

Analyser for research on

Catalysis & renewable energy

- permanent gases, hydrocarbons, aromatics, oxygenates, sulphur, etc.
- fast: result in seconds
- small 19" footprint
- highly robust
- exchangeable columns, programmable column oven
- TCD, FID, PFPD, PDD, ePD, MS

AN 306WA0720A

GAS offers custom configured GC analysers for many application fields for over 40 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 instruments with an optimal return on investment.

In catalysis and renewable energy research fast and flexible analysers for a wide range of components are demanded. Often limited space is available, and high robustness is essential because experiments may run 24/7 continuously. GAS CompactGC^{4.0} is a proven and widely appreciated solution for these requirements.

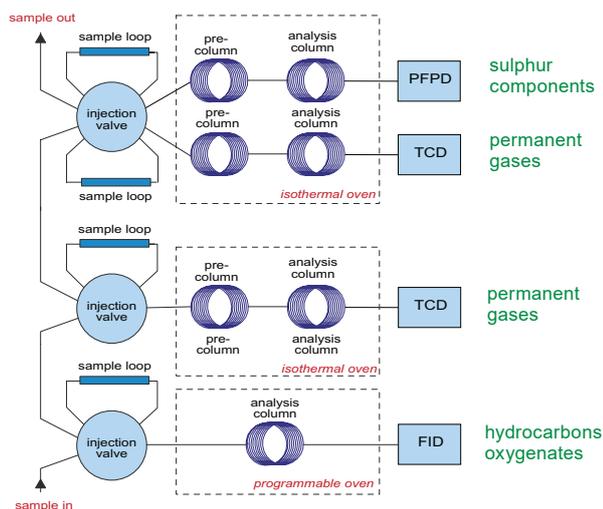


Figure 1. Example configuration CompactGC^{4.0} for catalysis and renewable energy experiments.



Figure 2. CompactGC^{4.0}

Fast analysis using 1-4 analysis channels

Fast measurement of permanent gases and hydrocarbons is frequently required in research on catalysis and renewable energy. H₂, O₂, N₂, CH₄ and CO are often analysed using Molsieve column and TCD (Thermal Conductivity Detector). CO₂, light hydrocarbons and light sulphur component are measured on Rt-QBOND column and a second TCD. A 3rd analysis channel using FID (Flame Ionisation Detector) is often applied for extended hydrocarbons measurement including isomers, up to C₂₀ (using temperature program). Research experiments often require analysis of additional components like aromatics, alcohols, ethers, aldehydes and sulphur components, which can be analysed partially using the mentioned channels. A 4th specific channel can be added for enhanced separation, for instance for low ppb level H₂S, COS, mercaptans and other sulphur compounds using PFPD (Pulsed Flame Photometric Detector). Figure 1 shows an example configuration. The channels run in parallel and have backflush columns, resulting in a short analysis time, often below 2 minutes. Analysis time equals runtime: the next analysis can start immediately, no additional flush or condition is required. See next page for chromatograms.

Programmable column oven

A programmable column oven is available for components with large boiling point range. The column is directly heated by a low mass nickel wire, resulting in efficient heating with fast heating rates up to 500 °C/min. See figure 3.

Sampling from low volume / low pressure

In research experiment often low pressure / low volume reactors are used, and accurate sampling is challenging. CompactGC^{4.0} provides a low pressure/low volume sampling option by prior vacuuming of the sample loops down to 4 mbar. As a result a few ml available sample is adequate and memory effects are avoided. CompactGC(s), sampling options and data system can be mounted in a 19" cabinet (figure 12).

Multiple sampling points

Multiple sampling streams from different reactors or catalyst are analysed by using a stream selection valve, see figure 10. The sequence is programmed by Chromeleon datasystem.

Robust & flexible

Robust diaphragm process valves guarantee unattended operation for many years (figure 11). Columns are replaced by the user in a minute, with resulting low operational cost and high flexibility.



Figure 3. Low mass wrapped analysis column provides fast heating rates

Results

Figure 4-9 show example chromatograms. Please contact us for other applications.

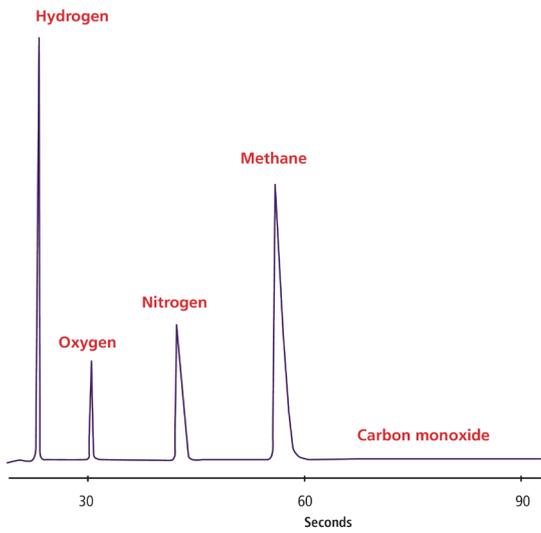


Figure 4. Permanent gases on Molsieve / TCD

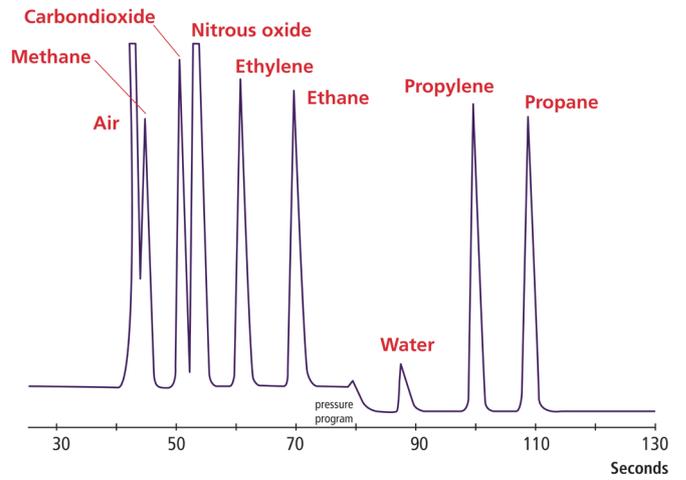


Figure 5. Permanent gases & hydrocarbons on Rt-QBond / TCD

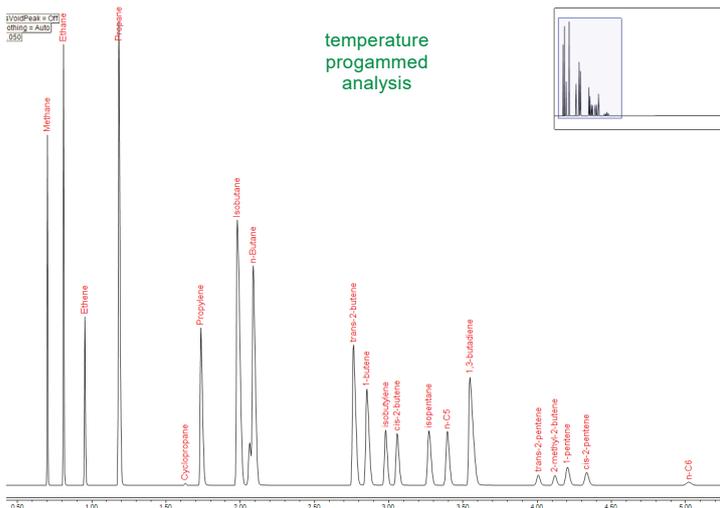


Figure 6. Hydrocarbons on MXT-Alumina-MAPD (50-200 °C) / FID

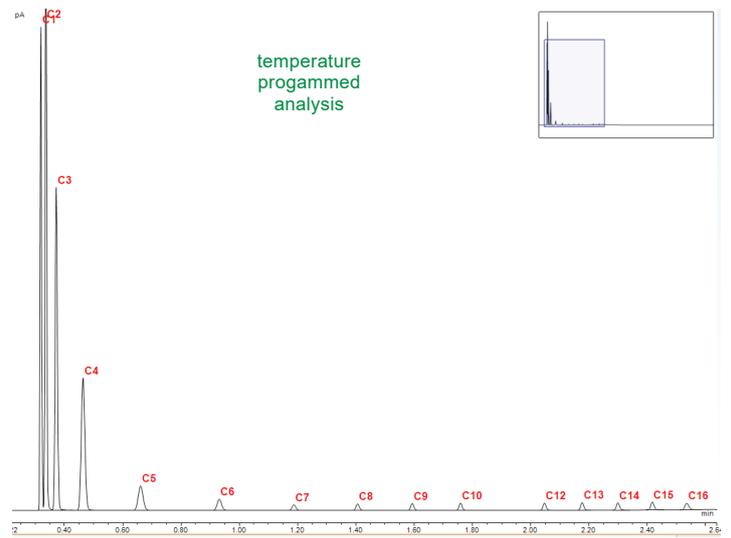


Figure 7. Baseline separation of n-paraffins C₁-C₁₆ in 2.6 minutes on Rtx-1, 3u (35-350 °C) / FID

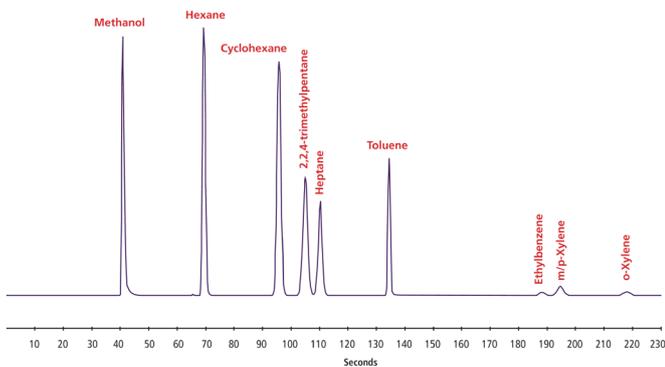


Figure 8. Hydrocarbons, aromatics and oxygenates on Rtx-1 / FID.

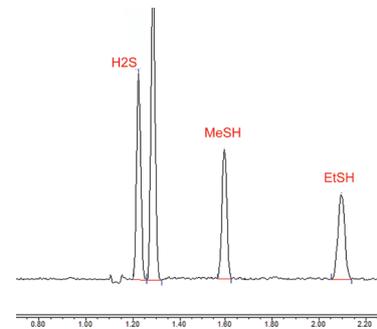


Figure 9. Sulphur components (sub-ppm level) / PFPD

Specification

Application:	Custom configured analyser for research on catalysts and renewable energy. For gaseous samples containing hydrocarbons, permanent gases, sulphur components, oxygenates, aromatics and others
Configuration:	1-4 channel analyser based on GAS CompactGC ^{4.0}
Detectors:	TCD, FID, PFPD, PDD, ePD (Enhanced Plasma Detector), MS
Column ovens:	isothermal or temperature programmed
Optional:	Configuration/channels (max. 4) depend on requirements. For example: <ul style="list-style-type: none">- additional channels for ammonia, trace H₂, siloxanes, terpenes, heavier hydrocarbons and others- stream selection valve- stop flow valve
Sample tubing:	Sulfinert® tubing for inert sample path (sulphur analysis)
Sample requirements:	See our pre-installation guide for additional requirements
Analysis Time:	depends on application; typical 2 minutes
Minimum detectability:	dependent on injection volume and column choice. Best achievable LOD: <ul style="list-style-type: none">TCD: LOD 1-3 ppmFID: LOD 25 ppbPFPD: LOD 20 ppbPDD: LOD 10 ppbMS: LOD 1 ppb
Accuracy:	Dependant on external calibration and repeatability
Repeatability:	< 0.1 % RSD
Data systems:	Chromeleon, OpenLab
Calculations:	Calorific value or custom calculations integrated in Chromeleon data-system



Figure 10.

Stream selector for analysing multiple streams



Figure 11.

Robust diaphragm valve with internal purge for millions of error-free injections



Figure 12.

Cabinet enclosure with CompactGC, data system and sampling option



Figure 13.

CompactGC is available with low pressure / low volume sampling option

**GLOBAL™
ANALYSER
SOLUTIONS**

G·A·S

MADE
IN
HOLLAND

GAS is an
Interscience company