



Universal Natural Gas Analyzer for Natural Gas and Natural Gas Liquids by Capillary Gas Chromatography, Available as a Preconfigured Agilent Technologies Analyzer

Application Note

Universal Natural Gas Analyzer

Authors

Kelly Beard, Shannon Coleman
Agilent Technologies, Inc.
USA

Introduction

A gas chromatography method has been developed for the analysis of permanent gases and extended hydrocarbons with an optional C1-C6 with a C6+ group, in natural gas and natural gas liquids. The gas chromatograph configuration consists of two channels. One channel is configured with a liquid and gas sample valve in series with a split inlet and a microfluidics Capillary Flow Technology (CFT) Deans Switch configured with a HP-PLOT Q and a Molsieve PLOT capillary column, interfaced with a single thermal conductivity detector (TCD). The TCD channel is used for the analysis of permanent gases and light hydrocarbons. The second channel is configured with a liquid and gas sample valve in series with a split inlet and DB-1 column interfaced with a flame ionization detector (FID) for the analysis of extended hydrocarbons. Additionally, the FID channel has a backflush to a detector 6-port valve, for a composite hexanes plus group when the extended hydrocarbon analysis is not required, and a shorter analysis time is desired. This configuration allows for the analysis of both permanent gases and extended hydrocarbons in natural gas, natural gas liquids (NGL), or liquefied petroleum gas (LPG) in a single analysis using capillary columns, with the option of an abbreviated C6+ composite analysis.



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Orderable parts:

- SP1 7890-0627: Universal Natural Gas Analyzer
- G3440B Option 2 × 112 (Capillary S/SI inlet with EPC)
- G3440B Option 1 × 210 (FID w/EPC)
- G3440B Option 1 × 220 (TCD with EPC)
- G3440B Option 1 × 301 (Three channel aux EPC)
- G3440B Option 1 × 305 (Factory plumbing for quick installation)
- G3440B Option 1 × 502 (Gas sampling valve loop, 0.25 cc)
- G3440B Option 1 × 504 (Gas sampling valve loop, 1cc)
- G3440B Option 1 × 708 (6-Port valve - sequence reversal)
- G3440B Option 1 × 752 (Two automated valves)
- G3440B Option 1 × 800 (10-Port valve - user specified)
- G3440B Option 1 × 860 (Interface a GSV or LSV to S/SI inlet)
- G3440B Option 5 × 872 (Zero volume union to 0.53 mm column)
- G3440B Option 1 × 874 (Install valve downstream)
- G3440B Option 1 × 888 (Deans Switch)
- SP1 option 7890-0020 (Supply second option 860)
- G3440B Option #44K (Installation)
- G3440B Option #44L (Familiarization)
- G3440B Option 1 × 852 (LSV, 0.5 µL sample volume)
- G3440B Option 1 × 854 (LSV, 1 µL sample volume)
- G3440B Option 2 × 861 (Mounting bracket for LSV)

The Agilent Technologies Application Note 5991-2886EN [1] describes "Analysis of Permanent Gases and Extended Hydrocarbons in Natural Gas and Natural Gas Liquids by Capillary Gas Chromatography", see Figure 1.

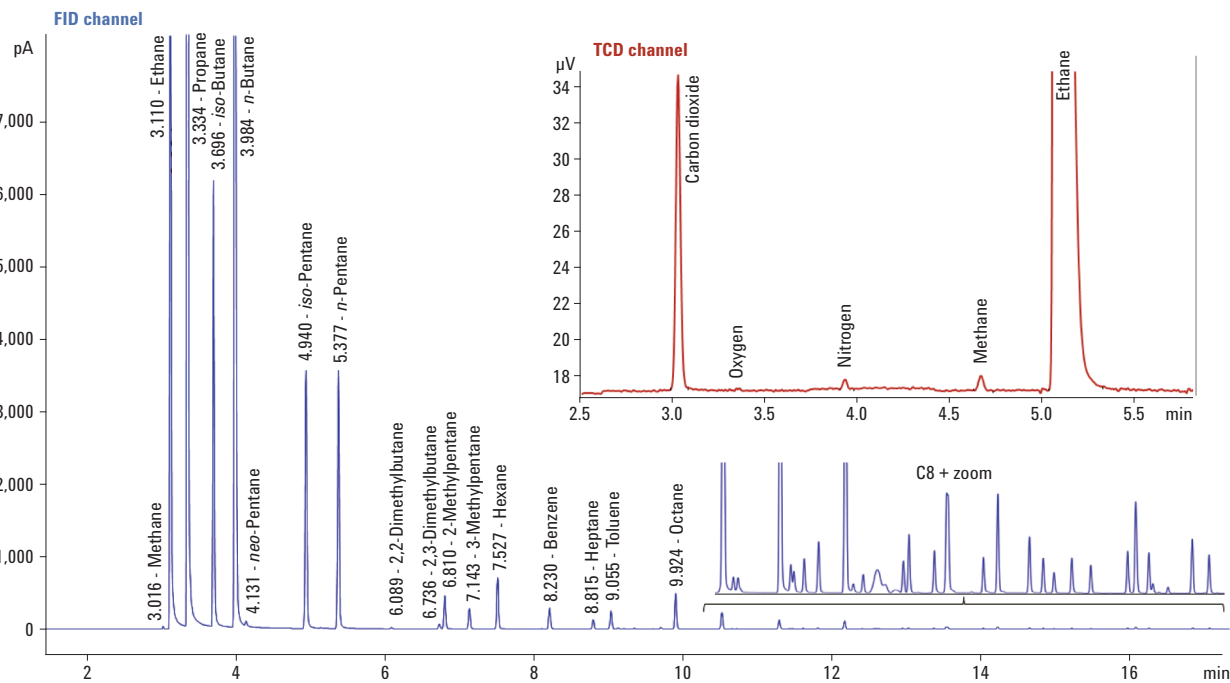


Figure 1. Extended natural gas from Application Note 5991-2886EN.

Results and Discussion

By adding the backflush to detector 6-port valve in this configuration, a composite of hexanes plus peak was achieved at the beginning of the chromatogram; see the chromatogram in Figure 2. This configuration provides entry into a capillary column equivalent to GPA 2186 [2], GPA 2286 [3], GPA 2261 [4], and GPA 2177 [5]. The system is highly configurable. The TCD channel allows the separation of all permanent gases, and can be extended to analyze out through C6 on the PLOT Q column. With the inclusion of a backflush valve, the system can be configured for either the analysis of extended hydrocarbons, or composite backflush when the extended analysis is not necessary.

Conclusion

Using a Capillary Flow Technology Deans Switch configured with a single TCD, and a second channel configured with an FID and backflush to detector 6-port valve provides an excellent solution for almost all natural gas chromatographic needs on a single instrument. The use of capillary columns improves speed, precision, resolution, and sensitivity compared to the packed column methods typically used for this analysis. The system is configurable with either gas sample valves, liquid sample valves, or both liquid and gas sample valves for analysis of a variety of sample phases in a single analysis.

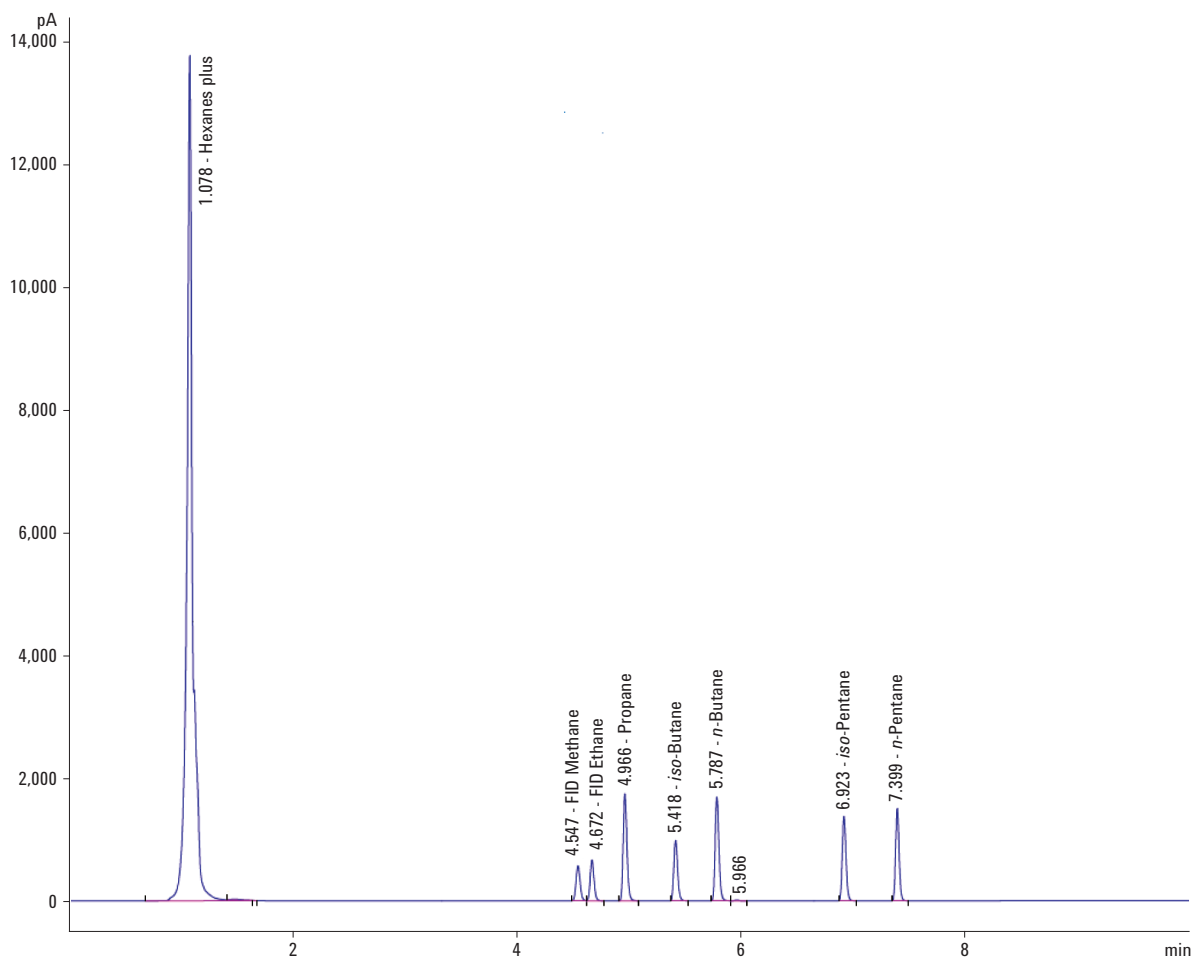


Figure 2. Hexanes plus composite.

References

1. S. Coleman, Analysis of Permanent Gases and Extended Hydrocarbons in Natural Gas and Natural Gas Liquids by Capillary Gas Chromatography *Agilent Technologies*, publication number 5991-2886EN, August, **2013**.
2. GPA Standard 2186, "Method for the Extended Analysis of Hydrocarbon Liquid Mixtures Containing Nitrogen and Carbon Dioxide by Temperature Programmed Gas Chromatography" Gas Processors Association, 6526 East 60th Street, Tulsa, Ok 74145.
3. GPA Standard 2286, "Method for the Extended Analysis of Natural Gas and Similar Gaseous Mixtures by Temperature Program Gas Chromatography" Gas Processors Association, 6526 East 60th Street, Tulsa, Ok 74145.
4. GPA Standard 2261, "Analysis for Natural Gas and Similar Gaseous Mixtures by Gas Chromatography" Gas Processors Association, 6526 East 60th Street, Tulsa, Ok 74145.
5. GPA Standard 2177, "Analysis for Natural Gas Liquid Mixtures Containing Nitrogen and Carbon Dioxide by Gas Chromatography" Gas Processors Association, 6526 East 60th Street, Tulsa, Ok 74145.

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