

Bitumen and bituminous binders — Determination of dynamic viscosity by vacuum capillary

The European Standard EN 12596:2007 has the status of a
British Standard

ICS 75.140; 91.100.50

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 12596:2007. It supersedes BS EN 12596:2000/IP which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PTI/13, Petroleum testing and terminology.

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 7100. Fax: 020 7255 1472.

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

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2007

© BSI and Energy Institute 2007

ISBN 978 0 580 50773 1

Amendments issued since publication

Amd. No.	Date	Comments

English Version

Bitumen and bituminous binders - Determination of dynamic viscosity by vacuum capillary

Bitumes et liants bitumineux - Détermination de la viscosité dynamique par viscosimètre capillaire sous vide

Bitumen und bitumenhaltige Bindemittel - Bestimmung der dynamischen Viskosität mit Vakuum-Kapillaren

This European Standard was approved by CEN on 3 February 2007.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

Page

Foreword.....	3
1 Scope	4
2 Normative references	4
3 Terms and definitions	4
4 Principle.....	5
5 Apparatus	5
6 Preparation of test samples.....	7
7 Procedure	7
8 Calculation.....	8
9 Expression of results	8
10 Precision	9
11 Test report	9
Annex A (normative) Specifications of viscometers	10
Annex B (normative) Characteristics of thermometer	16
Annex C (informative) Calibration of viscometers	17
Bibliography	19

Foreword

This document (EN 12596:2007) has been prepared by Technical Committee CEN/TC 336 "Bituminous binders", the secretariat of which is held by AFNOR.

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 September 2007, and conflicting national standards shall be withdrawn at the latest by September 2007.

This document supersedes EN 12596:1999.

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

1 Scope

This European Standard specifies a method for the determination of the dynamic viscosity of bituminous binders by means of a vacuum capillary viscometer at 60 °C in a range between 0,003 6 Pa · s to over 580 000 Pa · s. Bituminous Emulsions are not within the scope of this method.

NOTE 1 Emulsions containing bituminous binders are not considered to be covered by this method. This method can be used for anhydrous binders obtained from emulsions (stabilised and/or recovered binders).

NOTE 2 The viscosity behaviour of some polymer modified bitumens (PMB) is not demonstrated in a vacuum capillary viscometer. Other methods are more relevant.

WARNING — Use of this European Standard can involve hazardous materials, operations and equipment. This European Standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this European Standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 58, *Bitumen and bituminous binders - Sampling bituminous binders*

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

EN ISO 3696:1995, *Water for analytical laboratory use - Specification and test methods (ISO 3696:1987)*

3 Terms and definitions

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

3.1

dynamic viscosity

ratio between the applied shear stress and the velocity gradient

NOTE 1 Dynamic viscosity is a measure of the resistance to the flow of a liquid and is commonly called the viscosity of the liquid. For the purposes of this standard, the word viscosity means the dynamic viscosity of a liquid.

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

3.2

Newtonian liquid

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

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

3.3

density

mass of a liquid divided by its volume

NOTE 1 When reporting density, the unit of density used, together with the temperature, is stated explicitly, for example kilogram per cubic metre.

NOTE 2 The SI unit of density is kg/m³.

3.4

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 m^2/s ; for practical use, a sub-multiple (mm^2/s) is more convenient.

4 Principle

To determine the time for a fixed volume of the liquid to be drawn up through a capillary tube by means of a vacuum, under closely controlled conditions of vacuum and temperature. The viscosity is calculated by multiplying the flow time in s by the viscometer calibration factor.

5 Apparatus

5.1 Viscometer, capillary-type and made of borosilicate glass as described in 5.1.2 to 5.1.4.

5.1.1 General

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

NOTE Table A.1, Table A.2, Table A.3 and Figure A.1, Figure A.2, and Figure A.3 are given in Annex A.

5.1.2 Cannon-Manning vacuum capillary viscometer (CMVV)

The CMVV is available in eleven sizes (Table A.1), covering a range between 0,003 6 Pa · s to 8 000 Pa · s.

Details of the design and construction of CMVV are shown in Figure A.1. The size numbers, approximate calibration factors, K , and viscosity ranges for the series of CMVV are given in Table A.1.

For all viscometer sizes, the volume of measuring bulb C is approximately three times that of bulb B. Bulb B, bulb C and bulb D are defined by timing marks F, G and H.

5.1.3 Asphalt Institute vacuum capillary viscometer (AIVV)

The AIVV is available in seven sizes (Table A.2) from a range between 4,2 Pa · s to 580 000 Pa · s. Sizes 50 to 200 are best suited to viscosity measurements of bituminous binders at 60 °C.

Details of design and construction of the AIVV are shown in Figure A.2. The size numbers, approximate capillary radii, approximate calibration factors, K , and viscosity range for the series of AIVV are given in Table A.2.

This viscometer has measuring bulb, B, bulb C and bulb D, located on the viscometer arm, M, which is a precision bore glass capillary. The measuring bulbs are 20 mm long capillary segments defined by timing marks, F, G, H and I.

5.1.4 Modified Koppers vacuum capillary viscometer (MKVV)

The MKVV is available in five sizes (Table A.3) covering a range between 4,2 Pa·s to 20 000 Pa·s. Sizes 50 to 200 are best suited to viscosity measurements of bituminous binders at 60 °C.

Details of design and construction of the MKVV are shown in Figure A.3. The size numbers, approximate capillary radii, approximate calibration factors, K , and viscosity ranges for the series of MKVV are given in Table A.3.