

TOTAL AROMATIC, POLYAROMATIC AND FAME CONTENT OF DIESEL FUELS USING GC-VUV PF240



- ASTM D8368
- For diesel fuels and biodiesel blends
- Mono-, di-, tri+, total aromatic content, total PAHs, FAME content B1 – B20.

Get ready for tomorrow's analytics

Diesel analyser GC-VUV

The combustion properties of diesel fuel and the emissions it produces are strongly influenced by its aromatic hydrocarbon content. Measuring aromatics is therefore important for both fuel quality control and compliance with environmental regulations. Modern diesel fuels may also contain up to 20% biodiesel (B20), making it necessary to determine fatty acid methyl ester (FAME) content to ensure specification compliance. Traditional methods for aromatic analysis include Fluorescence Indicator Adsorption (FIA) and High-Performance Liquid Chromatography (HPLC). FIA is a labor-intensive technique developed in the 1950s and is susceptible to operator error. HPLC requires sample preparation, calibration standards, and hazardous solvents, resulting in lengthy analysis times and increased operator involvement. This application note presents a new approach for aromatic analysis in diesel fuel.

Spectral validation, automated analysis.

GC-VUV offers accurate diesel analysis with spectral validation. Sample preparation is not required; the diesel sample is injected directly. Aromatics, polyaromatic hydrocarbons and fatty acid methyl esters are rapidly separated and quantified in 25 minutes. The instrument provides automated analysis and reporting using VUV Analyze™ Software.

Straightforward instrumentation

GC-VUV uses easy instrumentation: Thermo Trace GC 1600 gas chromatograph, a single capillary column and VUV-VGA detector (figure 7). No traps, pre-column tuning or calibration requirements are needed. Method setup is easy, operational costs are low and time-consuming manual data review is no longer required.

Single analytical technique

GC-VUV offers a new approach for the analysis of diesel and biodiesel fuel blends using a single analytical technique, replacing the use of multiple analytical techniques and methods.

ASTM D8368

System validation is performed using a certified gravimetric standard manufactured in compliance with ISO 17034 containing known quantities of linear alkanes (C7 to C30) and compound class markers. This system validation mixture is used to automatically create a retention time marker file and to assess split linearity. Data acquisition takes approximately 25 minutes per sample, and post-processing takes approximately 60 seconds. Post-processing is an automated process using VUV Analyze Software in which each chromatogram is divided into 2400 equally spaced time intervals. Each of those time intervals is then analysed independently with each overlapping spectra deconvolved, identified, and then quantified using an approach called Time Interval Deconvolution™. Figure 1, 2 and 3 show results of a biodiesel blend.

Instrument specification

- Thermo Trace GC1600 with iConnect SSL (Split-splitless injector), capillary column and VUV VGA-100 detector
- VUV-Analyze™ software
- Runtime 25 minutes

Mass %								
C#	Saturates	Aromatics	Mono-A	Di-A	Tri(+)-A	PAHs	FAMEs	Total
C1-C5								
C6	0.2221	0.0389	0.0389					0.2810
C7	0.8331	0.2613	0.2613					1.0945
C8	1.5239	0.6432	0.6432					2.1671
C9	1.6290	1.0194	1.0194					2.6485
C10	2.8629	1.5779	1.5606	0.0173		0.0173		4.4408
C11	5.2669	3.0932	2.9734	0.1198		0.1198		8.3601
C12	5.3581	5.5808	5.3690	0.2118		0.2118		10.9389
C13	9.5396	4.5230	4.1730	0.3500		0.3500		14.0625
C14	7.6855	3.1503	2.9635	0.1868		0.1868		10.8358
C15	9.3762	1.8674	1.8667		0.0007	0.0007		11.2436
C16	8.2637	1.3547	1.3135	0.0047	0.0365	0.0412		9.6184
C17	4.2228	0.9877	0.6825	0.2403	0.0648	0.3051	0.7498	5.9603
C18	3.3195	0.4889	0.2531	0.1723	0.0635	0.2359		3.8084
C19	2.5133	0.2427	0.1261	0.0696	0.0469	0.1166	4.8086	7.5646
C20	1.9431	0.2090	0.0690	0.0256	0.1145	0.1401		2.1521
C21	1.5972	0.0548	0.0026	0.0213	0.0310	0.0523	0.0472	1.6993
C22	1.1206	0.0447		0.0006	0.0440	0.0447		1.1653
C23	0.8971	0.0071	0.0052		0.0019	0.0019	0.1165	1.0208
C24	0.5081	0.0024	0.0024					0.5105
C25	0.3676							0.3676
C26	0.0767							0.0767
C27	0.0034							0.0034
Total	69.1304	25.1474	23.3234	1.4201	0.4039	1.8240	5.7222	100.0000

Figure 1 Carbon number breakdown report of a biodiesel sample in mass %. (volume % and mole % are available as well). Note that the "Totals" column is the summation of the "Total Saturates", "Total Aromatics", and "Total FAMEs" parameters. Total Saturates are reported, however, precision has not been calculated for this parameter.

Speciated Results			
Report Name	Mass %	Volume %	Mole %
Total Saturates	69.1304	71.5370	67.5895
Total Aromatics	25.1474	23.2864	28.6988
Total Mono-Aromatics	23.3234	21.8453	26.9256
Total Di-Aromatics	1.4201	1.1412	1.4601
Total Tri(+)-Aromatics	0.4039	0.2999	0.3131
Total PAHs	1.8240	1.4411	1.7732
Total FAMEs	5.7222	5.1766	3.7116

Figure 2 Results of an analysis of diesel fuel using ASTM D8368. Results in mass %, volume % and mole %.

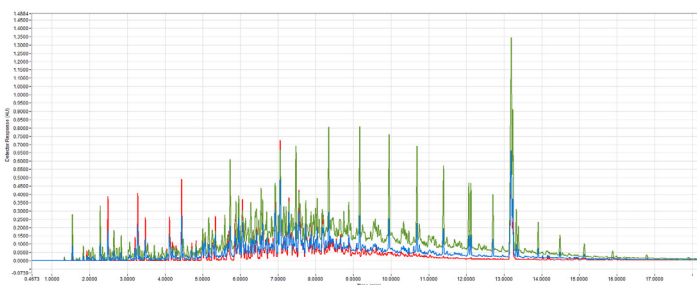


Figure 3 Chromatogram of a biodiesel blend by VUV-Analyze™ engine, showing spectral filters 170-200 nm (red, aromatics) and 125-160 nm (green, saturates). (The blue graph represents the total signal). The runtime is 25 minutes

Ordering information	PF24X - ABCDE			
code X	0	1	2	3
GC model, power	1600, 230V	1610, 230V	1600, 115V	1610, 115V

For the selection of options (e.g. GC oven cryo valves, Power plug type and more), see the options table in the order guide.