



Gas chromatography analyzers for the oil & gas industry: upstream to downstream

GC solutions for every stage of hydrocarbon processing

Petroleum and natural gas production

Oil, coal, natural gas. The oil & gas industry is undergoing a significant transformation in response to the Green Deal, climate goals, and rising pressure from regulators, investors, and society to reduce environmental impact.

Decarbonization, circular economy, and sustainability objectives are driving the evolution of the oil & gas industry. Transitioning from fossil to low-carbon energy is a challenge for diversification, renewable biofuels development and use of natural gas as a “transition fuel”.

Throughout the oil & gas value chain there are many standard methods in existence for various regulations covering a wide range of boiling point and applications.

Thermo Fisher Scientific™ is partnering you with a comprehensive offering of analytical techniques for petroleum and natural gas workflows across the entire value chain, based on the process, matrix, application, and analyte of interest.



Upstream

Midstream

Downstream

Exploration



Production



Custody Transfer



Storage



Wholesale Marketing



Refining



Distribution



Main regulatory requirements for oil and gas testing

Carbon number	1	2	3	4	5	6	10	16	20	30	44	60	80	120
Boiling point	-200	-100	-0			100	200	300	400	500	600	700	800	
GPA 2286			natural gas											
GPA 2177			natural gas liquid											
GPA 2186			natural gas liquid											
GPA 2261			natural gas											
ASTM D3710			gasoline											
ASTM D7096			gasoline + ethanol											
ASTM D5399			solvents											
ASTM D2887			petroleum fractions											
ASTM D5442			petroleum wax											
ASTM D7213			medium petroleum distillates											
ASTM D6417			medium petroleum distillates											
ASTM D6352			medium and heavy petroleum distillates											
ASTM D5307		crude petroleum												
ASTM D7500			medium and heavy petroleum distillates											
ASTM D7169		crude oil and residues												
DIN 51581-2			medium petroleum distillates											
DIN 51435			medium and heavy petroleum distillates											
IP 406			petroleum products											
IP 480			middle distillates and lubricating base oils											
IP 507			vacuum distillates and residues											
IP 545		crude oil												
EN 15199-1			middle distillates and lubricationg base oils											
EN 15199-2			vaccum distillates and residues											
EN 15199-3		crude oil												
ISO 3924			petroleum fractions											
UOP 1001-14			F and Cl in FPG											
ASTM D7359			F, Cl S in aromatic HC											
ASTM D5987											F in coal and coke			
UOP 991-13			F, Cl, Br in liquid organics											
ASTM D5600											metals in coke			
ASTM D5185											metals in lube oils			
ASTM D7691					metal in crude oils									
ASTM D5662			oxygen in gasoline and methanol											
ASTM D5291			C,H, N in petroleum products and oils											
ASTM D5373											C, H, N in coal and coke			
ASTM D5622			oxygen in gasoline and methanol											
■ Natural Gas and Natural Gas Liquid Analyzers ■ GC, GC-MS ■ CIC ■ ICP-OES ■ OEA														

Thermo Fisher delivers industry-leading, compliance-ready analytical solutions for all areas of refinery operations, including gas chromatography, liquid chromatography, mass spectrometry, ion chromatography, combustion ion chromatography, discrete analyzer, online process analyzer, Inductively coupled plasma (ICP-OES and ICP-MS), thermal elemental analyzer.



Gas chromatography (GC) plays a pivotal role in the oil and gas industry, offering unmatched accuracy, sensitivity, and speed for analyzing complex hydrocarbon mixtures. Whether in raw natural gas, liquefied petroleum gas (LPG), or final refinery products like gasoline and jet fuel, GC ensures compliance with international new specifications, optimizes process control, and supports environmental monitoring. As energy operations evolve, there's an increasing demand for automated, rugged, and regulation-compliant analyzers that can keep pace with industry standards across upstream, midstream, and downstream segments.

Engineered to meet the demanding requirements of a 24/7/365 operation – configured, tested, and ready for startup, Thermo Scientific™ GC analyzers offer a comprehensive portfolio of pre-configured and customizable solutions for the oil & gas industry, to deliver critical information about upstream, midstream, and downstream production, and stay ahead of the challenges of the future.



Gas chromatography in the oil & gas value chain

Upstream Exploration and production	Midstream Transportation, storage, and custody transfer	Downstream Refining, blending, and distribution
Upstream stage encompasses the exploration, drilling, and production of crude oil and natural gas from underground or underwater reservoirs. GC is key in analyzing natural gas, associated hydrocarbons, sulfur compounds, and trace contaminants.	Pipelines and other transport systems are used to move crude oil from production sites to refineries and deliver the various refined products to downstream distributors. GC plays a critical role in ensuring fuel quality, regulatory compliance, and custody transfer accuracy.	Crude oil is refined into petroleum products by distillation according to their boiling points (light, middle and heavy distillates). GC is essential for product specification, quality control, regulatory compliance, and process optimization.

Key GC applications

<ul style="list-style-type: none"> • Natural gas composition and BTU content • Gas condensate (C₅+) and Natural Gas Liquids (NGLs) • Fixed (permanent) gases and light hydrocarbons • Hydrogen sulfide (H₂S) and sulfur species 	<ul style="list-style-type: none"> • Pipeline natural gas certification • Monitoring LNG and LPG composition and quality • Determination of moisture, odorants, and contaminants in transport gases 	<ul style="list-style-type: none"> • Hydrocarbon group-type analysis (PIONA) in reformates and gasoline • BTEX (benzene, toluene, ethylbenzene, xylenes) and aromatics content in fuels • Ethanol and oxygenates quantification in fuels • Simulated distillation of gasoline, diesel, and jet fuel cuts
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We deliver more to meet your demands

Why choose Thermo Scientific GC Analyzers?

It starts with the Gas Chromatograph. The innovation of the Thermo Scientific™ TRACE™ 1610 GC changes the way to manage your analytical system. “Instant Connect” modularity, a patented Thermo Fisher Scientific technology, has completely revolutionized GC design. These modules incorporate all relevant pneumatic hardware and electronic parts necessary for making the injector or the detector a fully self-sufficient subunit of the instrument. The modules are plugged in to the top part of the GC, automatically configured into the system, and connected to the gas supply lines. Installing a module takes only two minutes. Combined with the flexible Thermo Scientific™ Auxiliary Oven, each GC analyzer is delivered ready to run, for maximized performance and minimized footprint.

- **Modular and Scalable:** Thermo Scientific GC analyzers support customizable configurations with multi-valve, multi-detector systems tailored to your process.
- **ASTM Method Compliance:** Designed to comply with the latest ASTM and ISO standards for gas and liquid hydrocarbon analysis.
- **Flexible Auxiliary Oven:** expanded capacity with easy access to up to 8 diaphragm valves or up to 6 rotary valves, multiple columns and IN/OUT connections.
- **Multi-Detector Capability:** with up to 4 channels capability, the analyzer combines FID, TCD, FPD, PDD, MS, or VUV detectors in a single system for broader analytical range.
- **Automation and Throughput:** Streamlined workflows with minimal manual intervention reduce downtime and increase efficiency.

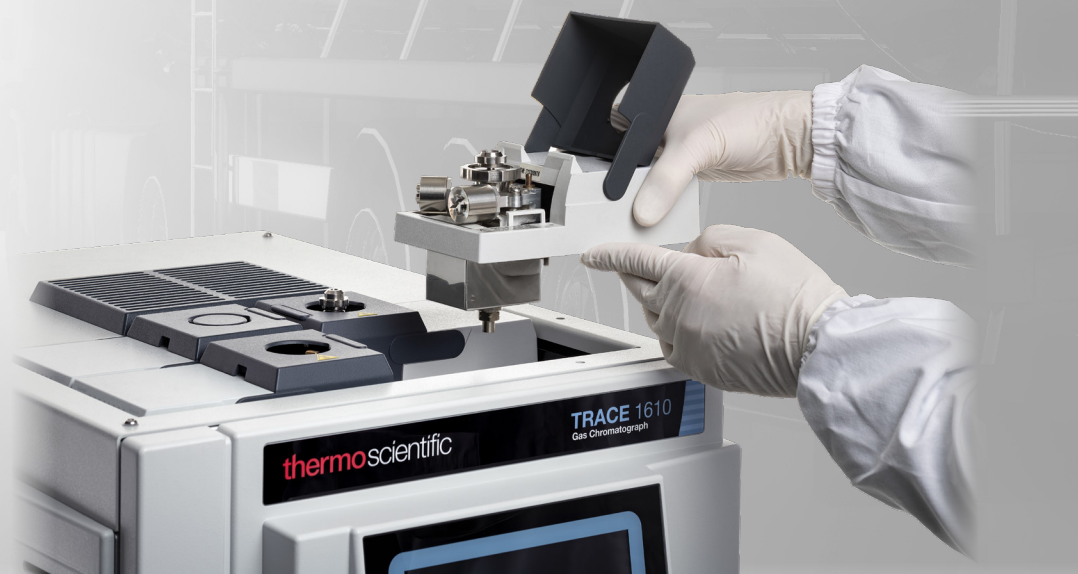
Each analyzer is delivered with a complete documentation package that includes detailed methods, complete plumbing schematics, a troubleshooting guide and consumables.

The powerful Thermo Scientific™ Chromeleon™ Chromatography Data System (CDS) is included for a complete turnkey solution, with custom reporting packages and LIMS interfaces. Additional drivers are available to connect the analyzer to other CDS platforms, like EZChrom, OpenLAB, and Empower.

These are changing times for our industry. And we're here to help you navigate whatever lies ahead with the products and support to get your job done.



Thermo Scientific™ TRACE™ 1610 GC with the Thermo Scientific™ Auxiliary Oven



Natural gas and natural gas liquid analyzers (NGA & NGL)

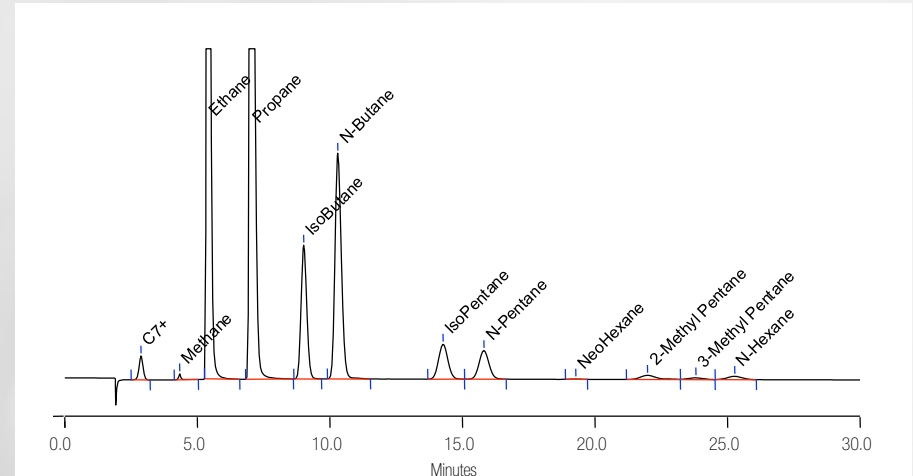
Natural Gas Analysis (NGA) provides the analytical foundation for characterizing Liquefied Natural Gas (LNG) across its lifecycle—from liquefaction to regasification and custody transfer. As Liquid Natural Gas (LNG) cements its role as a global energy commodity, precise and reliable analysis becomes essential for trade, compliance, and operational safety. From verifying composition and calorific value to detecting trace contaminants, LNG analysis ensures quality standards are met across international markets—supporting fair pricing, pipeline compatibility, and environmental performance. Accurate measurement is not just technical—it's strategic in a rapidly evolving global energy landscape.



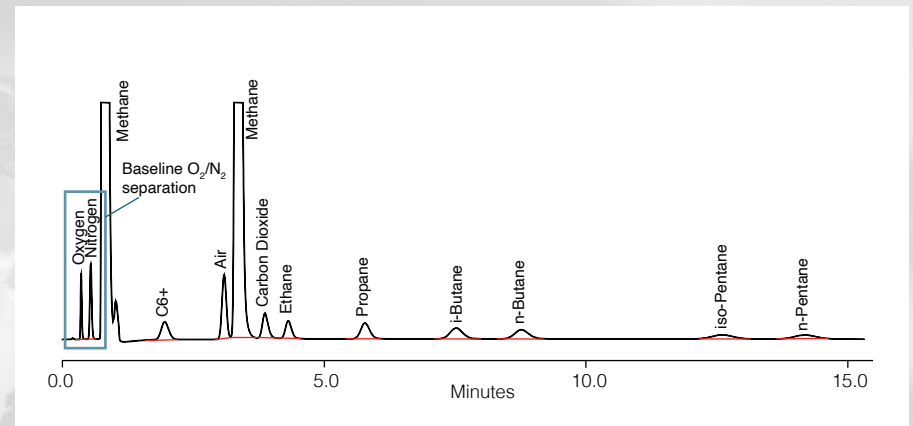
Thermo Scientific™ natural gas and natural gas liquid analyzers (NGA and NGL) are designed in more than 20 configurations to meet your demand for composition analysis, heating value (BTU), and impurities e.g., sulfur species, in compliance to standard methods.

- GPA – 2261, 2177, 2186, 2286
- ASTM – D1945, D1946
- DIN – 51872-5
- ISO 6974

Choose from single-channel, dual-channel, or highly flexible combination systems, with single sample injection or dual sample injection as productivity booster.



Natural gas liquid sample - C7+ early regroup



Natural gas sample - C6+ early regroup with oxygen/nitrogen separation

Thermo Scientific NG and NGL analyzers			Natural gas				Natural gas liquid	
Part Number	Description	Samples	GPA 2261	O2/N2	He/H2	GPA 2286	GPA 2177	GPA 2186
NATG16010011	NGA with early backflush C6+ peak	1	✓					
NATG16010021	NGA with early backflush C6+ peak plus O2/N2	1	✓	✓				
NATG16020281	NGA with C6+ plus O2/N2 and He/H2	1	✓	✓	✓			
NATG16020231	NGA with C6+ plus extended hydrocarbons	1	✓			✓		
NATG16020261	NGA with C6+ plus O2/N2 and extended hydrocarbons	1	✓	✓		✓		
NATG16010031	NGL with early backflush C7+ peak	1					✓	
NATG16010211	NGA with C6+ backflush plus O2/N2 or NGL with C7+ backflush	1	✓				✓	
NATG16C20211	NGA with C6+ backflush or NGL with C7+ backflush plus extended hydrocarbons	1	✓			✓	✓	✓
NATG16C20221	NGA with C6+ backflush plus He/H2 or NGL with C7+ backflush and extended hydrocarbons	1	✓		✓	✓	✓	✓
NATG16020011	Dual samples NGA with early backflush C6+ peak	2	✓					
NATG16020021	Dual samples NGA with C6+ peak plus O2/N2	2	✓	✓				
NATG16020061	Dual samples NGA with C6+ peak plus extended hydrocarbons	2	✓			✓		
NATG16020031	Dual samples NGL with early backflush C7+ peak	2					✓	
NATG16020211	Dual samples NGA with C6+ backflush or NGL with C7+ backflush plus O2/N2	2	✓	✓			✓	
NATG16020221	Dual samples NGA or NGL extended hydrocarbons only	2				✓		✓
NATG16CAP	NGA with C6+ method ISO6974	1						
B51007119	NGL with C6+ peak plus extended hydrocarbons	1					✓	✓

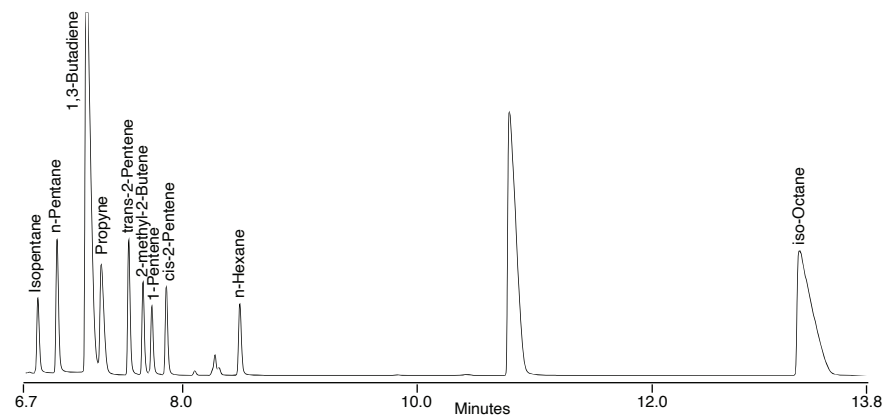
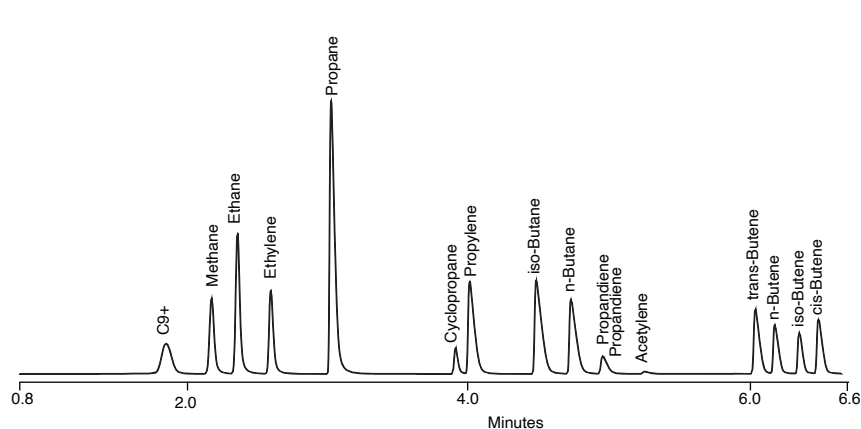
Light hydrocarbon (LPG) analyzers

Configured to meet regulatory requirement for ASTM D2163, D2712, D2593, D2820, D4424, ISO 7941, and others, the Thermo Scientific TRACE 1610 GC Light Hydrocarbon Analyzers are based on a modular platform to facilitate troubleshooting and maintenance.

Measurement of light hydrocarbons is necessary for refineries, natural/biogas production, research on renewable energy, catalyst screening and many other fields of application. Information on concentration and distribution of hydrocarbons is valuable for controlling processes, research and development, and establish market pricing of finished products.



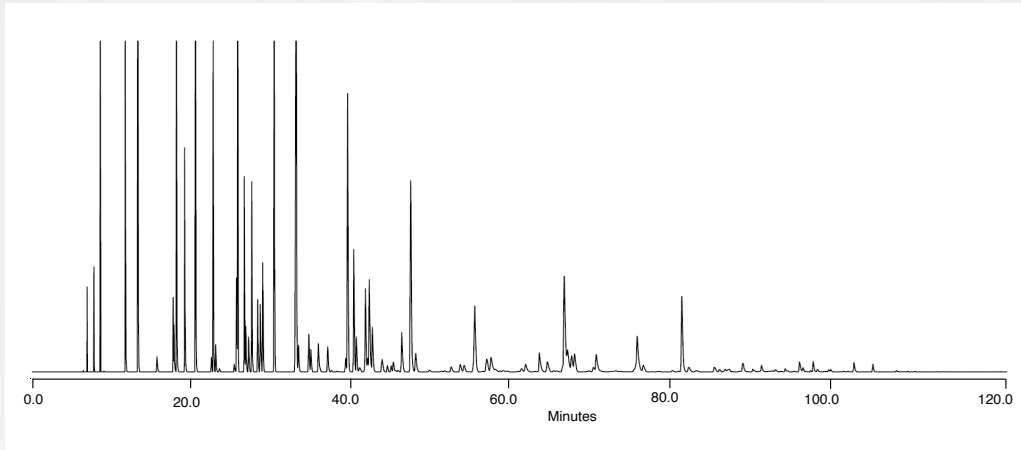
Thermo Scientific LPG analyzers						
Part Number	Description	Channels	ASTM D2163	ASTM D2712	ASTM D8098	ASTM D7423
LHA216316011	Single channel Light Hydrocarbon analysis C1-C5 with C6+ backflush or C1-C9 with C9+ backflush	1	✓			
B51007459	3-channels for trace impurities and oxygenates in high purity Ethylene and Propylene	3		✓	✓	✓



Light hydrocarbon analysis with C9+ group

Hydrocarbon analysis – DHA – PIONA - SimDist

From the initial analysis of incoming crude oil to final product characterization to meet customer specification or EPA regulations, gas chromatography plays a vital role for hydrocarbon analysis in refinery operations, quality control, and safety. The Thermo Scientific TRACE 1600 Series GC with its modular design, is conceived to simplify daily workflow, provide higher uptime, and reduce cost of ownership.



Detailed hydrocarbon analysis

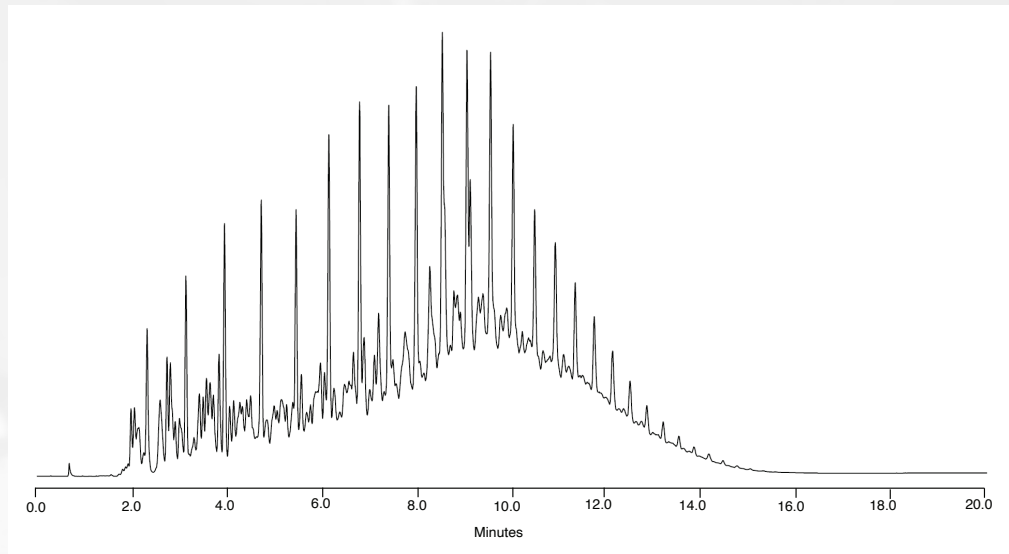
High resolution gas chromatography solutions for the detailed analysis of hydrocarbons in petroleum streams.

- Select from two base configurations
- Four mode kits for fast startup
- Integrated backflush for ASTM D7900

Simulated distillation (SIMDIS)

SIMDIS analyzers meet all industry standard methods covering boiling point requirements up to 750°C.

- Two configurations: cryo or no cryo
- Five mode kits for fast startup
- Simple connectivity

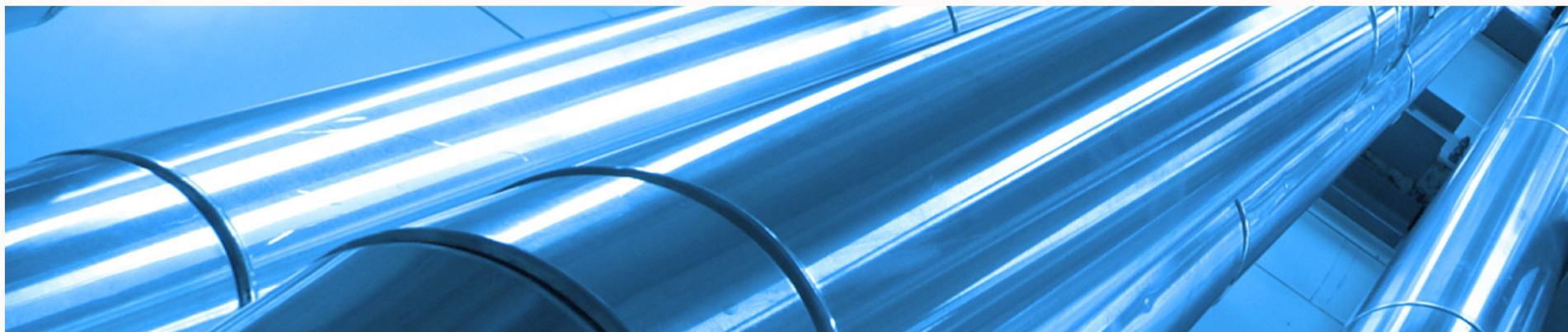


Refinery gas analyzers

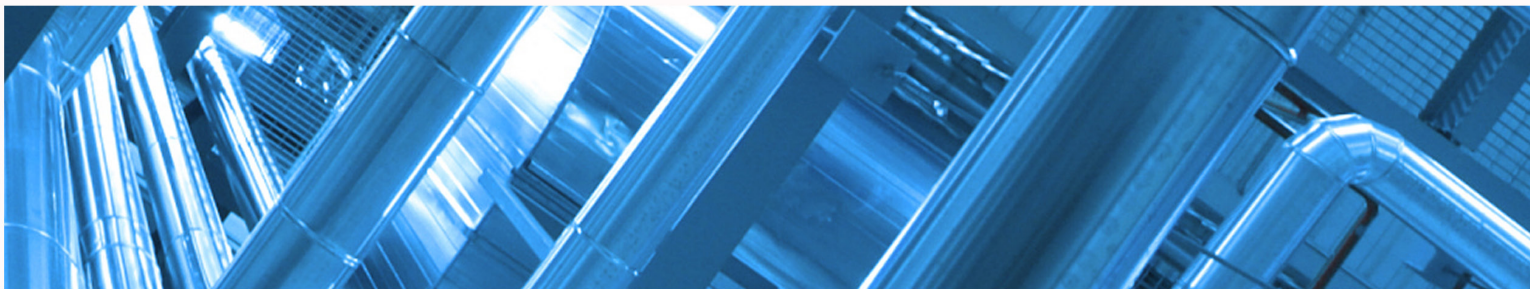
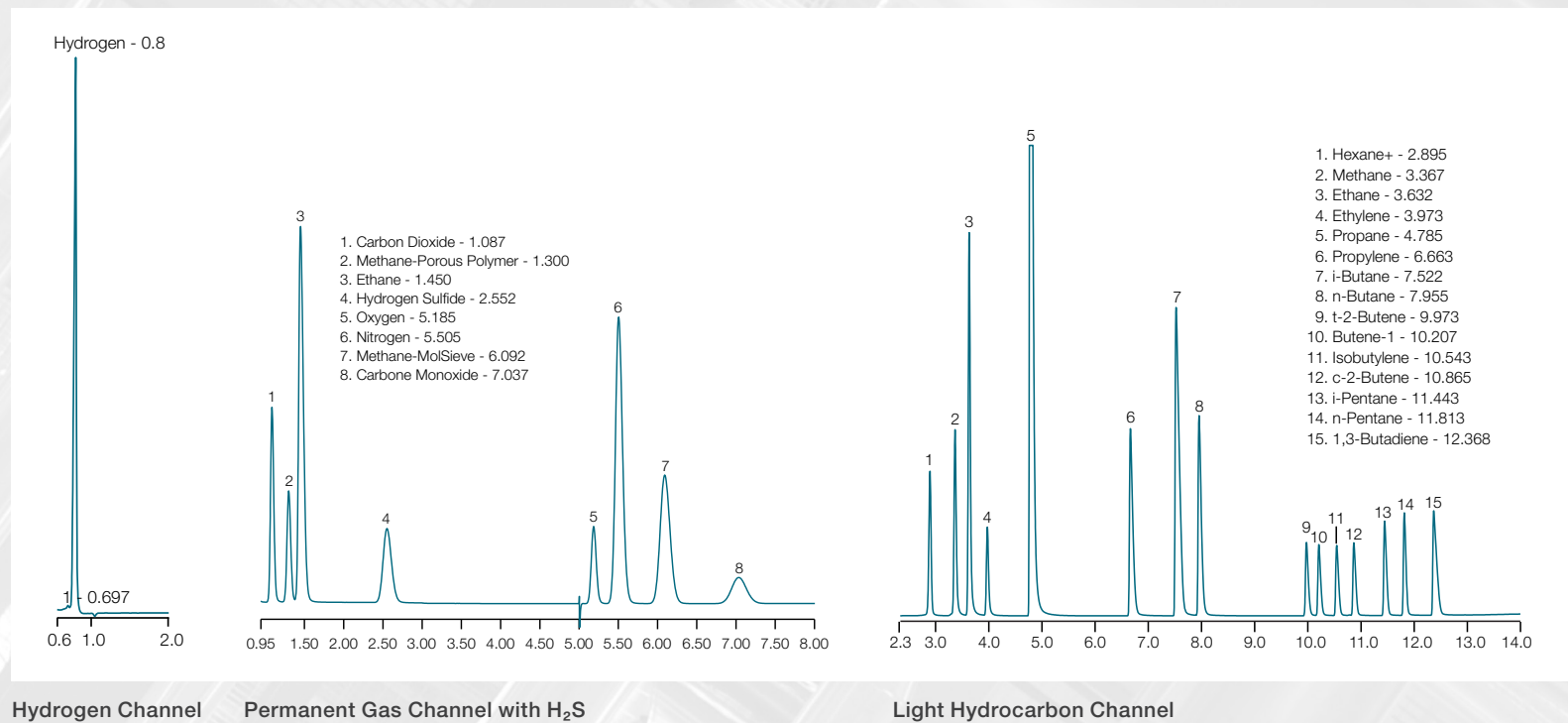
Accurately characterize the composition of complex refinery gas streams, including hydrogen, methane, ethylene, acetylene, CO/CO₂, and C₂–C₅ hydrocarbons with pre-configured and factory-tested TRACE 1610 Refinery Gas Analyzers (RGA).

These analyzers support process control, flare gas monitoring, and product recovery by delivering fast, repeatable analysis aligned with ASTM D1946, ASTM D7833, ASTM D6228 and ASTM UOP 539.

Thermo Scientific RGA analyzers							
Part Number	Description	Channels	H ₂ /He	Methanizer	ASTM D1946	ASTM D7833	ASTM D6228
REFG16030111	RGA C1-C8, Permanent Gas, He, CO ₂	3	✓		✓		
REFG16030121	RGA C1-C5/C6+, Permanent Gas, He, CO ₂	3	✓		✓	✓	
REFG16030131	RGA C1-C5/C6+, Permanent Gas, He, CO ₂ , H ₂ S	3	✓		✓	✓	
REFG16040141	RGA C1-C5/C6+, Permanent Gas, He, CO ₂ , H ₂ S and extended hydrocarbon analysis	4	✓		✓	✓	
REFG16040151	RGA C1-C5/C6+, Permanent Gas, He and Low CO/CO ₂	4	✓	✓	✓		
REFG16040161	RGA C1-C5/C6+, Permanent Gas, He, CO ₂ and Sulfur Compounds	4	✓		✓		✓
B51004500	Sulfur gases Analyzer with PFPD	1					✓



The RGA method preventing moisture to enter the PLOT column increases the total run time to 13 min (as shown in the example). A Fast RGA method using a different backflush column is available to shorten the total run time to < 9min.



GC-VUV analyzers for fuels

Thermo Scientific™ GC-VUV analyzers offer a powerful leap forward for petrochemical analysis, combining the VGA-100 Vacuum Ultraviolet (VUV) detector (VUV Analytics, Inc.) to the TRACE 1600 Series GC.

With universal detection, isomer differentiation, and minimal calibration requirements, GC-VUV simplifies complex hydrocarbon profiling while boosting confidence in results.

It's an ideal solution for refineries and petrochemical labs seeking faster, more accurate insights into streams like gasoline, olefins, and aromatics—without relying on multiple detectors.

Simplified PIONA analysis

Revolutionize and simplify PIONA group type analysis and hydrocarbon profiling of gasoline under ASTM D8071 with the VGA-100 detector for the TRACE 1600 Series GC. The method delivers comprehensive compositional data — including paraffins, isoparaffins, olefins, naphthenes, aromatics, ethanol, and benzene — in a single 34-minute run. With no sample prep, calibration standards, or multiple instruments required, this platform significantly reduces cost-per-sample and complexity, while improving precision and compliance with global fuel regulations.

ASTM METHOD	D6550	D4815	D5599	D1319	D3606	D5769	D5580	D6729 / D6730	D6839	D8071
TECHNIQUE	SFC	MDGC-FID	GC-OFID	FIA	GC-TCD	GC-MS	MDGC-FID	GC-FID	Reformulyzer®	GC-VUV
Aromatics				✓		✓	✓	✓	✓	✓
Benzene					✓	✓	✓	✓	✓	✓
Olefins	✓			✓				✓	✓	✓
Ethanol		✓	✓					✓	✓	✓
Ethyl Benzene						✓	✓	✓		✓
IsoParaffin								✓	✓	✓
Methanol		✓	✓					✓		✓
Methyl Naphthalene								✓		✓
Naphthalene								✓		✓
Naphthene								✓	✓	✓
Paraffin								✓	✓	✓
Toluene					✓	✓	✓	✓		✓

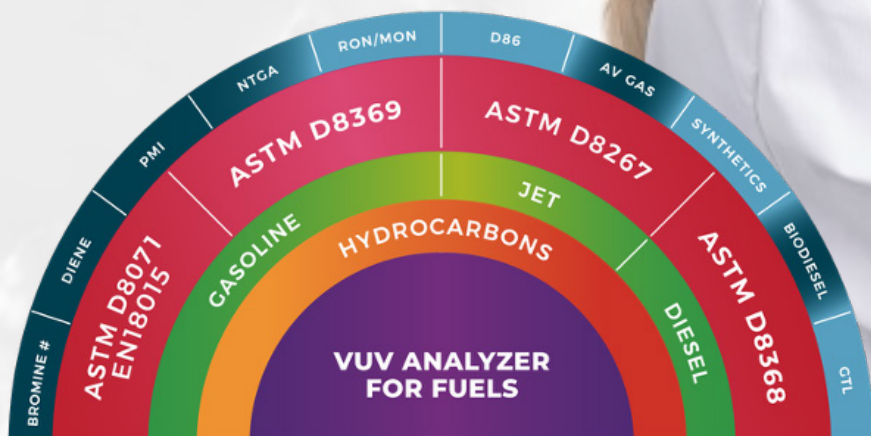
Several gasoline test methods and their parameters

Clear ROI Advantages

- 3x to 20x lower cost/sample
- Minimal labor, consumables, waste

Flexible Platform

- Multiple methods on a single platform
- Applications for low/no-carbon transition – sustainable jet fuel, renewable and biodiesel blends.
- Game-changing technique for Pyrolysis Oil analysis, offering detailed speciation of complex, highly unsaturated mixtures.



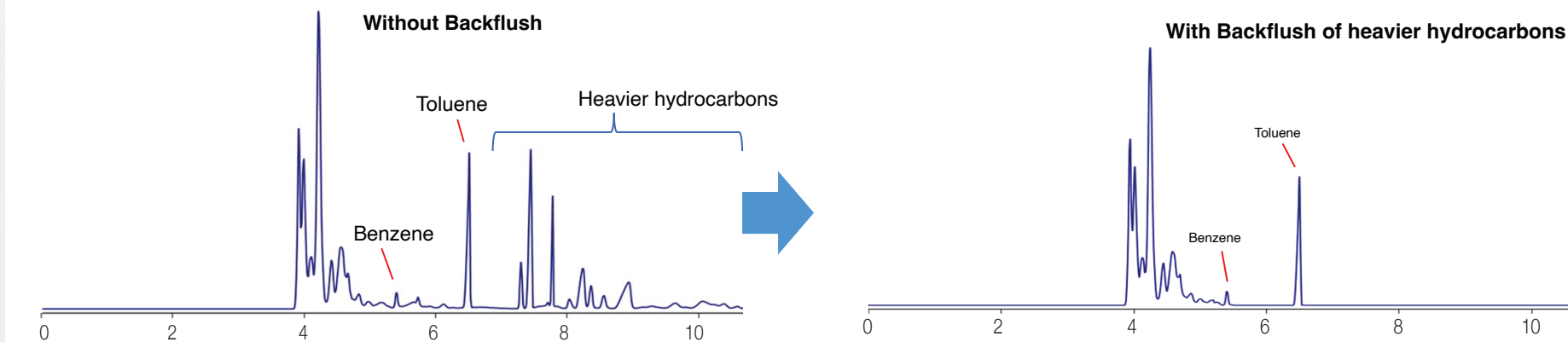
Thermo Scientific TRACE 1610 GC-VUV analyzer

Aromatics in fuels analyzers

Simplify automotive and aviation gasoline analysis for the determination of aromatics (BTX) according to ASTM standard methods D3606 and D5580 with the Thermo Scientific TRACE 1610 Analyzers for Aromatics in Fuel. Dedicated configurations are available including an extended dual channel configuration to combine the analysis of aromatics and oxygenates by ASTM D4815, D3606, and D5580.



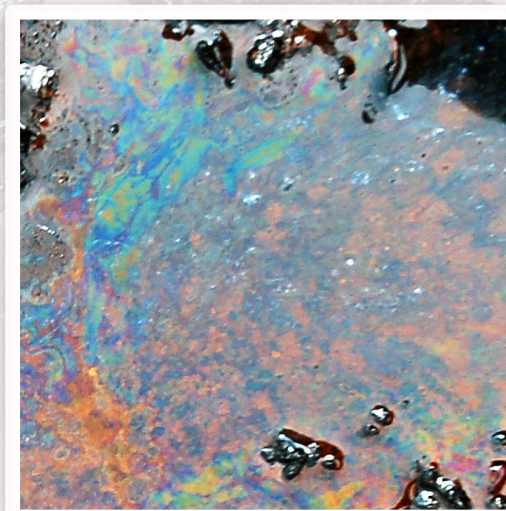
Thermo Scientific GC analyzers for aromatics					
Part Number	Description	Channels	ASTM D3606	ASTM D5580	ASTM D4815
BTX160010021	Benzene – toluene in gasoline	1	✓		
AROM1610031	aromatics in gasoline	1		✓	
OXBTXARC1611	Aromatics and oxygenates in gasoline	2	✓	✓	✓



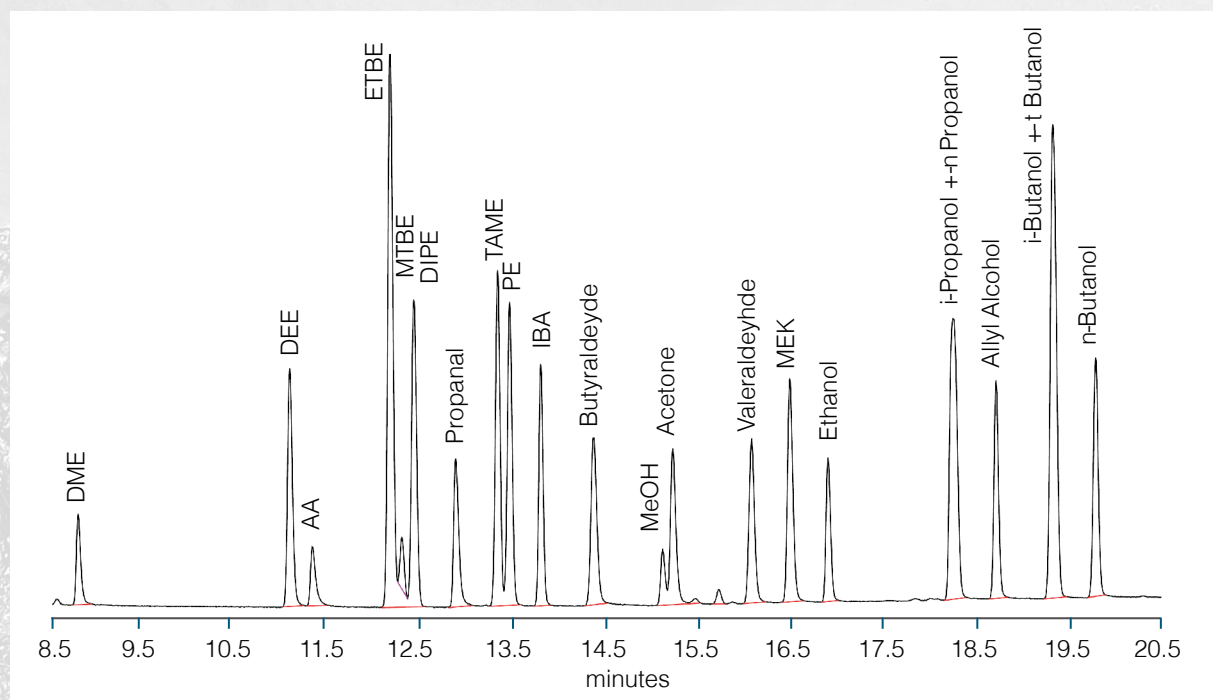
Gasoline sample run without and with backflush

Oxygenates analyzers

Determine trace oxygenates and octane enhancers in spark-ignition engine fuel and refinery streams according to ASTM methods. Simplify gasoline and light hydrocarbon streams analysis with the Thermo Scientific TRACE 1610 Analyzers for Oxygenates, based on a multidimensional GC configuration to perform the separation of target compounds. All systems utilize automated backflush of stripper column to prevent hydrocarbon contamination of the column for oxygenates, increasing robustness and performance.



Thermo Scientific GC analyzers for oxygenates					
Part Number	Description	Channels	ASTM D4815	ASTM D7423	ASTM D7754
OXY160010011	Oxygenates in gasoline	1	✓		
LLVLOX1610111	Low levels oxygenates in LPG	1		✓	
LLVLOX1610112	Low levels oxygenates in fuels	1			✓



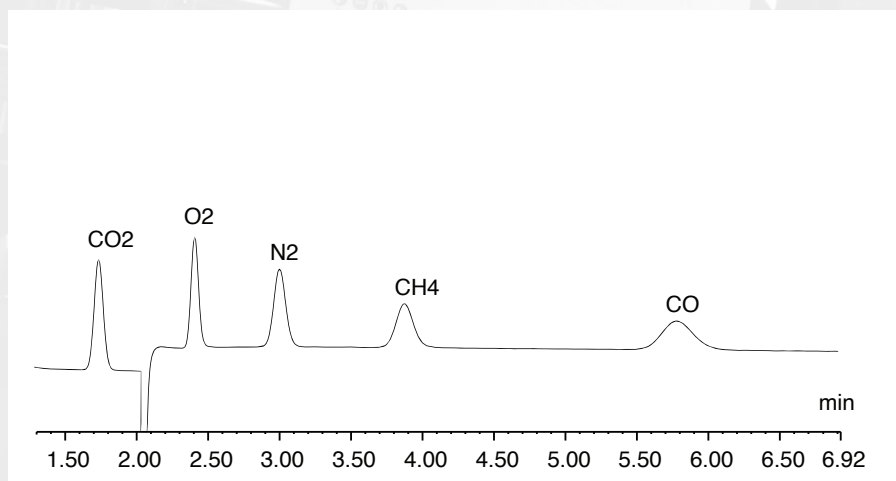
Oxygenates in light hydrocarbons - ASTM D7423

Permanent gas analyzers

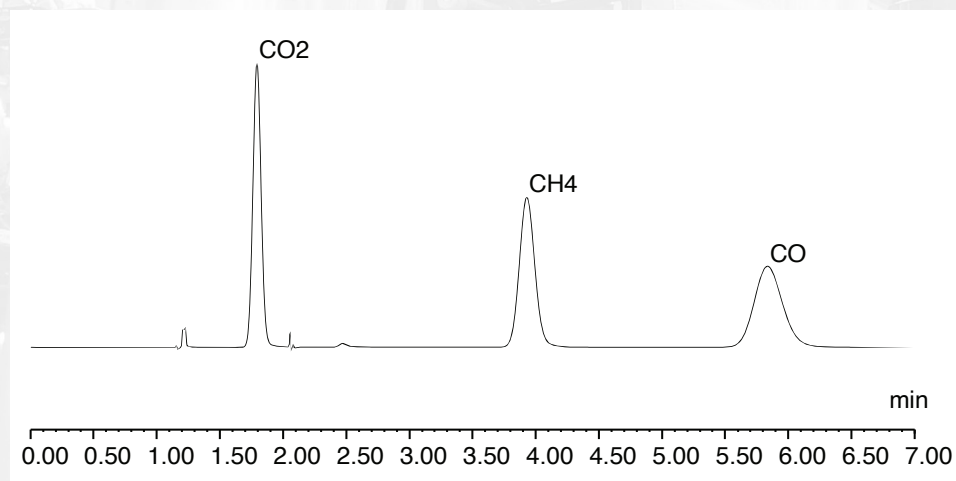
Rely on the performance and robustness of the variety of the TRACE 1610 Analyzers for the industrial gas streams analysis. These systems can be used in laboratories and in pilot/scale-up to at-line environments. Whether you need to analyze permanent gases, hydrogen, low levels of CO/CO₂, even in acid gas samples containing H₂S and other sulfur compounds, there is a system to meet your requirements.



Thermo Scientific permanent gas analyzers (PGA)		
Part Number	Description	Channels
PGA160010011	Single channel PGA	1
PGACOCO2161	Dual channel PGA including low CO/CO ₂	2
H2PGA1602011	Dual channel PGA including Hydrogen	2
H2PGAINRT1612	Dual channel PGA including Hydrogen and Sulfur compounds	2
H2PGACOCO216	Three channel PGA including low CO/CO ₂ and Hydrogen	3



Permanent gases in Helium at 500 ppm

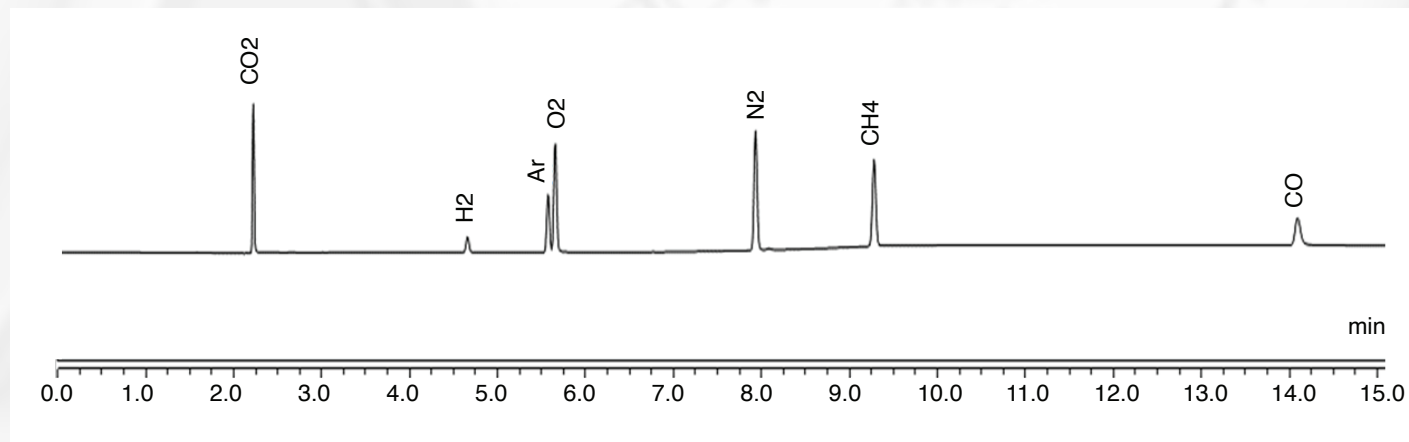


CO and CO₂ at low ppm levels in Helium

High purity gas analyzers

The TRACE 1610 High Purity Gas Analyzers are designed to cover a range of bulk gases like oxygen, hydrogen, helium, argon, nitrogen, C₂ and C₃ monomers, for impurities detection down to ppb-ppt levels by using a Pulsed Discharge Helium Ionization Detector (PDD).

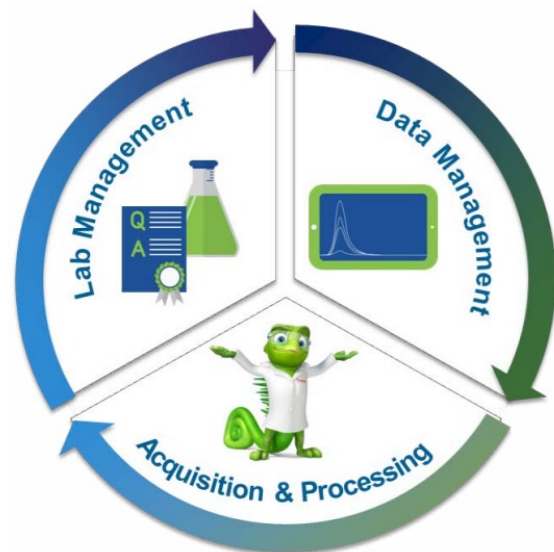
Thermo Scientific high purity gas analyzers					
Part Number	Description	Channels	ASTM D8098	ASTM D6159	ASTM D5273
TIGAOX160011	H ₂ , Ar, N ₂ , CO, CO ₂ and light hydrocarbons C ₁ -C ₄ in high purity Oxygen	1			
TIGAMS160012	H ₂ , O ₂ , Ar, N ₂ , CO, CO ₂ and light hydrocarbons C ₁ -C ₄ in high purity H ₂ , He, N ₂ , or Ar	1			
TIGAHE160013	H ₂ , O ₂ , Ar, N ₂ , CO, CO ₂ and light hydrocarbons C ₁ -C ₄ in high purity Helium.	1			
B51007466	H ₂ , O ₂ /Ar (combined peak), N ₂ , CH ₄ , CO, CO ₂ , C ₂ monomers in high purity gases	1			
IMPC2C316022	Trace impurities in C ₂ and C ₃ hydrocarbons	2	✓	✓	✓
B51007120	He, Ne, H ₂ , Kr, Xe, Ar, N ₂ , CO, CO ₂ in high purity Helium and Oxygen	3			



Example of 5 ppm impurities in high purity Helium

The power of fully integrated informatics

Thermo Scientific Integrated Software Solutions



Transform your laboratories into more agile, compliant, and data-driven environment. Thermo Scientific Integrated Software Solutions, with connectivity between the LIMS and CDS, enables real-time evaluation of results for process monitoring, ensuring that turnaround is timely and reducing the risk of lost quality or product.

- ✓ **Enhanced data integrity and compliance** with industry regulations and internal audit requirements
- ✓ **Improved workflow efficiency** reducing bottlenecks and enabling faster turnaround times
- ✓ **Centralized data management** in a single system, improving accessibility and long-term archival
- ✓ **Better decision-making and process control** enabling faster decision on refining operations, product release, or corrective actions
- ✓ **Scalability and standardization across sites** for harmonized workflows, uniform methods, and standardized reporting across global operations
- ✓ **Cost savings and reduced downtime** by reducing manual effort and data handling errors



Chromeleon CDS is a leading

chromatography data system, unifying workflows for chromatography and routine quantitative MS analysis. It allows you to run your analyses in an enterprise environment – from method creation to quantitation and library-based compound identification and offers industry-leading multi-vendor control, supporting over 500 instruments from over 20 manufacturers. With the Thermo Scientific™ SampleManager™ LIMS and

Chromeleon CDS connected as one platform, users will have complete control of all chromatography and Thermo Scientific mass spec instruments with data processing, combining two of the most common analytical techniques into a single system. SampleManager LIMS then allows you to turn that data into actionable knowledge by providing sophisticated data visualization, search, and data mining capabilities.

Learn more at thermofisher.com/gcsystems

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