- C_4 (1-butene)

Typical quantification range:

- Meets requirements for
ASTM D3612-A

Configured per method:

- ASTM D3612-A



► KEY BENEFITS AND FEATURES

- Single channel with packed columns
- Trace levels of CO and CO_2 can be analyzed by conversion to CH_4 and detection with FID
- 15 minute analysis time
- Includes macros for data reporting per ASTM D3612-A, requires Microsoft Excel

SOLUTIONS FOR REFORMULATED FUEL



Conform to strict octane and emissions regulations

The 1990 US EPA Clean Air Act sets strict limits on volatile organic compounds (VOCs) and other toxic chemicals that emit from gasoline engine exhaust.

To reach these target levels, fuel producers must reformulate their gasoline to increase octane levels. This is accomplished through catalytic restructuring of hydrocarbon molecules in naphtha feedstock to produce a more complex structure and increase oxygen content through oxygenate blending. The resulting fuels have higher octane ratings, and combust more efficiently and thoroughly.

Agilent, together with our Channel Partners, offers a portfolio of **Reformulated Gasoline (RFG) Analyzers** that are factory configured to meet standards such as ASTM and CEN – and are chemically tested for analyzing oxygenate concentrations, benzene, and heavier aromatic content in RFG.

Learn more about Analyzer solutions for the energy and chemical industry at [agilent.com/chem/energy](https://www.agilent.com/chem/energy)

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Solutions for Oxygenates and Aromatics in Fuel

Analyzer/SP1 Number	Configuration	Capability
G3445 Series #611/7890-0183	1-valve, 2-column (micro-packed and capillary), and FID/TCD	Oxygenates and aromatics in finished gasoline per ASTM D4815 and ASTM D5580
G3445 Series #612/7890-0291	2-valve, 4-column (micro-packed and capillary) and dual FID	Parallel Channel Oxygenates and Aromatics per ASTM D4815 and ASTM D5580
G3445 Series #614/7890-0049	1-valve, 2-column (micro-packed and capillary), and FID/TCD	Oxygenates in Finished Gasoline per ASTM D4815
G3445 Series #615/7890-0198	1-valve, 2-column (packed column), TCD or FID	Benzene in finished motor and aviation fuels per ASTM D3606
G3445 Series #616/7890-0106	1-valve, 2-column (micro-packed and capillary), 2-FID (or FID/TCD)	Aromatics in finished gasoline per ASTM D5580
G3445 Series #618/7890-0098	Deans Switching/2-column/Dual FID	Oxygenates and Aromatics in commercial and raw gasoline per EN 13132 and EN 12177
G3445 Series #618/7890-0178	Capillary Flow Technology micro volume tee/2-column/FID/Autosampler (for liquid samples), gas sampling valve (for gas samples), LSV (for liquefied gases)	Low level oxygenates in light hydrocarbons per ASTM D7423
G3445 Series #482/7890-0606	5975C GC/MS System/split/splitless inlet/7696A WorkBench (optional)	FAME Contamination in Jet Fuel per IP 585
7890-0308	3-valve, 5-column, FID and TCD	Oxygenates, Aromatics, and Benzene in finished motor and aviation fuels per ASTM D4815, ASTM D5580 and ASTM D3606
7890-0340	1-valve/2-column/FID	Trace oxygenates in reformulated gasoline per ASTM D7754
7890-0549	Split/splitless inlet/capillary column/pressure point/capillary column/FID/Automatic Liquid Sampler	MTBE and C ₁ -C ₄ alcohols in gasoline and light naphtha per ASTM D3606 and ASTM D4815 (partial)
7890-0589	1-Valve/Lowox column/FID	Low Level Oxygenates in LPG, ethylene, propylene, butene streams, and natural gas compounds

Reference Methods for Oxygenates: Quantitation Ranges for Compounds of Interest

ASTM D7423	
Analyte	The linear working range
Oxygenate compounds	0.50 mg/kg to 100 mg/kg

Single Channel Oxygenates and Aromatics in Fuel Analyzer (G3445 Series #611/7890-0183)

Analyzer Description

Configuration:

- 1-valve/2-column (micro-packed and capillary)/FID/TCD

Sample type:

- Finished gasoline

Compounds analyzed:

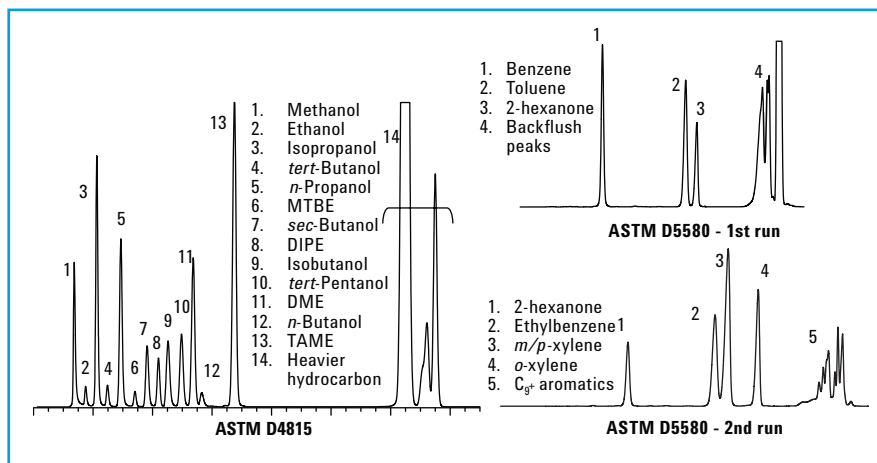
- ASTM D4815: MTBE, ETBE, TAME, DIPE, methanol, ethanol, isopropanol, *n*-propanol, isobutanol, *tert*-butanol, *sec*-butanol, *n*-butanol, *tert*-pentanol
- ASTM D5580: benzene, toluene, ethylbenzene, xylene, C₉ and heavier aromatics, total aromatics

Typical quantification range:

- 0.1 to 20 Wt% for individual ethers, 0.1 to 12 Wt% for individual alcohols
- 0.1 to 5 Vol% for benzene, 1 to 15 Vol% for toluene
- 0.5 to 10 Vol% for individual C₈ aromatics, 5 to 30 Vol% for total C₉ and heavier aromatics, 10 to 80 Vol% for total aromatics

Configured per method:

- ASTM D4815, ASTM D5580



► KEY BENEFITS AND FEATURES

- Designed for both ASTM D4815 and ASTM D5580 methods, uses same hardware configuration.
- Configured to determine oxygenates (ASTM D4815) and aromatics (ASTM D5580) in gasoline by using either helium or nitrogen (which is lower cost) carrier gas.

Dual Parallel Channel Oxygenates and Aromatics in Fuel Analyzer (G3445 Series #612/7890-0291)

Analyzer Description

Configuration:

- 2-valve/4-column (micro-packed and capillary)/2-FID

Sample type:

- Finished gasoline

Compounds analyzed:

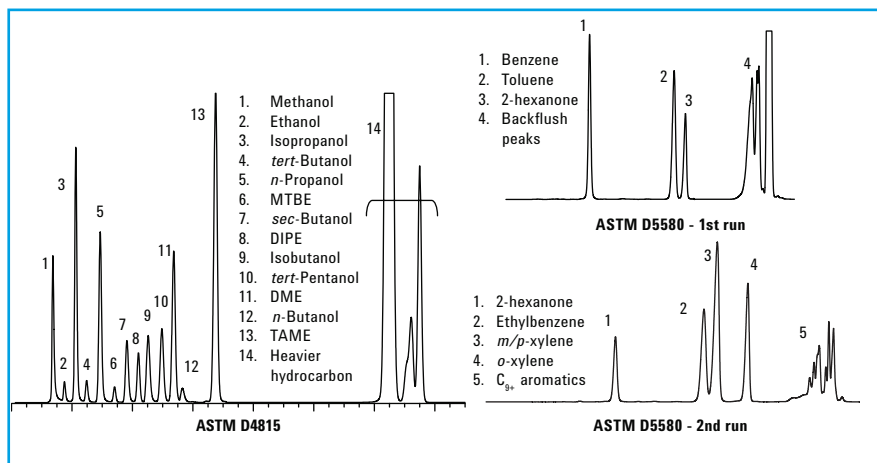
- ASTM D4815: MTBE, ETBE, TAME, DIPE, methanol, ethanol, isopropanol, *n*-propanol, isobutanol, *tert*-butanol, *sec*-butanol, *n*-butanol, *tert*-pentanol
- ASTM D5580: benzene, toluene, ethylbenzene, xylene, C₉ and heavier aromatics, total aromatics

Typical quantification range:

- 0.1 to 20 Wt% for individual ethers, 0.1 to 12 Wt% for individual alcohols
- 0.1 to 5 Vol% for benzene, 1 to 15 Vol% for toluene
- 0.5 to 10 Vol% for individual C₉ aromatics, 5 to 30 Vol% for total C₉ and heavier aromatics, 10 to 80 Vol% for total aromatics

Configured per method:

- ASTM D4815, ASTM D5580



► KEY BENEFITS AND FEATURES

- Dual parallel channels are configured on one GC system; one channel for ASTM D4815 and one for ASTM D5580
- Analyzer has the capability to determine oxygenates (ASTM D4815) and aromatics (ASTM D5580) in gasoline

Oxygenates in Fuel Analyzer (G3445 Series #614/7890-0049)

Analyzer Description

Configuration:

- 1-valve/2-column (micro-packed and capillary)/FID/TCD

Sample type:

- Finished gasoline

Compounds analyzed:

- MTBE, ETBE, TAME, and DIPE
- Methanol, ethanol, *iso*-propanol, *n*-propanol, *iso*-butanol, *tert*-butanol, *sec*-butanol, *n*-butanol, and *tert*-pentanol

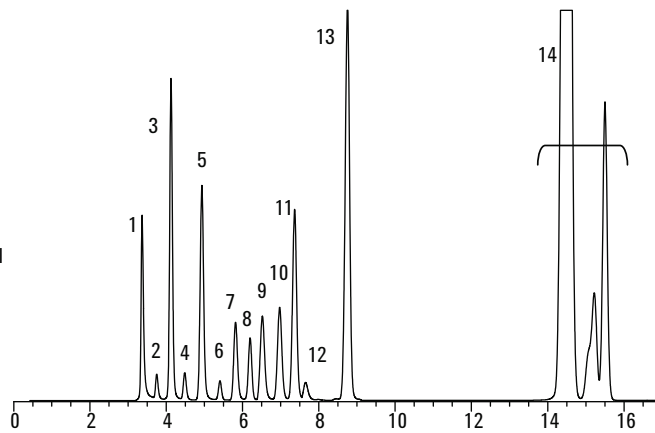
Typical quantification range:

- 0.1 to 20 Wt% for individual ethers, 0.1 to 12 Wt% for individual alcohols

Configured per method:

- ASTM D4815

1. Methanol
2. Ethanol
3. Isopropanol
4. *tert*-Butanol
5. *n*-Propanol
6. MTBE
7. *sec*-Butanol
8. DIPE
9. Isobutanol
10. *tert*-pentanol
11. DME
12. *n*-Butanol
13. TAME
14. Heavier hydrocarbon



► KEY BENEFITS AND FEATURES

- Analyzer configured to ether and alcohol additives in gasoline
- 18 minute analysis time
- Improved TCEP column and mounting hardware greatly improves method reliability and stability

Benzene in Gasoline Analyzer (G3445 Series #615/7890-0198)

Analyzer Description

Configuration:

- 1-valve/2-column/TCD or FID

Sample type:

- Finished motor and aviation gasoline

Compounds analyzed:

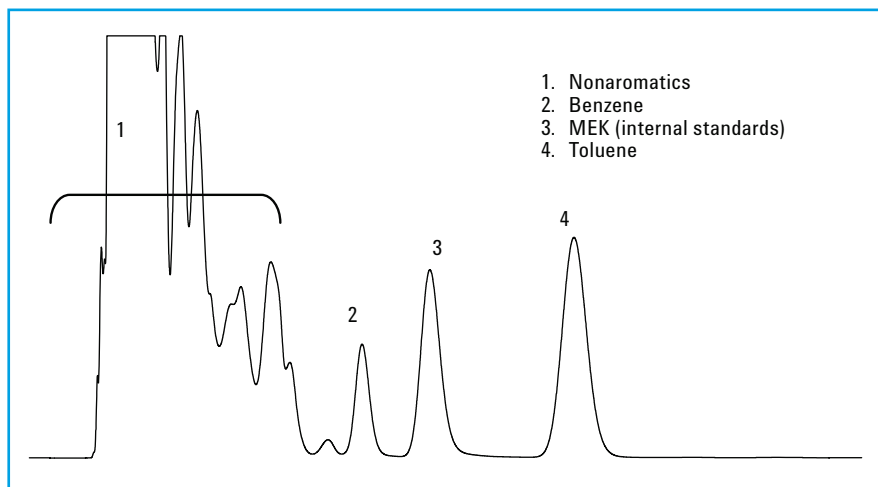
- Benzene, toluene

Typical quantification range:

- 0.1 to 5 Vol% for benzene
- 2 to 20 Vol% for toluene

Configured per method:

- ASTM D3606



► KEY BENEFITS AND FEATURES

- Single channel with dual packed-column configured to determine benzene and toluene in finished motor and aviation gasoline
- Independently heated valve system prevents condensation of heavy components in the sample

Aromatics in Fuel Analyzer (G3445 Series #616/7890-0106)

Analyzer Description

Configuration:

- 1-valve/2-column (micro-packed and capillary)/2-FID (or FID/TCD)

Sample type:

- Finished gasoline

Compounds analyzed:

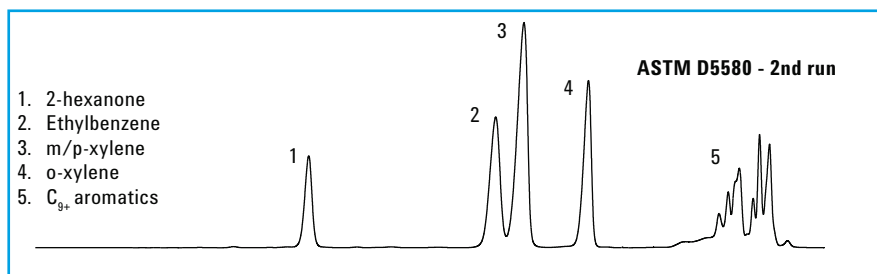
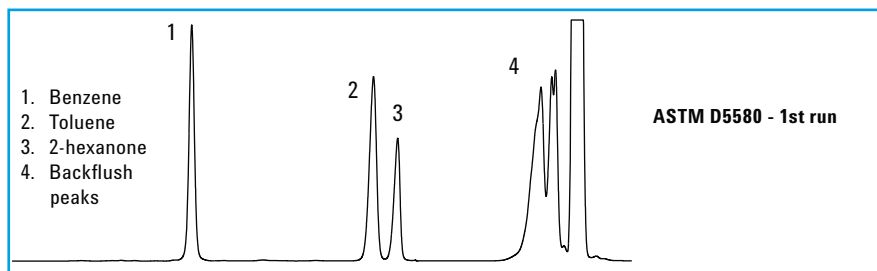
- Benzene, toluene, ethylbenzene, xylene, C₉ and heavier aromatics, total aromatics

Typical quantification range:

- 0.1 to 5 Vol% for benzene, 1 to 15 Vol% for toluene
- 0.5 to 10 Vol% for individual C₈ aromatics
- 5 to 30 Vol% for total C₉ and heavier aromatics
- 10 to 80 Vol% for total aromatics

Configured per method:

- ASTM D5580



► KEY BENEFITS AND FEATURES

- Dual-column system configured to determine benzene, toluene, ethylbenzene, and xylene in finished gasoline
- System configuration uses improved TCEP column mounting to greatly improve method stability

Oxygenates and Aromatics in Gasoline by Deans Switch Analyzer (G3445 Series #617/7890-0098)

Analyzer Description

Configuration:

- Deans Switching/2-column/2-FID

Sample type:

- Commercial or raw gasoline

Compounds analyzed:

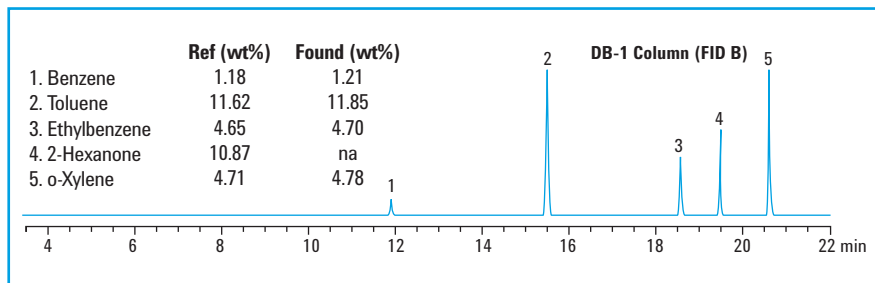
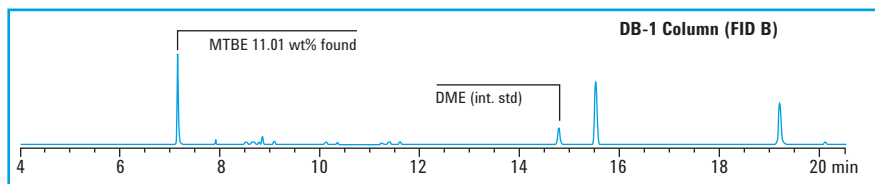
- Benzene, toluene, ethylbenzene, and oxygenates: MTBE, ETBE, TAME, DIPE, ethanol, isopropanol, *n*-propanol, isobutanol, *tert*-butanol, *sec*-butanol, *n*-butanol, and *tert*-pentanol

Typical quantification range:

- 0.05 to 6 Vol% for benzene, 0.17 to 15 Vol% for individual organic oxygenates

Configured per method:

- EN 13132, EN 12177



► KEY BENEFITS AND FEATURES

- Configured to determine the oxygenates (EN 13132) and benzene (EN 12177) in gasoline
- Capillary Flow Technology (CFT) Deans Switch provides easier method setup and reliable performance by eliminating carry-over and minimizing peak tailing for very polar compounds
- Uses backflush to reduce analysis time

Low Level Oxygenates in Light Hydrocarbons by Capillary Flow Technology micro volume tee (G3445 Series #618/7890-0178)

Analyzer Description

Configuration:

- Capillary Flow Technology micro-volume tee/2-column/FID/Autosampler (for liquid samples), gas sampling valve (for gas samples), LSV (for liquefied gases)

Sample type:

- Ethene, propene, hydrocarbon matrices that do not have a final boiling point greater than 200 °C

Compounds analyzed:

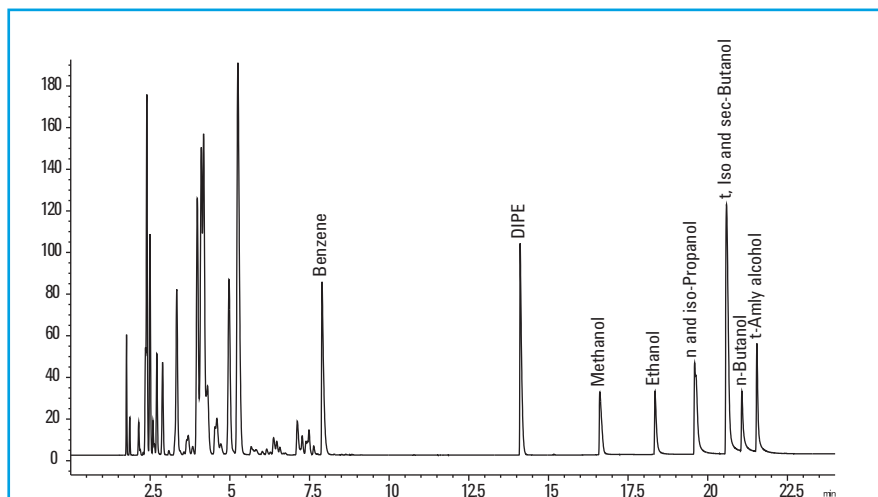
- MTBE, ETBE, DIPE, TAME, methanol, *n*-propanol and *i*-propanol, *n*-butanol, *i*-butanol, *tert*-butyl alcohol, *sec*-butyl alcohol, and *tert*-pentanol

Typical quantification range:

- 0.5 ppm for MTBE

Configured per method:

- ASTM D7423



► KEY BENEFITS AND FEATURES

- Analyzer configured to determine low level oxygenates in any hydrocarbon matrix with final boiling point <200 °C
- Capillary Flow Technology (CFT) fluidic switch with backflush used to remove hydrocarbons with higher boiling points
- Agilent GS-OxyPLOT column separates light hydrocarbons from oxygenates
- GS-OxyPLOT is surprisingly inert to polar compounds and is an excellent column for quantitative analysis of oxygenates at low concentrations

FAME Contamination in Jet Fuel Analyzer by GC/MS (G3445 Series #482/7890-0606)

Analyzer Description

Configuration:

- 5975C GC/MS System/Split/splitless inlet/7696A WorkBench (optional)

Sample type:

- Jet fuel

Compounds analyzed:

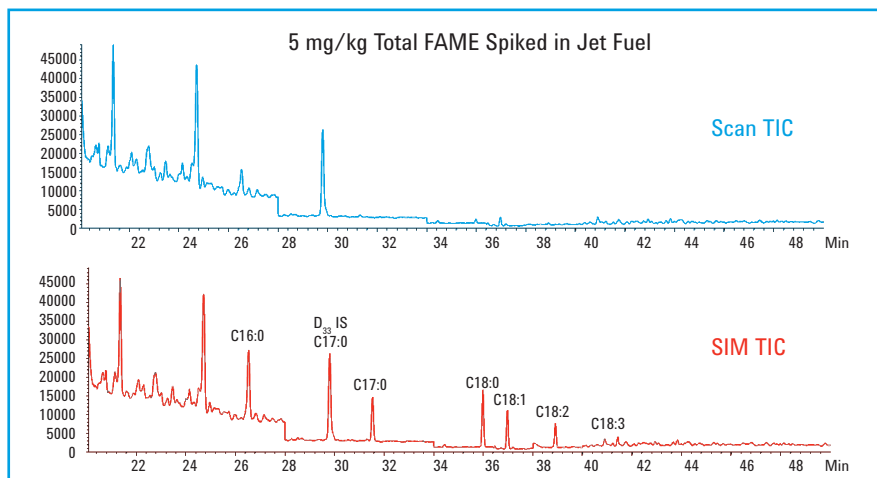
- C16:0, C17:0, C18:0, C18:1, C18:2, C18:3

Typical quantification range:

- 4.5 to 150 mg/kg total FAME in jet fuel

Configured per method:

- IP 585



► KEY BENEFITS AND FEATURES

- Setup for simultaneous SIM/SCAM data acquisition
 - Maximizes sensitivity and selectivity
 - Provides full spectra for qualitative analysis
- Optional 7696A WorkBench automates standard and sample prep for the analysis of trace FAMEs in Jet Fuel
 - Uses 10x less chemical resources
 - Improves calibration performance
 - Improves sample precision

Oxygenates, Aromatics, and Benzene in Fuel Analyzer (7890-0308)

Analyzer Description

Configuration:

- 3-valve/5-column/FID/TCD

Sample type:

- Finished motor and aviation gasoline

Compounds analyzed:

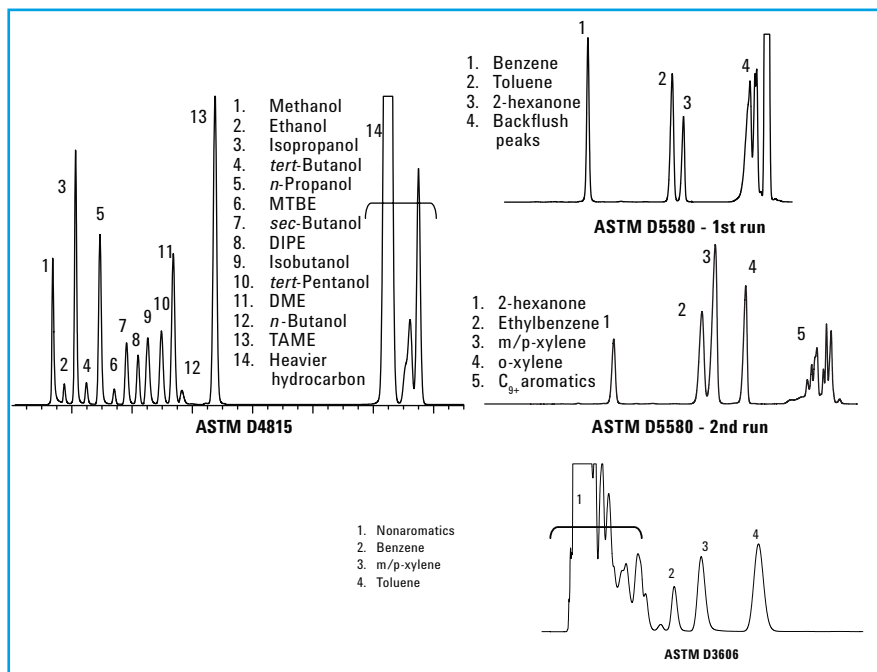
- ASTM D4815: MTBE, ETBE, TAME, DIPE, methanol, ethanol, isopropanol, *n*-propanol, isobutanol, *tert*-butanol, *sec*-butanol, *n*-butanol, *tert*-pentanol
- ASTM D5580: benzene, toluene, ethylbenzene, xylene, C₉ and heavier aromatics, total aromatics
- ASTM D3606: benzene, toluene

Typical quantification range:

- 0.1 to 20 Wt% for individual ethers, 0.1 to 12 Wt% for individual alcohols
- 0.1 to 5 Vol% for benzene, 1 to 15 Vol% for toluene, 0.5 to 10 Vol% for individual C₈ aromatics
- 5 to 30 Vol% for total C₉ and heavier aromatics, 10 to 80 Vol% for total aromatics
- 0.1 to 5 Vol% for benzene, 2 to 20 Vol% for toluene

Configured per method:

- ASTM D4815, ASTM D5580, and ASTM D3606



► KEY BENEFITS AND FEATURES

- Dual-channel system combines G3445 Series #615/7890-0198 and G3445 Series #612/7890-0291 on one GC
- Meets ASTM D4815, ASTM D5580 and ASTM D3606
- 10-port valve is used for column selection for ASTM D5580 and ASTM D3606

Trace Oxygenates in Reformulated Gasoline Analyzer (7890-0340)

Analyzer Description

Configuration:

- 1-valve/2-column/FID

Sample type:

- Reformulated gasoline, ethanol/gasoline blends, naphtha

Compounds analyzed:

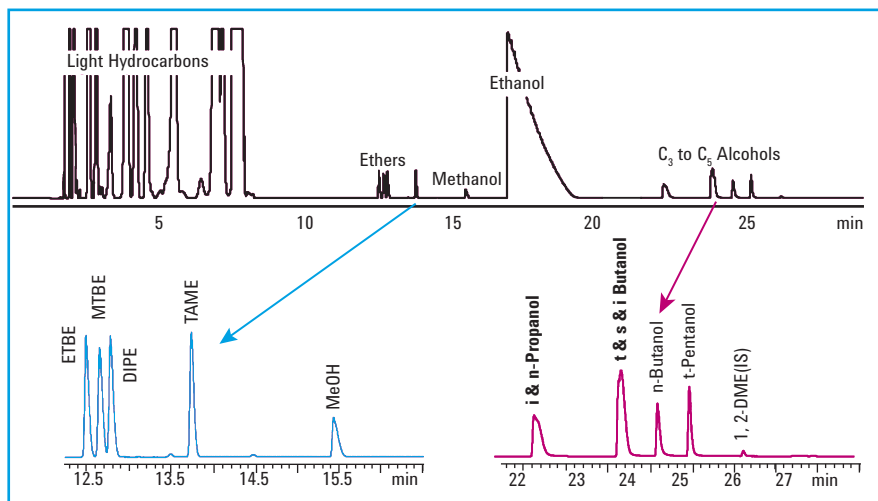
- MTBE, ETBE, DIPE, TAME, methanol, *n*-propanol, *i*-propanol, *n*-butanol, *i*-butanol, *tert*-butyl alcohol, *sec*-butyl alcohol, *tert*-pentanol

Typical quantification range:

- 10 to 1,000 ppm (wt/wt) for oxygenates
- 1 to 15 Vol% for ethanol

Configured per method:

- ASTM D7754



► KEY BENEFITS AND FEATURES

- Analyzer configured to analyze oxygenates (at the 10 to 1,000 ppm level) in gasoline containing 1 to 15 Wt% ethanol additive
- Excellent separation of oxygenates from light hydrocarbons
- Resolves all ethers (ETBE, MTBE, DIPE, and TAME)
- High quantitative precision for high and low ether concentrations in the presence of 1 to 15 Wt% ethanol

Gasohol Analyzer: Varian Legacy (7890-0549)

Analyzer Description

Configuration:

- Split/splitless inlet/capillary column/pressure point/capillary column/FID/ Automatic Liquid Sampler

Sample type:

- Gasoline and light naphtha

Compounds analyzed:

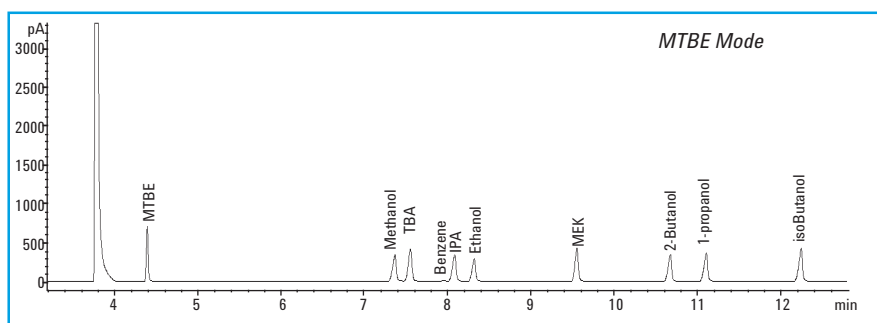
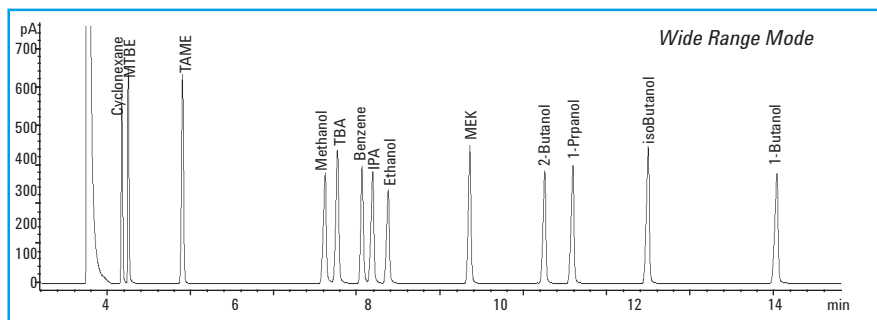
- Gasohol Analyzer has two modes of operation:
 1. Wide range mode (suitable for gasoline with low olefin content): MTBE, TAME and all C₁-C₄ alcohols
 2. MTBE mode: optimized for MTBE and oxygenates, excludes TAME
- Determines benzene and toluene (when present in the sample)

Typical quantification range:

- 0.01 Mol% for all compounds mentioned above

Configured per method:

- ASTM D3606, ASTM D4815 (partially)



► KEY BENEFITS AND FEATURES

- Analyzer configured to measure the low level ethers and all C₁-C₄ alcohols in gasoline's and light naphtha
- Analyzer has two modes of operation. The 'Wide Range' mode separates the MTBE, TAME and all C₁-C₄ alcohols for gasoline with low olefin content. The 'MTBE' mode specifically optimized to determine MTBE and oxygenates, except TAME and the butanols. (Will determine t-butanol)
- Will determine benzene and toluene when present in the sample
- To reduce cycle time, analyzer uses pressure point backflush

Low Level Oxygenates Analyzer: Varian Legacy (7890-0589)

Analyzer Description

Configuration:

- 1-Valve/Lowox column /FID

Sample type:

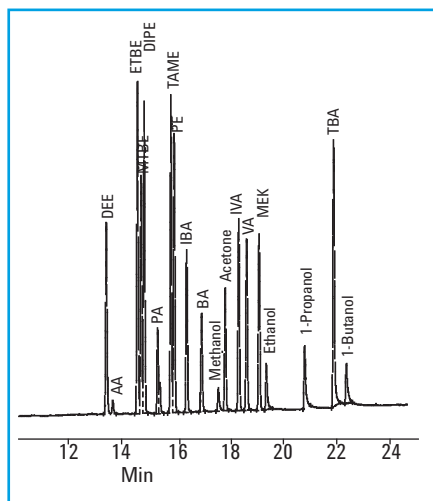
- LPG, ethylene, propylene, butene streams, natural gas compounds

Compounds analyzed:

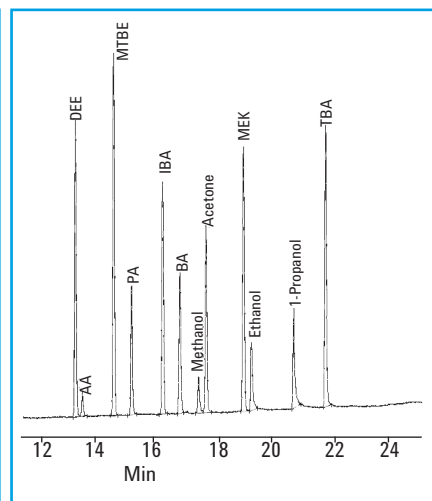
- Oxygen-containing hydrocarbons (aldehydes, ethers, alcohols and ketones) with a boiling point up to 100 °C

Typical quantification range:

- 100 ppb



Wide Range Mode



MTBE Mode

► KEY BENEFITS AND FEATURES

- Analyzer configured to measure the low level oxygenates in LPG, ethylene, propylene, and butene streams plus in natural gas (all matrices in gaseous state)
- Addition of a liquid sampling valve (SP1 7890-0593) allows for liquefied gases analysis and analysis of samples with a final boiling point up to 250 °C (Requires Luer-type fitting connection to the LSV)
- Analyzer operates in two modes
 1. *Wide Range Mode*: Measures components lighter than propylether
 2. *MTBE Mode*: Measures MTBE and lighter components
- Lowox column provides excellent quantitative analysis of oxygenates at low concentrations in hydrocarbon matrices

SOLUTIONS FOR SULFUR AND NITROSAMINE



Optimize product quality and promote good environmental stewardship

The analysis of sulfur-containing compounds, usually at low concentrations, is a critical step in quality control and assurance throughout the energy and chemical industry. Sulfur occurs naturally in crude oil and natural gas; therefore, sulfur-containing hydrocarbons are ubiquitous in refinery and petrochemical products.

Because sulfur species are small, polar and reactive, sulfur contaminants in concentrations as low as parts-per-billion (ppb) can corrode process hardware, and permanently poison expensive catalysts used to refine and downstream processes. Failure to quickly detect and accurately quantify a “sulfur event” could cause significant financial loss due to contamination and production downtime.

Increased sulfur emissions from hydrocarbon products also contribute to “acid rain,” which can corrode vegetation, building materials, and structures with its high concentrations of SO_2 . Accordingly, regulatory bodies such as the EPA and CEN have imposed legislation to reduce the presence of sulfur contaminants in hydrocarbon products.

Based on our most selective, sensitive detectors, **Agilent Sulfur Analyzers** are factory configured and chemically tested to reliably quantify trace-level sulfur compounds in a wide range of matrices.

Learn more about Analyzer solutions for the energy and chemical industry at [agilent.com/chem/energy](https://www.agilent.com/chem/energy)

Solutions for Sulfur and Nitrosamine

Analyzer/SP1 Number	Configuration	Capability
G3445 Series #662/7890-0365	Capillary inlet/capillary column/SCD (Requires additional Automatic Liquid Sampler for handling liquid sample analysis)	Volatile sulfur-containing compounds in light petroleum liquids, such as CS ₂ , COS, mercaptans, aromatic sulfur compounds, sulfides per ASTM D5623 and UOP 791
G3445 Series #661/7890-0375	1- valve/capillary column/SCD	Sulfur compounds in Natural Gas or Gaseous fuels; H ₂ S, CS ₂ , COS, mercaptans, aromatic sulfur compounds, sulfides per ASTM D5504
7890-0148/7890-0167	3-valve/2-column/2-VI (volatile inlets)/2-FPD	Volatile sulfur such as H ₂ S, COS, MeSH, EtSH, DMS, CS ₂ , t-BuSH and THT per ASTM D6228
7890-0460	On-column capillary inlet/Capillary column/NCD	N-Nitrosodimethylamine, N-Nitrosopyrrolidine, N-Nitrosodibutylamine, N-Nitrosopiperidine, N-Nitrosomorpholine, N-Nitrosomethylethylamine, N-Nitrosodiethylamine, N-Nitrosodipropylamine, N-Nitrosodiphenylamine in liquids

Reference Methods for Sulfur and Nitrosamine: Quantitation Ranges for Compounds of Interest

ASTM D5504 (SCD)	ASTM D5623 (SCD)	ASTM D6228 (FPD)
Detection range for sulfur compounds 10-1,000,000 pg of sulfur equivalent 0.01 to 1000 mg/m ³	Detection range for individual sulfur species 0.1 to 100 mg/kg	Detection range for sulfur compounds 20-20,000 pg of sulfur equivalent 0.02 to 20 mg/m ³

Inert treatment of sample pathways and detector components used in Agilent analyzers ensure your laboratory's success with trace impurity analysis.



Sulfur Analyzer by SCD (G3445 Series #662/7890-0365)

Analyzer Description

Configuration:

- Capillary inlet/Capillary column/SCD (Requires additional Automatic Liquid Sampler for liquid sample analysis)

Sample type:

- Gasoline motor fuels, petroleum liquids with a final boiling point of approximately 230 °C or lower at atmospheric pressure

Compounds analyzed:

- Volatile sulfur-containing compounds in light petroleum liquids, such as CS₂, COS, mercaptans, aromatic sulfur compounds, sulfides

Typical quantification range:

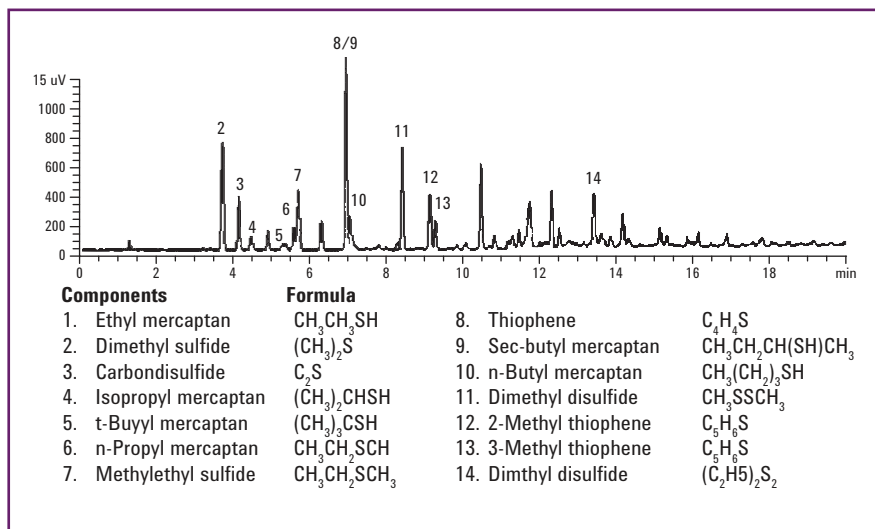
- 20 ppb of sulfur in gasoline

Linear Range:

- 0.1 to 10 ppm

Configured per method:

- ASTM D5623, UOP 791



► KEY BENEFITS AND FEATURES

- Analyzer configured with Sulfur Chemiluminescence Detector (SCD) for sulfur analysis in gasoline and light petroleum liquids
- High Selectivity: higher selectivity for sulfur over carbon
- No Quenching: detector response not inhibited by hydrocarbons
- Equimolar response: Simplifies quantification of unknowns
- Linearity: Simplifies calibration
- Sulfinert[®] treated capillary inlet to enhance sulfur analysis

Sulfur Analyzer by SCD (G3445 Series #661/7890-0375)

Analyzer Description

Configuration:

- 1-valve/Capillary column/SCD

Sample type:

- Natural gas and other gaseous fuels

Compounds analyzed:

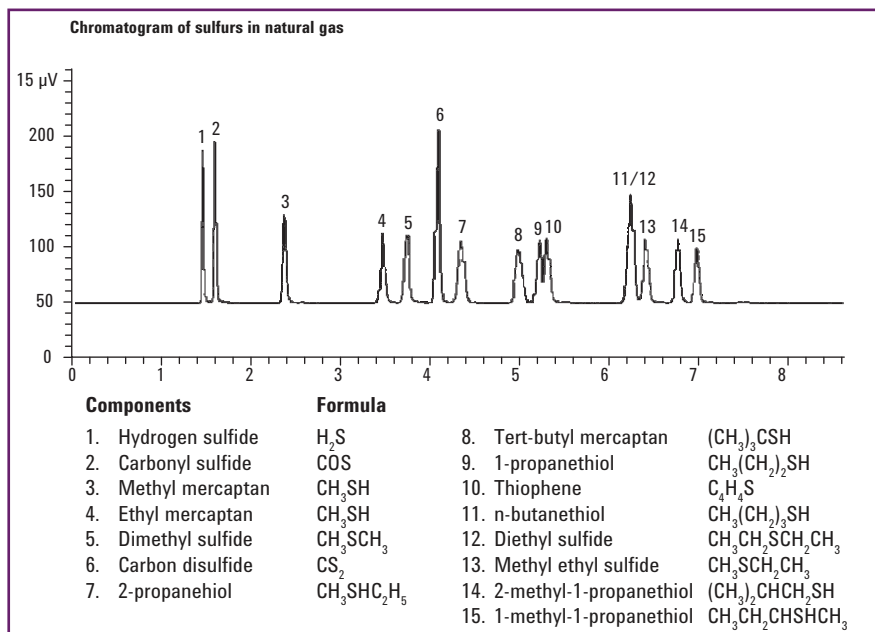
- Sulfur compounds in Natural Gas or Gaseous fuels
- H_2S , CS_2 , COS, mercaptans, aromatic sulfur compounds, sulfides

Typical quantification range:

- 100 ppb of H_2S
- 20-40 ppb for other S components (depends on different compounds)

Configured per method:

- ASTM D5504



► KEY BENEFITS AND FEATURES

- 7890 GC with Sulfur Chemiluminescence Detector-SCD for sulfur analysis in natural gas and gaseous fuels
- High Selectivity: higher selectivity for sulfur over carbon
- No Quenching: detector response not inhibited by hydrocarbons
- Equimolar: simplifies quantification of unknowns
- Linear: simplifies calibration
- Sulfinert[®] treated capillary inlet, valve plumbing to enhance sulfur analysis

Volatile Sulfur Analyzer (7890-0148/7890-0167)

Analyzer Description

Configuration:

- 3-valve/2-column/2-VI (volatile inlets)/2-FPD

Sample type:

- 7890-0148: C₂, C₃, C₄ monomers
- 7890-0167: Natural gas and fuel gas streams

Compounds analyzed:

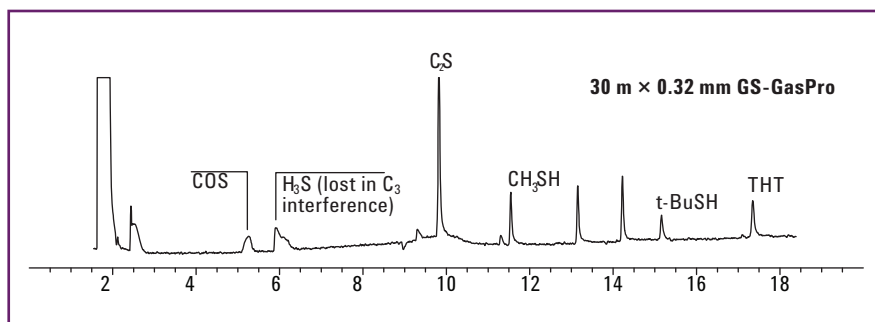
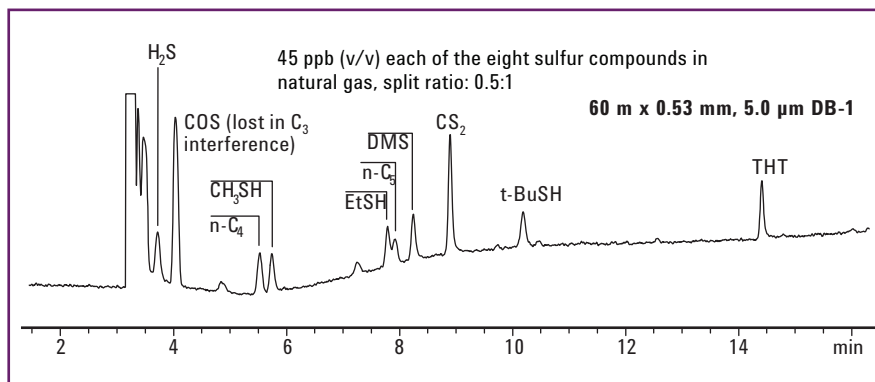
- Volatile sulfur such as H₂S, COS, MeSH, EtSH, DMS, CS₂, t-BuSH and THT

Typical quantification range:

- 50 ppb for sulfur compounds

Configured per method:

- ASTM D6228



► KEY BENEFITS AND FEATURES

- Dual-channel FPD system utilizing DB1 and GasPro column allows simultaneous determination of COS and H₂S in propylene and other light hydrocarbon streams
- Same GC configuration for two methods:
 1. 7890-0167: natural gas, fuel gas streams
 2. 7890-0148: C₂, C₃, C₄ monomers (uses a longer column)
- Can also be used to measure S and P
- Dynamic blending system (7890-0130) provides easy calibration and assists with method development
- System passivation with UltiMetal[®] for enhanced sulfur analysis
- Excellent alternative to more expensive specialty detectors SCD, PFPD, MSD

Nitrosamine in Liquids Analyzer by NCD (7890-0460)

Analyzer Description

Configuration:

- On-column capillary inlet/Capillary column/NCD

Sample type:

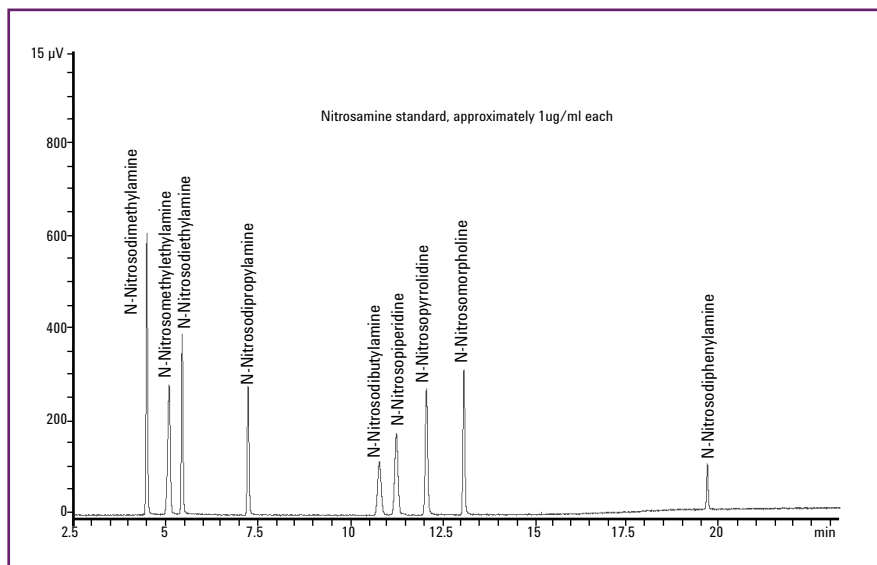
- Liquid samples

Compounds analyzed:

- N-Nitrosodimethylamine
- N-Nitrosomethylethylamine
- N-Nitrosodiethylamine
- N-Nitrosodipropylamine
- N-Nitrosodibutylamine
- N-Nitrosopiperidine
- N-Nitrosopyrrolidine
- N-Nitrosomorpholine
- N-Nitrosodiphenylamine

Typical quantification range:

- 10 ppb for N-Nitrosodimethylamine



► KEY BENEFITS AND FEATURES

- 7890 GC with Nitrogen Chemiluminescence Detector (NCD) in nitrosamine mode for nitrosamine analysis in liquids
- High Selectivity: higher selectivity for nitrosamine to low ppb level
- Equimolar: simplifies quantification of unknowns
- Linear: simplifies calibration

SOLUTIONS FOR BIOFUEL/ RENEWABLE FUEL



Ensure the highest quality standards from feedstock to final product

Global pressure to reduce our dependence on fossil fuels is driving the demand for sustainable, reliable, and clean alternative energy sources. It has also fueled a steady increase in research involving the conversion of biomass to biofuels.

In recent years, vegetable oil derivatives (*biodiesel*) have successfully powered automobiles, public transportation systems, and long-haul trucking fleets, while providing a fuel source – *produced from locally available feedstock* – that reduces engine wear and generates lower sulfur and CO₂ emissions.

While there is no question that biodiesel benefits our environment, producing biodiesel from many different oils does create product quality and uniformity challenges. Success depends upon characterizing raw materials, monitoring chemical conversions, ensuring process efficiency, and validating product quality.

To help you meet these challenges, Agilent has expanded our Alternative Energy Analyzer Portfolio to include **Biofuel GC Analyzers and Renewable Energy GC Analyzers**. These “ready-to-go” systems include proven analytical methods and advanced features that enable your lab to quickly validate methods that conform to ASTM and CEN standards for FAMEs, glycerin/glyceride, and trace methanol measurements.

Learn more about Analyzer solutions for the energy and chemical industry at
[agilent.com/chem/energy](https://www.agilent.com/chem/energy)

Solutions for Biofuel/Renewable Fuel

Analyzer/SP1 Number	Configuration	Capability
G3445 Series #634/7890-0297	Split/splitless inlet/FID with optional methods for automated sample preparation	Glycerol, monoglycerides, diglycerides, triglycerides in B100 Biodiesel per EN14105:2011
G3445 Series #633/7890-0300	Split/splitless inlet/FID with optional liquid autosampler	FAME content between C ₆ -C ₂₄ in B100 Biodiesel per EN 14103:2011
G3445 Series #632/7890-0427*	On-column capillary inlet/Split/splitless inlet/Auxiliary isothermal oven/capillary column/2-FID	FAME between C ₁₄ -C ₂₄ in B100 biodiesel. Configured per ASTM D6584, EN 14105:2011, EN 14103:2003, EN 14110:2003, EN 14106:2003
G3445 Series #631/7890-0294	On-column capillary inlet/FID with optional liquid autosampler	Free glycerin, monoglycerides, diglycerides, triglycerides, bound glycerin, and total glycerin in B100 Biodiesel per ASTM D6584
G3582A#110	Two channel Micro GC - Channel 1: CP-Molsieve 5Å - Channel 2: CP PoraPLOT U	Compounds analyzed in Biogas: - Channel 1: C ₁ , H ₂ , O ₂ , N ₂ and CO - Channel 2: C ₂ -C ₃ , H ₂ S and CO ₂
G3582A#111	Three channel Micro GC - Channel 1: CP-Molsieve 5Å - Channel 2: CP PoraPLOT U - Channel 3: CP-Sil 5 CB	Compounds analyzed in Biogas: - Channel 1: C ₁ , H ₂ , O ₂ , N ₂ and CO - Channel 2: C ₂ -C ₃ , H ₂ S and CO ₂ - Channel 3: C ₄ -C ₇
7890-0520	Split/splitless inlet/FID with optional liquid autosampler	Ethanol, Methanol per ASTM Method D5501
7890-0307**	Deans Switch/FID with optional liquid autosampler	FAME content in B ₂ to B ₂₅ Biodiesel Blends
7890-0295	Headspace/FID with optional liquid autosampler	Methanol in B100 Biodiesel per EN 14110:2003

* Not compatible with 2011 revision to EN methods

** SP1 7890-0307 analysis based on EN14331:2004; configuration with Dean's Switch simplifies sample preparation

From the laboratory to the field, Agilent Technologies can provide analytical solutions to address your requirements for Renewable Energy Research.



Biodiesel Analyzer per EN 14105:2011 (G3445 Series #634/7890-0297)

Analyzer Description

Configuration:

- Split/splitless inlet/FID

Sample type:

- B100 biodiesel

Compounds analyzed:

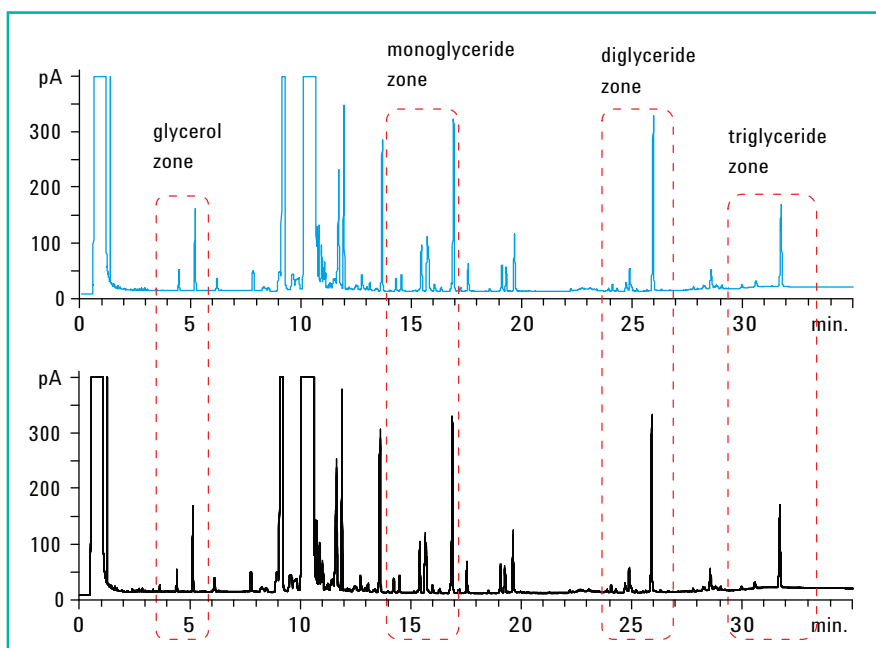
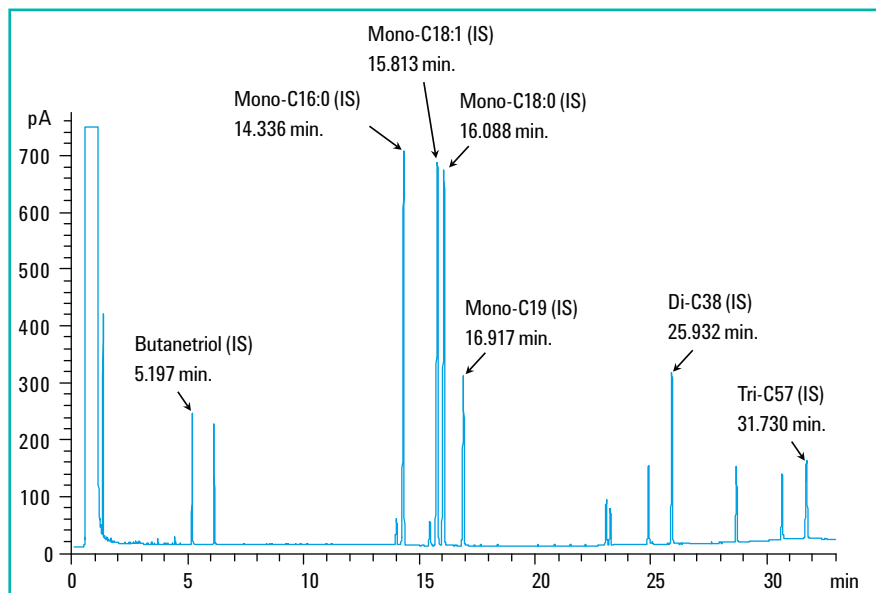
- Glycerol, monoglycerides, diglycerides, triglycerides

Typical quantification range:

- 0.001 to 0.05 Wt% for free glycerin, 0.1 to 0.5 Wt% for all glycerides

Configured per method:

- EN 14105:2011



Automated preparation of B100 Biodiesel sample with Agilent WorkBench (Upper chromatogram: Single run, Lower chromatogram: Overlay of 10 separate samples preparations)

(Continued)

► KEY BENEFITS AND FEATURES

- Configured for automated sample preparation with Agilent 7696A Sample Prep WorkBench
 - Automation reduces reagent consumption by up to 10x
 - WorkBench not included with system, must be purchased separately
- Exceeds CEN specifications for calibration and precision for method EN 14105:2011
 - Automated prep of calibration standard sample prep exceeds method performance criteria
 - Automated prep of B100 samples exceeds method precision requirement
- Includes macro for data calculation and reporting per method EN 14105:2011, requires Microsoft Excel



Are your analysts manually preparing samples and standards?

Automate workflow using the Agilent 7696A Sample Prep Workbench – precise sample prep per compliance method requirements.

FAME Content in Biodiesel Analyzer (G3445 Series #633/7890-0300)

Analyzer Description

Configuration:

- Split/splitless inlet/FID

Sample type:

- B100 biodiesel, which contains methyl esters between C₆-C₂₄

Compounds analyzed:

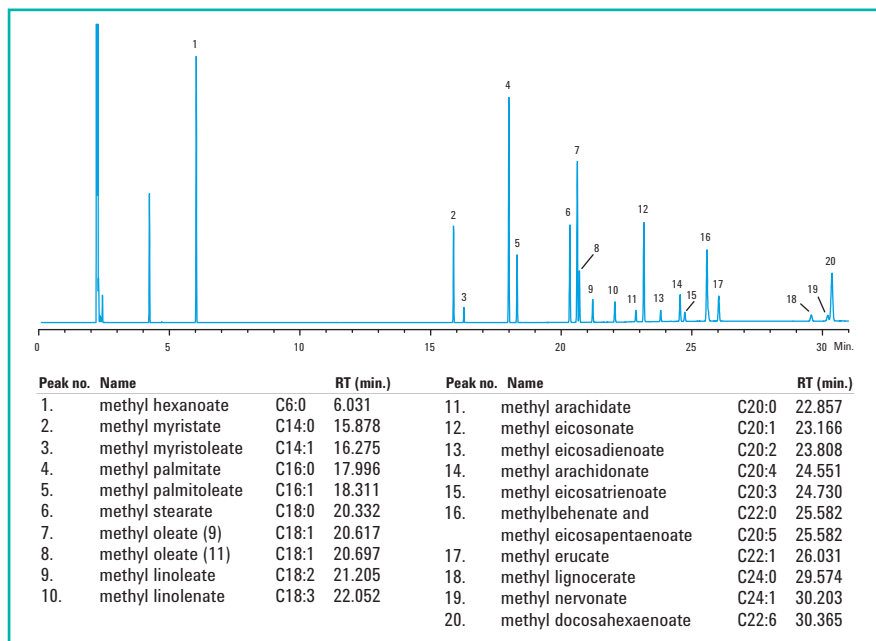
- Methyl esters between C₆-C₂₄

Typical quantification range:

- > 90 Wt% for esters, 1 to 15 Wt% for linoleic acid content

Configured per method:

- EN 14103:2011



► KEY BENEFITS AND FEATURES

- Excellent precision with a very simple, easy-to-use method
- Esters separated on wax-type column
- Internal standard (methyl nonadecanoate) used for quantification
- Analysis time about 35 minutes

Five-in-One Biodiesel Analyzer (G3445 Series #632/7890-0427)

Analyzer Description

Configuration:

- On-column capillary inlet/split/splitless inlet/Auxiliary isothermal oven/Capillary column/2-FID
- Requires headspace sampler, 7693A ALS and 7693A tray for method EN 14110:2003

Sample type:

- B100 biodiesel
- Not applicable to vegetable oil methyl esters obtained from lauric oils, such as coconut oil and palm kernel oil for ASTM D6584/EN 14105:2011

Compounds analyzed:

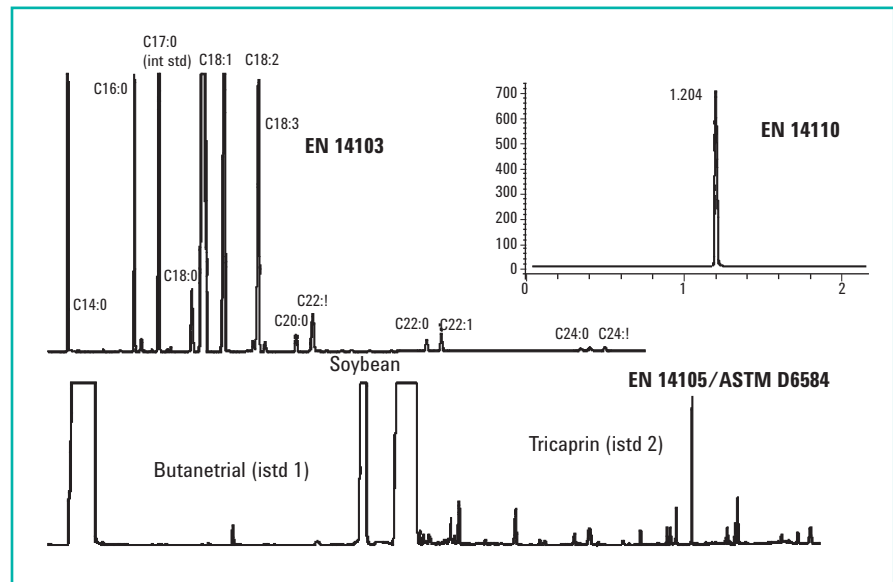
- EN 14103:2003: Methyl esters between C_{14} - C_{24}
- ASTM D6584/EN 14105:2011: Free glycerin, monoglycerides, diglycerides, triglycerides, bound glycerin, total glycerin
- EN 14110:2003 Methanol

Typical quantification range:

- EN 14103:2003 > 90 Wt% for esters, 1 to 15 Wt% for linoleic acid content
- ASTM D6584: 0.005 to 0.05 Wt% for free glycerin, 0.05 to 0.5 Wt% for total glycerin
- EN 14105:2011 0.001 to 0.05 Wt % for free glycerin, 0.10 to 0.5 Wt% for all glycerides
- EN 14110:2003 0.01 to 0.5 Wt% for methanol

Configured per method:

- ASTM D6584, EN 14105:2011, EN 14103:2003, EN 14110:2003, EN 14106:2003



► KEY BENEFITS AND FEATURES

- New external capillary column oven for isothermal chromatography
- Low temperature column thermally isolated from high temperatures of main column oven
- New 7693 ALS automates complex standard and sample preparation
- Single GC for complete analysis of biodiesel using 5 different reference methods
 - ASTM D6584, EN 14105:2011, EN 14103:2003, EN 14110:2003, EN 14106:2003

Glycerin in Biodiesel Analyzer (G3445 Series #631/7890-0294)

Analyzer Description

Configuration:

- On-column capillary inlet/FID

Sample type:

- B100 biodiesel
- Not applicable to vegetable oil methyl esters obtained from lauric oils, such as coconut oil and palm kernel oil

Compounds analyzed:

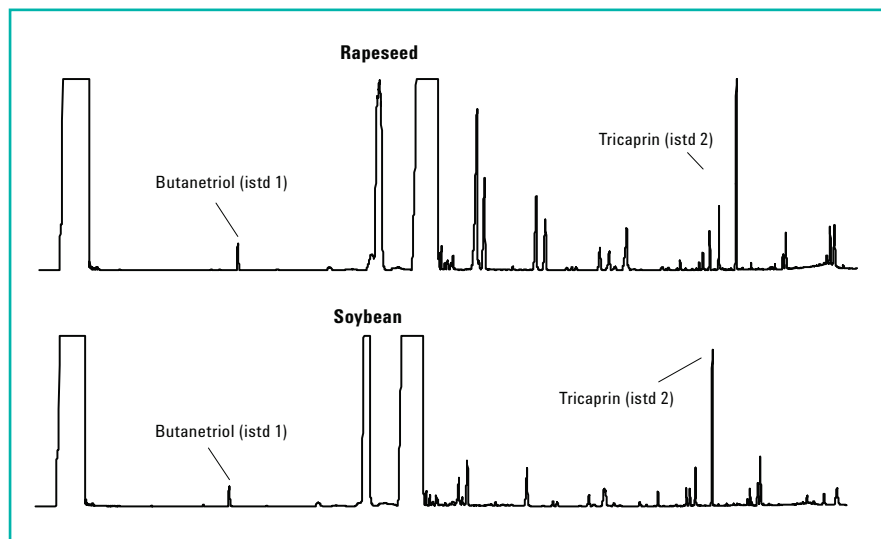
- Free glycerin, monoglycerides, diglycerides, triglycerides, bound glycerin, total glycerin

Typical quantification range:

- 0.005 to 0.05 Wt% for free glycerin, 0.05 to 0.5 Wt% for total glycerin

Configured per method:

- ASTM D6584



► KEY BENEFITS AND FEATURES

- Configured with COC inlet with a retention gap column in front of the analytical column
 - Significantly improves peak shape for better accuracy and reproducibility
 - Use of standard syringes instead of special narrow-bore syringes
- Uses Agilent “Ultimate Union” to connect retention gap to column
 - Reliable, leak-free, high-temperature connection
- Exceeds ASTM and CEN specifications for calibration and precision

Biogas Analyzer: 2-Channel Micro GC (G3582A#110)

Analyzer Description

Configuration:

- Two channel Micro GC
 - Channel 1: CP-Molsieve 5Å
 - Channel 2: CP PoraPLOT U

Sample type:

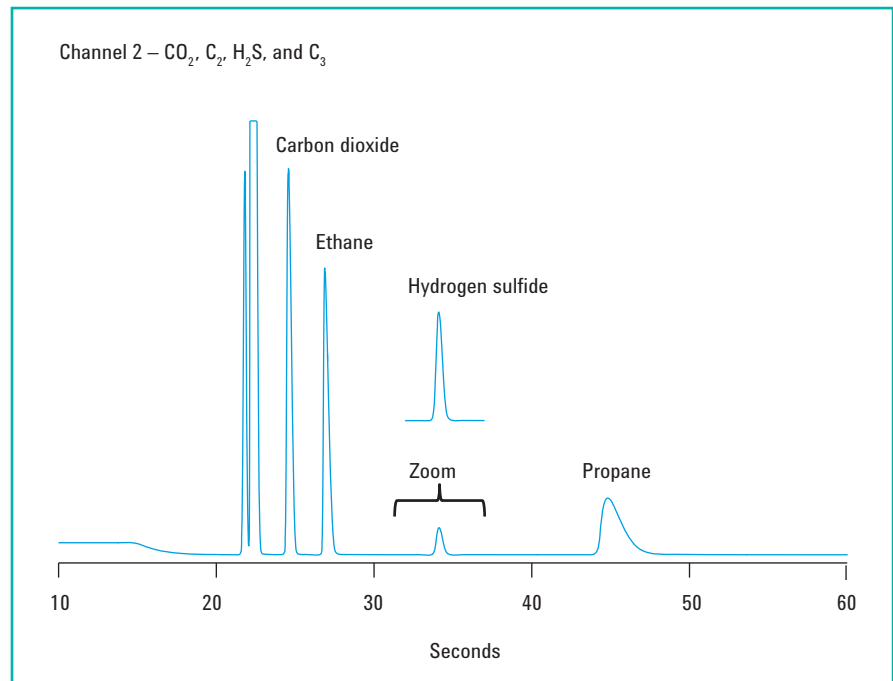
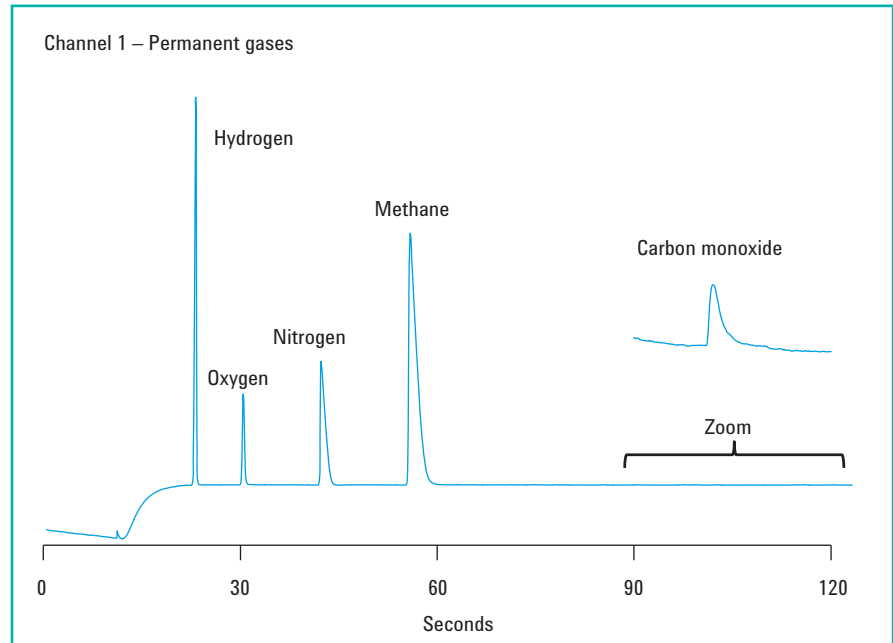
- Biogas

Compounds analyzed:

- Channel 1: C₁, H₂, O₂, N₂ and CO
- Channel 2: C₂-C₃, H₂S and CO₂

Typical quantification range:

- 1-10 ppm



(Continued)

► KEY BENEFITS AND FEATURES

- Optimized for the rapid analysis of biogas composition in 120 seconds
 - Characterizes permanent gases, hydrocarbons C₁-C₃ and H₂S concentrations
- Preconfigured with analytical method
 - Injection parameters
 - Analytical parameters
- Excellent reproducibility:
 - Retention time: RSD 0.05%
 - Peak area: RSD 0.2%
 - Repeatability: RSD 0.5%



Rapid, reliable results for laboratory, process, or field analysis. Micro GC Analyzers provide chromatographic results in seconds instead of minutes.

Biogas Analyzer: 3-Channel Micro GC (G3582A#111)

Analyzer Description

Configuration:

- Two channel Micro GC
 - Channel 1: CP-Molsieve 5Å
 - Channel 2: CP-PoraPLOT U
 - Channel 3: CP-Sil 5 CB

Sample type:

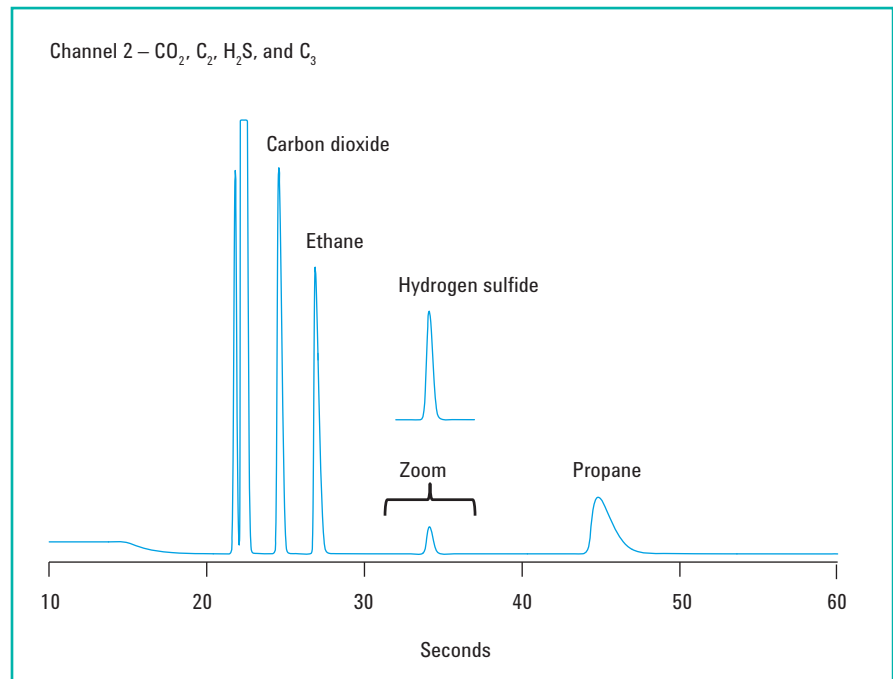
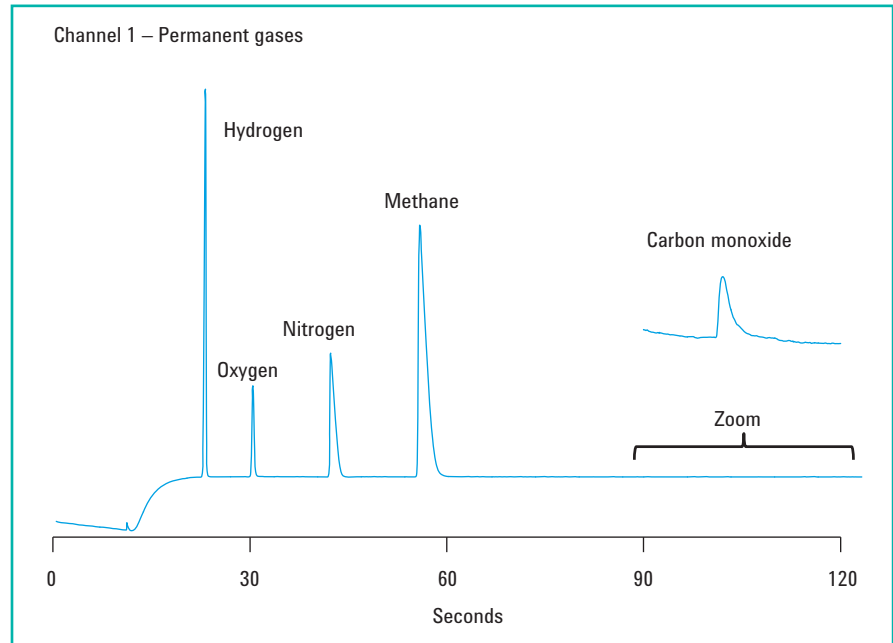
- Biogas mixed with hydrocarbon streams, e.g., LPG, Natural Gas

Compounds analyzed:

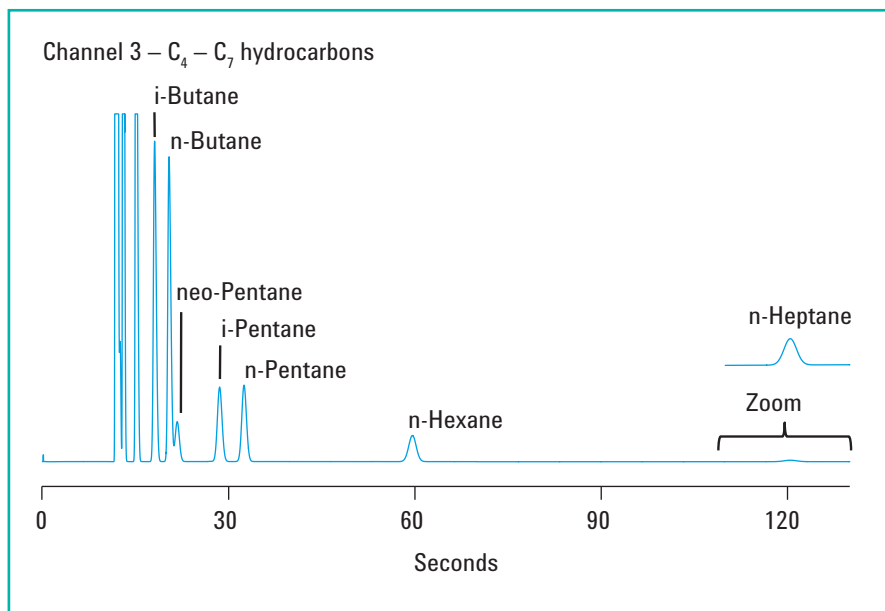
- Channel 1: C₁, H₂, O₂, N₂ and CO
- Channel 2: C₂-C₃, H₂S and CO₂
- Channel 3: C₄-C₇

Typical quantification range:

- 1-10 ppm



(Continued)



Take the quick, cost-effective path through your toughest challenges.

Contact Agilent to discuss an Analyzer or custom GC for your specific need at

agilent.com/chem/energy

► KEY BENEFITS AND FEATURES

- Optimized for the rapid analysis of biogas composition in 120 seconds
 - Characterizes permanent gases, hydrocarbons C₁-C₇, and H₂S concentrations
- Preconfigured with analytical method
 - Injection parameters
 - Analytical parameters
- Excellent reproducibility:
 - Retention time: RSD 0.05%
 - Peak area: RSD 0.2%
 - Repeatability: RSD 0.5%

Fuel Ethanol Analyzer (7890-0520)

Analyzer Description

Configuration:

- Split/splitless /FID with optional liquid autosampler

Sample type:

- Ethanol content motor fuels

Compounds analyzed:

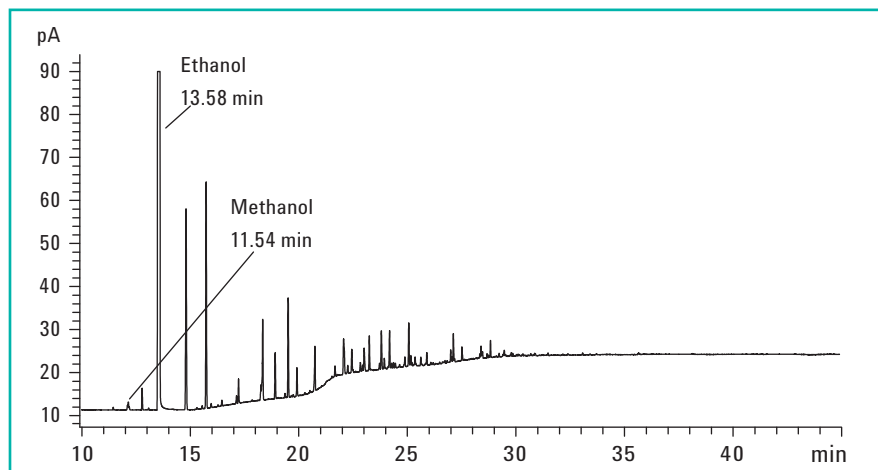
- Ethanol, Methanol

Typical quantification range:

- Methanol: 0.01 to 0.6 Wt%
- Ethanol: 93 to 97 Wt%

Configured per method:

- ASTM D5501



Analysis of a commercial denatured fuel ethanol sample using ASTM method D5501-09

► KEY BENEFITS AND FEATURES

- Automated analysis with GC-FID with no inlet discrimination
 - Allows for quantitative analysis of compounds with wide range of boiling points
- Uses Agilent MultiTechnique ChemStation
 - Allows system calibration with low level concentrations of methanol and hydrocarbons and high level concentrations of ethanol
- Excellent measurement precision for low level methanol and high level ethanol in complex fuel sample

FAME Content in Biodiesel Blends Analyzer (7890-0307)

Analyzer Description

Configuration:

- Deans Switch/FID

Sample type:

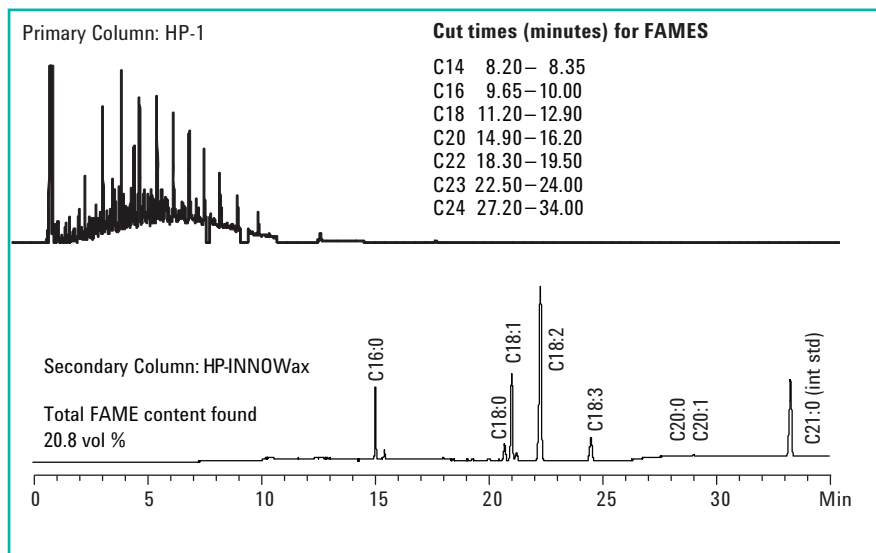
- B1 to B25 biodiesel blends

Compounds analyzed:

- Methyl esters between C₁₄-C₂₄

Typical quantification range:

- 1 to 20 Vol% for esters



► KEY BENEFITS AND FEATURES

- Innovative method of analysis for biodiesel content in blended fuel
 - Avoids complicated sample preparation using EN 14331:2004
 - Minimizes consumable costs: silica columns, solvents
 - Leverages Agilent's unique Capillary Flow Technologies, Deans Switch technique

Methanol in Biodiesel Analyzer (7890-0295)

Analyzer Description

Configuration:

- Headspace/FID

Sample type:

- B100 biodiesel

Compounds analyzed:

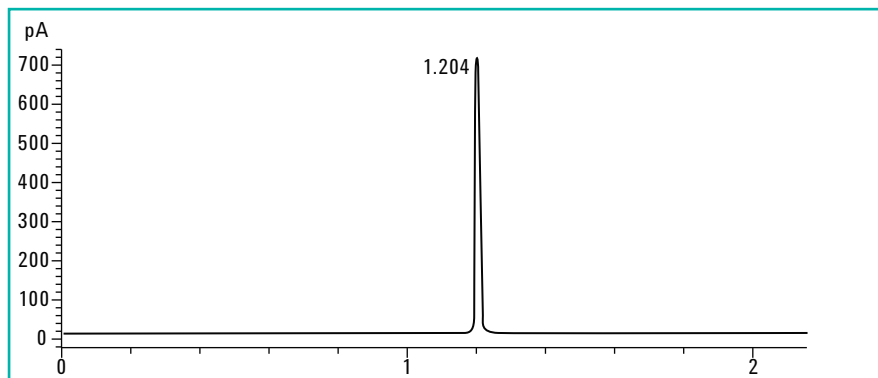
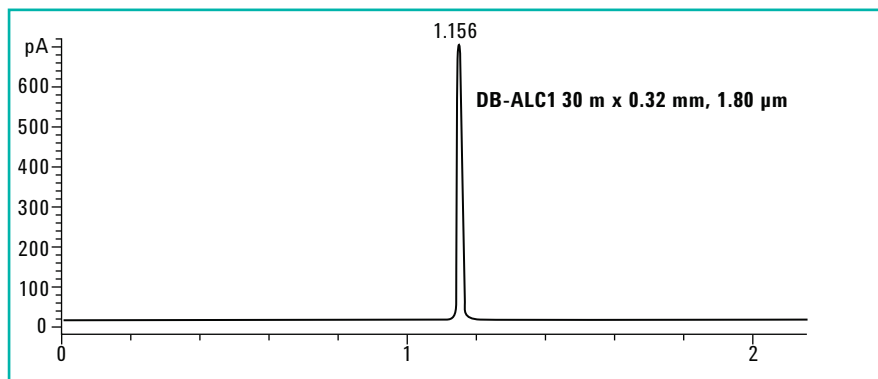
- Methanol

Typical quantification range:

- 0.01 to 0.5 Wt% for methanol

Configured per method:

- EN 14110:2003



► KEY BENEFITS AND FEATURES

- Uses Agilent 7697A headspace sampler for automated sample preparation
- Enhanced precision through backpressure regulation of headspace gas sampling valve loop
- Increased sensitivity for low concentration methanol through pressurization of the headspace sample loop
- Quantitative analysis using external calibration, no internal standard required
- Agilent J&W DB-ALC columns optimized for alcohol analysis by headspace GC
- Improved peak shape for easy quantification

SOLUTIONS FOR SIMULATED DISTILLATION



Perform fast, accurate calculations that conform to ASTM methods

Hydrocarbon processors use distillation as their primary separation technique in crude oil refining. Understanding the boiling point distribution of hydrocarbon fractions and crude oil improves production efficiency, quality control, and commercialization of petroleum streams.

Simulated Distillation, which is far less labor intensive than physical distillation, is the preferred method for characterizing boiling point distributions. Built around a GC analyzer equipped with a temperature-programmable inlet and FID, Sim. Dist. determines quantitative mass yield based on the boiling points for the components in hydrocarbon samples. Based on these results, producers can make informed decisions about process optimization and efficiency.

Agilent was one of the first companies to provide Sim. Dist. as a commercially available tool for hydrocarbon analysis. Our current **Simulated Distillation (Sim. Dist.) Analyzer** portfolio leverages cutting-edge technologies, such as a high-performance Multimode Inlet and user-friendly software for fast analysis, quick calculations, and detailed presentation of sample profiles. These complete, ready-to-use systems address ASTM methods D2887, D7213 (extended D2887), D6352, and D7169.

Learn more about Analyzer solutions for the energy and chemical industry at
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Solutions for Simulated Distillation

ASTM Method	Carbon Number	Sample Range	Boiling Range	Agilent Solution
ASTM D3710	C ₁₅	Gasoline naphtha	IBP-260 °C	Channel partner
ASTM D2887	C ₄₄	Jet fuel diesel	55-538 °C	G3440 Series, Option 653
ASTM D7213	C ₆₀	Lube oil base stocks	100-615 °C	G3445 Series #654/7890-0461 (D2887 extended)
ASTM D6352	C ₁₀₀	Lube oil base stock	174-700 °C	G3445 Series #655/7890-0462
ASTM D5307	C ₄₄	Crude oil	IBP-538 °C	Channel partner

Agilent's Multimode Inlet expands the range of applications for your laboratory GC; including suitability for Simulated Distillation.



Simulated Distillation Analyzer: Boiling Range from 174 to 700 °C (G3445 Series #655/7890-0462)

Analyzer Description

Configuration:

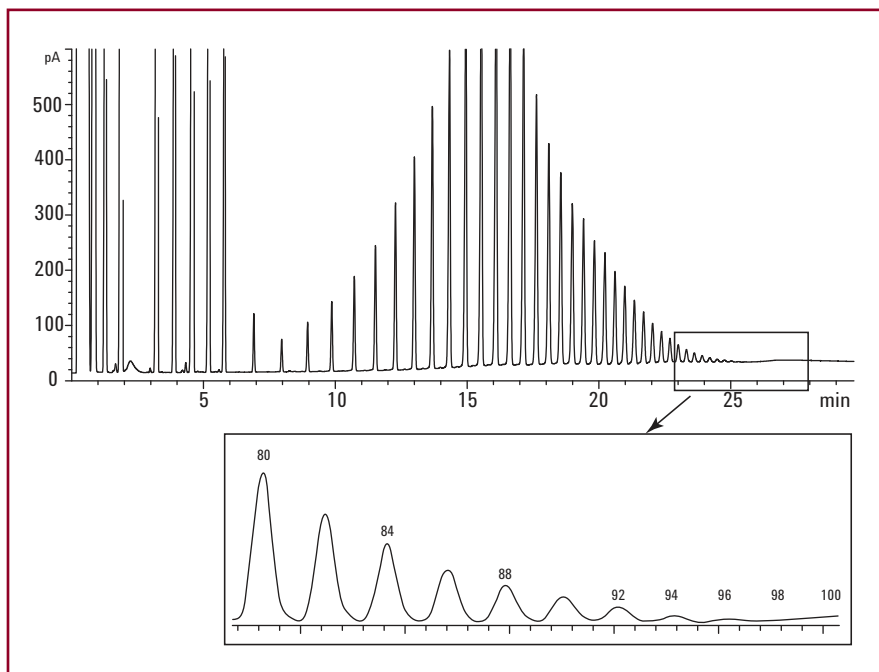
- Multimode Inlet/FID/Sim. Dist. software

Sample type:

- Lube oil, base stocks and petroleum distillate fractions having a boiling range from 174 to 700 °C

Configured per method:

- ASTM D6352



► KEY BENEFITS AND FEATURES

- Complete solution for extended ASTM D2887 (ASTM D7213), and ASTM D6352 on one GC
- High-performance Multimode Inlet
- Columns designed and perfected for Sim. Dist.
- Sim. Dist. software partially integrated with ChemStation
- Multiple reporting options

Simulated Distillation Analyzer: Boiling Range from 100 to 615 °C (G3445 Series #654/7890-0461)

Analyzer Description

Configuration:

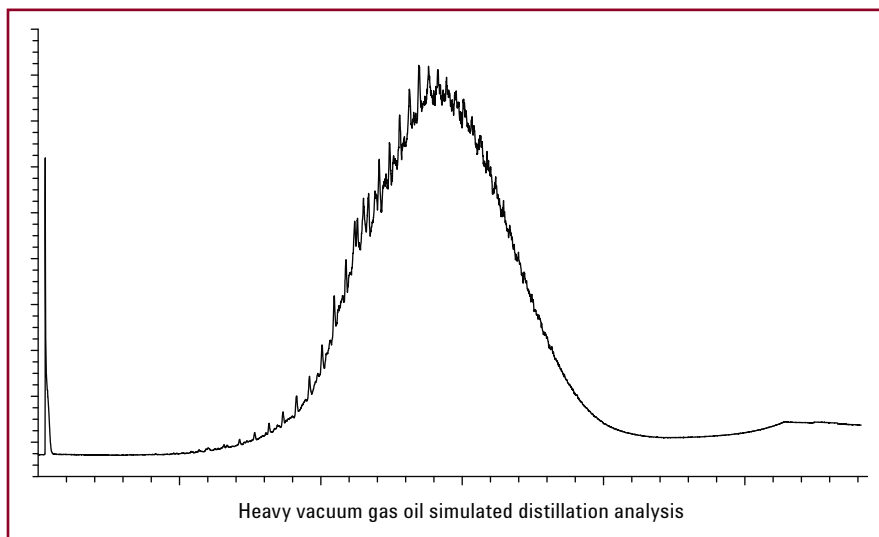
- Multimode Inlet/FID/Sim. Dist. software

Sample type:

- Lube oil, base stocks and petroleum distillate fractions having a boiling range from 100 to 615 °C

Configured per method:

- ASTM D7213 (D2887 extended)



► KEY BENEFITS AND FEATURES

- Configured with Multimode Inlet
 - No syringe-needle discrimination
 - Minimizes inlet discrimination
 - Solvent vent/matrix vent decreases interference and maintenance
 - Flexible modes of operation: hot/cold, split/splitless, and temperature programmed vaporization
 - Cold trapping in liner improves chromatographic peak shape, resolution
- Easy-to-use software
- User defined reporting options allow you to generate reports that meet the requirements for your laboratory

Simulated Distillation Analyzer: Boiling Range from 55 to 538 °C (G3440 Series Option 653)

Analyzer Description

Configuration:

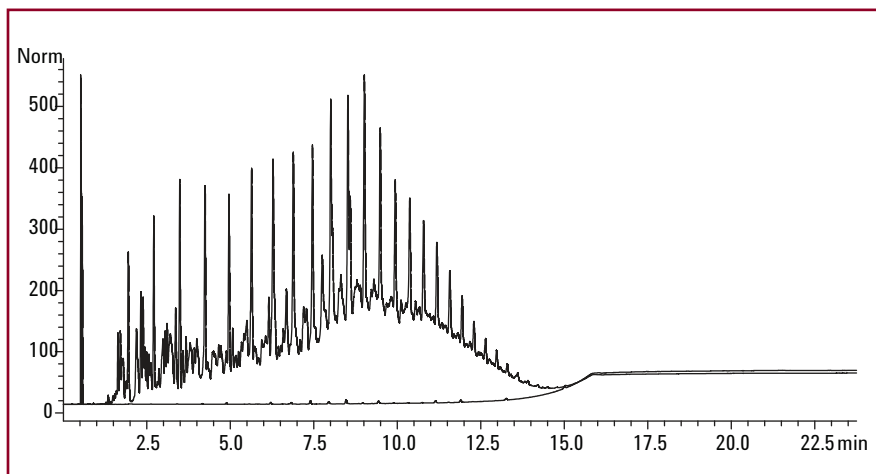
- Multimode inlet/FID/Sim. Dist. software

Sample type:

- Jet fuel, diesel, petroleum fraction with boiling range from 55 to 538 °C

Configured per method:

- ASTM D2887



► KEY BENEFITS AND FEATURES

- Easy-to-use software
- Flexible reporting options allow the user to customize reports to meet laboratory requirements
- Cost effective
- 6 minute fast Sim. Dist. can be achieved by use of short, small-diameter capillary column, 5 m × 180 mm, 0.4 μm

SOLUTIONS FOR GREENHOUSE GAS



Monitor and measure gases that contribute to climate change

Fossil fuel consumption increases the concentration of Greenhouse Gases (GHGs) – such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) – in Earth's atmosphere. These gases trap heat, thereby affecting our planet's temperature.

To help fight climate change caused by increased concentrations of atmospheric GHGs, regulatory institutions (such as the EPA and CEN) have initiated programs to inventory GHG emissions through continuous measurement.

Agilent can help you track GHG emissions with our comprehensive portfolio of factory-configured, chemically tested **Greenhouse Gas (GHG) Analyzers**.

Learn more about Analyzer solutions for the energy and chemical industry at [agilent.com/chem/energy](https://www.agilent.com/chem/energy)

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Solutions for Greenhouse Gas Analysis with Quantitation Ranges for Compounds of Interest

Analyzer/ SP1 Number	Configuration				Capability				
	Valve/ Column	Detector	Methanizer	Autosampler HSS/CTC	Fast analysis	O ₂ /N ₂ Separation	N ₂ O (lowest detection limit)	CH ₄	CO ₂
G3445 Series #561/7890-0468	3/2	FID/Micro-ECD	YES	HSS (optional)	NO	NO	50 ppb	0.2 ppm- 20%	0.4 ppm- 0.2%
G3445 Series #563/7890-0505	3/2	FID/Micro-ECD	YES	HSS	NO	NO	50 ppb	0.2 ppm- 20%	0.4 ppm- 0.2%
G3445 Series #562/7890-0467	4/4	FID/Micro-ECD/TCD	YES	NO	YES	NO	50 ppb	0.2 ppm- 20%	0.4 ppm- 20%
7890-0542	2/4	FID/Micro-ECD/TCD	NO	CTC (optional)	YES	NO	50 ppb	0.2 ppm- 20%	50 ppm- 20%
7890-0504	4/5	FID/Micro-ECD/TCD	YES	NO	NO	YES	50 ppb	0.2 ppm- 20%	0.4 ppm- 0.2%
7890-0469	3/4	FID/Micro-ECD/TCD	NO	NO	YES	NO	50 ppb	0.2 ppm- 20%	50 ppm- 20%

Don't stretch your resources for method development. Agilent energy and chemical solutions let you quickly implement new technologies for analyzing difficult matrices!



Greenhouse Gas Analyzer (G3445 Series #561/7890-0468)

Analyzer Description

Configuration:

- 3-valve/2-packed column/Micro-ECD/FID/Methanizer

Sample type:

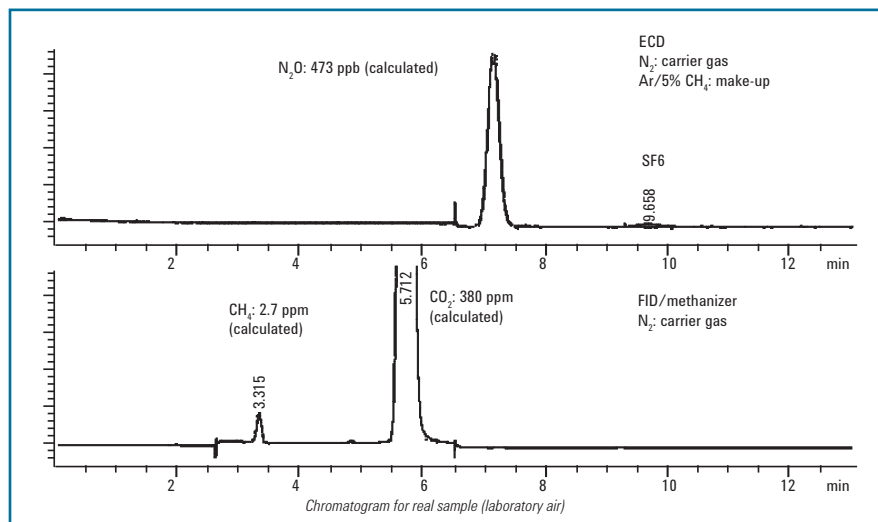
- Greenhouse gases and soil gases with compounds of interest contain gases such as CH₄, N₂O and CO₂

Compound analyzed:

- CH₄, N₂O, CO₂

Typical quantification range:

- 50 ppb for N₂O
- 0.2 ppm-20% for CH₄
- 0.4 ppm-0.2% for CO₂



► KEY BENEFITS AND FEATURES

- Configured for simultaneous analysis of greenhouse gas with one injection
- Sensitivity of Micro-ECD ensures the detection of N₂O at ppb level
- An easy-to-use union based on Capillary Flow Technology connects valves and Micro-ECD to improve chromatographic performance, including the peak shape
- Easily expanded to include the determination of SF₆
- Single channel with a simple valve configuration
 - Possible to use 6-port valve instead of a 10-port for automated headspace sampling (see G3445 Series #563/7890-0505)

Greenhouse Gas Analyzer (G3445 Series #563/7890-0505)

Analyzer Description

Configuration:

- 3-valve/2-packed column/Micro-ECD/FID/Methanizer

Sample type:

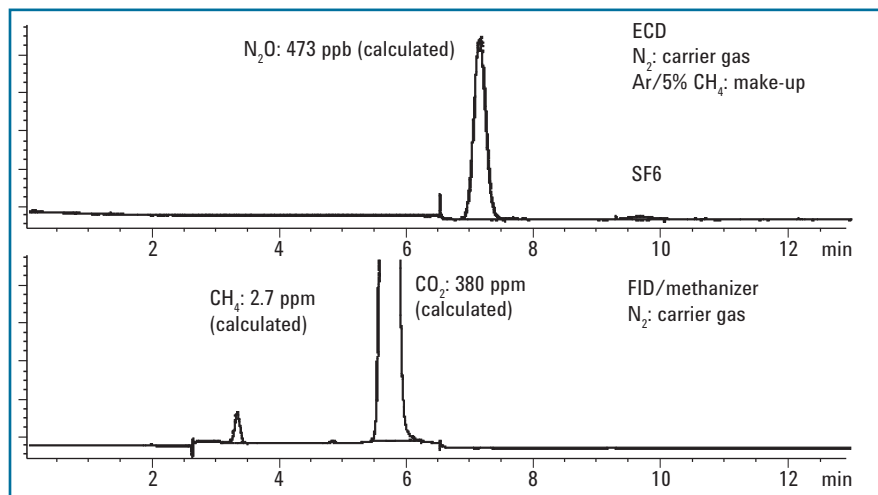
- Greenhouse gases, soil gases where the compounds of interest include gases such as CH_4 , N_2O and CO_2

Compound analyzed:

- CH_4 , N_2O , CO_2

Typical quantification range:

- 50 ppb for N_2O
- 0.2 ppm-20% for CH_4
- 0.4 ppm-0.2% for CO_2



► KEY BENEFITS AND FEATURES

- Analyzer configured for simultaneous analysis of greenhouse gas with one injection
- Sensitivity of Micro-ECD ensures the detection of N_2O at ppb level
- An easy-to-use union based on Capillary Flow Technology connects valves and Micro-ECD to improve chromatographic performance, including the peak shape
- Single channel with a simplified valve configuration
- Easily expanded to include the determination of SF_6
- Modification to G3445 Series #561/7890-0468 that allows for automated headspace sampling
 - Headspace sampler and Interface not included: HSS must be ordered separately

Greenhouse Gas Analyzer (G3445 Series #562/7890-0467)

Analyzer Description

Configuration:

- 4-valve/4-packed column/Micro-ECD/TCD/FID/Methanizer

Sample type:

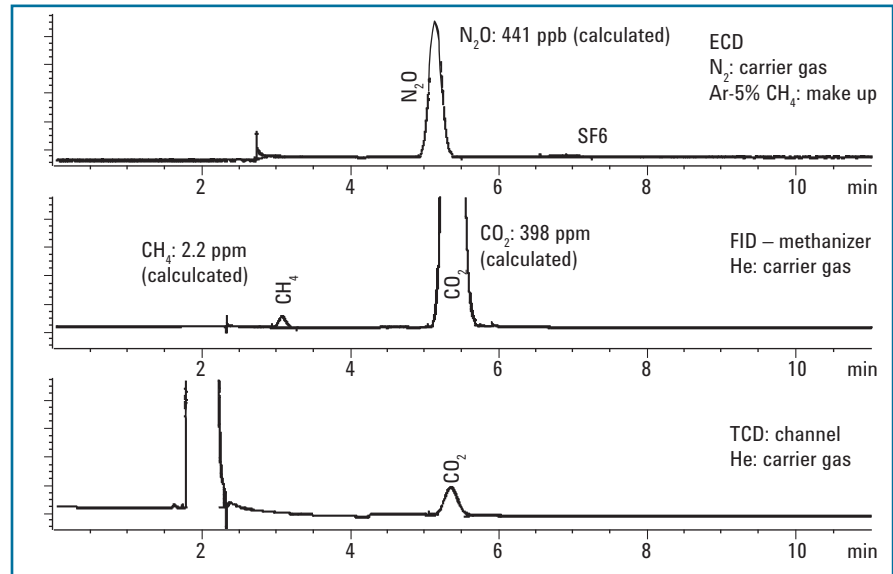
- Greenhouse gases and soil gases with compounds of interest contain gases such as CH_4 , N_2O and CO_2

Compound analyzed:

- CH_4 , N_2O , CO_2

Typical quantification range:

- 50 ppb for N_2O
- 0.2 ppm-20% for CH_4
- 0.4 ppm-20% for CO_2



► KEY BENEFITS AND FEATURES

- Configured for simultaneous analysis of greenhouse gas with one injection
- Sensitivity of Micro-ECD ensures the detection of N_2O at ppb level
- An easy-to-use union based on Capillary Flow Technology connects valves and Micro-ECD to improve chromatographic performance, including the peak shape
- Easily expanded to include the determination of SF_6
- Uses 2 separate channels with three detectors
 - Achieve faster results
 - Increases flexibility reducing critical nature timing for valve switching
 - Facilitates method setup
 - Uses third TCD to expand concentration range for CO_2 determinations

Fast Greenhouse Gas Analyzer: Varian Legacy (7890-0542)

Analyzer Description

Configuration:

- 2-valve/4-packed column/Micro-ECD/TCD/FID

Sample type:

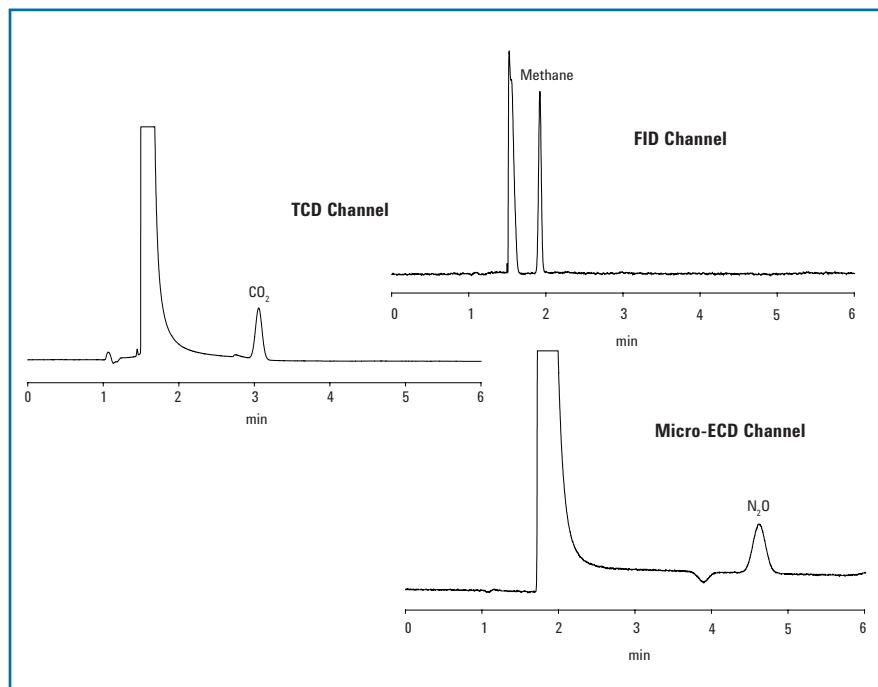
- Greenhouse gases, soil gases where the compounds of interest include gases such as CH_4 , N_2O and CO_2

Compound analyzed:

- CH_4 , N_2O , and CO_2

Typical quantification range:

- 50 ppb for N_2O
- 0.2 ppm-20% for CH_4
- 50 ppm-20% for CO_2



► KEY BENEFITS AND FEATURES

- Analyzer configured for simultaneous analysis of greenhouse gas with one injection
- Sensitivity of Micro-ECD ensures the quantification of N_2O at ppb level
- Fast analysis within 5 minutes
- Compatible with CTC headspace sampler; requires additional 7890-0537

Greenhouse Gas Analyzer (7890-0504)

Analyzer Description

Configuration:

- 4-valve/5-packed column/Micro-ECD/TCD/FID/Methanizer

Sample type:

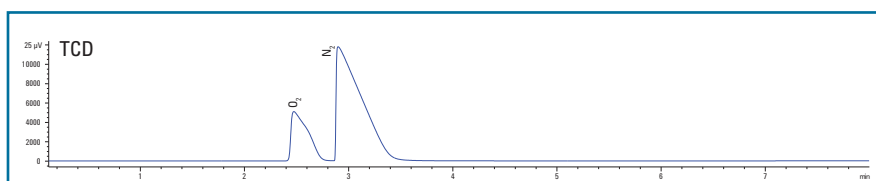
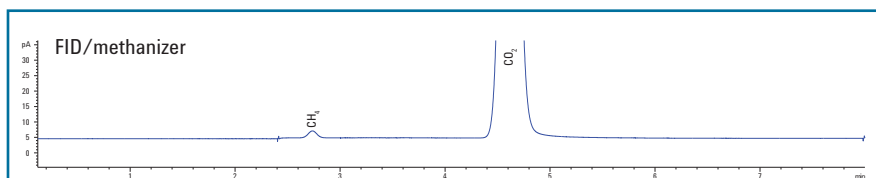
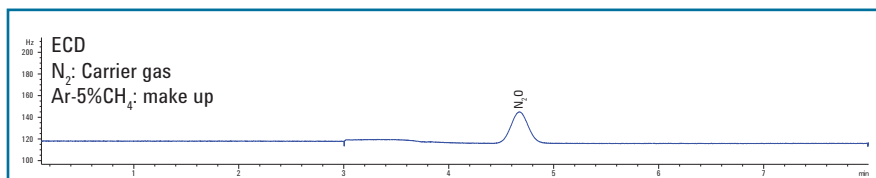
- Greenhouse gases, soil gases where the compounds of interest include gases such as CH_4 , N_2O and CO_2

Compound analyzed:

- CH_4 , N_2O , CO_2 , O_2 , N_2

Typical quantification range:

- 50 ppb for N_2O
- 0.2 ppm-20% for CH_4
- 0.4 ppm-0.2% for CO_2



► KEY BENEFITS AND FEATURES

- Analyzer configured for simultaneous analysis of greenhouse gas with one injection
 - Modified G3445 Series #562/7890-0467 includes additional Molecular Sieve 13X packed column to separate O_2 and N_2 in air
- Sensitivity of Micro-ECD ensures the detection of N_2O at ppb level
- An easy-to-use union based on Capillary Flow Technology connects valves and Micro-ECD to improve chromatographic performance, including the peak shape

Greenhouse Gas Analyzer (7890-0469)

Analyzer Description

Configuration:

- 3-valve/4-packed column/Micro-ECD/TCD/FID

Sample type:

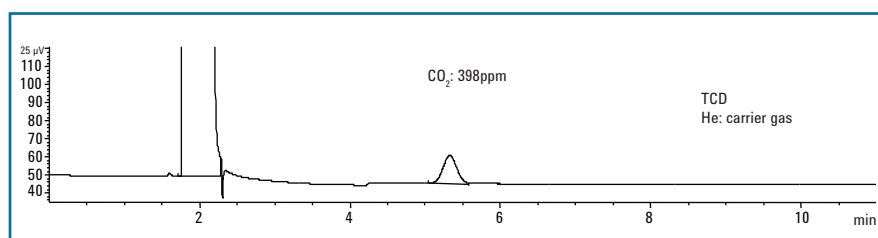
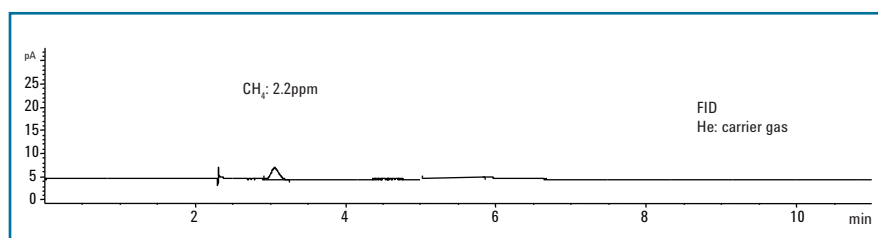
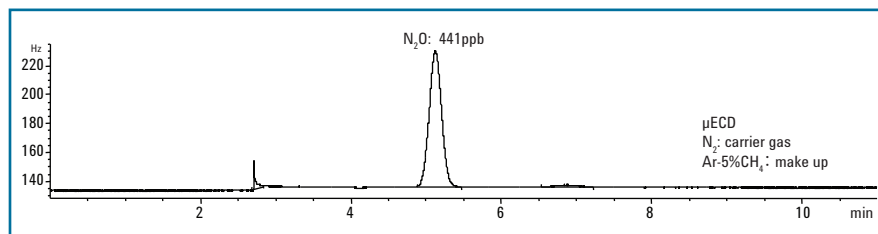
- Greenhouse gases, soil gases where the compound of interest include gases such as CH_4 , N_2O and CO_2

Compound analyzed:

- CH_4 , N_2O , CO_2

Typical quantification range:

- 50 ppb for N_2O
- 0.2 ppm-20% for CH_4
- 50 ppm-20% for CO_2



► KEY BENEFITS AND FEATURES

- Analyzer configured for simultaneous analysis of greenhouse gas with one injection
- Sensitivity of Micro-ECD ensures the quantification of N_2O at ppb level
- An easy-to-use union based on Capillary Flow Technology connects valves and Micro-ECD to improve chromatographic performance, including the peak shape
- TCD and FID connected in series to measure CH_4 by FID and CO_2 by TCD
- Simplified configuration (no Methanizer) for analysis of CO_2 at concentrations > 50 ppm

MISCELLANEOUS SOLUTIONS



We support your lab with integrated components for your specific method requirements

In addition to our standard GC analyzers, Agilent can also pre-configure your GC with features such as:

- ✓ Deactivated plumbing
- ✓ Devices for sample blending and selection
- ✓ Stream selection valves with up to 16 ports
- ✓ Other valves and sample loops, available with dead-end, common, and individually vented return paths for unselected samples

Let our experts provide a customized sample introduction system that fits your analytical needs.

Learn more about Analyzer solutions for the energy and chemical industry at [agilent.com/chem/energy](https://www.agilent.com/chem/energy)

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Analyzer Checkout with EZChrom Software (G3445 Series #699/7890-0376)

Analyzer Description

Specifies checkout of SP1/Analyzer with EZChrom software. Customer will receive checkout results under EZChrom instead of OpenLab/ChemStation.

Requires order for EZChrom Instrument Control and Data Analysis Software and at least one SP1 (with included checkout).

For each GC requiring checkout with EZChrom please include a corresponding order for 1 each, G3445 Series #699.

Delivery to the customer includes the following items:

- 1 x Printed EZChrom Method
- 1 x Printed EZChrom analysis result
- CD-ROM containing EZChrom method

Not available for MS or MS/MS system configurations.

Analyzer for Low Sulfur Compounds in Hydrocarbon Matrices with Deans Switch Backflush System (7890-0455)

Analyzer Description

Configuration:

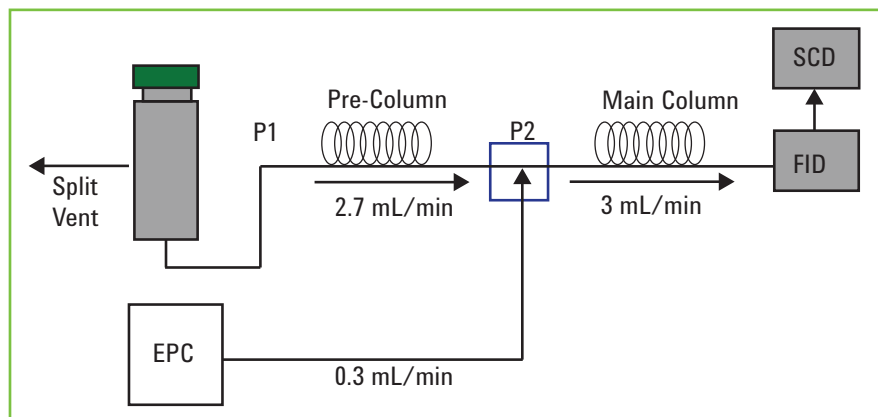
- Gas sampler valve/split/splitless inlet/CFT micro-volume tee/ Capillary column/FID/SCD/ Sulfinert® treated capillary inlet and plumbing

Sample type:

- Gas fuels/heavy hydrocarbon matrices (gasoline, diesel oil, crude oil)

System scheme:

System designed for the determination of trace sulfur compounds (H_2S , mercaptans and others) and light hydrocarbons in fuels or heavy hydrocarbon matrices with CFT backflush and FID-SCD in tandem



System at the time of injection

► KEY BENEFITS AND FEATURES

- Allows for simultaneous GC analysis of traces level of sulfur compounds (H_2S , mercaptans and others) by SCD, and light hydrocarbons by FID in fuels (diesel) or heavy (crude oil) hydrocarbon matrices
- Complex hydrocarbon matrices (gasoline or diesel) not resolved in the analytical column and are backflushed to vent using Deans-type switching
- Separates volatile Sulfur species in the analytical column
- Midpoint pressure control allows the analytical column to run at the desired flow while the precolumn undergoes backflush during the run
- Sulfinert® treated capillary inlet and plumbing enhances trace level sulfur analysis

Prefractionator for Analysis of Light Ends of Crude Oil Analyzer (7890-0496)

Analyzer Description

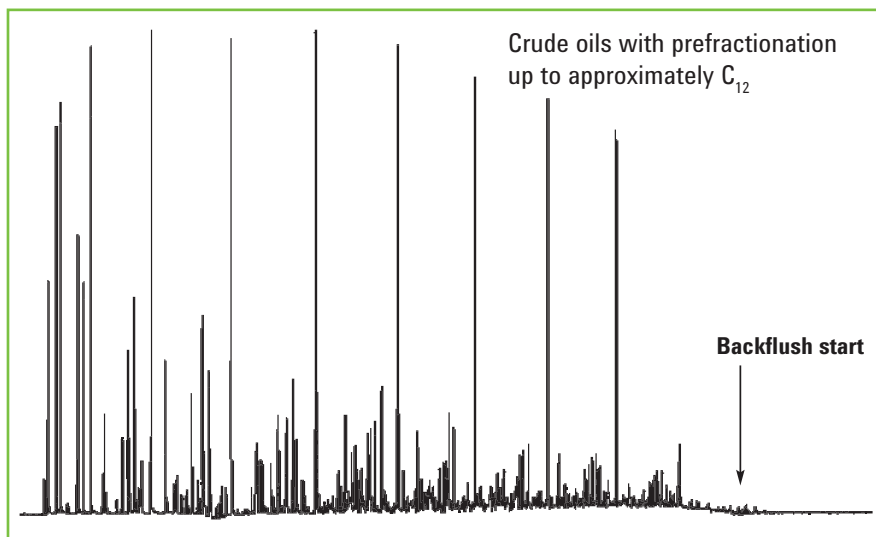
Many petroleum materials contain components with high boiling points that can never elute from the column. Analysis time can also be an issue even for compatible samples and columns because heavy materials may require longer times to elute from the column. Prefractionation optimizes analysis of a broad range of petroleum samples such as crude oils, providing a time optimized, high-resolution separation for only the fraction of interest without damaging the column or detector.

Configuration:

- Multimode Inlet/CFT Prefractionator /Capillary column/ FID

Typical sample:

- Crude oil, other petroleum fractions where sample components elute (or in some cases never elute) after the last compound of interest



► KEY BENEFITS AND FEATURES

- Backflush is carried out while analysis is occurring on the analytical column
- Midpoint pressure control allows the analytical column to run at the desired flow while the precolumn is backflushed during the run
- The use of an uncoated precolumn transfers the desired compounds at a low temperature. This has the added benefit of faster backflushing of the heavier material
- The Capillary Flow Technology purged union designed for leak-free connections, superior inertness, and lack of unswept volumes yields chromatographic performance identical to single column systems

Analyzer with Parallel Splitter for Liquefied and Gas Samples through Tandem SCD-FID (7890-0377)

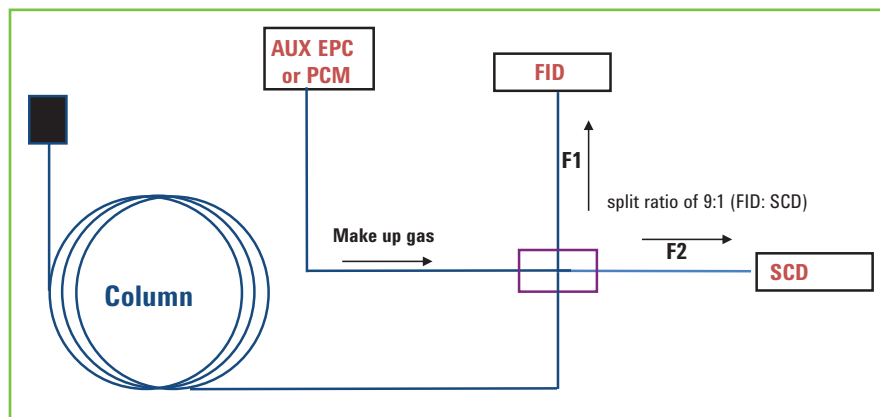
Analyzer Description

Configuration:

- Split/splitless inlet/CFT splitter/
Gas sample valve/Liquid sample
valve/4 port valve/FID/SCD

System scheme:

Analyzer with special hardware and set up splitter in use with FID and SCD is for parallel analysis in two channels. The system is suitable for liquefied and gaseous samples. A four port Valco valve will be used to control the flow of gas sample. Splitter will be set up for an approximate split ratio of 9:1 (FID:SCD) using the customer's SCD.



► KEY BENEFITS AND FEATURES

- The system allows GC analysis of sulfur compounds by SCD and hydrocarbons by FID simultaneously
- System passivation with Sulfinert® enhanced sulfur analysis
- The system is suitable for liquefied and gaseous samples

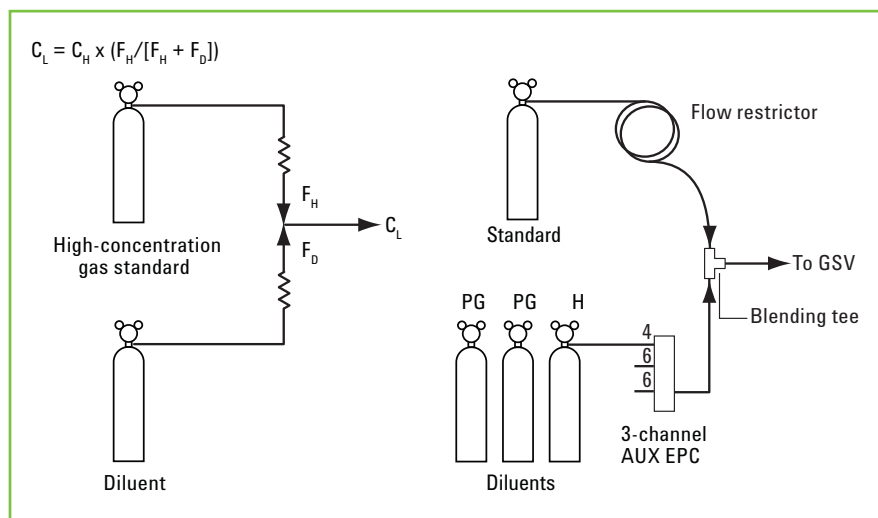
Gas Blender (7890-0084/7890-0130)

Analyzer Description

The Dynamic blending system uses the Agilent 7890A 3-Channel AUX EPC module to automate precise preparation of multilevel gas phase calibration standards. The AUX EPC module delivers variable diluent gas flows to change the final concentration of the standard. Different gas diluents can also be used to observe matrix effects. This is very useful when measuring trace levels of active compounds that would not be stable in pre-prepared mixtures.

A very low concentration gas standard (CL) can be generated by diluting a higher concentration standard (CH) with another diluent gas (D). The final concentration (CL) is proportional to the ratio of gas flows (F_H , F_D) shown by the equation in the following blending scheme.

Dynamic Blending Scheme



► KEY BENEFITS AND FEATURES

- Automatically prepare multilevel trace component calibration standards
- Ensure accurate calibration of active, unstable compounds
- Reduce cost of purchasing multiple premixed calibration gases in different matrices
- 7890-0130 designed for GC/MS systems

SP1 for Stream Selection Valve – Type SC

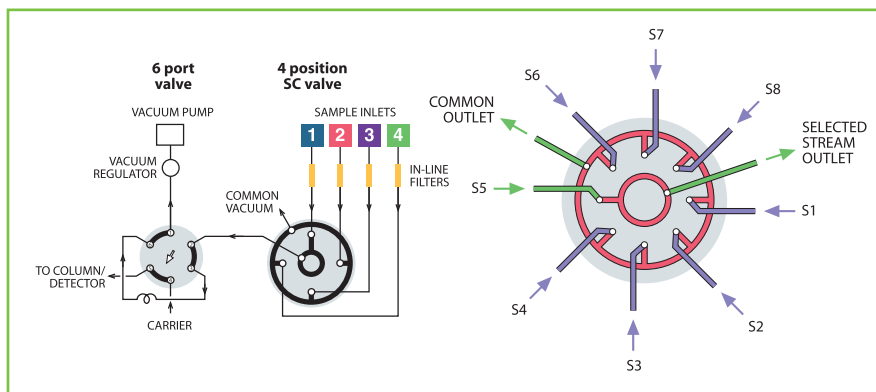
Analyzer Description

SSVs can be used for building unique integrated sample introduction systems, offering an array of possibilities for sample introduction. SSVs can even be used for online sample preparation. Different types of SSVs can be selected for different purposes.

SC valves select one of 4 to 16. The selected stream flows from the outlet to a sample valve, pressure sensor, detector, column, etc. SC valves are similar to the SD configuration in that regard, but instead of being dead-ended as in the SD valves, the non-selected streams flow to a common outlet so that flow of all streams is constantly flowing.

Typical application:

SC configuration (low pressure) for automated sampling of non-pressurized containers



Valve Drawing (Diagrams reproduced courtesy of Valco Instruments)

(CAM Note: Diagram from original solution guide)

► LIST OF SP1 STREAM SELECTION VALVE – SC

SP1 Number	Stream Selection	Type
7890-0326	6-stream selector	SC
7890-0190	16-stream selector	SC
7890-0067	8-stream selector	SC
7890-0037	4-stream selector	SC
7890-0005	12-stream selector	SC

SP1 for Stream Selection Valve – Type SD

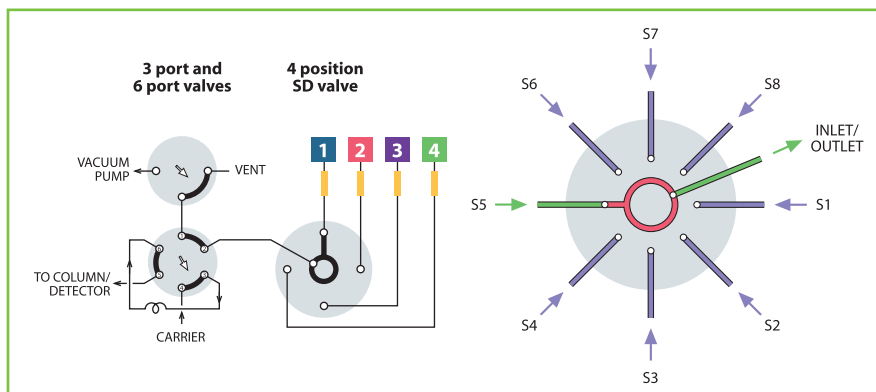
Analyzer Description

Stream selection valves (SSVs) can be used for building unique integrated sample introduction systems, offering an array of possibilities for sample introduction. SSVs can even be used for on-line sample preparation. Different type of SSVs can be selected for different purposes.

SD valves select one of 4 to 16 dead-ended streams. The selected stream flows from the valve outlet to a sample valve, pressure sensor, detector, column, etc. The same configuration may also be used to direct one stream to a number of outlets for applications such as fraction collection.

Typical application:

SD configuration (low pressure), for automated sampling of non-pressurized containers



Valve Drawing (Diagrams reproduced courtesy of Valco Instruments)

(CAM Note: Diagram from original solution guide)

► LIST OF SP1 STREAM SELECTION VALVE – SD

SP1 Number	Stream Selection	Type
7890-0244	10-stream selector	SD
7890-0204	6-stream selector (Hastelloy)	SD
7890-0145	16-stream selector (Hastelloy)	SD
7890-0064	12-stream selector	SD
7890-0063	4-stream selector (Hastelloy)	SD
7890-0048	6-stream selector	SD
7890-0030	8-stream selector	SD
7890-0010	4-stream selector	SD
7890-0007	16-stream selector	SD

SP1 for Stream Selection Valve – Type SF

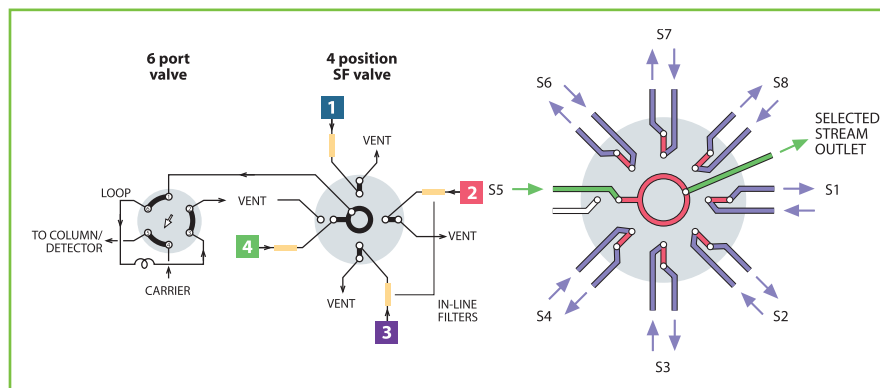
Analyzer Description

SSVs can be used for building unique integrated sample introduction systems, offering an array of possibilities for sample introduction. SSVs can even be used for online sample preparation. Different types of SSVs can be selected for different purposes.

SF valves select one of 4 to 16 streams, which are similar to SD and SC valves, selecting a stream and sending it to the outlet. However, SFs allow the non-selected streams to flow through individual outlets instead of a common outlet.

Typical application:

SF configuration (low pressure) is the ideal solution when reactions or process streams with differing upstream pressures must be analyzed. SF valve configuration can also provide independent containment of toxic or noxious streams.



Valve Drawing (Diagrams reproduced courtesy of Valco Instruments)

(CAM Note: Diagram from original solution guide)

► LIST OF SP1 STREAM SELECTION VALVE – SF

SP1 Number	Stream Selection	Type
7890-0287	10-stream selector	SF
7890-0077	4-stream selector	SF
7890-0057	16-stream selector	SF
7890-0055	8-stream selector	SF
7890-0034	4-stream selector	SF

SP1 for Stream Selection Valve – Type ST

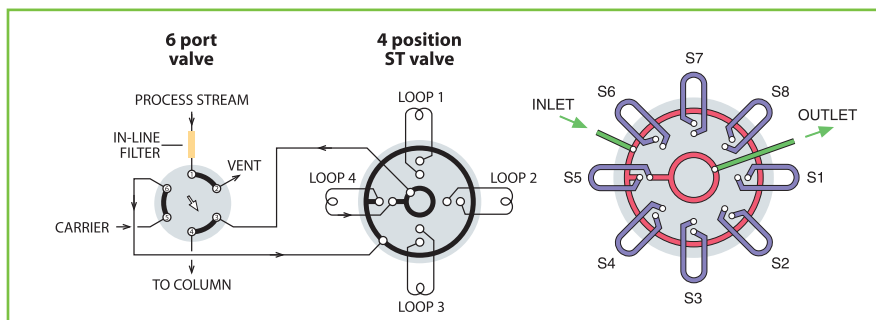
Analyzer Description

SSVs can be used for building unique integrated sample introduction systems, offering an array of possibilities for sample introduction. SSVs can even be used for online sample preparation. Different types of SSVs can be selected for different purposes.

ST valves are used for multi-column, multi-sample, or multi-trap operations, and are available for use with 4 to 16 loops or positions.

Typical application:

ST configuration – low pressure. A typical application is the collection of fractions at timed intervals for analysis at a later time.



Valve Drawing (Diagrams reproduced courtesy of Valco Instruments)

(CAM Note: Diagram from original solution guide)

► LIST OF SP1 STREAM SELECTION VALVE – ST

SP1 Number	Stream Selection	Type
7890-0301	16-stream selector (Hastelloy)	ST
7890-0299	16-stream selector	ST
7890-0090	10-stream selector	ST
7890-0089	8-stream selector	ST
7890-0088	6-stream selector	ST
7890-0080	10-stream selector	ST

SP1 for Stream Selection Valve – Type STF

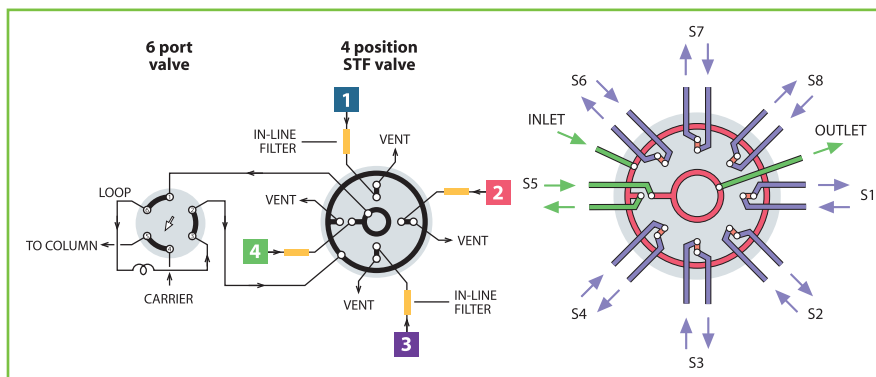
Analyzer Description

SSVs can be used for building unique integrated sample introduction systems, offering an array of possibilities for sample introduction. SSVs can even be used for online sample preparation. Different types of SSVs can be selected for different purposes.

The STF valve is a variation of the ST flow path, with the single difference that the non-selected streams are returned to their own vents or sources rather than being dead-ended or trapped, as they are in the standard ST configuration.

Typical application:

STF configuration (low pressure) ideal for reactor processes in which removal of substantial amounts of sample would upset the equilibrium within the reactor, or if the stream is toxic or noxious and must be isolated.



Valve Drawing (Diagrams reproduced courtesy of Valco Instruments)
(CAM Note: Diagram from original solution guide)

► LIST OF SP1 STREAM SELECTION VALVE – STF

SP1 Number	Stream Selection	Type
7890-0076	6-stream selector	STF
7890-0075	10-stream selector	STF

Special Passivation with Sulfinert®

Analyzer Description

Analyzing trace levels of sulfur species in HPI samples requires special consideration to sample transfer within the analytical system. Special passivation of components contacting the sample with Sulfinert® enhances sampling and analysis of organo-sulfur compounds at concentrations of less than 20 ppb.

SP1s with Sulfinert® Treated System

7890-0082	Supply sample inlet lines and connection to one valve and inlet in Sulfinert® tubing
7890-0103	Supply a Sulfinert® treated Capillary inlet system
7890-0239	Supply a valve option 702 or 732 with Sulfinert® fittings for packed columns and a Sulfinert® treated needle valve
7890-0240	Supply a 6-port valve option other than option 701/731 and 702/732 and all 10-port valve options with Sulfinert® fittings for packed columns
7890-0243	Supply an LSV option with Sulfinert® inlet and outlet lines and connection to a valve or volatiles inlet
7890-0313	Supply 1/16 VALCO Zero Dead Volume Tee, Sulfinert® treated for merging two streams into one. The Tee will be mounted inside the GC oven
7890-0382	Supply 1 inert option #873 (Siltek® treated). If customer requires extra columns then please order multiples of this SP1 Customer can order spare part from Agilent with P/N G1580-60060 For inert option #872, please order SP1 7890-0381 For inert adjustable need valve, please order SP1 7890-0406 For inert interface of valve to 1/8" packed column, please order SP1 7890-0407
7890-0381	Supply 1 inert option #872 (Siltek® treated). If customer requires extra adaptors then please order multiples of this SP1 Customer can order spare part from Agilent with P/N G1580-60062 For inert option #873, please order SP1 7890-0382 For inert adjustable need valve, please order SP1 7890-0406 For inert interface of valve to 1/8" packed column, please order SP1 7890-0407
7890-0407	Supply 1 inert interface of valve to 1/8" packed column (Siltek® treated). If customer requires extra columns then please order multiples of this SP1. For inert adjustable need valve, please order SP1 7890-0406 For inert option #872, please order SP1 7890-0381 For inert option #873, please order SP1 7890-0382
7890-0406	Supply 1 inert adjustable needle valve (Siltek® treated option #870). If customer requires extra columns then please order multiples of this SP1 For inert option #872, please order SP1 7890-0381 For inert option #873, please order SP1 7890-0382 For inert interface of valve to 1/8" packed column, please order SP1 7890-0407

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Enriching our expertise with specialized technologies and experience

Helping you meet your analytical challenges does not end with our own technological developments. Agilent's industry leadership has enabled us to nurture valuable partnerships that complement our energy and chemical analysis capabilities with solutions such as:

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 - Micro GC
 - Sulfur in LPG
- ✓ Natural Gas Analyzers
- ✓ Petrochemical Analyzers
 - Trace sulfur in ethylene and propylene
- ✓ PIONA/Reformulyzer M₃
- ✓ Olefins Analyzer
- ✓ DHA Analyzer
- ✓ Oxygenates Analyzer
- ✓ Aromatics Analyzer
- ✓ 8634 Analyzer for ASTM D86 (equivalent for groups 3 and 4)
- ✓ Sim. Dist. Analyzer/HT Sim. Dist. Analyzer
- ✓ DHA front end
- ✓ Apply lab GC on-line
- ✓ HPLC-based solutions

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