

Methods of test for petroleum and its products —

**Part 156: Determination of hydrocarbon
types in petroleum products —
Fluorescent indicator adsorption
method
(Identical with IP 156:2005)**

ICS 75.080

National foreword

This British Standard reproduces verbatim IP 156:2005 and implements it as the UK national standard. It supersedes BS 2000-156:1997 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PT/13, Petroleum testing and terminology, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Energy Institute, under the brand of IP publishes and sells all parts of BS 2000, and all BS EN petroleum test methods that would be part of BS 2000, both in its annual publication “Standard methods for analysis and testing of petroleum and related products and British Standard 2000 parts” and individually.

Further information is available from:

**Energy Institute, 61 New Cavendish Street, London W1G 7AR.
Tel: 020 7467 7110. Fax: 020 7255 1472.**

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages 1 to 10, an inside back cover and a back cover.

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Determination of hydrocarbon types in petroleum products — Fluorescent indicator adsorption method

This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This Standard describes a fluorescent indicator adsorption method for the determination of hydrocarbon types over the concentration ranges from 5 % (V/V) to 99 % (V/V) aromatic hydrocarbons, 0,3 % (V/V) to 55 % (V/V) olefins, and 1 % (V/V) to 95 % (V/V) saturated hydrocarbons in petroleum fractions that distill below 315 °C. This method may apply to concentrations outside these ranges, but the precision has not been determined.

When samples containing oxygenated blending components are analysed, the hydrocarbon type results can be reported on an oxygenate-free basis or, when the oxygenate content is known, the results can be corrected to a total-sample basis.

This test method is for use with full boiling range products. Cooperative data have established that the precision statement does not apply to petroleum fractions with narrow boiling ranges near the 315 °C limit. Such samples are not eluted properly, and results are erratic.

Samples containing dark-coloured components that interfere with reading the chromatographic bands cannot be analysed.

NOTE 1 - The precision of this test method has been determined with unleaded fuels that do not contain oxygenated blending components. It may or may not apply to fuels containing lead antiknock mixtures or oxygenated blending components or both. However the oxygenated blending components methanol, ethanol, *tert*-butyl methyl ether (MTBE), methyl *tert*-pentyl ether (*TAME*) and *tert*-butyl ethyl ether (ETBE) do not interfere with the determination of hydrocarbon types at concentrations normally found in commercial petroleum blends. These oxygenated compounds are not detected since they elute with the alcohol desorbent. The effects of other oxygenated compounds should be individually verified.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ISO 3696, *Water for analytical laboratory use — Specification and test methods*.

IP 408, *Determination of organic oxygenate compounds and total organically bound oxygen content by gas chromatography (O-FID)*.
(=EN 1601)

IP 466, *Determination of organic oxygenate compounds and total organically bound oxygen content by gas chromatography using column switching*.
(=EN 13132)

IP 475, *Manual sampling*.
(=EN ISO 3170)

IP 476, *Automatic pipeline sampling*.
(=EN ISO 3171)

3 Definitions

For the purposes of this Standard, the following definitions apply.

3.1

saturates

volume percent % (V/V) of alkanes plus cycloalkanes.

3.2

olefins

volume percent % (V/V) of alkenes plus cycloalkenes plus some alkadienes.

3.3

aromatics

volume percent % (V/V) of monocyclic and polycyclic aromatic hydrocarbons plus aromatic olefinic hydrocarbons, some dienes, compounds containing sulfur and nitrogen, or higher-boiling oxygenated compounds, excluding those listed in note 1.

4 Principle

Approximately 0,75 ml of sample is introduced into a special glass adsorption column packed with activated silica gel. A small layer of the silica gel contains a mixture of fluorescent dyes. When all the sample has been adsorbed onto the gel, alcohol is added to desorb the sample down the column. The hydrocarbons are separated, according to their adsorption affinities, into aromatics, olefins and saturates. The fluorescent dyes are also separated selectively with the hydrocarbon types, and render the boundaries of the aromatic, olefin and saturate zones visible under ultraviolet light. The volume percentage % (V/V) of each hydrocarbon type is calculated from the length of each zone in the column.

5 Apparatus

5.1 Adsorption column, with precision bore tubing conforming to the specification given in Table 1 and as shown in Figure 1, made of glass and consisting of a charger section with a capillary neck, a separator section, and an analyzer section.

NOTE 2 - For routine/non-specification compliance analysis adsorption columns with standard wall tubing conforming to the specification given in Annex A and as shown in Figure 1 may be used.

In addition the length of a thread of liquid approximately 100 mm long shall not vary in length by more than 0,3 mm in any part of the analyzer section.

Glass-sealing of the various sections to each other shall be done with long-taper connections rather than shouldered connections. The silica gel shall be supported with a small piece of glass wool located between the ball socket of the 12/2 spherical joint and covering the analyzer outlet. The column tip

attached to the 12/2 socket shall be approximately 2 mm inside diameter. The ball and socket joints shall be clamped together to ensure that the tip does not tend to slide from a position in a direct line with the analyzer section during the packing and subsequent use of the column.

Table 1 - Precision bore column dimensions and tolerance limits

Precision bore column dimensions	
Charger section	
Inside diameter	12 mm $\pm$ 2 mm
Overall length	150 mm $\pm$ 5 mm
Neck section	
Inside diameter	2 mm $\pm$ 0,5 mm
Overall length	50 mm $\pm$ 5 mm
Separator section	
Inside diameter	5 mm $\pm$ 0,5 mm
Overall length	190 mm $\pm$ 5 mm
Analyzer section	
Inside diameter	1,60 mm to 1,65 mm
Overall length	1200mm $\pm$ 30 mm
Tip	
Overall length	30 mm $\pm$ 5 mm

5.2 Zone-measuring-device

Either a metre rule mounted adjacent to the column, fitted with four movable metal index clips, for measuring the length of each zone, see Figure 1, or glass-writing pencils for marking zone boundaries and metre rule for measuring the length of each zone.

5.3 Ultraviolet light source, with radiation predominantly at wavelength 365 nm.

NOTE 3 - A convenient arrangement consists of one or two units 915 mm or 1 220 mm in length mounted vertically alongside the apparatus adjusted to give the best fluorescence.

5.4 Electric vibrator, for vibrating the individual columns or for vibrating the frame supporting multiple columns.

Dimensions in millimetres
unless otherwise indicated

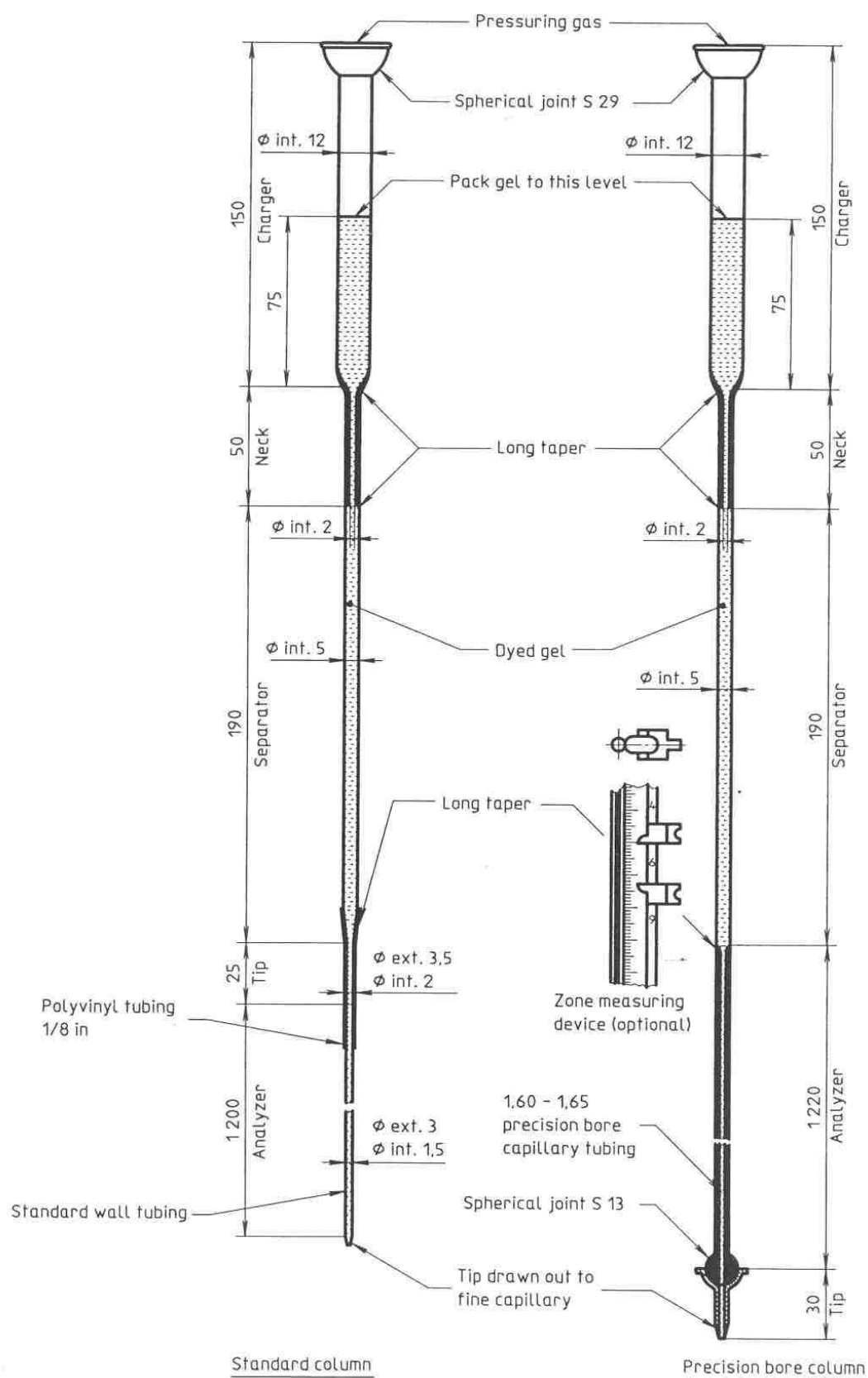


Figure 1 - Adsorption columns with standard wall (left) and precision bore (right) tubing in analyzer section