



Institut luxembourgeois de la normalisation
de l'accréditation, de la sécurité et qualité
des produits et services

ILNAS-EN 12596:2014

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

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

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

11/2014



National Foreword

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**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

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Foreword

This document (EN 12596:2014) 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of an identical text or by endorsement, at the latest by May 2015 and conflicting national standards shall be withdrawn at the latest by May 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12596:2007.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

In comparison with EN 12596:2007, the following significant changes have been made:

- the possibility to measure at other temperatures than 60 °C has been added to the Scope;
- changed/added wording of the Warning in the Scope;
- the reference to mercury thermometer has been deleted (see subclause 5.2) and Annex C is informative;
- subclause 7.2: an upper time limit for applicable viscometer has been added.

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, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the 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 and 580 000 Pa·s. Other temperatures are possible if calibration constants are known. 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 recovered and/or stabilized binders obtained from emulsions.

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 identify the hazards and assess the risks involved in performing this test method and to implement sufficient control measures to protect individual operators (and the environment). This includes appropriate safety and health practices and determination of the applicability of regulatory limitations prior to use.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 to entry: 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 European Standard, the word viscosity means the dynamic viscosity of a liquid.

Note 2 to entry: 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 1 to entry: 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 to entry: When reporting density, the unit of density used, together with the temperature, is stated explicitly, for example kilogram per cubic metre.

Note 2 to entry: The SI unit of density is kg/m^3 .

3.4**kinematic viscosity**

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

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

Note 2 to entry: 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 B.

5.1.2 Cannon-Manning vacuum capillary viscometer (CMVV)

The CMVV is available in eleven sizes (see 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 (see 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.