SLOVENSKI STANDARD
SIST EN 13589:2018

01-oktober-2018

Nadomešča:
SIST EN 13589:2008
SIST EN 13703:2004

Bitumen in bitumenska veziva - Določanje nateznih lastnosti modificiranih bitumnov z metodo določanja sile pri merjenju duktilnosti

Bitumen and bituminous binders - Determination of the tensile properties of modified bitumen by the force ductility method

Bitumen und bitumenhaltige Bindemittel - Bestimmung der Streckeigenschaften von modifizierten Bitumen mit dem Kraft-Duktilitäts-Verfahren

Bitumes et liants bitumineux - Détermination des caractéristiques de traction des bitumes modifiés par la méthode de force-ductilité

Ta slovenski standard je istoveten z: **EN 13589:2018**

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

SIST EN 13589:2018 **en,fr,de**

EUROPEAN STANDARD
NORME EUROPÉENNE
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EN 13589

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Supersedes EN 13589:2008, EN 13703:2003

English Version

Bitumen and bituminous binders - Determination of the tensile properties of modified bitumen by the force ductility method

Bitumes et liants bitumineux - Détermination des caractéristiques de traction des bitumes modifiés par la méthode de force ductilité

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 13589:2018) 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of an identical text or by endorsement, at the latest by December 2018, and conflicting national standards shall be withdrawn at the latest by December 2018.

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

This document supersedes EN 13589:2008 and EN 13703:2003.

This document contains the following changes compared to EN 13589:2008:

— updated normative references;

— additional terms and definitions;

— deleting determination of deformation energy by EN 13703;

— introduction of calculation methods of deformation energy in the standard;

— updated bibliography;

— combining time frame EN 13589 with EN 13587;

— renaming “conventional energy” by “cohesion energy”;

— complying with CEN/CENELEC Internal Regulations – Part 3:2011, 6.6.8.3: "Each group of three digits reading to the left and to the right of the comma sign shall be separated by a small space from preceding digits or following digits respectively, except for four-digit numbers designating years";

— complying with CEN/CENELEC Internal Regulations – Part 3 – June 2015, 6.6.8.1: "The decimal point shall be a comma on the line in all language versions".

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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies a method for determining the tensile properties of an unaged, aged, residual or recovered bituminous binder, in particular those of polymer-modified bitumens by means of a force ductility test.

The work done during the force ductility test is a criterion for assessing the quality of these materials.

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

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 13398, *Bitumen and bituminous binders — Determination of the elastic recovery of modified bitumen*

3 Terms and definitions

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

3.1
tensile force
force undergone by a specimen subjected to extension, expressed in N

3.2
elongation
increase in length of a specimen, expressed in metres

Note 1 to entry: Elongation is also expressed in % from the initial length. It is calculated as [(new length – initial length)/initial length] × 100.

3.3
break
every rupture before 1 333 % of elongation performing the force ductility test

3.4
deformation energy
E_i
energy in joules (J) supplied by test pieces, until displacement, *i*, of the moving element

3.5
cohesion energy
***E**i**
quotient of deformation energy, E_i (in joules) and the initial cross section of the test pieces (in square centimetres)

4 Principle

A moulded test specimen is extended in a ductilometer at the test temperature and at constant speed until fracture or an elongation of at least 1 333 % (0, 400 m) is achieved. The cohesion from the Force ductility test is the difference between cohesion energy at break or at 1 333 % elongation (0, 400 m) and cohesion energy at 667 % elongation (0, 200 m).

NOTE The specimen is a symmetrical shaped block of bitumen (Figure 1).

The deformation energy (E_i) is determined from the recordings of the tensile curves (see Figure A.1) obtained according to Clause 7 by calculating the area delimited by:

— the abscissa axes corresponding to elongations;

— the recorded curve (force versus elongation);

— a parallel to the ordinates axis which passes by a given elongation or the breaking point (see Figure A.2).

Cohesion energy (E^*_i) is obtained as a quotient of the deformation energy and the initial cross-area of the test specimens.

5 Apparatus

5.1 Ductilometer

The ductilometer consists of a traction device (5.1.1) and a water bath (5.1.2).

5.1.1 Traction device

5.1.1.1 The traction device shall be capable of maintaining a constant speed of the moving elements at (50 ± 2,5) mm/min.

5.1.1.2 The specimen attachment device located at both ends of the specimen shall not exert on any part of the ends of specimen, localized stresses liable to cause tearing or fracture of the specimen.

5.1.1.3 Appropriate facilities shall permit the following measurements to be made:

a) tensile force exerted on the specimen over the range from 1 N to 300 N, to an accuracy of ± 0,1 N.

b) elongation of the specimen, either by following the movement of the attachment points or by means of an optical extensiometer over the range 1 mm to not less than 450 mm to an accuracy of ± 1 mm.

5.1.2 Water bath

Use a water bath, temperature-controlled, capable of maintaining the specimen and the attachment device at the specified temperature throughout the test to an accuracy of ± 0,5 °C, provided with a means of checking the test temperature.

When the test is performed at 0°C (see Clause 7) or at a lower temperature, the liquid bath shall be water added with 15 % mass fraction of ethanol or glycerol.

5.2 Recording device

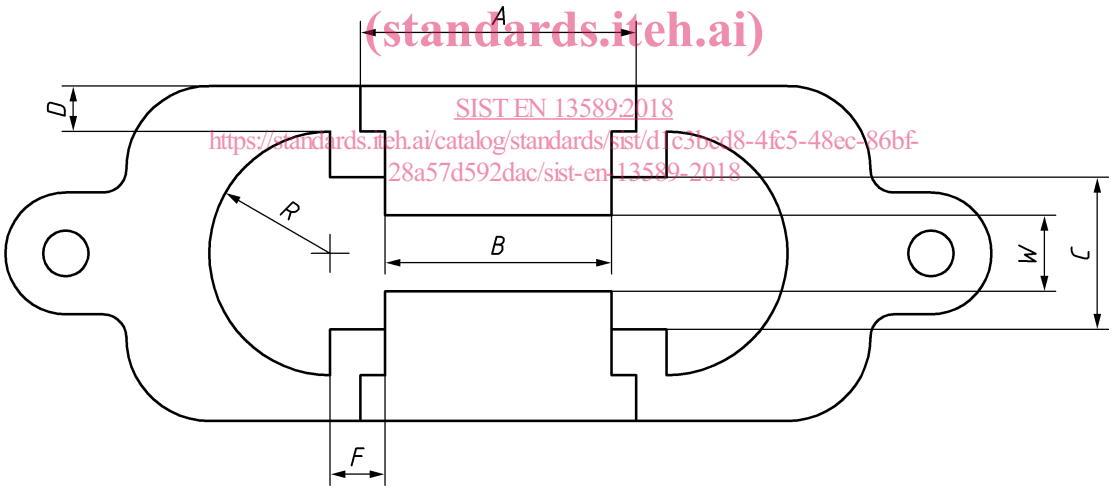
A recording device for force applied and elongation of the test specimen.

5.3 Specimen moulding equipment

The moulds shall be made of metal, shall consist of four parts (2 side halves and 2 clips), and shall have the dimensions given in Figure 1.

The ends for the moulds are known as clips and are similar to those specified in EN 13398. The inner radius of the clips should be of (15,5 ± 0,1) mm, the opening width (20,0 ± 0,2) mm and the inner length of the clips should be (22,8 ± 0,2) mm.

While testing, both clips of a mould shall be kept in place by two diametrically opposed sliding pins. While the test specimens are being cast and kept on test temperature, the moulds shall be placed on a base plate, also made of metal, and they shall be pressed together with a knurled screw.



Key

A	36,5 mm ± 2,0 mm	W	10,0 mm ± 0,1 mm
B	30,0 mm ± 0,1 mm	F	7,3 mm ± 0,1 mm
C	20,0 mm ± 0,2 mm	R	15,5 mm ± 0,1 mm
D	≥ 5,5 mm	thickness	10,0 mm ± 0,1 mm

Figure 1 — Symmetrical mould

6 Preparation and conservation of samples for testing

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

Coat the base plate and the interior side of the lateral walls of the side parts of the mould with a release agent consisting of one part by mass of dextrine (or mineral talc) and one part by mass of

glycerine, or with a silicone based release agent. Assemble the parts of three moulds and place them on the base plate. Press both halves of the moulds together using the knurled screw.

Immediately fill the three slightly heated moulds to avoid air traps. Use a backward and forward filling motion in the longitudinal direction of the mould, in order to give a uniform sample distribution in the mould, until a convex meniscus is obtained.

Keep the moulded specimens for 1,5 ± 0,5 h at room temperature then remove the excess binder using a heated knife. Reject any specimens exhibiting defects. Place the moulded specimens in the water bath maintained at the test temperature for (90 ± 10) min, before testing. The maximum time allowed between preparation and testing of the samples shall not exceed 4 h.

7 Procedure

Run the test with at least three samples.

Once the level filled moulds have been kept at the test temperature for (90 ± 10) min, remove the moulded specimen from the base plate, transfer the test specimen to the traction plates and remove the sides of mould. Then stretch the specimen at the defined test temperature ± 0,5°C and at a speed of (50,0 ± 2,5) mm/min up to an elongation of 1 333 % (0,400 m) while recording tensile force as function of elongation. The test temperature is generally (5,0 ± 0,5) °C.

NOTE From existing experience, starting test temperature for Polymer modified Binders (PmB) and hard or soft binders may be different from (5,0 ± 0,5) °C.

8 Calculation and expression of results

The deformation Energy, E_i, is calculated as the definite integral of force as a function of elongation, see Formula (1).

For each test specimen, the energy calculation is accomplished from the computerised data of couples force/elongation. This calculation can be done using any specific reprocess data software or computer worksheet. This will be the calculation method to be used preferably.

If the equipment is not connected with a calculation device or computer, Formula (1) can also be used:

$$\int_{L1}^{L2} f(x)dx = \Delta L \times \left(\frac{F_0}{2} + \frac{F_n}{2} + \sum_{1}^{n-1} F_i \right) \quad (1)$$

where

L_1 is the length at 0,200 m elongation;

L_2 is the Length at 0,400 m elongation or the length at break;

ΔL is the incremental length between force determinations; normally 0,005 m;

F_0 is the force at 0,200 m elongation;

F_i is the force at (L_1 + i* ΔL);

F_n is the force at break or 0,400 m elongation;

n is the total amount of force values used in the equation ($= \frac{L_2 - L_1}{\Delta L}$); if needed rounded to the nearest integer value.