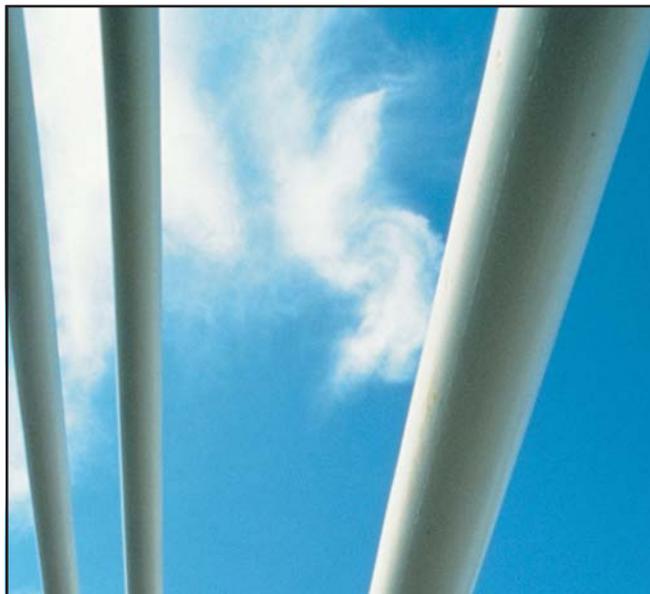


# Refinery Gas

Analysis by Gas Chromatography



*Engineered Solutions, Guaranteed Results.*



WASSON-ECE  
INSTRUMENTATION

# Refinery Gas Analysis

## Method Compliance

- UOP 539
- ASTM D7833
- ASTM D1946 - TCD analysis
- ASTM D2163 - FID analysis

## Reliability & Precision

Wasson-ECE has been generating repeatable data through innovative engineering for over 30 years.

## Efficiency

Wasson-ECE provides high speed multi-dimensional chromatography.

## Wasson-ECE Instrumentation Refinery Gas Analyzers

Wasson-ECE Refinery Gas Analyzers are an integral part of any refinery or petrochemical lab. These analyzers provide valuable information regarding plant operations, unit optimization, and quality control. Refinery Gas Analyzers often carry the heaviest sample loads because of the critical information they provide.

### Comparison Chart

	383	583	383D	783	783D
Run Time (minutes)	15	7	Method 1: 15 Method 2: Varies	Method 1: 15 Method 2: 25	25
Detectors	TCD/TCD/FID	TCD/TCD/FID	TCD/TCD/FID 4th Detector	TCD/TCD/FID	TCD/TCD/FID FID
Number of Valves	5	5	6+	6	6
Liquid Sample Valves	Optional	Optional	Optional	Optional	Optional
EPC	Yes	Yes	Yes	Yes	Yes
Fused Silica Tubing	Optional	Optional	Optional	Optional	Optional
On-Line Availability	Yes	Yes	Yes	Yes	Yes

### Components

	383	783/ 783D	383D	583
H <sub>2</sub>	■	■	■	■
CO	■	■	■	■
CO <sub>2</sub>	■	■	■	■
Ar/O <sub>2</sub>	■	■	■	■
N <sub>2</sub>	■	■	■	■
H <sub>2</sub> S	■	■	■	■
C <sub>1</sub> -C <sub>7</sub>	■	■	■	
C <sub>1</sub> -C <sub>5</sub>				■
C <sub>5</sub> -C <sub>12</sub>		■		
BTEX		■		
Additional Options for the 383D				
Sulfurs			■	
Oxys			■	
Amines			■	
CO/CO <sub>2</sub>			■	

The refinery gas family of applications is designed to provide a flexible approach to meet your analytical requirements. As a premier channel partner of Agilent Technologies, Wasson-ECE extends the capabilities of the 7890 GC to meet three key requirements of refinery gas analysis: reliability, efficiency, and precision.



# Introduction

## Multi-Dimensional Chromatography

Wasson-ECE solutions are built on an Agilent 7890 GC allowing for easy integration into the lab or process. The 7890 with two inlet positions, up to four detector positions, and two positions for rotary valves in the programmable oven, is the premier multi-dimensional gas chromatograph.



The Wasson-ECE auxiliary oven holds up to an additional five rotary valves and seven columns, further expanding the analytical capabilities.

The addition of a second thermal zone allows unique temperature programming of the permanent gas analysis and the hydrocarbon analysis for easier method development and troubleshooting.

The Wasson-ECE auxiliary oven can be configured to contain an on-board vaporizer for the repeatable analysis of liquids. Alternatively, liquid sampling valves can be mounted in the side carrier panel.

The Wasson-ECE auxiliary oven's removable insulated cover provides easy access for routine maintenance.



### Guaranteed Solution

All Wasson-ECE systems are guaranteed and have a one year warranty on the hardware and the application.

### Customization

All instruments are designed to customer's specific needs including detection limits, concentration ranges, analysis time, unique sets of compounds, backflushes, and carrier gases.

### Superior Service and Support

Wasson-ECE is committed to service and support. Every instrument is installed and calibrated by a trained engineer. Our engineers take the time to train operators on all aspects of the system.

Service engineers are on call Monday through Friday to provide phone and e-mail technical support on the hardware and the application.

Comprehensive, customizable service contracts are also available.

### Comprehensive Approach

Wasson-ECE provides comprehensive gas chromatography service and support including laboratory hardware, custom engineering solutions, unique sampling systems, calibration standards, replacement parts, and training classes.

# Application 383 - Standard Refinery Gas Analysis

## The 383 TCD Channel

Dual TCDs detect hydrogen, carbon dioxide, ethane, ethylene, acetylene, hydrogen sulfide, oxygen/argon composite, nitrogen, and methane to a lower detection limit of 100 ppm for hydrogen, 200 ppm for carbon monoxide, 300 ppm for hydrogen sulfide, and 100 ppm for all remaining components.

## Optional Configurations

Liquid sampling valves for the sampling of liquefied petroleum gas (LPG).

Backflush can be tailored for individual streams.

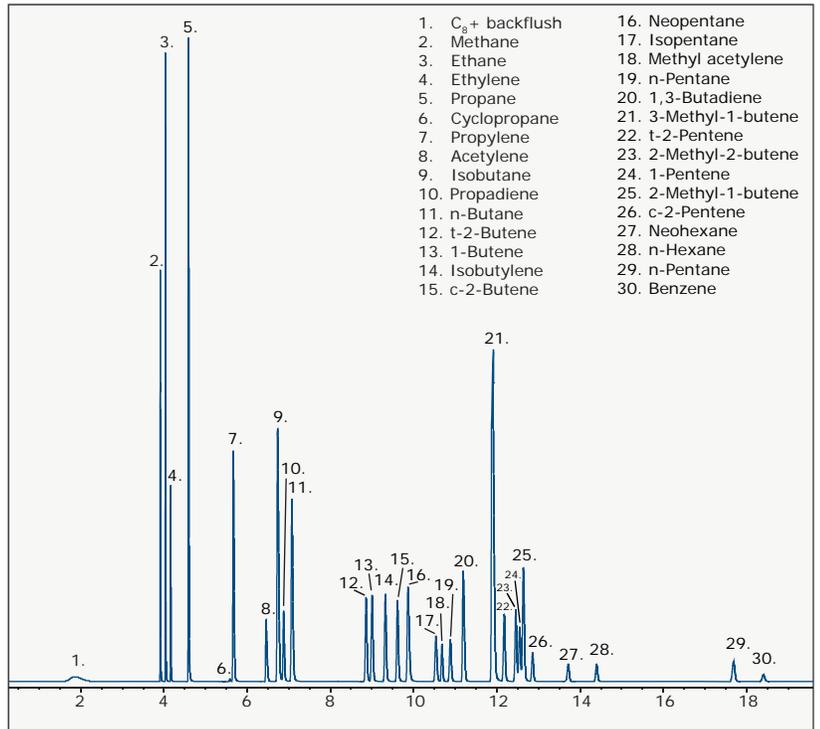
High temperature injection for heavy fractions.

Analysis of percent level of water.

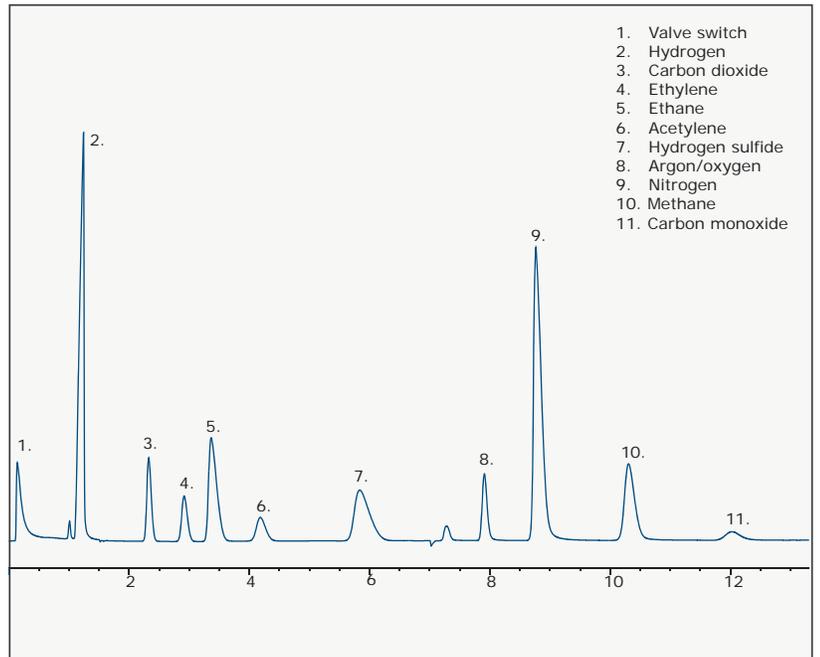
On-board vaporizer for liquid or gas sampling.

## The 383 FID Channel

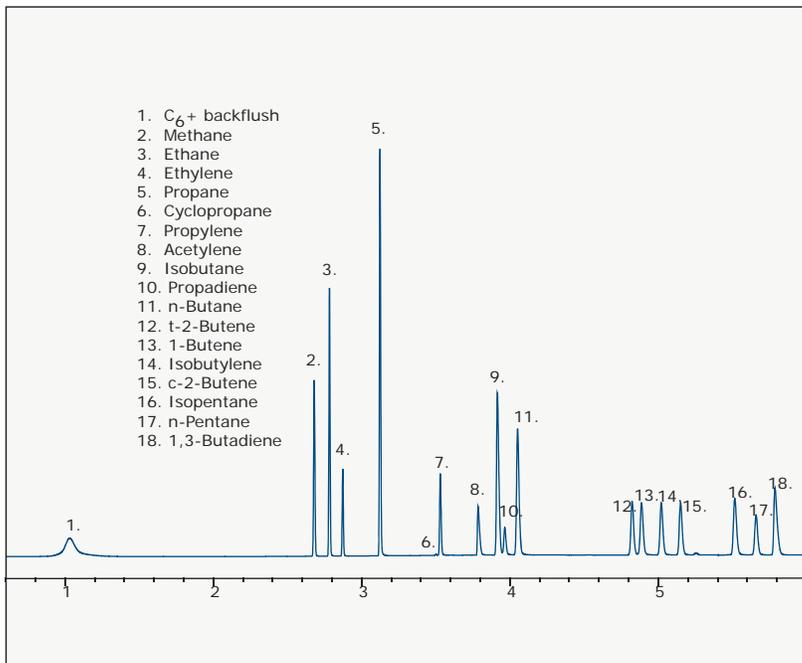
The FID detects C<sub>1</sub> through C<sub>7</sub> paraffins and olefins to a lower detection limit of 10 ppm.



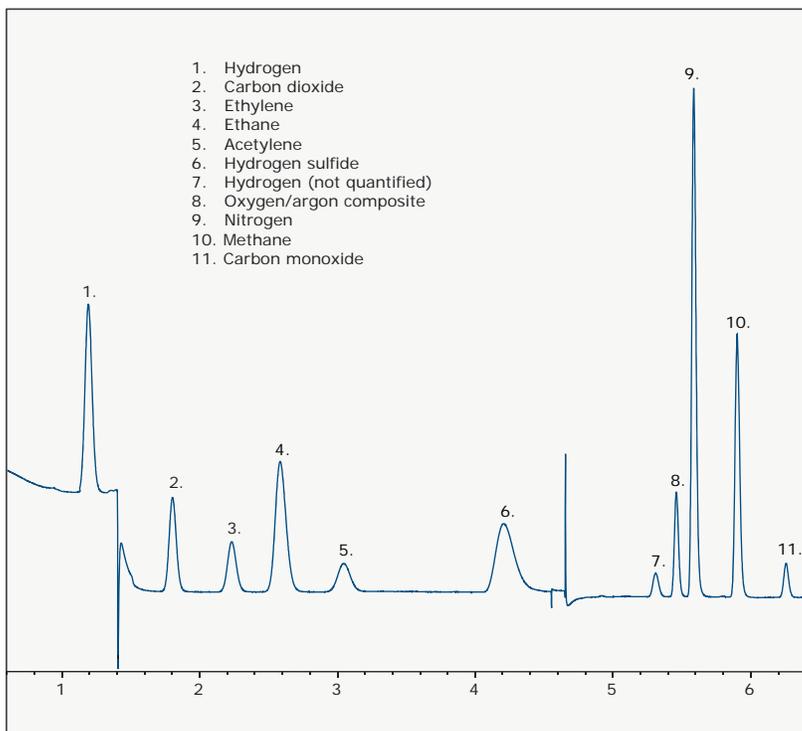
The 383 Refinery Gas Analyzer allows for detailed analysis of feed stocks through the use of multiple detectors. Permanent gases are detected by dual thermal conductivity detectors while a flame ionization detector simultaneously quantifies C<sub>1</sub> to C<sub>7</sub> hydrocarbons. The analysis is complete in less than 20 minutes.



# Application 583 - Fast Refinery Gas Analysis



The 583 Refinery Gas Analyzer allows for a rapid analysis of feed stocks. The analysis is complete in less than 7 minutes. This configuration allows the flexibility of a longer analysis if higher resolution is required.



## The 583 FID Channel

The FID analyzes C<sub>1</sub> through C<sub>5</sub> paraffins and olefins with an initial C<sub>6</sub>+ backflush. The FID channel is configured with hydrogen carrier to maximize analysis speed.



## The 583 TCD Channels

Dual TCDs detect hydrogen, carbon dioxide, argon/oxygen composite, nitrogen, methane, carbon monoxide, carbon dioxide, ethane, ethylene, acetylene, and hydrogen sulfide. The TCD channel is configured using the latest micropack and capillary column technology to provide maximum separation in the minimum amount of analysis time.

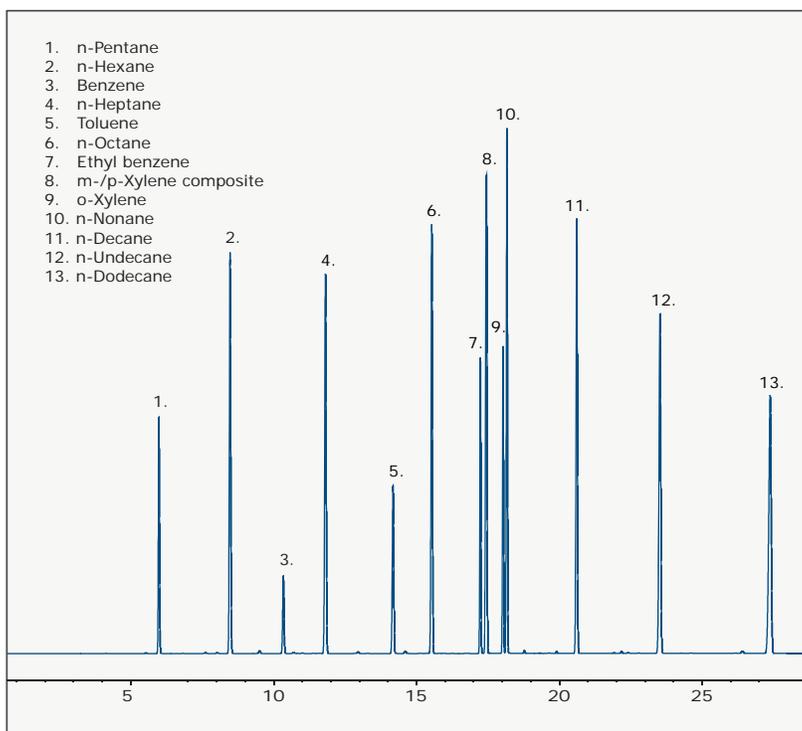
# Application 783 & 783D - Extended Hydrocarbons

## 783D Heavy Hydrocarbons by Second FID

The 783D extends the capability of the 383 or 583 applications by adding an extra capillary column and a second FID. This feature allows the system to analyze heavier hydrocarbon fractions and BTEX simultaneously with the standard refinery gas analysis.



The 783 and 783D Refinery Gas Analyzers allow for the extended hydrocarbon analysis of C<sub>5</sub> to C<sub>12</sub> paraffins, benzene, toluene, ethylbenzene, and xylenes.



## 783 Heavy Hydrocarbons by Second Method

The 783 uses an additional valve to analyze heavier hydrocarbons and BTEX in a second method using a single FID.



# Application 383D - Super Refinery Gas Analysis

## Four Detector Super Refinery Gas Analyzer

The four detector Super Refinery Gas Analyzer is completely customizable. By using Wasson-ECE dual thermal conductivity detectors with single signal peak summing capabilities, a fourth detector can be added to the instrument.

### Cost Effective

Two instruments can be combined into one with a multi-dimensional Wasson-ECE Super Refinery Gas Analyzer. Instead of purchasing a separate gas chromatograph, a second method can be added using the fourth detector and the expanded capacity for additional columns and valves in the Wasson-ECE auxiliary oven.

### Versatile

The fourth detector is completely customizable. Wasson-ECE thermal conductivity detectors are located on the side of the gas chromatograph in the manual pneumatics carrier panel. Dual Wasson-ECE thermal conductivity detectors have a unique capability to combine outputs into a single signal which leaves a detector position open for any standard Agilent Technologies detector or any detector capable of operating on an analog input board.

#### Additional Methods

- ASTM D5504
- ASTM D5623
- ASTM D7423
- ASTM D6729
- ASTM D6730
- UOP 960
- ASTM D6228
- ASTM D7754

#### Optional Fourth Detectors

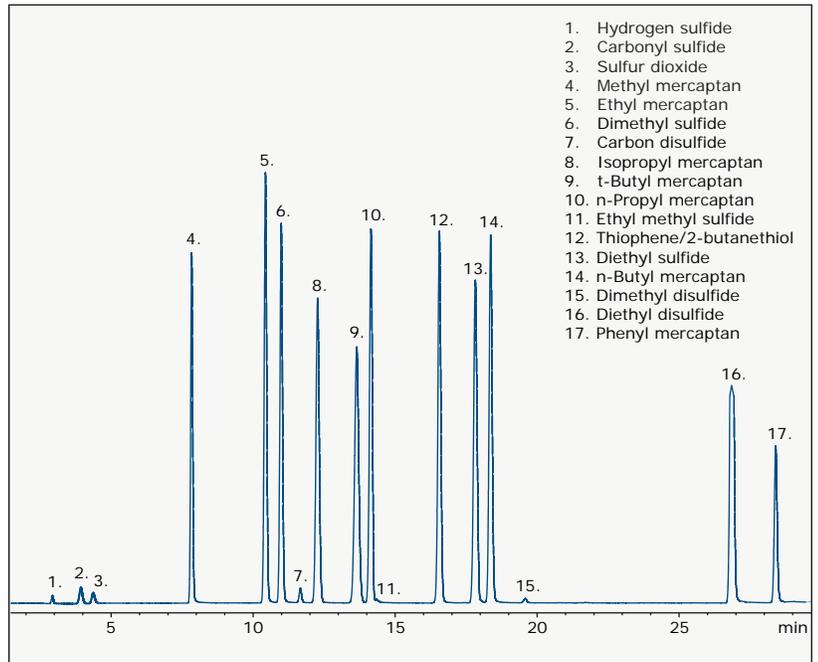
- Flame Ionization Detector (FID)
- Thermal Conductivity Detector (TCD)
- Methanizer-FID
- Sulfur Chemiluminescence Detector (SCD)
- Nitrogen Chemiluminescence Detector (NCD)
- Flame Photometric Detector (FPD)
- Pulsed Flame Photometric Detector (PFPD)
- Mass Spectrometer Detector (MSD)
- Photoionization Detector (PID)
- Electron Capture Detector (ECD)



# Application 383D-SCD - Sulfur Analysis

## Sulfur Methods

- ASTM D5504
- ASTM D5623
- ASTM D6228

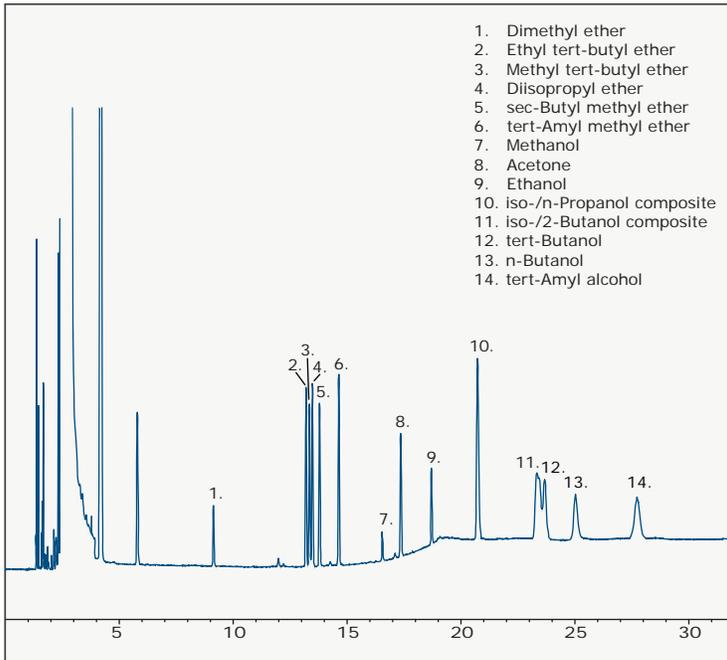


The 383D-SCD Refinery Gas Analyzer can be configured with a sulfur selective detector for the analysis of trace sulfurs in gases or pressurized liquids for environmental monitoring or feedstock quality determinations.

## Sulfur Selective Detectors

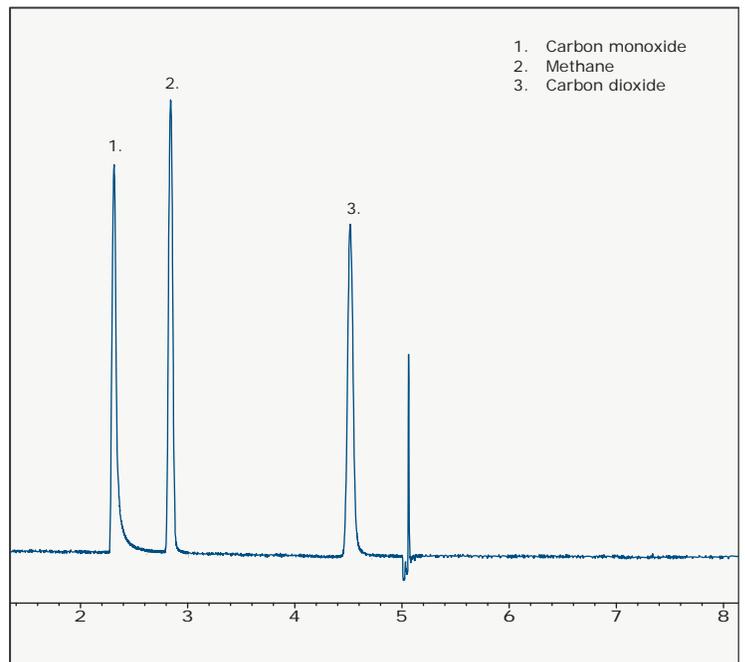
	Ease of Use	Lower Detection Limit	Linear Range	Advantages	Limitations
SCD	Difficult	0.01 ppm	10 <sup>4</sup>	<ul style="list-style-type: none"> <li>• No hydrocarbon quenching</li> <li>• Linear, equimolar response to organic sulfur compounds</li> </ul>	<ul style="list-style-type: none"> <li>• Advanced technical knowledge required to troubleshoot and maintain</li> <li>• If proper vacuum isn't maintained air will be drawn into the system and reduce response</li> </ul>
PFPD	Moderate	0.05 ppm	10 <sup>3</sup>	<ul style="list-style-type: none"> <li>• Long-term calibration stability</li> <li>• Linearized response</li> </ul>	<ul style="list-style-type: none"> <li>• Hydrocarbon quenching</li> <li>• Detector must be tuned for specific sulfur concentration ranges</li> <li>• Not compatible with packed columns</li> </ul>
FPD	Easy	0.50 ppm	10 <sup>3</sup>	<ul style="list-style-type: none"> <li>• Cost effective</li> <li>• Minimal maintenance required</li> </ul>	<ul style="list-style-type: none"> <li>• Hydrocarbon quenching</li> <li>• Quadratic response requires multiple calibration blends</li> </ul>

# Application 383D-OXY & 383D-MET - Oxygenate Analysis



Alternatively, the fourth detector could be configured to perform ASTM D7423 or ASTM D7754 to identify oxygenates in hydrocarbon matrices. The lower detection limit for oxygenates is 0.1 ppm.

For the assessment of feedstock quality, the fourth channel of the Super Refinery Gas Analyzer can be configured to contain a methanizer-FID for the analysis of trace levels of carbon monoxide and carbon dioxide as low as 0.1 ppm.



## Oxygenate Methods

- ASTM D7423
- ASTM D7754
- UOP 960
- Wasson-ECE 253
- Trace carbon monoxide and carbon dioxide

# Application 383D - Additional Configurations

## The possibilities are endless with the 383D Four Detector Super Refinery Gas Analyzer.

### DHA

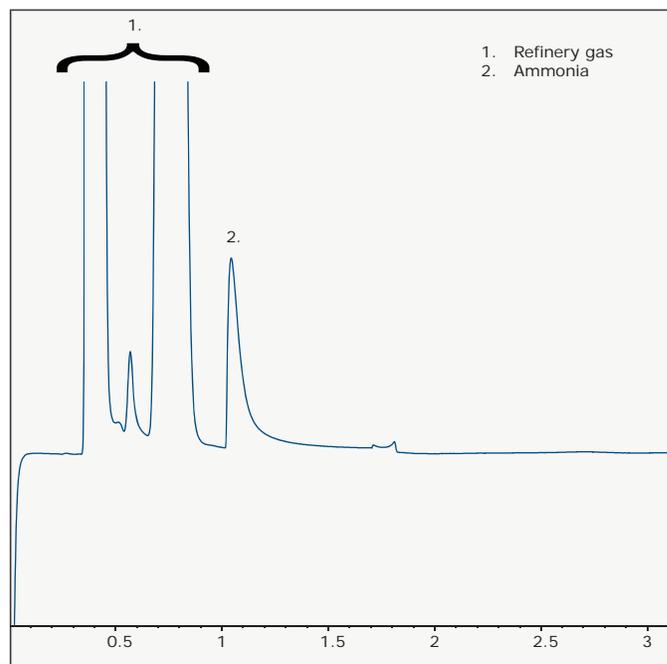
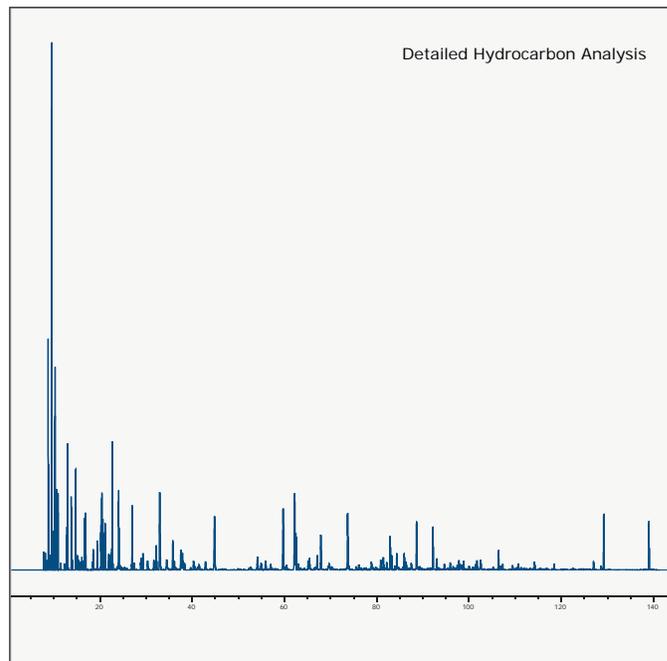
Wasson-ECE's detailed hydrocarbon analysis of petroleum products is a fast, easy to use application. Dragon DHA uses a convenient, graphical interface which provides a one-screen display for viewing the chromatogram and manipulating the data calculations in order to obtain the optimum results.

### Ammonia

The addition of ammonia analysis allows for process monitoring and assessing feedstock quality. The instrument can be configured with a thermal conductivity detector for percent levels or with a nitrogen chemiluminescence detector for trace levels down to 1 ppm.

### Amines

A nitrogen chemiluminescence detector can be added for trace level analysis of nitrogen-containing components to monitor the effectiveness of the process amine unit. Alternatively, the instrument can be configured with a flame ionization detector for analysis of alkanolamines.



# Wasson-ECE Instrumentation

*Engineered Solutions, Guaranteed Results.*

Wasson-ECE Instrumentation is a world leader in gas chromatography. We can manage your exposure to risk at every point, from sampling to service and support. Method development and leading edge gas chromatography applications are our primary focus. Wasson-ECE applications are developed on Agilent Technologies GC platforms for a level of quality and reliability that is unsurpassed.

Gas chromatographs are powerful, technologically complex analytical tools. With so many options available, many find it difficult to customize an instrument to perform a particular analysis. For those who don't specialize in GC customization, it can be a time-consuming and costly process where the end result may not provide an optimized, consistent analysis.

Our expertise is not limited to laboratory solutions. The Wasson-ECE Analytical Engineering Group designs solutions for projects that require analytical accuracy and innovative engineering. We employ highly experienced, multi-disciplinary engineers ready to solve challenges such as fluid handling, hazardous areas, analyte extraction, micro- reactors, and more. We specialize in laboratory and pilot plant automation and on-line and process GCs. Our custom hardware and software can be designed to meet project requirements in ways that off-the-shelf products cannot.

Wasson-ECE Instrumentation has been providing quality analytical solutions for over 30 years. Our products can be found in more than 35 countries around the world. Contact Wasson-ECE today to find out how we can help your company save time and money with a custom analytical system.



Please contact us for more information



*Engineered Solutions, Guaranteed Results.*