

General principles governing the gas chromatographic analysis of petroleum products and related liquids and solvents used in paints and varnishes

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Prüfung von Mineralöl-Kohlenwasserstoffen, verwandten Flüssigkeiten und Lösemitteln für Lacke und Anstrichstoffe – Gaschromatographische Analyse – Allgemeine Arbeitsgrundlagen

*In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.*

## Foreword

This standard has been prepared by Technical Committee *Prüfung von flüssigen Kraftstoffen und Heizölen* of the *Fachausschuss Mineralöl- und Brennstoffnormung* of the *Normenausschuss Materialprüfung* (Materials Testing Standards Committee).

## Amendments

This standard differs from the May 1987 edition in that the terminology has been amended, details of the detector have been included, the evaluation method has been described in more detail and the standard has been editorially revised.

## Previous editions

DIN 51504: 1972-03, 1987-05.

## 1 Scope

The method specified in this standard serves to analyse petroleum products, related organic substances, gases and solvents as used for paints, varnishes and similar coatings, and their volatile components by gas chromatography. The standard also defines a number of relevant concepts.

Gas chromatography provides information about the components of a sample and their concentration, thus making it possible to determine its composition or to characterize its purity.

## 2 Normative references

This standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the titles of the publications are listed below. For dated references, subsequent amendments to or revisions of any of these publications apply to this standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

DIN 1310	Concepts and symbols relating to the composition of gaseous, liquid and solid mixtures
DIN 32645	Establishing the limit of detection and quantification under repeatability conditions in chemical analysis – Terminology, methods and evaluation
DIN EN ISO 4259	Petroleum products – Determination and application of precision data in relation to methods of test (ISO 4259 : 1992 + Corr 1 : 1993)
ASTM E 355-96	Standard practice for gas chromatography terms and relationships <sup>1)</sup>

<sup>1)</sup> Obtainable from *Beuth Verlag GmbH*, 10772 Berlin, Germany.

Document comprises 12 pages.

Translation by DIN-Sprachendienst.

In case of doubt, the German-language original should be consulted as the authoritative text.

- [1] Kovats, E. *Gaschromatographische Charakterisierung organischer Verbindungen* (Gas chromatographic characterization of organic compounds), *Helv. Chim. Acta*, 1958: **41**, 1915-1932;  
and  
Wehrli, A., and Kovats, E. *Gaschromatographische Charakterisierung organischer Verbindungen* (Gas chromatographic characterization of organic compounds), *Helv. Chim. Acta*, 1959: **42**, 2709-2736.
- [2] Rohrschneider, L. *Grundlagen chromatographischer Trennverfahren* (Principles of chromatographic separation methods), Ullmann, 1980: *Verlag Chemie*, vol. 5, 105.
- [3] Deans, D.R., *Chromatographia*, 1968: **1**, 18.

### **3 Principles**

#### **3.1 Gas chromatography**

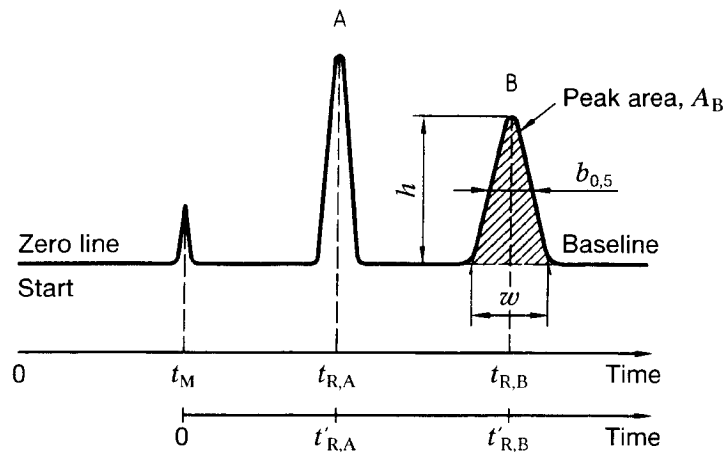
The term 'gas chromatography' (GC) refers to chromatographic methods in which the mobile phase is gaseous and the stationary phase is contained in the column (see subclause 4.1.3). In gas-liquid chromatography (GLC), the stationary phase may consist of a liquid film on the surface of a carrier material or on the internal wall of a capillary tube, while, in gas-solid chromatography (GSC), it is the surface of an adsorbent.

After the sample has been injected at the column inlet, its components are swept through or eluted from the column by the mobile phase. The sample components are analysed by a detector at the outlet of the column.

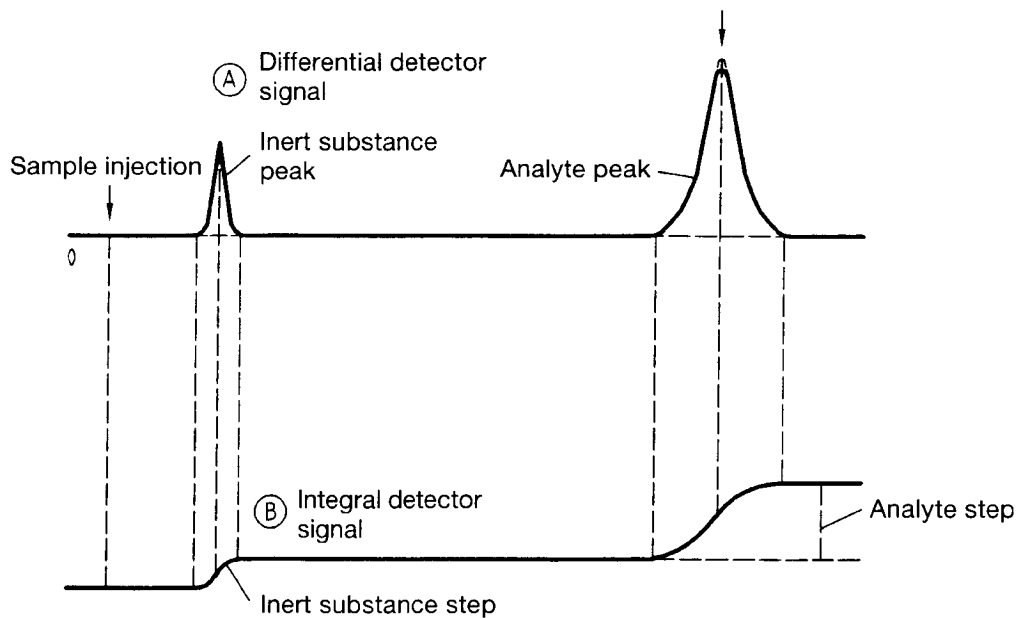
#### **3.2 Gas chromatogram**

##### **3.2.1 General**

A gas chromatogram is a plot of the detector signal against time. The concepts given in subclauses 3.2.2 to 3.2.7 are used when referring to differential gas chromatograms (see figure 1). Integral gas chromatograms are plotted, for example, in the volumetric determination of gases.



a) Differential gas chromatogram



b) Comparison of differential and integral chromatograms

**Figure 1: Gas chromatograms**

### 3.2.2 Zero line

The line recorded by the plotter or computer during the flow of pure carrier gas.

### 3.2.3 Baseline

An imaginary line underneath a peak or a group of superimposed peaks obtained by connecting the consecutive minima of a gas chromatographic curve. It is generally assumed to be a straight line, but it does not necessarily coincide with the zero line\*).

### 3.2.4 Peak

The portion of a chromatogram that deviates from the baseline when a single component is eluted from the column, as recorded by a plotter or computer. If there are a number of components present in a sample, peaks may be superimposed.

### 3.2.5 Peak height

The distance between the peak maximum and the baseline (designated by  $h$ ).

\* ) Translator's note. In ASTM E 355 defined as 'the portion of a chromatogram recording the detector response in the absence of solvent eluted from the column'.