



## LPG analyser

- Highest accuracy and precision
- Highest laboratory safety
- Easy to use
- ASTM D2163, D2712, D4424, D5303, D5504, D6159, D6228, D7423,  
IP 264/72 405 CD/96/97  
ISO 7941  
UOP 960

AN 203WA0718M

GAS offers custom configured GC analysers for many application fields since 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.

The GAS LPG analyser is the customised solution for determination of several components in Liquefied Petroleum Gases like hydrocarbons, oxygenates and sulphur components.

### LPG Analyser

Liquid injection of LPG samples is preferred over gas injection for accurate analysis of heavier components like C<sub>6</sub>-C<sub>10</sub> hydrocarbons. Diagram 1 shows the basic diagram for high pressure liquid sample introduction. The sample cylinder is pressurised to 7-20 bar (depending on sample type) and a dedicated LPG pressure regulator controls the pressure at the outlet of the Liquid Sampling Valve (LSV). In this way, the liquid state of the sample in the valve is guaranteed, which is essential for correct sample injection. This setup guarantees accurate quantitative results, and is preferred over manual adjustment of the sample flow. Figure 9 (p. 4) shows excellent repeatability of successive injections of a butane / iso-butane sample.

### Sample Securitiser: Safety first

When high pressures (up to 20 bar) are applied in laboratories, safe sample handling is essential. The Sample Securitiser (figure 8) complies with Pressure Equipment Directive PED 97/23/EG and ATEX Directive 94/9/EG. More details are available in a separate brochure.



### InstantConnect module concept

The GAS LPG analyser is based on Thermo Trace 1600/1610 GC. This instrument uses the InstantConnect module technology, offering a novel module design for injectors, detectors and LSV (Liquid Sampling Valve). The user can exchange modules in minutes, for high uptime and low maintenance costs. See figure 3.

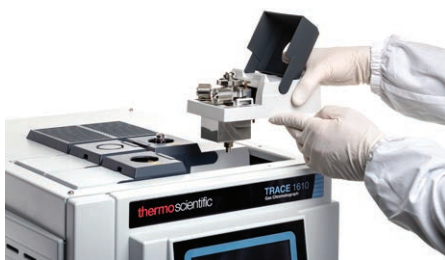


Figure 3. Thermo Trace 1600 InstantConnect injector and detector technology

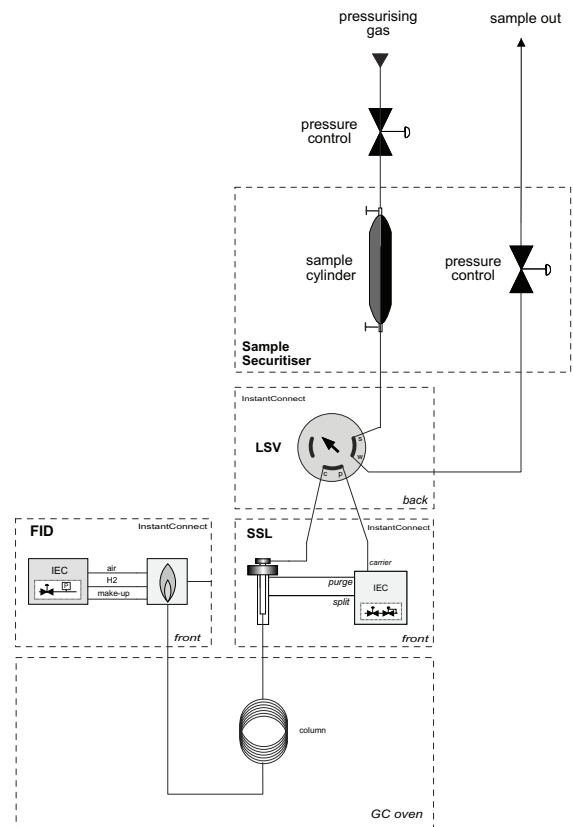


Figure 1. Diagram LPG analyser with LSV



Figure 2. InstantConnect Liquid Sampling Valve (LSV)

## Results

Figure 4 shows impurities in propylene using FID detection. In figure 5 sulphur components in propylene are analysed using PFPD (Pulsed Flame Photometric Detector) or SCD (Sulphur Chemiluminescence Detector); see also the specific application notes on low sulphur analysis. The concentration level is 1 ppm for each component. In figure 6, oxygenated components in LPG are shown (100 ppm, ASTM D7423; 0.5-100 ppm range; see the specific application note). Figure 9 shows excellent repeatability for liquid injection of butane using LSV and Sample Securitiser.

## Sample Securitiser/LSV - Vaporiser/GSV

Injection of LPG samples by Liquid Sampling Valve and Sample Securitiser is the preferred technique for analysis of C<sub>1</sub>-C<sub>10</sub> hydrocarbons. In case of measurement of light hydrocarbons and permanent gases in LPG, injection by GSV (Gas Sampling Valve) is a good alternative. In that case the Vaporiser is used to obtain a gaseous sample. GSV is also used for the analysis of light hydrocarbons streams like C<sub>1</sub> and C<sub>2</sub>. GSV and LSV can be mounted in series, injecting on the same column.

Figure 7. Vaporiser for injecting LPG as a gas



## Backflush option

Analysis of C<sub>1</sub>-C<sub>5</sub> (detailed separation) and C<sub>6</sub>+ (single backflush peak) is available by adding a 'backflush to detector' option to the analyser. A backflush configuration based on Deans switching is offered as well.

## Multi-channel instruments

The LPG analyser can be combined with other methods in one base unit. For instance simultaneous analysis of hydrocarbons and sulphur components, or an additional channel for a specific analysis like propyne in 1.3-butadiene.

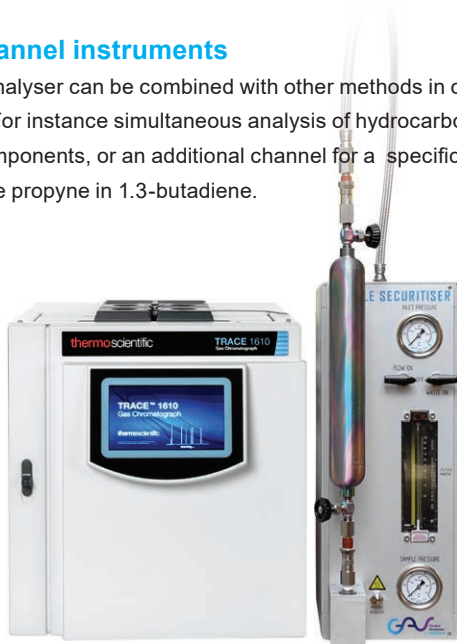


Figure 8. Trace GC1600 with Sample Securitiser

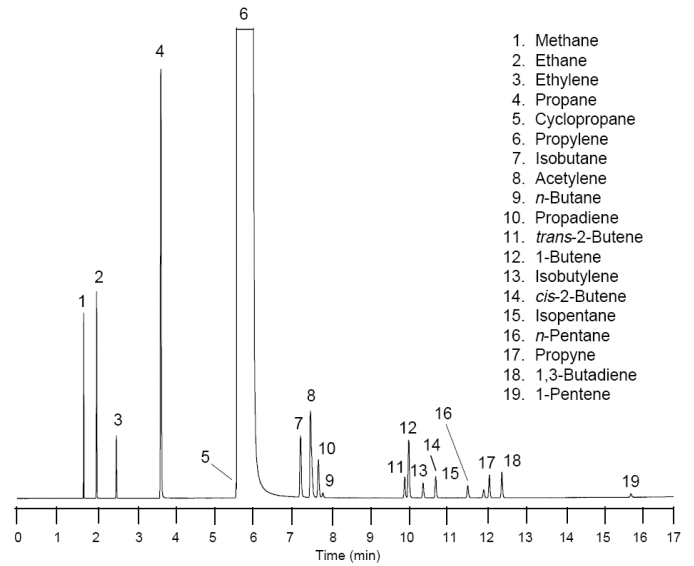


Figure 4. Impurities in Propylene. FID detector

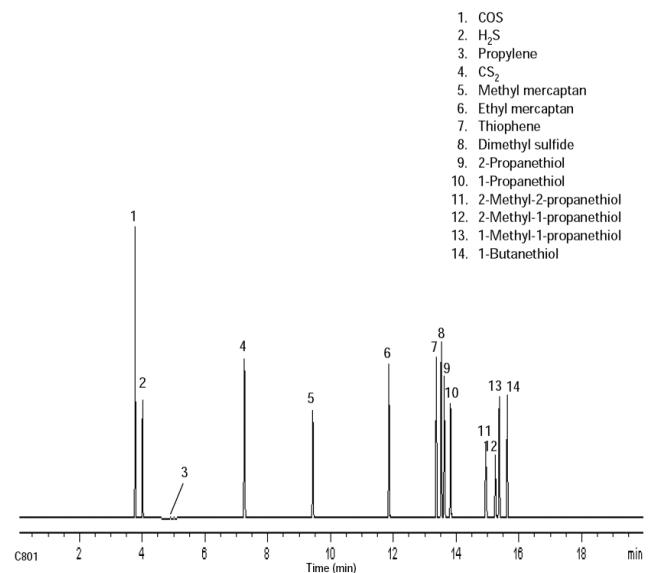


Figure 5. Sulphur components in LPG. PFPD detector

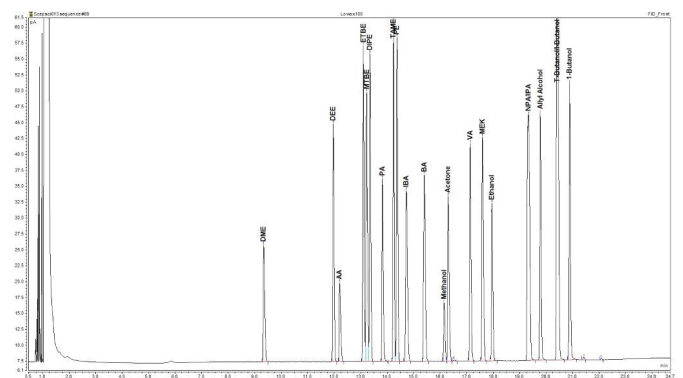


Figure 6. Oxygenated components in LPG, 100 ppm level. (ASTM D7423, 0.5-100 ppm range)

## Specifications

- Standardised method:** ASTM D2163, D2712, D4424, D5303, D5504, D6159, D6228, D7423  
 IP 264/72, 405, CD/96/97  
 ISO 7941  
 UOP 960
- Configuration:** 1 channel instrument for liquid injection of LPG samples, expandable to 4 channels. Detector depending on application: FID for hydrocarbons, PFPD or SCD for sulphur compounds, TCD and PDD for permanent gases, and others. Liquid Sampling Valve (LSV) for liquid injection of LPG samples
- Optional:**  
 -Sample Securitiser for accurate and safe high pressure injection of LPG samples  
 -Vaporiser in case of optional GSV  
 -Gas injection valve (GSV) ; optional stop-flow valve  
 -Backflush to detector of C<sub>5</sub>+ or C<sub>6</sub>+ fraction  
 -Multi channel system for combined methods  
 -Auto sampler for unattended analysis of 10 sample cylinders
- Sample tubing:** Sulfinert® tubing for inert sample path (H<sub>2</sub>S analysis).
- Application:** Custom configured analyser for the analysis of LPG and gaseous samples, containing for example hydrocarbons, sulphur compounds or oxygenated compounds. The instrument is factory tuned for the specific application intended.
- Sample requirements:** See our pre-installation guide for additional requirements.
- Analysis Time:** Depending on application.
- Minimum detectability:** Hydrocarbons: down to 0.5 ppm, depending on sample loop volume and separation, sulphur compounds: < 100 ppb S, depending on sample loop volume and separation.
- Dynamic Range:** 7 decades for FID, others depending on specific detector.
- Accuracy:** Depending on external calibration and repeatability.
- Repeatability:** Better than 1% RSD (depending on application and configuration).

TRACE GC-FID	I-Butane	Butane
Instrument Name	Area	Area
Trace GC Valve Inj	75405191.00	112744059.00
Trace GC Valve Inj	74636676.00	111717664.00
Trace GC Valve Inj	74925955.00	111509437.00
Trace GC Valve Inj	75377429.00	112744895.00
Trace GC Valve Inj	75092654.00	112570174.00
Trace GC Valve Inj	73793171.00	110533659.00
Trace GC Valve Inj	74145739.00	110950372.00
Trace GC Valve Inj	74078879.00	110862094.00
Trace GC Valve Inj	74135522.00	111265145.00
Min:	73793171.00	110533659.00
Max:	75405191.00	112744895.00
Mean:	74617912.89	111655276.56
Std Dev:	606575.71	849350.84
%RSD:	0.81	0.76

Figure 9. Repeatability LPG analyser (LSV + Sample Securitiser)



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GC & GC-MS solutions



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