SI-PIONA analyser
Single column GC-MS method
Introduction

The SI-PIONA GC-MS analyser offers complete analysis of Paraffins, Iso-paraffins, Olefins, Naphthenes, Aromatics and Oxygenates in gasoline-range materials. The instrument analyses large numbers of gasoline samples like spark ignition fuels, providing fast, precise hydrocarbon characterisation for each carbon number up to C12. The GC-MS method offers a number of advantages over the common multidimensional method, like 35 minutes analysis time and individual component reporting.

Method

SI-PIONA is a method for detailed group type analysis of gasoline and petroleum naphtha containing hydrocarbons with boiling points between -42 °C (propane) and 216 °C (dodecane). The gasoline compounds are divided into 94 subgroups. In addition to these hydrocarbon groups, the method includes six oxygenates: methanol, ethanol, t-butanol, t-buthylmethyl ether, t-butylether, t-amylmethyl ether.

The SI-PIONA GC-MS analyser is based on GC/MS data, using a single high resolution capillary column. The method shows excellent conformity with the multidimensional PIONA analyser.

The main elements of SI-PIONA are:

1. A MS library containing approximately 1100 mass spectra of the different compounds present in gasoline/naphtha.
2. A RI (Retention Index) database of approximately 400 compounds for correct isomer identification.
4. Software for reporting the main PIONA groups.
Comparison with PIONA multi-dimensional method

The SI-PIONA GC-MS single column method was extensively compared with the commonly used multidimensional method. This analyser uses multiple valves, several columns and selective component traps. Tables 1 and 2 show the result of Round Robin tests. The compliance between both methods is excellent. The GC-MS method offers clear advantages over the multidimensional method:

- The analysis time is only 35 minutes (with 0.18mm ID capillary column)
- The SI-PIONA analyser only uses a single column, saving effort in setting up and maintaining the instrument.
- The multidimensional analyser offers only group-type information, while the GC-MS method reports the individual components as well. This additional information is often required in case of samples like Pye gas and Reformates.
- The multidimensional instrument cannot analyse samples with high olefin content (30-40%) because of the limited capacity of the trap. The SI-PIONA method can handle these samples since each component is analysed separately. In case of detector overload by a single component, the value of this component is entered in the software, and the results are recalculated automatically.
- The GC-MS instrument can be used for all kinds of applications, such as Fame in Jet Fuel.
Specifications

**Application:** Full PIONA analysis of several hydrocarbon samples like naphtha and spark ignition fuels

**Configuration:** One channel instrument based on single column separation and GC/MS detection

**Injector:** Split

**Column:** 100m * 0.25mm id, 0.5u apolar phase, or 40m * 0.18mm id, 0.5u apolar phase

**Detection:** Thermo ISQ quadropole mass spectrometer

**Software:** Dedicated SI-PIONA software, with databases of 1100 MS spectra, and 400 component Retention Indices.

**Analysis Time:** 100 minutes (100m column); 35 minutes (40m column)

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For more information:

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