

## Natural gas analyser

- ASTM D1945, D1946, ISO 6974, 6975, 6976, GPA 2261, 2177, 2186, 2286
- Integrated calorific value calculation
- High accuracy
- Various options available

Get ready for tomorrow's analytics

## Global Analyser Solutions

GAS offers custom configured GC analysers for many application fields for over 50 years. GAS analysers are designed to meet many standardised methods from GPA, ASTM, UOP, ISO, EN and others. The efficient configurations are based on proven GC technology, resulting in robust, highly productive instruments with an optimal return on investment.

Accurate natural gas analysis is of vital importance since small differences in BTU value have large effects on costs and profits. GAS offers a range of Natural Gas Analysers, from single valve/ single detector instruments to comprehensive multi-channel analysers. The configuration depends on requirements like standardised methods and components to be analysed.



Figure 1 Natural gas analyser NGA-2A extended



Figure 2 Trace GC 1610 with modular injectors and detectors

#### NGA-2A Extended

Configuration 'NGA-2A Extended' is often used and covers many NGA requirements. The 2-channel instrument has 3 valves, packed and capillary columns, and TCD-FID for detection. See figure 1 and 3. The TCD channel analyses CO<sub>2</sub>,  $\rm C_2$  and  $\rm H_2S$  on Hayesep column and  $\rm H_2, O_2, N_2, CH_4$  and CO on Molsieve column, see figure 4. On the FID channel hydrocarbons from  $C_1$  up  $C_8$  and higher (i.e.  $C_{20}$ ) are measured, including baseline separation of neo-pentane, see figure 5. Robust diaphragm valves with extended lifetime are mounted in an independently heated valve oven. Micropacked columns (for TCD channel) are located in this valve oven as well, while a capillary column (on FID channel) is placed in the GC oven with temperature programming, allowing optimal settings for both channels. The analyser is based on Thermo GC1600, with modular injector and detectors, providing high flexibility and high uptime (figure 2).

#### Data processing and Calorific Value calculation

All required calculations according to ISO 6976 like Calorific Value, Gross heating value, density and compression factor, are fully integrated in Chromeleon data system, therefore data export to external software is unnecessary. The result is a reliable, user friendly and easy-workflow based system. Calculation and reporting start automatically after each run (figure 8). Figure 6 shows the excellent repeatability.



Figure 3 Diagram NGA-2A extended

### Results



Figure 4 Chromatogram TCD channel



Figure 5 Chromatogram FID channel

TRACE 1300 GC-FID Sample ID	Methane Area	Ethane Area	Propane Area	TRACE 1300 G C-TCD Sample ID	CO2 Area	E thane Area	Nitrogen Area	Methane Area
Reprotest NGA 111	20139243	1739944	640911	Reprotest NGA 111	2226454	5898353	5345064	90507939
Reprotest NGA 112	20066079	1734190	638430	Reprotest NGA 112	2217093	5902294	5346925	90445635
Reprotest NGA 113	20044487	1731425	637100	Reprotest NGA 113	2215965	5903676	5346602	90526422
Reprotest NGA 114	20036909	1732525	637037	Reprotest NGA 114	2227435	5904121	5345091	90517862
Reprotest NGA 115	20018051	1730020	636031	Reprotest NGA 115	2213580	5897482	5346060	90501697
Reprotest NGA 116	20091304	1733729	637896	Reprotest NGA 116	2217296	5901460	5349411	90488306
Reprotest NGA 117	20025051	1729628	636297	Reprotest NGA 117	2222737	5903879	5349656	90549145
Reprotest NGA 118	20075026	1735024	637270	Reprotest NGA 118	2219658	5908502	5350448	90595649
Reprotest NGA 119	19994570	1727838	636393	Reprotest NGA 119	2223410	5902305	5351021	90504111
Reprotest NGA 120	20012133	1728047	635546	Reprotest NGA 120	2217703	5904050	5353904	90638117
Reprotest NGA 121	20010572	1728331	635273	Reprotest NGA 121	2225062	5898589	5345321	90599110
Reprotest NGA 122	20031270	1730048	635984	Reprotest NGA 122	2219024	5902849	5351045	90574361
Reprotest NGA 123	19971068	1723629	634951	Reprotest NGA 123	2224970	5902603	5350288	90568154
Reprotest NGA 124	20019514	1728056	634989	Reprotest NGA 124	2226904	5901536	5349733	90598430
Reprotest NGA 125	200 02092	1728500	635194	Reprotest NGA 125	2223668	5904325	5345351	90531033
Reprotest NGA 128	19945816	1722529	632508	Reprotest NGA 126	2232354	5907475	5351045	90639410
Reprotest NGA 127	19970722	1723681	633248	Reprotest NGA 127	2224085	5903110	5350234	90640979
Reprotest NGA 128	200 0 40 32	1728207	636239	Reprotest NGA 128	2219309	5904037	5352404	90570039
Reprotest NGA 129	20023385	1729286	635917	Reprotest NGA 129	2216183	5913463	5352165	90560228
Reprotest NGA 130	19907280	1721258	634269	Reprotest NGA 130	2221801	5909808	5346745	90588078
Minc	19907280	1721258	632508	Min:	2213580	5897482	5345064	90445635
Max	20139243	1739944	640911	Max	2232354	5913463	\$353904	90670039
Mean:	200 19430	1729295	636074	Mean:	2221734	5903696	5348928	90562235
Std D ev:	51251	4519	1835	Std Dev:	4782	3839	2770	5965.9
%RSD:	0.26	0.26	0.29	%RSD:	0.22	0.07	0.05	0.07





Component	Retention	Area	Amount
Name	min	pA*min	mol%
Propane	1.537	48.055	1.000
2-Methylpropane	1.918	12.705	0.200
n-Butane	2.240	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	3.053	9.390	1.495
Ethane	4,913	24.868	4.000
Nitrogen	8.215	24.166	3.998
Methane	9.517	395.946	89.035
Dihydrogen sulphide	4.170	0.022	0.001
Carbonyl Sulfide	4.863	0.001	0.001
A father mer with	0.000	0.049	0.001

Figure 8 Calorific Value report by Chromeleon

#### NGA configurations and options

- NGA 1: (1 valve, 1 TCD); C1-C5, C6+, N2, CO2 (ISO 6974-4)
- NGA3: (3 valves, 1 TCD); C1-C5, C6+, O2, N2, CO2, H2S (ASTM D1945)
- Addition channel for low level sulphur using FPD (figure 9), PFPD (figure 7)
- Additional channel with carrier gas argon or nitrogen for accurate helium and hydrogen analysis
- Stop-flow valve or back pressure regulator to control the pressure in the sample loop (precise and repeatable volume)
- Stream selection valve for analysing different samples and calibration gases (fig. 10)
- Mass Spectrometer for ppb level detection of sulphur components, siloxanes, terpenes and ammonia. (figure 11)
- CompactGC: Fast NGA on a small footprint (2 minutes runtime)



Modular Flame Photometric Detector

(FPD) for ppb sulphur analysis

Figure 9



Figure 10 Sample stream selector

Figure 7 Optional channel for low level sulphur using PFPD. 5 ppm standard, LOD = 25 ppb

## **Specification**

NGA configuration:	NGA-2A Extended					
Standardised methods:	ASTM D1945, D1946, ISO 6974, 6975, 6976, GPA 2261, 2177, 2186, 2286					
GC instrument:	2 channel instrument based on Thermo Trace GC1600					
Optional:	Addition channel for low level sulphur using FPD or PFPD					
	Additional channel with carrier gas argon or nitrogen for accurate helium and hydrogen analysis					
	Stop-flow valve or back pressure regulator					
	Stream selector valve					
	Mass Spectrometer for ppb level detection of sulphur components, siloxanes, terpenes and ammonia					
	CompactGC <sup>4.0</sup> : Fast NGA on a small footprint (2 minutes runtime)					
	NGA 1: (1 valve, 1 TCD); C <sub>1</sub> -C <sub>5</sub> , C <sub>6</sub> +, N <sub>2</sub> , CO <sub>2</sub> (ISO 6974-4)					
	NGA 3: (3 valves, 1 TCD); C <sub>1</sub> -C <sub>5</sub> , C <sub>6</sub> +, O <sub>2</sub> , N <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> S (ASTM D1945)					
	Various configurations, please contact us					
Sample tubing:	Sulfinert <sup>®</sup> tubing for inert sample path (H <sub>2</sub> S analysis)					
Application:	Custom configured analyser for the analysis of gaseous natural gas samples, containing					
	hydrocarbons, permanent gases and sulphur (H <sub>2</sub> 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:	< 0.01% for components on TCD; H <sub>2</sub> S: 0.05%					
	< 10ppm for hydrocarbons on FID					
	< 1 ppb for sulphur components, siloxanes, terpenes on mass spectrometer (AEI)					
	< 200 ppb for sulphur components on FPD					
	< 25 ppb for sulphur components of PFPD					
Dynamic Range:	TCD: 4 decades; FID: 7 decades					
Accuracy:	Dependant on external calibration and repeatability					
Repeatability:	< 0.1 % RSD for CH, (see table on page 3)					



Figure 11 Extended NGA with large valve oven, TCD, FID and mass spectrometer

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Fully automated solutions for sample preparation