



Light hydrocarbon analyser

- ASTM D2163, D2712, D2593, D2820, D4424, ISO 7941 and others
- Benchtop GC or fast CompactGC^{4.0}
- Modular injectors and detectors
- Expandable

AN10WA1020A

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.

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 & development and establish market pricing of finished products.

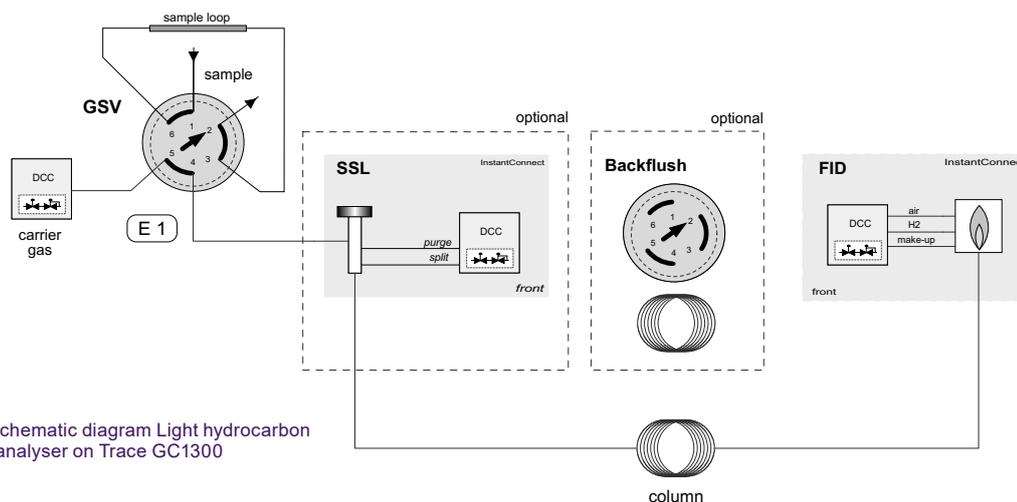


Figure 1. Schematic diagram Light hydrocarbon analyser on Trace GC1300

Experimental

Figure 1 shows the schematic diagram of the analyser. The gas sample is injected using an automatic 6-port gas sampling valve (GSV). Next the sample is transferred to the column directly, or by using a splitting device (liquid sample injector or optimised gas splitter). An optional backflush valve and pre-column are added when a single peak for the heavier components (C_6^+) is required. FID detection delivers high sensitivity and linearity.

Separation column

Both packed and capillary columns are used, however capillary columns are often preferred for their superior separation power and low bleed. Alumina plot columns are frequently used for providing most detailed C_1 - C_{10} hydrocarbon analysis and easy separation of C_4 - C_5 components, including cis/trans isomers. For heavier components, for instance up to C_{20} and higher, thick film nonpolar columns are available. Alumina columns cannot handle properly large amounts of compounds like CO_2 , H_2O , NH_3 and H_2S . In that case plot columns with porous polymers or silica can be used.

Gas and liquid type samples

Figure 1 can be extended with a GAS Vaporiser (figure 8) for gas injection of liquid samples like LPG or liquid C_4 streams. When liquid injection is preferred, the analyser is equipped with liquid sampling valve (LSV) and Sample Securitiser (figure 9). See our LPG analyser application note for more information.

GC instruments

Thermo Trace GC1300 (figure 2) and CompactGC^{4.0} (figure 7) are both available for light hydrocarbon analysis. The choice depends on components of interest, required runtime and available laboratory space. Both instrument can be extended with analysis channels for permanent gases or sulphur components and others. Up to 4 independent channels can be configured in a single instrument.

GAS analyser portfolio

Besides light hydrocarbons often analysis of additional components is required. See our application notes on refinery gas, permanent gas, aromatics, oxygenates, PIONA, detailed hydrocarbons, LPG, and natural gas / biogas.



Figure 2. Trace GC1300 with gas sampling valve and backflush option in external valve oven

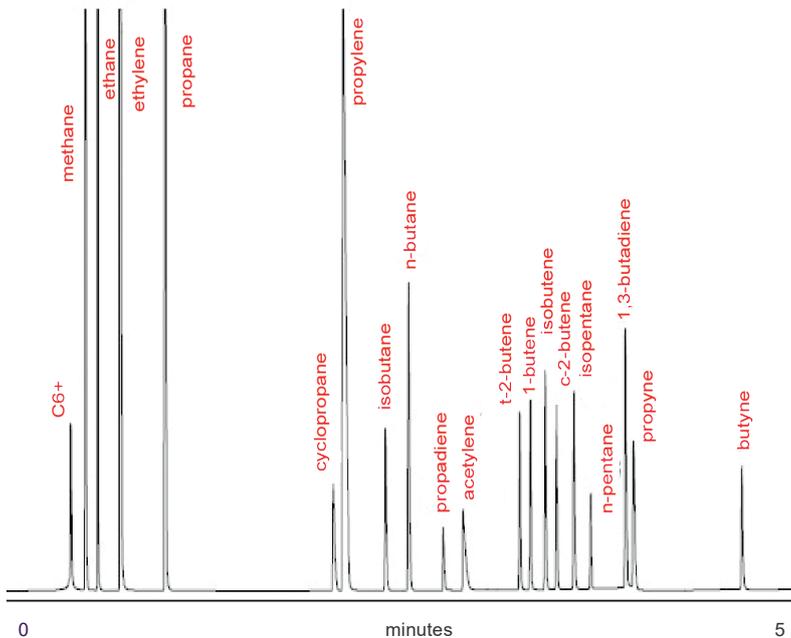


Figure 3. Chromatogram Light hydrocarbon analyser with optional C₆⁺ backflush option. column: Al₂O₃/Na₂SO₄. Trace GC1300, FID detection

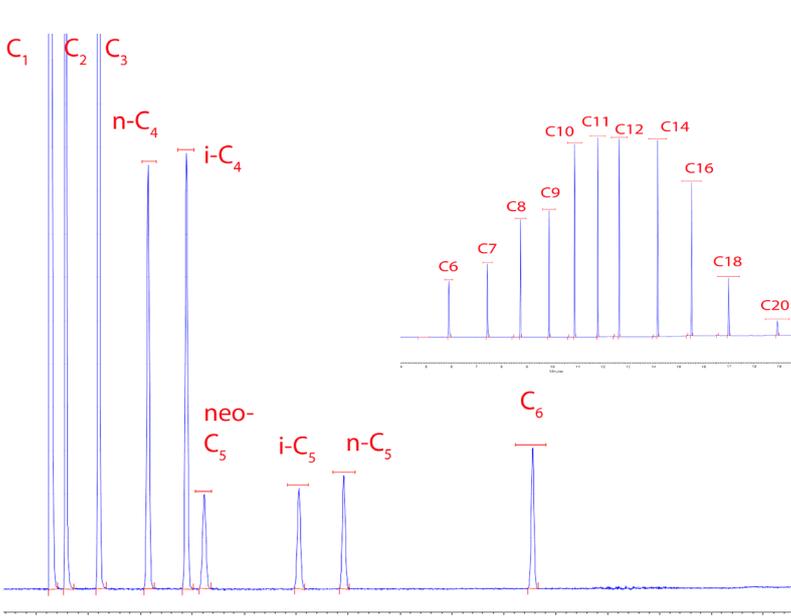
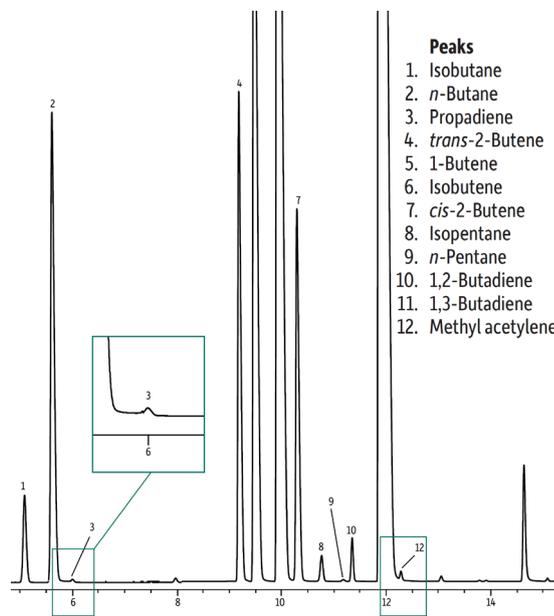


Figure 4. Light hydrocarbon analysis C₁-C₂₀. Sample: NGA standard spiked with n-alkanes. Column: Rtx-1. FID detection



- Peaks**
1. Isobutane
 2. n-Butane
 3. Propadiene
 4. *trans*-2-Butene
 5. 1-Butene
 6. Isobutene
 7. *cis*-2-Butene
 8. Isopentane
 9. n-Pentane
 10. 1,2-Butadiene
 11. 1,3-Butadiene
 12. Methyl acetylene

Figure 5. Impurities in 1,3-butadiene. Column: Al₂O₃/MAPD, FID detection

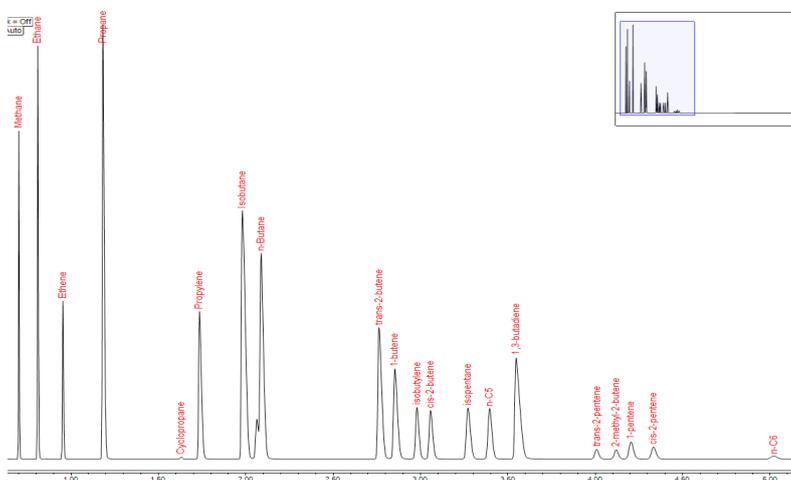


Figure 6. C₁-C₆ analysis (up to C₁₀ is possible) on CompactGC^{4.0} with programmable oven. Al₂O₃/MAPD - FID

Results

Figure 3 shows a chromatogram of light hydrocarbon analysis on GC 1300 with C₆⁺ backflush option. The used separation column is Alumina/Na₂SO₄.

When hydrocarbons above C₈/C₁₀ are required, a Rtx-1 column is used. See figure 4 (C₁-C₂₀).

Impurity analysis of 1,3-butadiene on Alumina/MAPD is demonstrated in figure 5.

CompactGC^{4.0} with Al₂O₃/MAPD and programmable column oven was applied for the chromatogram in figure 6. Temperature program: 60-200 °C). Analysis up to C₁₀ is provided when the runtime is extended.



Figure 7. 19" CompactGC^{4.0} with programmable oven

Specification

Application:	Custom configured analyser for analysis of light hydrocarbons
Application:	* C ₁ -C ₅ detailed isomer separation; C ₆ ⁺ backflush to detector * C ₁ -C ₂₀ (and heavier)
Configuration:	1 channel analyser based on Thermo GC 1300 or CompactGC ^{4.0}
Injection type	GSV (Gas Sampling Valve)
Injection type	FID
Optional:	- Vaporiser to evaporate liquid hydrocarbon samples - LSV and Sample Securitiser when liquid injection is preferred - backflush to detector of higher boiling components - Stop flow valve - extra channels for other component groups like permanent gases or sulphurs
Sample tubing:	Sulfinert® tubing for inert sample path (active components)
Sample requirements:	See our pre-installation guide for additional requirements
Analysis time:	2 to 15 minutes, dependent on components and column
Minimum detectability:	< 100 ppb
Linearity:	10 ⁷
Repeatability:	< 1 % RSD
Data systems:	Chromeleon, EZChrom



Figure 8. GAS Vaporiser for evaporation of liquid samples like LPG prior to injection by GSV



Figure 9. GC 1300 + optional Sample Securitiser for liquid injection of liquefied hydrocarbon samples.



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