SLOVENSKI STANDARD
SIST EN 13702-2:2004

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Bitumen in bitumenska veziva ï Določ evanje dinamič ne viskoznosti modificiranih bitumnov ï 2. del: Metoda s koaksialnim cilindrom

Bitumen and bituminous binders - Determination of dynamic viscosity of modified bitumen - Part 2: Coaxial cylinders method

Bitumen und bitumenhaltige Bindemittel - Bestimmung der dynamischen Viskosität von modifizierten Bitumen - Teil 2: Koaxial-Zylinder-Verfahren

Bitumes et liants bitumineux - Détermination de la viscosité dynamique des bitumes modifiés - Partie 2: Méthode cylindres coaxiaux

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ICS:

75.140	Voski, bitumni in drugi naftni proizvodi	Waxes, bituminous materials and other petroleum products
91.100.50	Veziva. Tesnilni materiali	Binders. Sealing materials

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Foreword

This document EN 13702-2:2003 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of an identical text or by endorsement, at the latest by June 2004, and conflicting national standards shall be withdrawn at the latest by June 2004.

This European Standard consists of the following parts under the general title Bitumen and bituminous binders – Determination of dynamic viscosity of modified bitumen:

Part 1 – Cone and plate method

Part 2 – Coaxial cylinders method

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies a method for determining the dynamic viscosity of a modified bituminous binder over a range of temperatures by means of a coaxial viscometer. Although the method has been developed for modified binders, it is also suitable for other binders.

NOTE Unlike penetration grade bitumen, polymer modified bitumens (PMBs) do not show a straight line on the Heukelom-Diagram. This implies that in order to obtain information about the temperature susceptibility of PMBs, viscosity should be measured at different temperatures.

WARNING — The use of this European Standard may 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

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 (including amendments).

EN 58[1)], *Bitumen and bituminous binders - Sampling bituminous binders.*

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

3 Principle

The sample is contained in a beaker into which a cylinder is placed. The sample is stressed by rotation of the cylinder or the beaker. The torque applied is measured and with shear rate data, the dynamic viscosity is calculated.

The dynamic viscosity is the measure of the resistance to flow of the liquid.

4 Apparatus

4.1 Coaxial viscometer (see Figure 1) with a fixed beaker and rotating cylinder or with a fixed cylinder and rotating beaker, with the following minimum capabilities:

— range of shear rate: 1 s^{-1} to 10^4 s^{-1};

— range of viscosity: 10^{-1} Pa·s to 10^6 Pa·s;

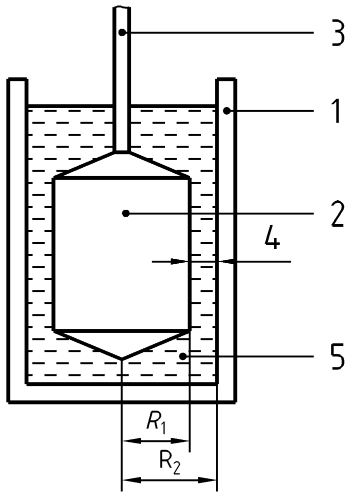
— ratio of the radius: $R_2 / R_1 \leq 1{,}1$;

— difference between the radius $R_2 - R_1 = 1$ mm to 6 mm;

— range of temperature: 60 °C to 150 °C;

1) In course of revision

— sample temperature maintained to within reading accuracy ± 0,5 °C.



Key

1. Beaker
2. Cylinder
3. Axle (spindle)
4. Thickness of sample being measured
5. Sample under test

Figure 1 — Coaxial viscometer (principle)

4.2 Oven

5 Sampling

Take the sample in accordance with EN 58 and prepare the sample in accordance with EN 12594.

6 Procedure

Before commencing a test, measure the required temperature of the temperature control device.

6.1 Preparation of test sample

Place the beaker and cylinder in an oven at a temperature of not more than 80 °C above the Ring and Ball softening point of the sample for at least 45 min.

Pour approximately $3/4$ of the sample into the beaker. Place the cylinder immediately in the beaker and pour in the rest of the sample.

Fill the beaker according to the prescriptions of the apparatus supplier. Avoid incorporation of air bubbles into the sample.

NOTE The beaker should not be overfilled, as the sample volume is critical to meet the system calibration conditions.

6.2 Preheating

Bring the binder as rapidly as possible to the higher test temperature and leave for 30 min at constant temperature. Allow the moveable part (beaker or cylinder) to rotate during the preheating-time at a very low shear rate. Maintain the temperature during the test at within ± 0,5 °C up to 100°C and ± 1,0 °C above 100°C.

6.3 Measurement

Begin the measurement at the highest temperature (150°C). Rotate the moveable part at the prescribed shear rate and allow to stabilise for 60 s. Take the reading after the shear rate value is stabilised.

Record the reading of the instrument, the shear rate and the temperature. The reading should be between 10 % and 90 % of the working range of the apparatus; if it is not, change one of the variables, i.e. the shear rate or the rotating equipment and repeat the measurement to obtain a new result, with a working range closer to 50 % of the apparatus.

Repeat the test and calculate the result as an average of two tests.

6.4 Other temperatures

Repeat the test described in 6.3 at the next lower temperatures.

6.5 Test conditions

This standard specifies a test applicable to a large diversity of products for which the usable temperatures and shear rates are not necessarily the same. The proposed typical test conditions are the following:

Temperature	Shear rate	Typical reference conditions
60 °C ± 0,5 °C	1 s^{-1}	(service conditions of asphalt)
100 °C ± 0,5 °C	10^2 s^{-1}	(conditions at the end of compaction of asphalt)
150 °C ± 1,0 °C	10^2 s^{-1}	(conditions during mixing of asphalt)

In addition to these test temperatures and shear rates any other temperature and shear rate may be used.

7 Expression of results

Record the results of the measurement of the dynamic viscosity with the corresponding shear rate and the test temperature.
Express the viscosity values in Pa·s, as follows: (1,000 x 10^n) Pa·s.

8 Precision

NOTE The following precision data are the best currently estimated and are proposed until results of further round robin tests are available.

8.1 Repeatability

The difference between two test results obtained by the same operator with the same apparatus under constant operating conditions on identical test material would, in the long run, in the normal and correct operation of the test method, exceed 5 % only in one case in twenty.