
**Petroleum products — Determination
of boiling range distribution — Gas
chromatography method**

*Produits pétroliers — Détermination de la répartition dans l'intervalle
de distillation — Méthode par chromatographie en phase gazeuse*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 28, *Petroleum and related products, fuels and lubricants from natural or synthetic sources*.

This method was originally based on the joined IP 406^[3] and ASTM D2887^[4] methods.

This fifth edition cancels and replaces the fourth edition (ISO 3924:2016), which has been technically revised. The main changes compared with the previous edition are as follows.

- The accelerated procedure has been moved from [Annex B](#) to the main body text. It is described as Procedure B and has a precision and bias calculation in relation to Procedure A (the original procedure).
- A new annex has been added with the newly defined boiling points for n-alkanes to keep the method technically equivalent with IP 406 and ASTM D2887.
- [Annexes E](#) and [F](#) have been added with information on the use of alternative carrier gases.
- Several safety warnings and editorial updates have been made.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Petroleum products — Determination of boiling range distribution — Gas chromatography method

WARNING — The use of this document can involve hazardous materials, operations and equipment. This document does not purport to address all the safety problems associated with its use. It is the responsibility of users of this document to take appropriate measures to ensure the safety and health of personnel prior to application of the document.

1 Scope

This document specifies a method for the determination of the boiling range distribution of petroleum products. The method is applicable to petroleum products and fractions with a final boiling point of 538 °C or lower at atmospheric pressure as determined by this document. This document does not apply to gasoline samples or gasoline components. The method is limited to products having a boiling range greater than 55 °C and having a vapour pressure sufficiently low to permit sampling at ambient temperature.

The document describes two procedures.

- a) Procedure A allows a larger selection of columns and analysis conditions, such as packed and capillary columns as well as a thermal conductivity detector in addition to the flame ionization detector. Analysis times range from 14 min to 60 min.
- b) Procedure B is restricted to only three capillary columns and requires no sample dilution. The analysis time is reduced to about 8 min.

Both procedures have been successfully applied to samples containing fatty acid methyl esters (FAME) up to 20 % (volume fraction).

NOTE For the purposes of this document, the terms “% (mass fraction)” and “% (volume fraction)” are used to represent the mass fraction (μ), the volume fraction (φ) of a material.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3170, *Petroleum liquids — Manual sampling*

ISO 3171, *Petroleum liquids — Automatic pipeline sampling*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1
initial boiling point
IBP

temperature corresponding to the retention time at which a net area count equal to 0,5 % of the total sample area under the chromatogram is obtained

3.2
T10, T30, T50, T70, T90

temperature (T) corresponding to the retention time at which a net area count equal to the 10 %, 30 %, 50 %, 70 % or 90 % of the total sample area under the chromatogram is obtained

3.3
final boiling point
FBP

temperature corresponding to the retention time at which a net area count equal to 99,5 % of the total sample area under the chromatogram is obtained

3.4
slice rate

number of data slices acquired per unit of time used to integrate the continuous (analogue) chromatographic detector response during an analysis

Note 1 to entry: The slice rate is expressed in Hz (for example, slices per second).

4 Principle

A sample is introduced into a gas chromatographic column, which separates hydrocarbons in the order of increasing boiling point. The column temperature is raised at a reproducible rate and the area under the chromatogram is recorded throughout the analysis. Boiling temperatures are assigned to the time axis from a calibration curve, obtained under the same conditions by running a known mixture of hydrocarbons covering the boiling range expected in the sample. From these data, the boiling range distribution is obtained.

[Annex A](#) presents a correlation model for the calculation of physical distillation^{[1][5][6]} equivalent data from boiling range distribution analysis by gas chromatography determined following this document.

5 Reagents and materials

5.1 Stationary phase for columns, non-polar, that elutes hydrocarbons in boiling point order.

NOTE The following materials have been used successfully as liquid phases, other stationary phases can be used, see [6.2](#).

For packed columns:

- silicone gum rubber UC-W98;
- silicone gum rubber GE-SE-30;
- silicone gum rubber OV-1;
- silicone gum rubber OV-101.

For capillary columns:

- polydimethylsiloxane.