



SLOVENSKI STANDARD
SIST EN 13398:2004

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Bitumen and bituminous binders - Determination of the elastic recovery of modified bitumen

Bitumen und bitumenhaltige Bindemittel - Bestimmung der elastischen Rückstellung von modifiziertem Bitumen

Bitumes et liants bitumineux - Détermination du retour élastique des bitumes modifiés

Ta slovenski standard je istoveten z: EN 13398:2003

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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en

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EUROPEAN STANDARD

EN 13398

NORME EUROPÉENNE

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December 2003

ICS 91.100.50

English version

Bitumen and bituminous binders - Determination of the elastic recovery of modified bitumen

Bitumes et liants bitumineux - Détermination du retour élastique des bitumes modifiés

Bitumen und bitumenhaltige Bindemittel - Bestimmung der elastischen Rückstellung von modifiziertem Bitumen

This European Standard was approved by CEN on 21 November 2003.

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 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 Management Centre has the same status as the official versions.

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

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document EN 13398:2003 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.

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 the determination of the elastic recovery of bituminous binders in a ductilometer at a given temperature. It is especially applicable to bituminous binders modified with thermoplastic elastomers, but can also be used with other bituminous binders which generate only small recovery.

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.

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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 58¹⁾, *Bitumen and bituminous binders – Sampling bituminous binders*.

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

ISO 5725 (all parts), *Accuracy (trueness and precision) of measurement methods and results*.

3 Terms and definitions

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

3.1

bitumen thread

test specimen of moulded bitumen, stretched to a thread

1) In course of revision

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3.2

half-threads

the two pieces obtained, when a bitumen specimen has been stretched by 200 mm to a thread and then cut in the middle

3.3

elastic recovery

expressed as a percentage of the distance between the ends of the half-threads, which has developed 30 min after the division relative to the elongation length of 200 mm

4 Principle

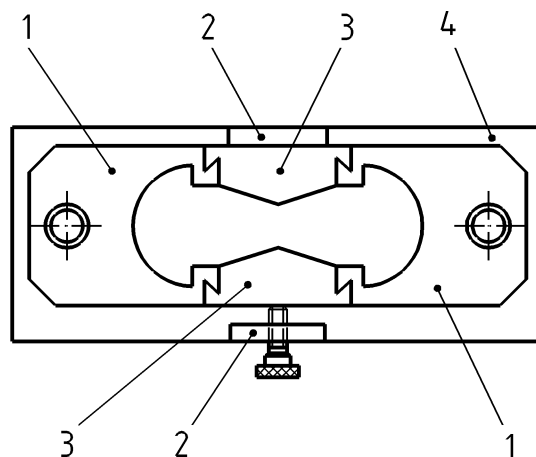
A bitumen specimen is stretched at a temperature of 25 °C and a constant rate of 50 mm/min to a predetermined elongation (200 mm). The bitumen thread thus produced is cut in the middle to obtain two halves of thread. After a predetermined time for recovery has elapsed, the shortening of the half threads is measured and expressed as the percentage of the elongation length.

5 Apparatus

Usual laboratory apparatus and glassware, together with the following:

5.1 Mould (Figure 1), of a copper-zinc alloy (brass), consisting of four parts (two clips and two side-pieces) with a thickness of $10,0 \text{ mm} \pm 0,1 \text{ mm}$ and the other dimensions given in Figure 2. The pinholes of the clips shall fit to the traction device (Figure 3) without any undue gap. During preparation of the bitumen specimen, the mould is held together by a screw mounted on the base plate. The base plate is made of a $3,0 \text{ mm} \pm 0,5 \text{ mm}$ non-corrosive metal sheet.

NOTE ASTM D 133 mould can also be used.

**Key**

- 1 Clip
- 2 Clamping device
- 3 Side-piece
- 4 Base plate

Figure 1 — The mould

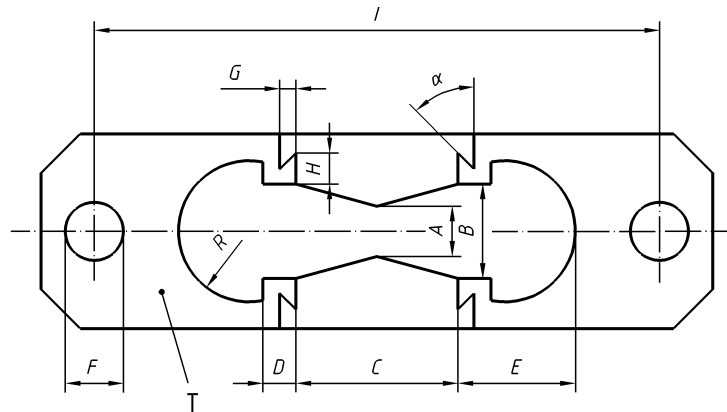
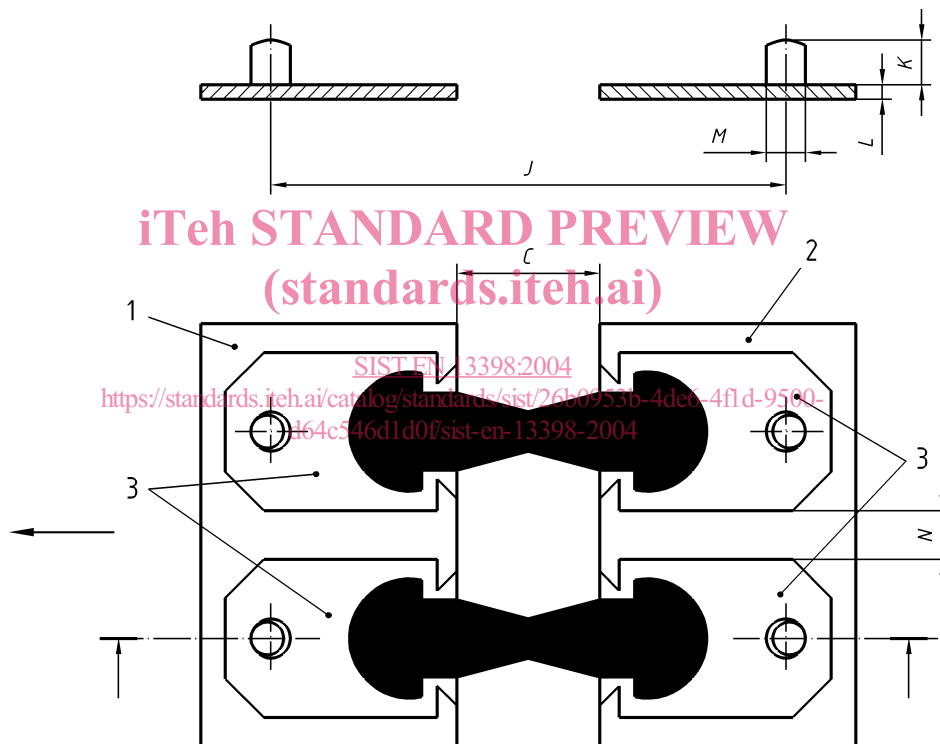


Figure 2 — Example of the divisible shape for preparing the test specimen

**Key**

- 1 Left-and stay bolt plate
- 2 Right-and stay bolt late
- 3 Clip
- T Thickness

Normative values (in mm)		Non-normative values corresponding to the shape in example in Figures 2 and 3 (in mm)	
$A = 10,0 \pm 0,2$	$D = 7,5 \pm 0,2$	$E = 22,5 \pm 0,3$	$J = 109 \pm 1$
$B = 20,0 \pm 0,2$	$R = 15,0 \pm 0,2$	$F = 10,0 \pm 0,2$	$K = 10 \pm 1$
$C = 30,0 \pm 0,3$	$N \geq 10$	$G = 4,0 \pm 0,1$	$L = 3,0 \pm 0,5$
		$H = 7,0 \pm 0,2$	$M = 8,0 \pm 0,2$
		$I = 109,0 \pm 0,5$	$\alpha = 45,0^\circ \pm 0,5^\circ$

Figure 3 — Standboltplates of the extension machine with two test specimens in the initial position

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5.2 Ductilometer, consisting of a water bath (5.2.1) with a temperature control (5.2.3) and a traction device (5.2.2).

5.2.1 Water bath

The water bath shall allow elongation of the test specimen to at least 200 mm. It shall be designed in such a way that at least two specimens can be tested in parallel. The distance between each mould and between the walls of the water bath shall be at least 10 mm. The water level shall be such that there is at least 25 mm of water above and below the specimen.

Circulation of the bath water via a thermostat and, possibly, additional thermal insulation of the water bath shall guarantee the required temperature of $25,0\text{ °C} \pm 0,5\text{ °C}$. Circulation shall be maintained during the test at a reduced rate of approximately 1,5 l/min.

NOTE It may be advisable to direct the water stream at the inlet against a baffle plate to avoid turbulent water flow.

5.2.2 Traction device

The traction device shall allow two specimens to be tested in parallel. The traction plates shall be exactly positioned by a stop switch allowing easy introduction of the pins into the holes of the clips with ease. The drive of the traction device shall be designed in such a way that the combined movement of the pins during the entire test is steady at a constant rate of $50,0\text{ mm/min} \pm 2,5\text{ mm/min}$. The drive should be sufficiently powerful to overcome high deformation resistance at the beginning of the test without speed loss.

5.2.3 Temperature control

The temperature control shall be capable of maintaining the temperature within the water bath of the ductilometer constant within a limit of $\pm 0,5\text{ °C}$.

5.3 Knife, with a straight blade of at least 40 mm length or a plane blade

5.4 Mould release agent, mixture of one part glycerine and one part dextrine.

5.5 Scissors

5.6 Ruler with scale divisions to 1 mm.

6 Preparation of test samples**6.1 General**

Ensure that the laboratory sample is representative of the modified bitumen to be analysed, in accordance with EN 58. Ensure that the laboratory sample is homogeneous and non-contaminated. The test samples shall be prepared in accordance with EN 12594.

6.2 Preparation of the moulds

The base plate and the inner walls of the sides-pieces shall be applied with a thin coat of the release agent. Assemble the clips and sides on the base plate and arrest them with the screw. Ensure that the specified distance of 10 mm minimum between the sides is achieved.

6.3 Filling the moulds

The slightly heated moulds shall be carefully filled with the bitumen up to the surfaces of the moulds with a meniscus protruding.

6.4 Keeping specimens at specified temperature

Allow the filled moulds, protected from dust, to cool to ambient temperature for up to 30 min and transfer them into the water bath. Placed at distances against each other and walls and bottom of the bath as described in 5.2.1, they shall remain there for 30 min \pm 5 min. In order to cut off the surplus bitumen above the mould surface with the heated knife, take them out of the bath and return them immediately. They shall remain there for another 90 min \pm 5 min.

The time from filling the moulds to the start of stretching shall be kept within 150 min \pm 10 min.

6.5 Temperature check of the water bath

Check the temperature of the water at the far end of each traction plate by the pins. The temperature shall not differ by more than \pm 0,5 °C from the specified test temperature of 25,0 °C.

7 Procedure

Once the level filled moulds have been kept at the test temperature for 90 min, remove the sides of the moulds and transfer the bitumen specimens to the traction plates. Then stretch the specimens at the test temperature of 25,0 °C \pm 0,5 °C and at a speed of 50,0 mm/min \pm 2,5 mm/min up to an elongation of 200 mm \pm 1 mm. Within 10 s after the traction device is halted, cut the bitumen threads in the middle with a pair of scissors, produce two half-threads. Thirty minutes after cutting the bitumen threads, use a ruler to measure the lengths between the ends of the half-threads and express them in millimetres.

NOTE The operator is allowed to move the half threads slightly in case they are not facing each other properly ("curled ends").

8 Calculation

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For each specimen, calculate the elastic recovery, R_E , up to 1 % (absolute) using the following equation:

$$R_E = \frac{d}{200} \times 100$$

where

d is the distance between half-threads, in millimetres.

If the values of elastic recovery determined for both test pieces do not differ by more than 5 % in absolute value, determine the arithmetic mean of these two values.

Otherwise, determine the elastic recovery of an additional test piece. Then calculate the arithmetic mean of the two values which differ the least. However, if their difference differs by more than 5 % in absolute value, ignore the three values and repeat the test with two new test specimens.

9 Expression of results

Report the elastic recovery in percentage rounded to full percent (absolute value).

The arithmetic mean shall be rounded up to 1 % in accordance with ISO 5725.