

DVLS Low Oxygenates Analyzers

Determine Oxygenate Traces in Hydrocarbon Matrices

To prevent the poisoning effects of oxygenates on catalysts in downstream polymerization processes it is essential to determine the oxygenate traces in hydrocarbon feedstocks. Also regulations require the analysis of oxygenates in fuels, even at ppm level. Da Vinci Laboratory Solutions (DVLS) offers a range of Low Oxygenates (LowOx) Analyzers to determine oxygenate traces in hydrocarbon matrices such as crude oils, gases and gasolines.

Application Range

The DVLS Low Oxygenates Analyzers comply with the ASTM D7059, D7423, D7754 or UOP 960 test methods to characterize oxygenates traces in Hydrocarbon Matrices.

Test Method	Analysis
ASTM D7059	Methanol traces in Crude Oil
ASTM D7423	Trace Oxygenates in C2—C5 Hydrocarbon Matrices and Hydrocarbon Liquids with a BP <250°C
ASTM D7754	Trace Oxygenates in Automotive spark-ignition Engine Fuels
UOP 960	Trace Oxygenated Hydrocarbons in Refinery Gases, LPG and Liquid Hydrocarbons

Table One: Application Range of the DVLS Low Oxygenates Analyzers

Low Oxygenates UOP 960 Analyzer

The DVLS Low Oxygenates Analyzer complies with UOP 960 to determine trace levels of individual oxygenated hydrocarbons, with boiling points up to 138°C, in refinery gas streams, C4 liquefied petroleum gas (LPG), light isomerate and naphtha. Mono-oxygenated hydrocarbons determined include C1-C5 alcohols, C2-C6 carbonyls and ethers.

The system requires a valve configuration with a non-polar column to hold the Hydrocarbons and a Lowox column to separate the oxygenates.



Figure One: DVLS Low Oxygenates UOP 960 Analyzer

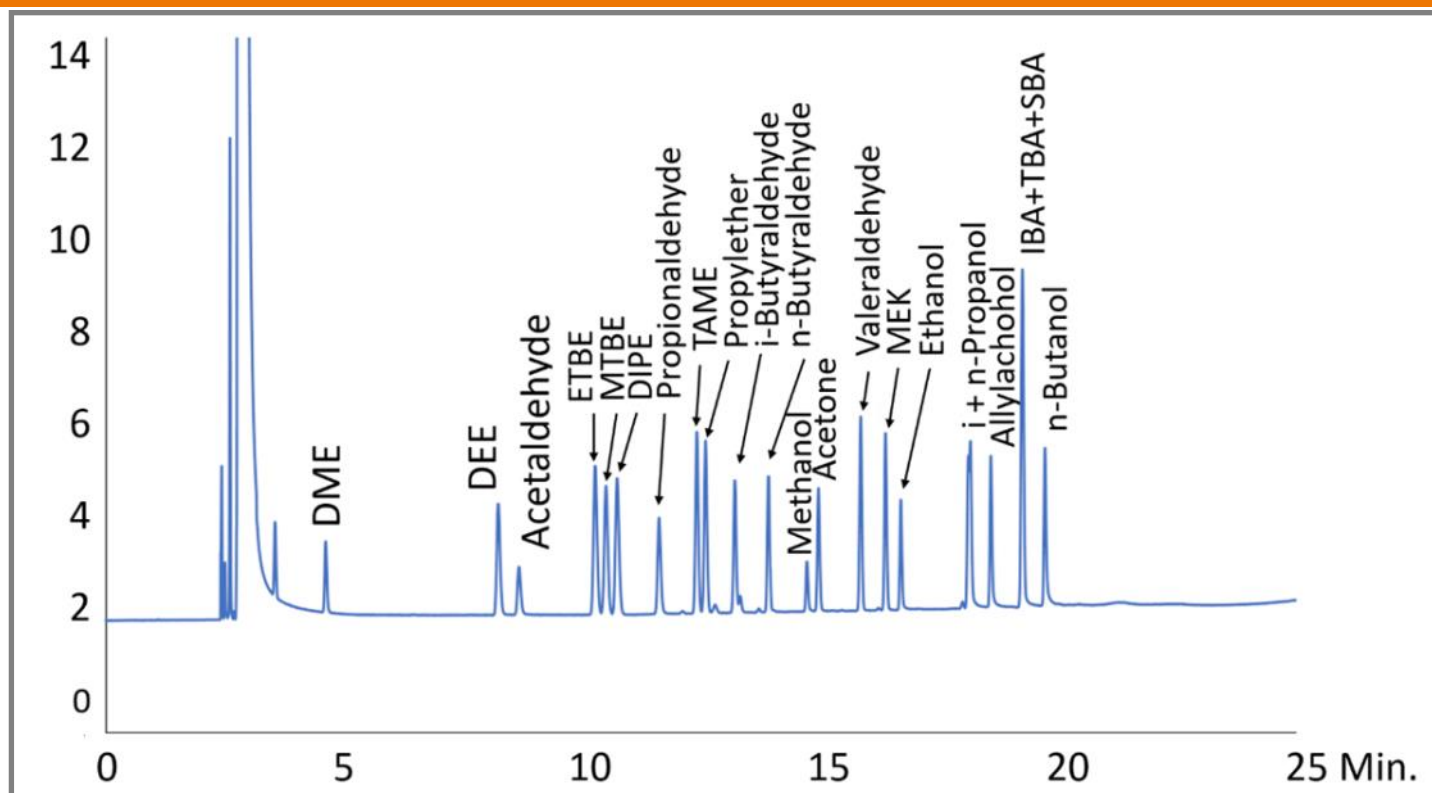


Figure Two: ASTM D7754 Analysis of Oxygenates in Naphtha/Pygas Matrices

Low Oxygenates D7423/D7754 Analyzer

Da Vinci offers a GC solution that complies with ASTM D7423 & D7754 for the analysis of oxygenate traces, such as alcohols and ethers, in gasoline & liquid hydrocarbon matrices.

The DVLS Low Oxygenates Analyzer is based upon the Agilent 8890 Gas Chromatograph (GC) with built-in intelligence and electronic pneumatic control (EPC).

The Agilent GC is configured with a Deans switching bracket, a Programmable Temperature Inlet (PTI) or split/splitless inlet to determine the oxygenate traces.

The Deans switching technique cuts the components of interest from the matrix. One capillary column analyzes the oxygenate traces and another column monitors the valve timing.

The oxygenates will then be separated by carbon number. A pre-column followed by an analytical column and a Deans switching valve are used to separate the sample components. The high boiling point compounds are retained on the pre-column. Oxygenates and low boiling point hydrocarbons elute to the analytical column, where the oxygenates on the front of the column elute during a temperature program of the GC oven.

The high boiling compounds are then transferred to the monitor column and detected by the FID.



Figure Three: The DVLS Low Oxygenates D7423 Analyzer



Figure Four: the Liquid Sampling Valve

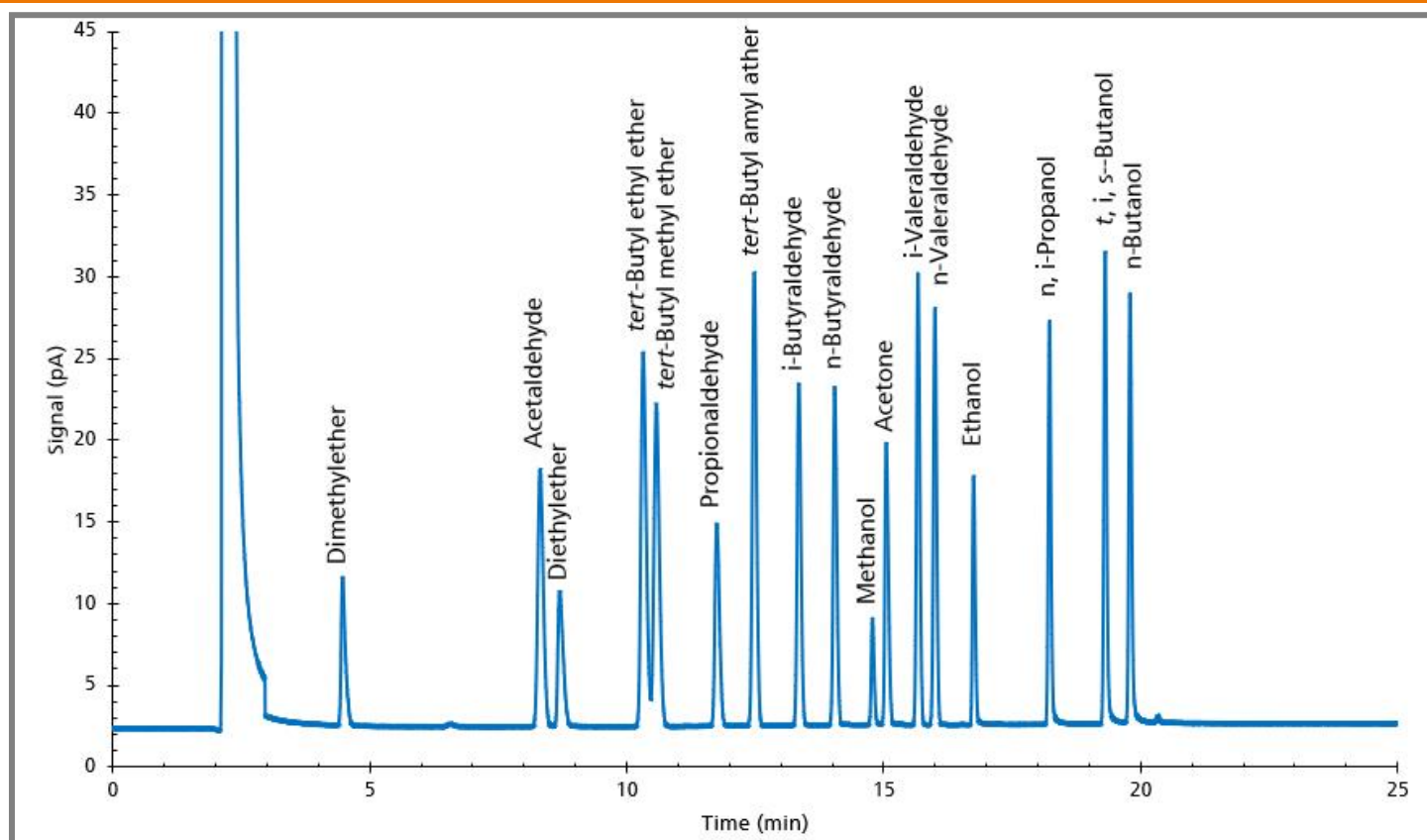


Figure Five: ASTM D7423 Analysis of 10 mg/kg Oxygenates in n-Butane

Configuration

The DVLS Low-Oxygenates D7423/D7754 Analyzer uses the Agilent 8890 Gas Chromatograph (GC) configured with:

- a Flame Ionization Detector (FID)
- an additional FID (optional)
- an Automatic Liquid Sampler (optional)
- a Split/Splitless injection port or Programmable Temperature Inlet
- Capillary columns
- a Deans switching bracket
- a Pressure Station (optional)
- a Liquid Sampling Valve (optional)
- a Gas Sampling Valve (optional)
- a Liquefied Gas Injector (optional)

Customized Analysis

Select the following options to customize your analysis:

- an additional Flame Ionization Detector for additional analysis;
- a Liquid Sampling Valve or Gas Sampling Valve for the sampling of liquefied gases;
- a Liquefied Gas Injector for the direct injection of liquefied gases;
- a Pressure Station for a representative sample introduction.

Injection of Liquefied Gases

The Liquefied Gas Injector (LGI) is a dedicated GC solution for direct injection of C3 - C4 streams. The LGI is connected to a standard GC injector needle, which is inserted into a GC injection port. Solenoid activation transfers the pressurized liquid sample directly onto the GC inlet.

The direct injection approach of the Liquefied Gas Injector (LGI) is based on the proven fuel direct injection technique used by the automotive industry. The LGI is used to achieve ppb level detection limits for the analysis of trace oxygenates.

Online Demonstration



[Check out the demonstration video](#) on the Liquefied Gas Injector.

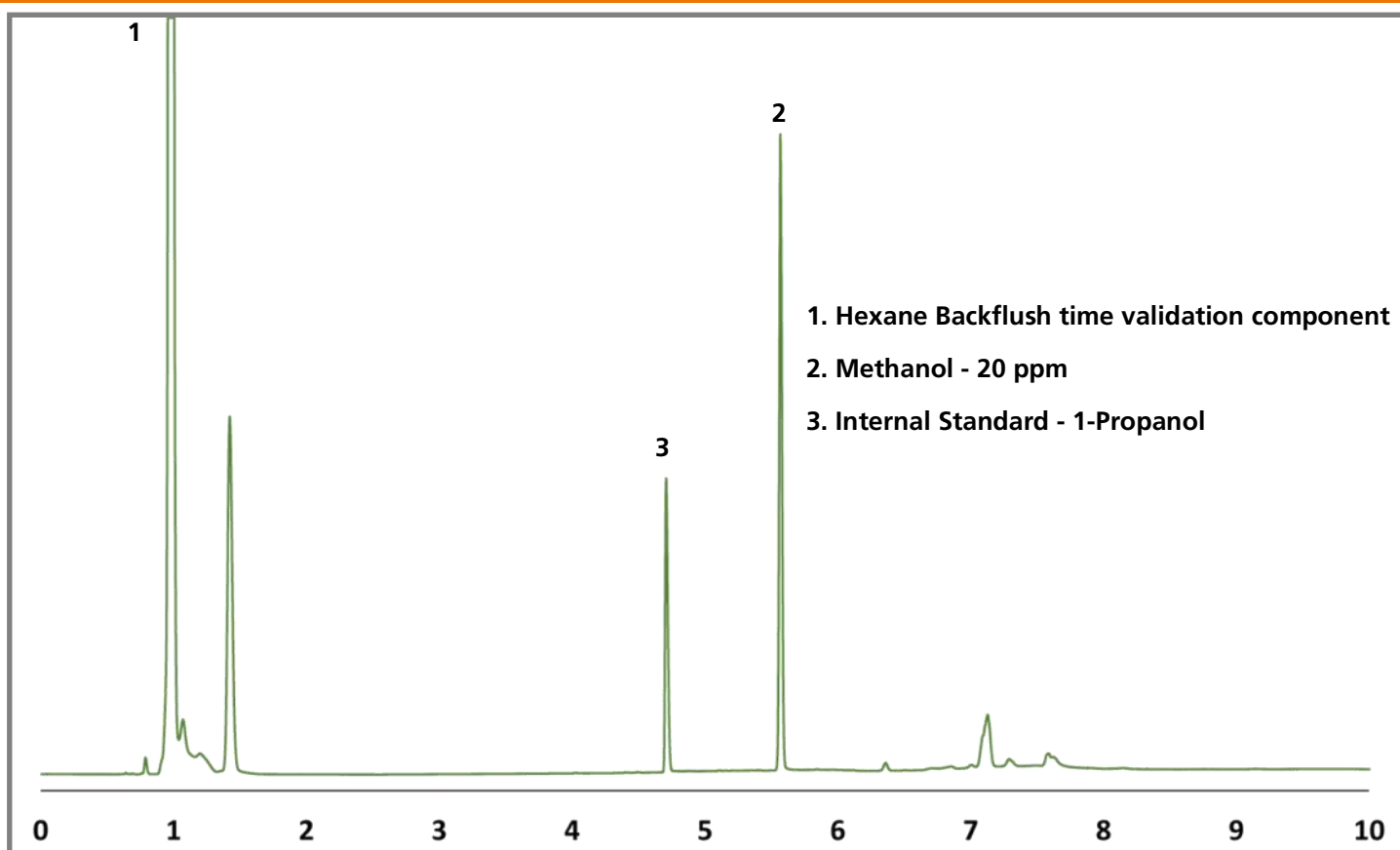


Figure Six: ASTM D7059 Analysis of Methanol in Crude Oil

Low Oxygenates ASTM D7059 Analyzer

The Low Oxygenates D7059 Analyzer characterizes Methanol traces in Crude oils and is based upon the Agilent 8890 GC with built-in intelligence and electronic pneumatic control (EPC). The Agilent GC is configured with a Programmable Temperature Vaporizer (PTV) which allows the system to backflush heavier components and to detect the oxygenate traces with an FID detector.

Backflushing heavier matrix components will prevent the contamination of the inlet and columns.



Configuration

The DVLS Low-Oxygenates D7059 Analyzer uses the Agilent 8890 Gas Chromatograph (GC) configured with:

- a Flame Ionization Detector (FID)
- an additional FID (optional)
- an Automatic Liquid Sampler
- a Programmable Temperature Vaporizer (PTV)
- Capillary columns
- a Mid Point Backflush setup



Figure Seven: The Oxygenates ASTM D7059 Analyzer

DVLS Low Oxygenates Analyzers



Figure Eight: The DVLS Pressure Station

Representative Sample Introduction

To allow a safe and representative sample introduction of a (liquefied) gas Da Vinci Laboratory Solutions developed the DVLS Pressure Station.

The Pressure Station introduces a (liquefied) gas sample into a chromatographic system and keeps the pressure at a constant level.

The design of the DVLS Pressure Station offers you a high flexibility. For a representative analysis, the liquefied gas sample must remain in a liquid phase under constant pressure during the GC injection. This is especially required for LPG or other liquefied gases.

The DVLS Pressure Station keeps the sample pressurized to control the outlet pressure and flow. Optionally the Pressure Station can also be configured with a vaporizer for a gas injection. The waste sample is vented to a central waste system to ensure laboratory safety.



Performance Specifications

The linear working range for oxygenates is at least 0.50 mg/kg to 100 mg/kg in C2 to C5 streams according to ASTM D7423.

Lower detection limits can be achieved using the DVLS Liquefied Gas Injector.

Key Benefits

- ☑ Analyzers comply with ASTM D7059, D7423, D7754 or UOP 960
- ☑ High quality GC hardware based on Agilent platform
- ☑ Multidimensional setup of the configurations
- ☑ Analysis of individual oxygenates in various hydrocarbon matrices down to 100 ppb
- ☑ Dedicated options available to customize your oxygenates analysis

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