GLOBAL™ ANALYSER SOLUTIONS G·A·S

Benzene, Toluene, Ethanol in finished motor and aviation gasoline

- Improved D3606 performance
- No benzene / ethanol interference
- Ethanol analysis is included
- Can be combined with D5580 and D4815
- High uptime

ASTM D3606

AN 229WA0816A

GAS offers custom configured GC analysers for many application fields since 40 years. GAS analysers are designed to meet many standardised methods from GPA, ASTM, UOP, ISO, EN and others. The efficient configurations are based on proven GC technology, resulting in robust instruments with an optimal return on investment.

Accurate benzene and toluene analysis is critical because incorrect data can result in inaccurate octane levels and out-of-specification products. The analysis is described by ASTM D3606, using packed columns. The measurement can be complicated by ethanol content; GAS therefore offers an improved solution based on capillary columns.

BENZENE, TOLUENE

Many laboratories analyse benzene and toluene in gasoline, which are added to increase octane levels. The analyser uses two separation columns. The first one offers boiling point separation and is backflushed after elution of octane. Transfer of heavier components to the second column is avoided in this way. The second column has a highly polar TCEP stationary phase for separation of aromatic and non-aromatic components.

ETHANOL

Ethanol is often used as a cost effective additive to reduce greenhouse gas emissions and air polution. However this component is difficult to separate from benzene on the packed columns described by ASTM D3606. Therefore GAS offers this analyser based on capillary columns, resulting in excellent separation of ethanol and benzene.

PRINCIPLE

Figure 1 shows the analyser diagram. The sample is injected on the non-polar Rtx-1 column, using a split injector. After octane elution, the main carrier gas control (at the injector) is switched off. Next, the flow on the pre-column is reversed thanks to auxiliary gas 1 (backflush), while the analysis on the TCEP column continues. MEK is used as internal standard.

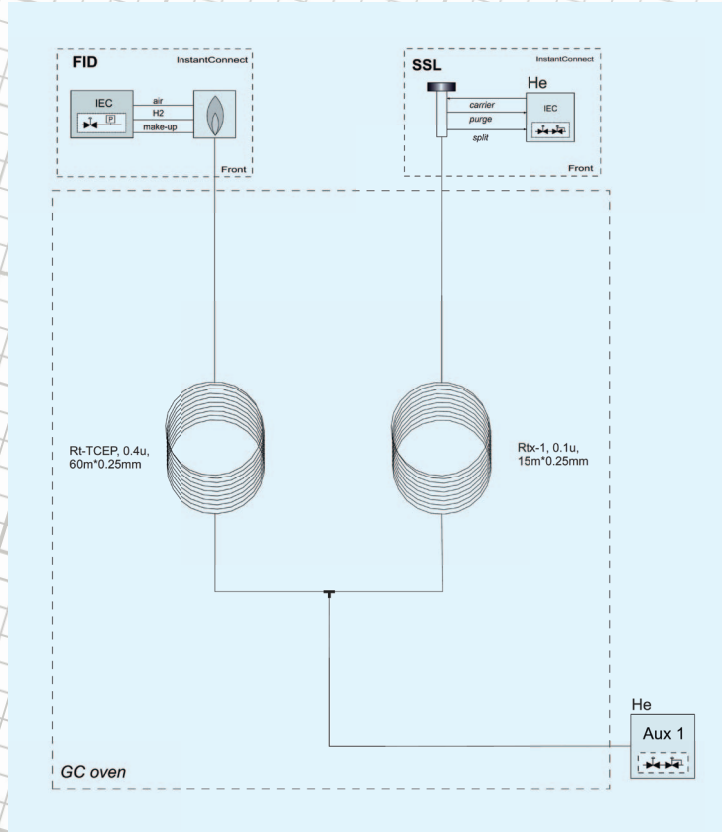
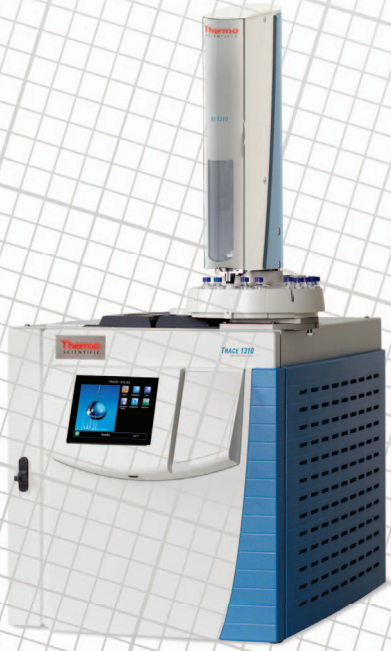


Figure 1. Analyser diagram ASTM D3606 using capillary columns



RESULTS

Figure 2 shows the analysis of benzene and toluene in finished gasoline.

Figure 3 demonstrates the excellent separation of benzene and ethanol.

A D3606 calibration mixture of 0.67% benzene, 4% MEK (methyl ethyl keton) and 5% toluene dissolved in iso-octane, was spiked with methanol and ethanol, and illustrates the advantage of using capillary columns for this method.

Repeated injection using the AS1310 autosampler shows good repeatability (figure 4).

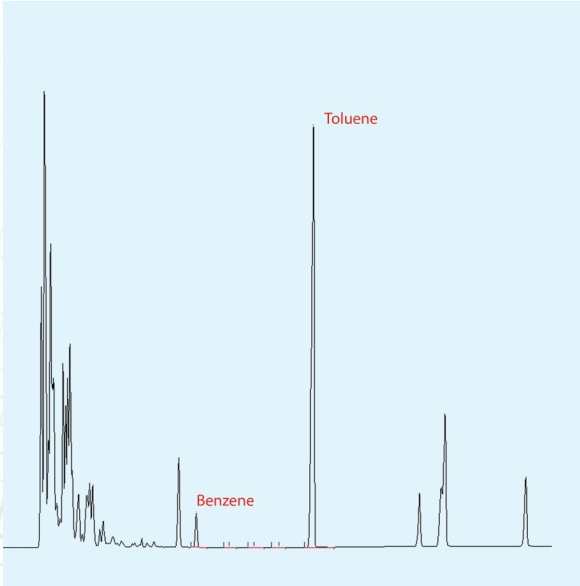


Figure 2. Benzene en toluene in finished gasoline

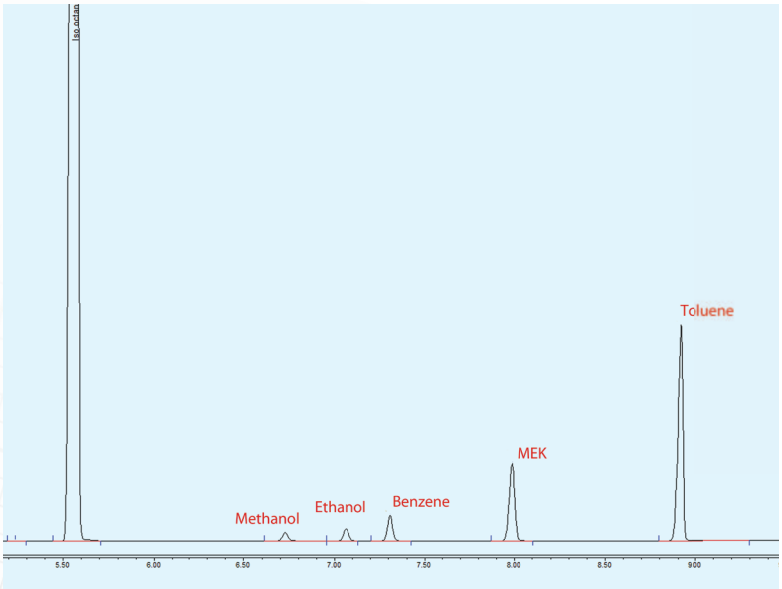


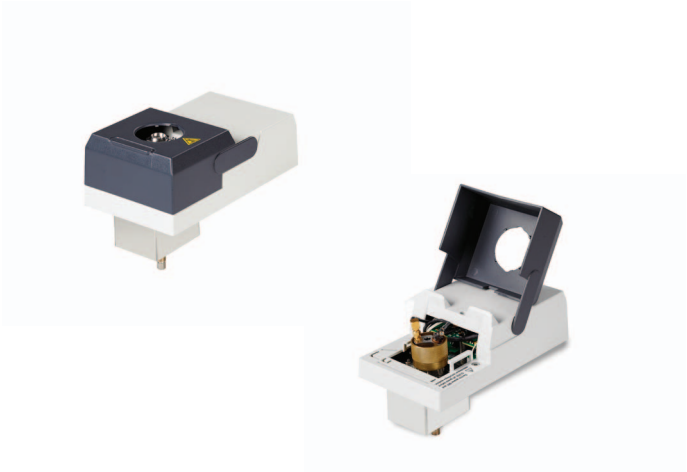
Figure 3. ASTM D3606 calibration standard spiked with alcohols

nj Injection Name	Type	Area		
No Selected Peak:		pA*min		
		FID		
		Benzene	MEK	Toluene
## D3606 mix Repro	Unknown	8.808	29.300	69.678
## D3606 mix Repro	Unknown	8.661	28.545	69.347
## D3606 mix Repro	Unknown	8.736	28.942	69.394
## D3606 mix Repro	Unknown	8.723	28.845	69.461
## D3606 mix Repro	Unknown	8.744	28.779	70.012
## D3606 mix Repro	Unknown	8.891	29.526	70.443
## D3606 mix Repro	Unknown	8.718	28.879	69.389
## D3606 mix Repro	Unknown	9.273	30.524	74.097
## D3606 mix Repro	Unknown	8.720	28.855	69.466
## D3606 mix Repro	*Unknown*	*8.656*	*28.515*	*69.305*
Maximum		9.273	30.524	74.097
Average		**8.793**	**29.071**	**70.059**
Minimum		8.656	28.515	69.305
Standard Deviation		0.182	0.596	1.463
Relative Standard Deviation		**2.07%**	**2.05%**	**2.09%**

Figure 4. Method repeatability

Component	Concentration (vol %)
Benzene	0.67
Toluene	5.00
MEK	4.00
Iso-octane	Balance

Figure 5. ASTM D3606 Calibration mix



D3606 + D4815 + D5580

ASTM methods D4815 (Oxygenated components) and D5580 (Aromatic components) are other frequently used methods in many petrochemical laboratories. GAS can combine both methods with ASTM D3606 in a single instrument, as an alternative to the use of separate instruments. The result is a cost efficient solution on a small footprint.

MODULAR INJECTOR AND DETECTOR

User-installable InstantConnect modules place the expertise and control in the hands of the operators without the requirement for special training, dedicated tools, or on-site service engineers. This unique modular design offers many advantages to the analytical laboratory when compared to traditional GC systems.

SPECIFICATION

Configuration:	1-channel instrument based on Thermo Trace 1300 GC with InstantConnect SSL and FID, Triplus RSH or AS/AI-1310 liquid autosamplers
Optional:	ASTM D5580 and/or D4815 combined with D3606 using a single instrument
Sample path:	Sulfinert® tubing and couplings
Application:	Benzene and toluene in finished gasoline without ethanol interference Optional: simultaneous analysis of ethanol
Range	0.1 - 20 % for all components
Repeatability	< 3 % RSD
Sample requirements:	See our pre-installation guide for additional requirements
Analysis time:	10 minutes
Chromatography	
Data system:	Chromeleon / OpenLab

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GAS is an Interscience company

MADE IN HOLLAND

GAS is the preferred solution partner of Thermo SCIENTIFIC