

Methods of test for petroleum and its products — BS 2000-319: Bitumen and bituminous binders — Determination of kinematic viscosity (Identical with IP 319-2000)

The European Standard EN 12595:1999 has the status of a
British Standard

ICS 75.140; 91.100.50

National foreword

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

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- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the 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.

The Institute of Petroleum 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.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 15 and a back cover.

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English version

Bitumen and bituminous binders – Determination of kinematic viscosity

Bitumes et liants bitumineux – Détermination de la viscosité cinématique

Bitumen und bitumenhaltige Bindemittel – Bestimmung der kinematischen Viskosität

This European Standard was approved by CEN on 19 September 1999.

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 19, Petroleum products, lubricants and related products, the Secretariat of which is held by NNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2000, and conflicting national standards shall be withdrawn at the latest by May 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This draft European Standard is based on ASTM D 2170-95.

This standard includes 3 annexes where annexes A and B are normative and annex C is informative.

1 Scope

This European Standard specifies a method for the determination of the kinematic viscosity of bituminous binders at 60 °C and 135 °C, in the range from 6 mm²/s to 300 000 mm²/s.

Results from the method can be used to calculate dynamic viscosity when the density of the test material is known or can be determined.

WARNING The use of this standard can involve hazardous materials, operations and equipment. 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.

2 Normative references

This European 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 publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 58, *Sampling bituminous binders*.

EN 12594, *Bitumen and bituminous binders – Preparation of test samples*.

EN 22592, *Petroleum products – Determination of flash and fire points – Cleveland open cup method (ISO 2592:1973)*.

EN ISO 3696, *Water for analytical laboratory use – Specification and test methods (ISO 3696:1987)*.

3 Terms and definitions

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

3.1

kinematic viscosity

ratio between the dynamic viscosity and the density of a liquid at the temperature of viscosity measured

NOTE 1: Kinematic viscosity is a measure of the resistance to flow of a liquid under gravity.

NOTE 2: The SI unit of kinematic viscosity is m²/s; for practical use, a submultiple (mm²/s) is more convenient.

3.2

density

mass of a liquid divided by its volume

NOTE: When reporting density, the unit of density used, together with the temperature, is stated explicitly, for example kilogram per cubic metre.

3.3

dynamic viscosity

ratio between the applied shear stress and the velocity gradient

NOTE 1: Dynamic viscosity is a measure of the resistance to flow of a liquid under gravity, and is commonly called the viscosity of the liquid.

NOTE 2: The SI unit of dynamic viscosity is Pa·s.

3.4 newtonian liquid

liquid having a viscosity that is independent of the rate of shear

NOTE: The constant ratio of the shear stress to the velocity gradient is the viscosity of the liquid. If this ratio is not constant, the liquid is non-newtonian.

4 Principle

The time for a fixed volume of the liquid to flow through the capillary of a calibrated glass capillary viscometer under an accurately reproducible head and at a closely controlled temperature is determined. The kinematic viscosity is calculated by multiplying the efflux time in seconds by the viscometer calibration factor.

5 Apparatus

Usual laboratory apparatus and glassware, together with the following.

5.1 Viscometer, Cannon-Fenske, the Zeitzuchs Cross-Arm and BS/IP/RF viscometers, capillary-type, made of borosilicate glass, suitable for this method are described in Figures A.1, A.2 and A.3, and Tables A.1, A.2 and A.3. Other viscometers are allowed if test results obtained are comparable.

Calibrated viscometers are available from commercial suppliers. Details regarding the calibration of viscometers are given in annex C.

5.2 Thermometers, calibrated liquid-in-glass, of an accuracy of 0,2 °C can be used or another thermometric device of equal accuracy as described in annex B.

The specified thermometers shall be standardized at total immersion that is immersion to the top of the mercury column with the remainder of the stem and the expansion chamber at the top of the thermometer exposed to room temperature.

NOTE 1: The practice of completely submerging the thermometer is not recommended. When thermometers are completely submerged, corrections for each individual thermometer based on calibration under conditions of complete submergence are determined and applied. If the thermometer is completely submerged in the bath during use, the pressure of the gas in the expansion chamber will be higher or lower than during standardization, and can cause a high or low reading on the thermometer.

It is essential that liquid-in-glass thermometers be recalibrated periodically and that official corrections be adjusted as necessary to conform to any changes in temperature readings. The thermometer shall be read, estimating the reading to 0,1 °C.

NOTE 2: Thermometers should be checked at regular time intervals.

NOTE 3: A commonly used procedure given in Method ASTM E 77 applies correction which is based on changes in the ice point calibration.

Other temperature measuring devices may be used instead of mercury stem thermometers. However, the mercury stem thermometer is the reference device. Therefore any alternative device employed shall be calibrated so as to provide the same readings as would be provided by the mercury stem thermometer, recognizing and allowing for the fact of changed thermal response times compared with the mercury thermometer.

NOTE 4: When measuring and controlling nominally constant temperatures as in this test method, alternative devices can indicate greater cyclic variations than mercury thermometers, to an extent depending on the cycle time of heating and the power of the controlled heat input.