



APPLICATION NOTE 206WA0810C

## **DHA**

### **Detailed Hydrocarbon Analysis**

ASTM D5134, D6729  
D6730, D6733  
Fast DHA, DHA Front End  
IP PM DL  
prEN 15199-4

## Introduction

The G-A-S DHA analyser offers detailed characterisation of petroleum streams like spark ignition engine fuels. Undiluted samples are injected on a high resolution capillary column, for the best possible separation of all individual components. Dedicated, fully automated software provides detailed reporting of the sample composition and calculation of several physical parameters. The G-A-S DHA analyser is the solution for all published ASTM, DIN, EN and IP methods.

## Instrumentation

### GC instruments

DHA methods are based on obtaining as much as possible separation of individual components, using a single high resolution capillary column. Undiluted samples are injected on the Split-Splitless injector with a high split ratio (1:150), and FID is used for detection. The Thermo Trace 1300 GC is the optimal choice for this type of analysis, because the low thermal mass oven design offers superb retention time stability. This is of great importance for DHA, since component identification relies on retention time indices from a database.

With the optional iConnect SSL backflush module, DHA front-end analysis is available as well. C1-C9 detailed analysis in crude oil is offered in this way. With this method, heavier components are backflushed, leaving the analysis column in optimal condition.

### iConnect module concept

The Trace 1300 GC offers the unique Instant Connect concept. Injector and detector modules can be replaced by the user in minutes, guaranteeing high uptime and low maintenance costs.

### Columns and options

The well known ASTM methods for DHA describe the different needed columns. We use Restek Rtx-1 50m\*0.21mm for ASTM D5134 or Restek Rtx-DHA 100, 100m\*0.25mm for ASTM D6729. An optional tuning column can be used for enhanced separation in case of oxygenated components (ASTM D6730/DHAX). Depending on the complexity of the sample, the GC oven programming starts at 35 °C or at sub-ambient temperatures (cryogenic cooling option). The latter is especially needed in case of high olefin content and/or C1-C3 light petroleum compounds.

The typical analysis time is 140 minutes with Helium carrier gas, and 85 minutes using Hydrogen as carrier gas. Columns with smaller internal diameters can be used to reduce analysis time even more.



**RESTEK**

# Software

## Identification and easy updating of the database

A calibration mixture containing n-alkanes is used to calculate the retention time indices of all components in the sample. The obtained indices are compared with known indices from the supplied database, and the peaks are identified accordingly. In case of overloaded peaks, a dedicated algorithm corrects for peak distortion, effectively predicting the retention time for non-overloaded symmetrical peaks. An easy to use editor is available to fine-tune the database, based on specific reference samples.

## Results

The analysis results are reported in weight% and volume% to the nearest 0.001 % for accurate results.

## Calculation of group type and physical parameters

Besides reporting of all components, also hydrocarbon group type data is presented. These groups include normal, iso- and cyclic saturates, unsaturates, aromatic component and oxygenates (O-PIONA). Physical parameters like Specific Gravity, True Boiling Point, MON, RON and Vapour Pressure are reported as well.

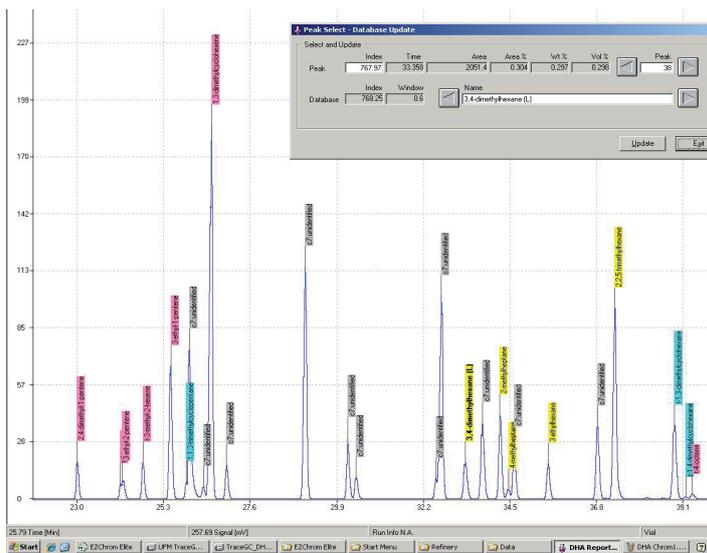
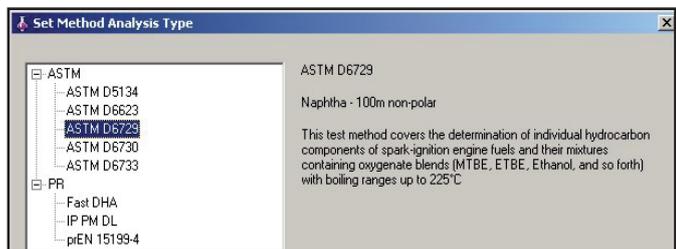
## Fully automated

The G-A-S DHA software is fully integrated in EZChrom. Identification and calculation starts automatically after the GC run, and the result is printed and/or exported in PDF, XLS, RTF or CSV format.

## All published standardised methods are implemented

The G-A-S DHA software package provides a solution for all published standard methods, and even those that are still in discussion or awaiting publication. The software identifies all the individual components in petroleum naphtha or other petroleum streams with components ranging from nC1 to nC16.

A component database with retention indices of 500 components is part of the software package.



**DHA according to ASTM D 6729**

Sample Info	Blend A5415	Date Printed	30 Sep 2008, 09:59:28
Sample Type	Sample	Vial	27
Date Analysed	25 Sep 2008		
Analyst	Wilco		
Data File	Blend A5415.dat		
Method	C:\EZChrom Elite\Refinery\Data\d6729.dha		
Description	DHA D6729		
Instrument	TraceGC 7 DHA6729		

*Weight Percent Profile*

Carbon	Saturates			Unsaturates			Aromatics	Oxyg	Unknown	Total
	Cyclic	Iso	Normal	Cyclic	N + Iso					
1										
2										
3										
4		0.15	0.62							<b>0.77</b>
5		0.44	2.49	0.87	0.27					<b>4.07</b>
6		2.89	2.67	1.92	2.35		0.98			<b>10.81</b>
7	6.09	4.15	2.83	3.39	4.56		2.89			<b>23.91</b>
8	6.50	5.36	3.67	2.93	2.27		3.05	0.04		<b>23.82</b>
9	5.36	5.42	3.12	1.23	1.11		3.16	0.22		<b>19.62</b>
10	1.57	4.67	1.42	0.22			2.39	0.70		<b>10.98</b>
11	0.17	1.82	0.74				0.08	0.53		<b>3.34</b>
12		0.78	0.62					0.60		<b>2.00</b>
13		0.43						0.25		<b>0.68</b>
14								0.00		<b>0.00</b>
<b>Total</b>	<b>19.68</b>	<b>26.12</b>	<b>18.18</b>	<b>10.56</b>	<b>10.56</b>	<b>12.55</b>		<b>2.34</b>		<b>100.00</b>

**Physical Properties**

MON Value	79.40	Net Heat	43.9 kJ/g
RON Value	83.50	Gross Heat	47.0 kJ/g
Reid Vapor P.	5.07 mm Hg	Bromine Nr.	33.9978
Density	0.5660 g/ml		

# Conclusion

The G-A-S Detailed Hydrocarbon Analyser offers reliable results according to all well known published standard methods for DHA analysis. Weight% and volume% data, as well as hydrocarbon group type information (O-PIONA) and physical property results are fully automated reported.

# Specifications

**Standard methods:** ASTM D5134, D6729, D6730, D6733, Fast DHA, DHA Front End, IP PM DL, prEN 15199-4

## HARDWARE

**Configuration:** 1-channel instrument based on Thermo Trace 1300 GC, with iConnect SSL injector and FID, Triplus RSH or AS/AI-1310 liquid autosamplers



**Optional:** iConnect SSL module with Backflush for DHA-front end analysis. Cryogenic oven cooling (CO<sub>2</sub> or LN<sub>2</sub>) Hydrogen safety system in case of Hydrogen carrier gas

**Application:** Detailed analysis of petroleum products in the range of gasoline to middle distillates. Separation of as many as possible components using a long high resolution capillary column with optional pre-column for polarity tuning. Dedicated DHA software for analysis of the individual component concentrations; grouping on carbon number; grouping on component type (O-PIONA); and calculation of the various physical properties of the sample. Software merge of DHA and Simdist data in case of DHA in crudes.

**Sample requirements:** Undiluted sample injection.

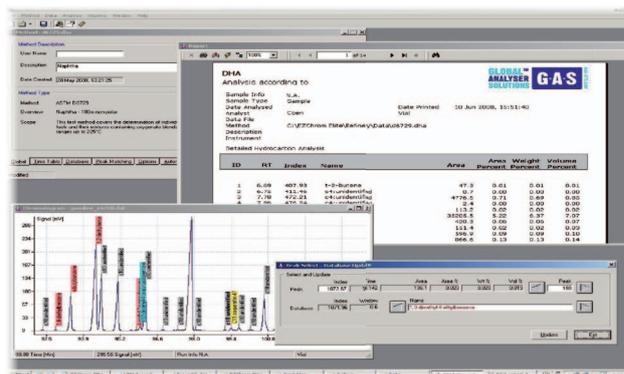
**Analysis Time:** Typical 140 minutes (85 minutes in case of Hydrogen carrier gas).

## SOFTWARE

Dedicated DHA software, fully integrated in EZChrom, providing unattended reporting.

Reporting of:

- individual components (weight% and volume%)
- O-PIONA group type data
- physical properties: Specific Gravity, True Boiling Point, MON, RON, Vapour Pressure



For more information:

GAS is an  
INTERSCIENCE company



GAS is the preferred  
solution partner of

