

**GLOBAL™
ANALYSER
SOLUTIONS**

G·A·S



APPLICATION NOTE 202WA1012G

Natural Gas Analysers

GPA 2261, 2177, 2186, 2286
ISO 6974, 6975
ASTM D1945, D1946

G·A·S offers custom configured GC analysers for complex TCD separations, data processing and reporting. We have over 35 years of experience in designing and building turnkey analysers for many application fields. We invite you to take advantage of our latest hardware, software and column technologies to accomplish the best possible results. Our analysers are designed to meet many accepted standard methods (like GPA, ASTM, UOP, ISO, etc) in the Oil and Gas industry. The efficient hardware configurations are based on proven GC technology, resulting in robust instruments with an optimal return on investment.

Accurate natural gas analysis is important for many companies, from large gas suppliers to small end users. Since normally large volumes of natural gas are involved, small differences in BTU value have a large effect on profits.

Many NGA configurations

Natural gas analysers are used in many different configurations, from single valve/detector instruments to complex multi-channel analysers. The optimal design depends on the number of components to be analysed, the required accuracy and the analysis time. Our analysers comply with standardised methods from GPA (2261, 2177, 2186, 2286), ISO (6974) and ASTM (D1945 and D1946).

NGA 2A Extended

Configuration NGA 2A Extended is often used and covers many NGA application areas and standardised methods. It is a 2-channel configuration with TCD and FID detection. The TCD channel analyses CO₂, C₂, H₂S, (H₂), O₂, N₂, CH₄ and CO. On the FID channel hydrocarbons from C₁ up to C₂₀ and higher are analysed, including baseline separation of neo-pentane. See the chromatograms shown on the right page. The instrument is equipped with an independent heated valve oven on the right side of the instrument, with robust diaphragm valves inside which offer extended lifetime compared to rotary valves. Micro-packed columns (for TCD channel) are located in the valve oven, while a capillary column (for FID channel) is placed in the GC oven with temperature programming, allowing optimal settings for both channels.

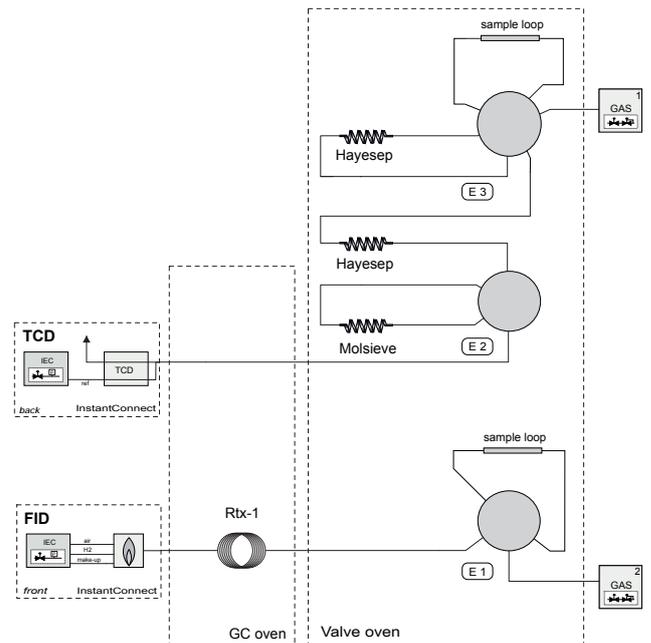


Diagram NGA2A extended



NGA 2A Extended analyser based on Thermo GC TRACE 1310



Robust process diaphragm valve for extended lifetime



InstantConnect Injector and Detector technology

Results

DATA PROCESSING AND BTU REPORTING

The Natural Gas Analyser is available with Chromeleon, ChromCard, OpenLab and EZChrom Elite/ChromQuest datasystems, for comprehensive datahandling and instrument control. Dedicated calculation modules are available for calculation of calorific value and other parameters like Gross heating value, density and compression factor.



Natural gas calculation pack for Chromeleon V2.1



Natural gas calculations			
Instrument	Trace 1300 NGA	Sequence name	Data G.A.S. NGA pack
Instrument Method	Initial gas injection	Data Vault	ChromeleonLocal
Processing Method	New Processing Method	Report Template	G.A.S. NGA Report Template
Data File	NGA mix repro TCDs	Seq. Line	10
Injection Date	08/Jul/2014	Peaks	9
Injection Time	13:21		
Calculation Type	Total		

Physical property report for the dry gas - combustion at 15°C according to ISO 6976						
Metering at 0°C and 101.325kPa						
	Molar basis	Mass basis	Volumetric basis	Calories	Wobbe Index	BTU
Sup. Calorific Value	897.41 kJ/mol	49.60 MJ/kg	40.15 MJ/m ³	2587.52 kcal/m ³	50.78 MJ/m ³	3077.55 BTU/ft ³
Inf. Calorific Value	809.73 kJ/mol	44.75 MJ/kg	36.23 MJ/m ³	8196.57 kcal/m ³	45.78 MJ/m ³	972.22 BTU/ft ³
Mean mol weight	18.093 g/mol					
Compression factor	0.9972					
Relative Density	0.6261					
Density	0.8094 kg/m ³					

Metering at 15°C and 101.325kPa						
	Molar basis	Mass basis	Volumetric basis	Calories	Wobbe Index	BTU
Sup. Calorific Value	897.41 kJ/mol	49.60 MJ/kg	38.04 MJ/m ³	9084.12 kcal/m ³	48.09 MJ/m ³	1020.97 BTU/ft ³
Inf. Calorific Value	809.73 kJ/mol	44.75 MJ/kg	34.32 MJ/m ³	8196.57 kcal/m ³	43.39 MJ/m ³	921.22 BTU/ft ³
Mean mol weight	18.093 g/mol					
Compression factor	0.9977					
Relative Density	0.6258					
Density	0.7669 kg/m ³					

Metering at 20°C and 101.325kPa						
	Molar basis	Mass basis	Volumetric basis	Calories	Wobbe Index	BTU
Sup. Calorific Value	897.41 kJ/mol	49.60 MJ/kg	37.39 MJ/m ³	8928.14 kcal/m ³	47.27 MJ/m ³	1003.44 BTU/ft ³
Inf. Calorific Value	809.73 kJ/mol	44.75 MJ/kg	33.73 MJ/m ³	8055.83 kcal/m ³	42.65 MJ/m ³	905.40 BTU/ft ³
Mean mol weight	18.093 g/mol					
Compression factor	0.9978					
Relative Density	0.6257					
Density	0.7538 kg/m ³					

Composition report (mol %)				
Component Name	Retention min	Area pA*min	Amount mol%	
Propane	1.537	48.055	1.000	
2-Methylpropane	1.938	12.705	0.200	
n-Butane	2.246	12.784	0.200	
2,2-Dimethylpropane	2.400	3.985	0.050	
2-Methylbutane	3.381	3.887	0.050	
n-Pentane	3.866	3.909	0.050	
n-Hexane	5.709	4.688	0.050	
Carbon Dioxide	3.051	9.390	1.499	
Ethane	4.913	24.868	4.000	
Nitrogen	8.215	24.166	3.998	
Methane	9.517	395.946	89.015	
Oxygen sulphide	4.176	0.022	0.001	
Carbonyl Sulfide	4.863	0.003	0.001	
Methylmercaptan	8.075	0.048	0.001	

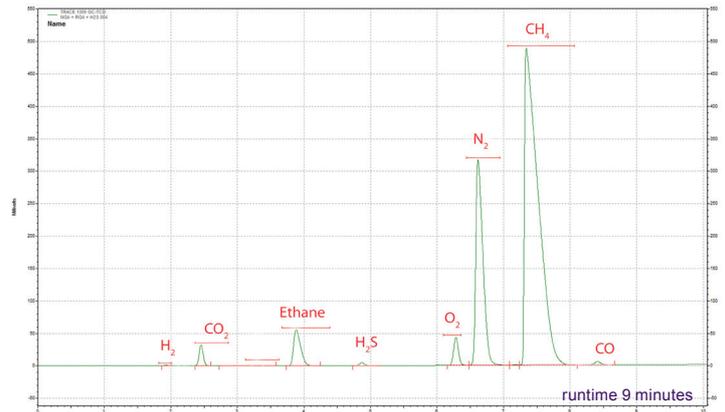
Calorific value calculation report by Chromeleon

NGA OPTIONS

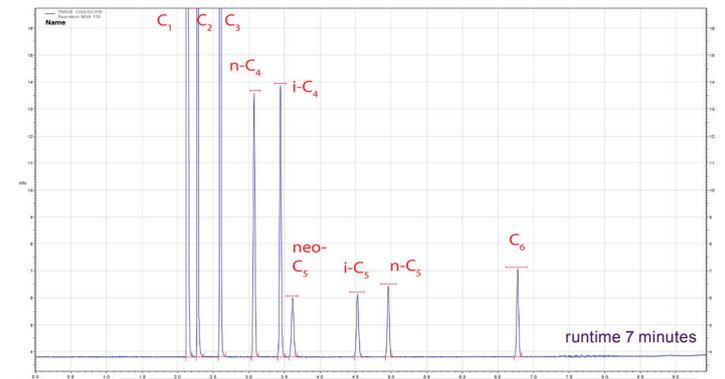
- Liquid sample valve for gas liquids.
- Additional channel with carrier gas argon or nitrogen for more accurate helium and hydrogen analysis.
- Stop flow valve or back pressure regulator to control the pressure in the sample loop (precise and repeatable sample volume).
- Stream selection valve for analysing different samples and

OTHER CONFIGURATIONS

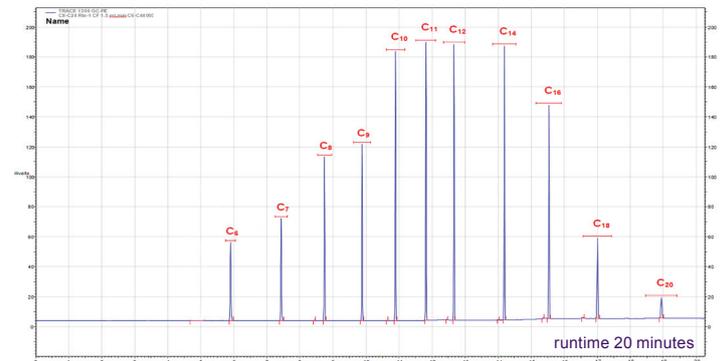
- NGA3: single detector instrument (TCD) for analysing CO₂, H₂S, (H₂), O₂, N₂, CO, C₁-C₅ and C₆+
- CompactGC: Robust NGA on a small footprint with 2 minutes runtime.



chromatogram TCD channel



chromatogram FID channel, C₁-C₆



chromatogram FID channel, up to C₂₀

TRACE 1300 GC-TCD	CO2	Ethane	Nitrogen	Methane
Sample ID	Area	Area	Area	Area
Reprotest NGA 111	2226454	5898353	5345064	90507939
Reprotest NGA 112	2217093	5902294	5346925	90445635
Reprotest NGA 113	2215965	5903676	5346602	90526422
Reprotest NGA 114	2227435	5904121	5345091	90517862
Reprotest NGA 115	2213580	5897482	5346060	90501697
Reprotest NGA 116	2217296	5901460	5349411	90488306
Reprotest NGA 117	2222737	5903879	5349656	90549145
Reprotest NGA 118	2219658	5908502	5350448	90595649
Reprotest NGA 119	2223410	5902305	5351021	90504111
Reprotest NGA 120	2217703	5904050	5353904	90638117
Reprotest NGA 121	2225062	5898589	5345321	90599110
Reprotest NGA 122	2219024	5902849	5351045	90574361
Reprotest NGA 123	2224970	5902603	5350286	90568154
Reprotest NGA 124	2226904	5901536	5349733	90598430
Reprotest NGA 125	2223668	5904325	5345351	90531033
Reprotest NGA 126	2232354	5907475	5351045	90639410
Reprotest NGA 127	2224065	5903110	5350234	90640979
Reprotest NGA 128	2219309	5904037	5352404	90670039
Reprotest NGA 129	2216183	5913463	5352165	90560228
Reprotest NGA 130	2221801	5909808	5346745	90588078

Min:	2213580	5897482	5345064	90445635
Max:	2232354	5913463	5353904	90870039
Mean:	2221734	5903696	5348926	90562235
Std Dev:	4782	3839	2770	5965.9
%RSD:	0.22	0.07	0.05	0.07

accurate quantitative results

Specifications

GC HARDWARE

Standard Methods:	GPA 2261, 2177, 2186, 2286; ISO 6974, 6975; ASTM D1945 and D1946.
Configuration:	2 channel instrument based on Thermo TRACE 1300 GC.
Optional:	Liquid sample valve, additional channel for helium/hydrogen, stop flow valve, back pressure regulator, stream selection valves.
Sample tubing:	Sulfinert® tubing for inert sample path (H ₂ S analysis).
Application:	Custom configured analyser for the analysis of gaseous and liquefied natural gas samples, containing hydrocarbons, permanent gases and sulfur (H ₂ S).
Sample requirements:	See our pre-installation guide for additional requirements.
Analysis Time:	9 minutes up to C ₈ ; 20 minutes up to C ₂₀ .
Minimum detectability:	Better than 0.01% for all individual components. H ₂ S: 0.05%.
Dynamic Range:	Four decades for all components.
Accuracy:	Dependant on external calibration and repeatability.
Repeatability:	< 0.1 % RSD for CH ₄ . (See tabel on page 3).
SOFTWARE:	Chromeleon, ChromCard, OpenLab and EZChrom Elite/ChromQuest datasystems.
Calculations:	Calorific value (sup. and inf.), mean molecular weight, compression factor, relative density, density, Wobbe index, BTU, and others on request.

For more information:

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