

Chemical Analysis



Bruker Refinery Gas Analyzer

- Optimized GC Analysis Solutions

think forward

Gas Chromatography

Bruker Refinery Gas Analyzers

The source and composition of refinery gases varies considerably. Measuring gas composition precisely and accurately is a significant challenge in today's refinery operations. Bruker's refinery gas analyzers are designed to deliver superior, reliable results for a wide range of sources and analysis throughput requirements.

- A range of refinery gas analysis (RGA) solutions. Bruker offers RGA solutions to meet the broadest range of stream sample types and throughput requirements.
- A powerful, easy to use GC solution. Bruker's 450-GC and Galaxie™ chromatography software is a very powerful combination designed to achieve the best possible results. In addition, these systems do not require a high degree of operator skills.
- A highly flexible solution for analysis. The Bruker RGA solutions can optional be configured to analyze high pressurized gas and liquefied petroleum gas (LPG) through the use of a fully integrated Micro-Gasifier, giving the flexibility to accommodate a wide range of stream types.
- Operational procedures are fully documented. Bruker RGA analyzers not only incorporate proven GC hardware and software but also arrive pre-loaded with analysis methods, and include documentation specific to the application required.
- A comprehensive, single vendor solution. Bruker provides complete solutions. The hardware, software, application optimization, documentation, installation and performance verification are all provided by Bruker, offering an all inclusive, convenient analysis solution.

Figure 1: The 450-GC RGA has outstanding flexibility, analytical power and robustness.



● Key Benefits

Bruker solutions for refinery gas analysis

Typical sources for refinery gases include atmospheric or FCC overheads, ethylene, propylene production, fuel gas, stack gas and off gas from desulfurization. The physical stream types range from gas to highly pressurized gas or liquefied gases. Bruker's refinery gas analyzers (RGA) are 'turnkey' systems pre-configured and tuned at the factory to conform to industry standard methods including: UOP 539, DIN-51666 and ASTM D2163. The RGA systems are based on the Bruker 450-GC. To perform good analysis, the RGA is optional equipped with an integrated micro-gasifier. This sample conditioning device ensures complete vaporization of LPGs and high pressures samples to prevent any sample discrimination prior injection.

The Analyzers employ a proven and optimized multi-channel approach. They determine the concentration of individual saturated and unsaturated hydrocarbon components up to and including C5 (C6 and higher components as a composite peak) and all permanent gases, including hydrogen and hydrogen sulfide in a single analysis. Included in every system is Bruker's powerful Galaxie™ chromatography software to provide complete analyzer control, data acquisition and flexible report generation.

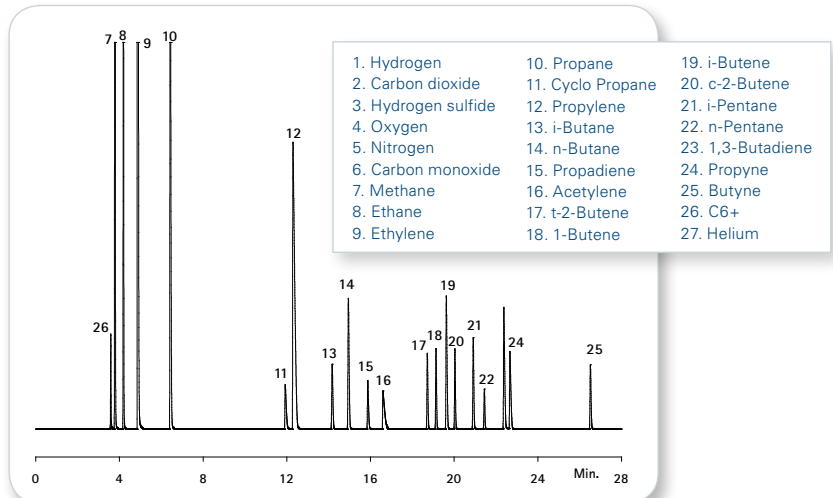


Figure 2: The separation of light hydrocarbons using the Standard RGA.

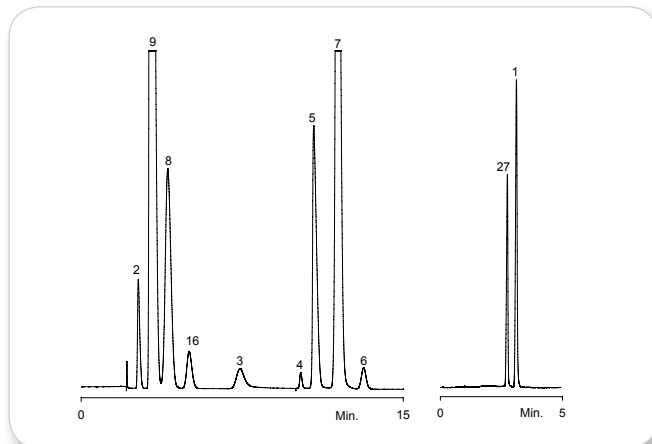


Figure 3: The analysis of the permanent gases and hydrogen (and helium) using the Standard RGA.



Figure 4: The RGA analyzers are applicable to a variety of different hydrocarbon streams.

● Bruker Refinery Gas Analyzers

Bruker offers two RGA systems to meet the widest range of analysis requirements:

- Standard RGA: A three channel 450-GC with a multi-valve design using both capillary and packed columns. The first channel is optimized for the analysis of permanent gases, the second is designed for light hydrocarbons, and the third specifically for hydrogen. The system is configured and fully tested in accordance with industry standard methods. Total analysis time for all components is less than 25 minutes.

The standard RGA analyzer is the most powerful tool to analyze the widest range of RGA type streams. This includes sample streams with a high % level of components as in ethylene, propylene and butylene streams.

- Rapid RGA: A three channel 450-GC that utilizes a multi-valve design in which the packed columns used in the Standard RGA are replaced by micro-packed columns in both the hydrogen and permanent gas channels. Since the micro-packed columns are installed in a separate heated zone, the capillary columns located in the GC oven can be temperature programmed in a more aggressive manner. For high sample analysis demand, the Rapid RGA Analyzer concept provides a substantial reduction in overall analysis time of 5 minutes (7 minutes with H₂S) compared to the 25 minutes with the standard RGA.

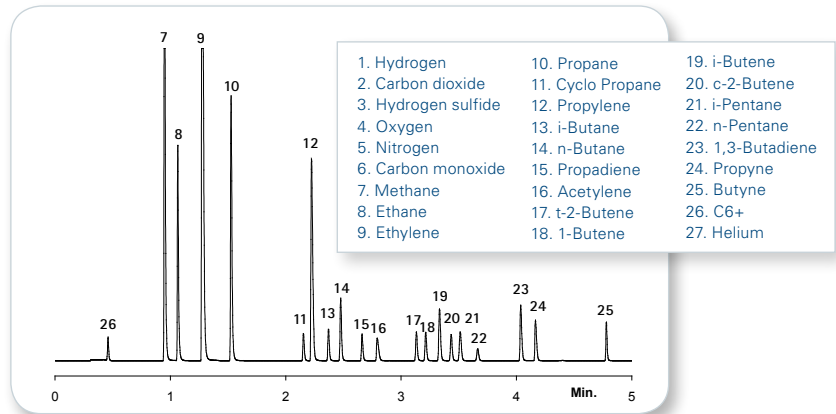


Figure 5: The analysis of light hydrocarbons using the Rapid RGA, with complete separation in less than five minutes.

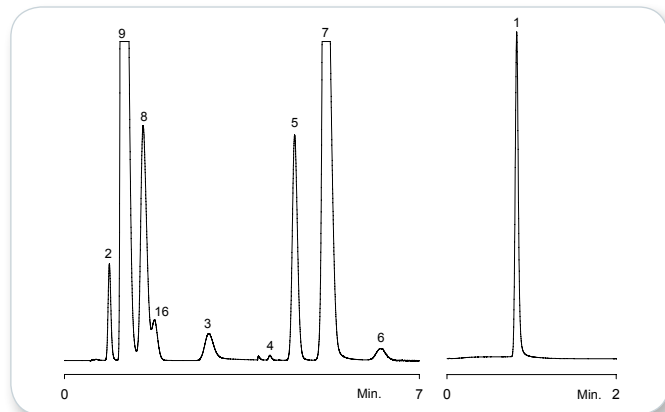


Figure 6: The analysis of permanent gases and hydrogen using the Rapid RGA.

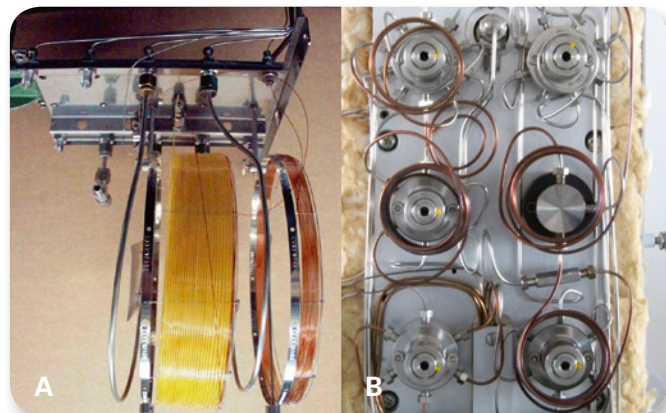


Figure 7: A shows a 'traditional' RGA with all columns mounted in oven. B shows the micro-packed columns mounted in the separate heated zone in the Rapid RGA.

● Bruker Refinery Gas Analyzers

Table 1: RGA Analyzer Characteristics.

Characteristics	Standard RGA	Rapid RGA
No. of Channels/Detectors Used	3	3
No. of Column Ovens	1	2
Analysis Time	25 min	5 min (7 min with H ₂ S)
Repeatability	<1%	<1%
Linear Bench Space Required	66 cm/26 in.	66 cm/26 in.
Minimum Component Detection Level	0.01% all components except H ₂ S = 0.05%	0.01% all components except H ₂ S = 0.05%
Suitability		
Typical Refinery Gas	Excellent	Excellent
Impurities in Bulk Ethylene	Excellent	Excellent
Impurities in Bulk Propylene	Excellent	Good
Impurities in Bulk C4	Good	Good

Table 2: Multiple channels of data are conveniently combined into a single analysis report.

Peak No.	Peak Name	Channel	RT (min.)	Result (g/l)	Norm. (%)	Area (uV/Sec.)
1	Hydrogen	Middle (TCD)	1.6967	36.0300	22.7681	390257
2	Carbon dioxide	Front (TCD)	2.6000	0.1000	0.0632	13376
3	Hydrogen sulfide	Front (TCD)	-	0.0000	0.0000	0
4	Oxygen	Front (TCD)	9.9200	0.0000	0.0000	37325
5	Nitrogen	Front (TCD)	10.3267	1.1990	0.7577	2122071
6	Carbon monoxide	Front (TCD)	-	0.0000	0.0000	0
7a	Methane	Front (TCD)	11.1917	11.9900	7.5767	1394584
7b	Methane	Rear (FID)	3.7350	11.9900	7.5767	1492388
8a	Ethane	Front (TCD)	3.5367	17.9900	11.3682	2867688
8b	Ethane	Rear (FID)	4.1283	17.9900	11.3682	4480322
9a	Ethylene	Front (TCD)	2.9550	29.9800	18.9449	4139442
9b	Ethylene	Rear (FID)	4.7217	29.9800	18.9449	7411134
10	Propane	Rear (FID)	6.1933	0.1990	0.1258	71402
11	Cyclo Propane	Rear (FID)	-	0.0000	0.0000	0
12	Propylene	Rear (FID)	-	0.0000	0.0000	0
13	i-Butane	Rear (FID)	-	0.0000	0.0000	0
14	n-Butane	Rear (FID)	-	0.0000	0.0000	0
15	Propadiene	Rear (FID)	-	0.0000	0.0000	0
16a	Acetylene	Front (TCD)	5.0283	0.5020	0.3172	49786
16b	Acetylene	Rear (FID)	16.4331	0.5020	0.3172	121300
17	t-2-Butene	Rear (FID)	18.5050	0.0990	0.0626	138647
18	1-Butene	Rear (FID)	-	0.0000	0.0000	0
19	i-Butene	Rear (FID)	19.5167	0.0990	0.0626	44492
20	cis-2-Butene	Rear (FID)	-	0.0000	0.0000	0
21	1,3-Butadiene	Rear (FID)	22.1367	0.0000	0.0000	16165
22	Propyne	Rear (FID)	-	0.0000	0.0000	0
23	C5+	Rear (FID)	2.9217	0.1000	0.0632	58164
Totals				158.2480	100.0000	

Chemical Analysis Solutions

GC quadrupole mass spectrometers

The Bruker 300-MS series GC/MS systems stand at the pinnacle of versatility for quadrupole mass spectrometer systems. Both the 300-MS and 320-MS are configurable as either single-quadrupole, or triple-quadrupole systems.

The 300-MS delivers the performance you've come to expect from an industry leader in quadrupole innovation. It features an 800 Da mass range, superior negative ion sensitivity, and unmatched robustness in its performance class. The 320-MS delivers femtogram sensitivity, 2000 Da mass range, and a wide array of chromatographic and ionization configurations to uniquely match your needs - all in less than 72 cm. (28 in.) of linear bench space!



In minutes, our 300-MS series systems can be changed from EI to CI modes of operation. Easily, our 300-MS and 320-MS are the most sensitive, robust, and flexible quadrupole GC/MS systems currently available.

ICP mass spectrometers

Choosing an ICP-MS for your elemental analysis needs has never been easier with the Bruker 800-MS Series. The 810-MS is the instrument of choice for routine analysis with industry leading sensitivity and intuitive Web-integrated ICP-MS Expert software. The 820-MS features Bruker's novel collision reaction interface (CRI), providing interference-free analysis and allowing you to tackle any application with ease. With a vast range of accessories, Bruker has the solution to all your ICP-MS application requirements.



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