



Global  
Analyser  
Solutions



## Verified Hydrocarbon Analysis using VUV

PF220

- ASTM D8369
- Highly improved DHA using VUV spectra
- Accurate and reliable identification
- Replaces multiple existing traditional DHA methods with one easy-to-use application



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PF220v1

# PIONA - VUV analyser

ASTM D8369 describes the determination of individual compounds and compound classes by percent mass or percent volume with a final boilingpoint up to 225 °C. Typical products encountered in petroleum refining or biofuel operations, such as blend stocks; naphthas, reformates, alkylates, FCC gasoline, liquefied petroleum gas (LPG), alcohols and ethers can be analysed. Spark-ignition engine fuels including

## Principle of operation

Hydrocarbon analysis that previously required complex chromatographic separation can be simplified and shortened due to the ability to deconvolve overlapping spectral responses. VUV absorbance spectra are typically highly structured and distinct for individual compounds, yet exhibit the intrinsic property of having similar features when measuring related compound classes, see figure 2. GC-VUV absorbance data is inherently three-dimensional (time, absorbance, wavelength) and specific to the compound chemical structure.

## VHA: Verified DHA

The VUV VHA component database contains up to 700 individual components; around 350 species are already spectrally verified and speciated, while another 350 can be selected and added by the user. Oxygenates methanol, ethanol, butanols, methyl t-butyl ether (MTBE), ethyl t-butyl ether (ETBE) and t-amyl methyl ether (TAME) are included as well. All other compounds are identified by carbon number based on retention index and by class type based on spectral response. The resulting verified hydrocarbon analysis therefore identifies, classifies, and reports 100 % of the spectral responses.

## Results

VHA offers DHA-level speciation with greater accuracy and less resources in a significantly shorter time. VHA uses a shorter separation column compared to classical DHA (60m instead of 100m), but offers better and more reliable component resolution thanks to the spectral information. The runtime is reduced from 3 hours to 45 minutes in this way. Figure 3 shows the resulting chromatogram with spectral filters for aromatics and saturates applied by VUV-Analyze™ software. Figure 2 displays a part of the individual components report; the total report includes up to 700 compounds. The PIONA group type/carbon number breakdown report is shown in figure 1.

## Specification

- Thermo Trace GC1600 with iConnect SSL (Split-splitless injector), cryogenic oven cooling, capillary column and VUV VGA-100 detector
- VUV-Analyze software
- Runtime 45 minutes
- Reporting of individual components, PIONA group and physical parameters

| Mass % | P      | I       | O      | N      | A       | Oxy     | Total    |
|--------|--------|---------|--------|--------|---------|---------|----------|
| C1     |        |         |        |        |         |         |          |
| C2     |        |         |        |        |         | 11.6702 | 11.6702  |
| C3     |        |         |        |        |         |         |          |
| C4     | 1.3354 | 0.0894  | 0.0642 |        |         |         | 1.4890   |
| C5     | 3.0684 | 6.5351  | 3.1798 | 0.3239 |         |         | 13.1072  |
| C6     | 2.2775 | 6.8407  | 2.6831 | 1.9381 | 0.8511  |         | 14.5905  |
| C7     | 1.2879 | 5.5580  | 0.9570 | 1.9848 | 4.0231  |         | 13.8108  |
| C8     | 0.2602 | 17.9417 | 0.6399 | 1.9301 | 5.8566  |         | 26.6286  |
| C9     | 0.2909 | 3.6293  | 0.1052 | 0.4961 | 6.2967  |         | 10.8181  |
| C10    | 0.2493 | 1.0226  | 0.0803 | 0.2538 | 2.8931  |         | 4.4990   |
| C11    | 0.0974 | 0.9111  | 0.0086 | 0.2749 | 1.5984  |         | 2.8865   |
| C12    | 0.0571 | 0.1328  | 0.0166 | 0.0064 | 0.2074  |         | 0.4202   |
| C13    | 0.0173 | 0.0232  |        |        | 0.0343  |         | 0.0749   |
| C14    |        | 0.0030  |        |        |         |         | 0.0030   |
| C15    |        |         |        |        |         |         |          |
| Total  | 8.9416 | 42.6868 | 7.7347 | 7.2080 | 21.7587 | 11.6702 | 100.0000 |

Figure 1 VHA report in mass %. Mole % and volume % are also available.

| Compound Name     | Category    | Molecular Weight (g/mol) | Mass %  | Mole %  | Volume % |
|-------------------|-------------|--------------------------|---------|---------|----------|
| Isobutane         | Isoparaffin | 4.1066                   | 0.0894  | 0.1172  | 0.1330   |
| Butane            | Paraffin    | 4.4468                   | 1.3354  | 1.0605  | 1.9873   |
| trans-2-Butene    | Olefin      | 4.5468                   | 0.0271  | 0.0328  | 0.0418   |
| cis-2-Butene      | Olefin      | 4.6966                   | 0.0298  | 0.0351  | 0.0460   |
| Ethanol           | Alcohol     | 5.0206                   | 11.6702 | 10.8115 | 21.9114  |
| 3-Methyl-1-butene | Olefin      | 5.0866                   | 0.0828  | 0.0732  | 0.0774   |
| Isopentane        | Isoparaffin | 5.3586                   | 6.5263  | 7.8991  | 7.8240   |
| 1-Pentene         | Olefin      | 5.5966                   | 0.1818  | 0.2075  | 0.2243   |
| 2-Methyl-1-butene | Olefin      | 5.7166                   | 0.4465  | 0.5019  | 0.5507   |
| n-Pentane         | Paraffin    | 5.7966                   | 3.0684  | 3.5817  | 3.6786   |
| trans-2-Pentene   | Olefin      | 5.9466                   | 0.8403  | 0.9476  | 1.0364   |

Figure 2 Part of VHA individual components report. In total up to 700 components including oxygenates are reported. Custom components can be added by the user.

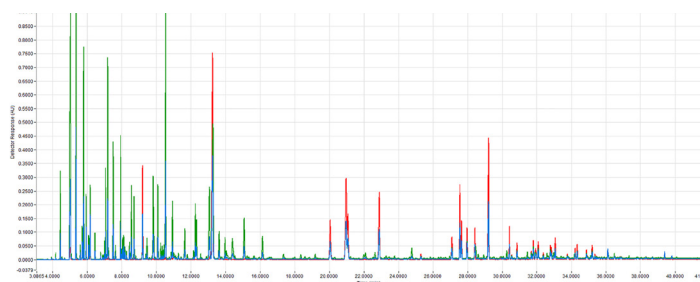


Figure 3 VHA example chromatogram by VUV-Analyze™ engine, showing spectral filters 170-200 nm (red, aromatics) and 125-160 nm (yellow, saturates). The blue graph represents the total signal. The runtime is 45 minutes.

| Ordering information | PF22X - ABCDE | EN18015 (includes cryo valve) |            |            |
|----------------------|---------------|-------------------------------|------------|------------|
| 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.