SLOVENSKI STANDARD
oSIST prEN 1426:2023

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Bitumen in bitumenska veziva - Določanje penetracije z iglo

Bitumen and bituminous binders - Determination of needle penetration

Bitumen und bitumenhaltige Bindemittel - Bestimmung der Nadelpenetration

Bitumes et liants bitumineux - Détermination de la pénétrabilité à l'aiguille

Ta slovenski standard je istoveten z: **prEN 1426**

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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Bitumen and bituminous binders - Determination of needle penetration

Bitumes et liants bitumineux - Détermination de la pénétrabilité à l'aiguille

Bitumen und bitumenhaltige Bindemittel - Bestimmung der Nadelpenetration

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

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European foreword

This document (prEN 1426:2023) has been prepared by Technical Committee CEN/TC 336 “Bituminous binders”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 1426:2015.

The main changes compared to the previous edition are listed below:

— Scope updated;

— automatic operation introduced in Clause 5;

— 5.1 split into subclauses, wording clarified;

— timing device (formerly 5.6) moved to new 5.2, as the timing device might also be integrated in the penetrometer;

— dimensions removed from 5.3.1 (formerly 5.2.1) and reference to Figure 2 added;

— wording updated in 5.3.2 (formerly 5.2.2);

— Clause 5.4 (formerly 5.3) split into subclauses to improve readability;

— Table 1 removed as it contained information already given in 5.4, consequently Table 2 and Table 3 were renumbered;

— cover of water bath added to 5.5 (formerly 5.4);

— 5.6 (formerly 5.5) renamed “Transfer equipment” and split into two subclauses, one on transfer dish (5.6.1, formerly 5.5) and a new one on “transfer bath” (5.6.2);

— recording of calibration/verification and verification of temperature distribution in water bath added to 5.8;

— alignment with prEN 12594 for sample preparation added in 6.1 and 6.2;

— practical information on covering the filled sample container added in 6.3 and 6.4;

— Note 2 from 6.4 moved as standard text to 6.3;

— duration between sample preparation and start of testing specified in 6.4;

— more precise description of ambient temperature given in 6.4 and new note added;

— wording in 7.1 updated;

— transfer bath (5.6.2) added to 7.3;

— second paragraph removed from 7.3;

— automatic surface detection introduced and wording updated in 7.4.1, entire standard was aligned accordingly;

— test report updated in Clause 10;

— Bibliography updated by removing reference to EN 1427.

1 Scope

This document specifies a method for determining the consistency of bitumen and bituminous binders. The normal procedure is described for penetrations up to 330 mm × 0,1 mm at 25 °C. The maximum penetration that can be tested is 500 mm × 0,1 mm.

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1425, *Bitumen and bituminous binders - Characterization of perceptible properties*

EN 10088-3, *Stainless steels - Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes*

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

EN 12597, *Bitumen and bituminous binders - Terminology*

EN ISO 6508-1, *Metallic materials - Rockwell hardness test - Part 1: Test method (ISO 6508-1)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12597 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
penetration
consistency, expressed as the distance in tenths of a millimetre that a standard needle will penetrate vertically into a sample of the material under specified conditions of temperature, load and loading duration

4 Principle

The penetration of a standard needle into a conditioned test sample shall be measured. For penetrations up to approximately 330 mm × 0,1 mm the operating parameters shall be a test temperature of 25 °C, an applied load of 100 g, and a loading duration of 5 s. For penetrations expected above approximately 330 mm × 0,1 mm, the test temperature shall be reduced to 15 °C but the operating parameters of the applied load and the loading duration remain unchanged. Other conditions can be applied; also, to reflect different purposes, e.g. 200 g, 60 s and 5 °C may be used as indicative for low temperature performance.

5 Apparatus

Usual laboratory apparatus and glassware, together with the following:

5.1 Penetrometer; apparatus that permits a needle holder to move vertically without measurable friction and enables the needle penetration to be determined with a maximum permissible measurement error of 0,1 mm.

NOTE Penetrometers can be operated manually or automatically.

5.1.1 The needle holder shall be able to maintain firmly the needle. The needle holder shall be readily detachable from the apparatus and shall have a mass of (47,50 ± 0,05) g.

5.1.2 A weight of (50,00 ± 0,05) g suitable for attachment to the needle holder shall be provided if not already fixed to the needle holder. The 50 g weight shall be fixed underneath the support (see Figure 1).

The mass of the needle plus needle holder together with the additional mass of the weight provides a moving load of (100,00 ± 0,10) g in order to ensure satisfactory test conditions.

NOTE The use of a needle holder of a mass of around 97,50 g without an additional mass is possible.

5.1.3 The stand upon which the specimen container, or transfer dish rests shall be flat and horizontal.

5.1.4 The penetrometer should be located on a plane and stable surface without vibration. Level adjustment, e.g. by level adjustment screws, shall be possible and level should be checked, as it is essential for correct measurements.

To facilitate levelling, the penetrometer should be equipped with a built-in spirit level allowing to verify that the penetrometer on its base stands horizontally.

NOTE The horizontal position of the penetrometer allows vertical movement of the needle dropping assembly and thus vertical load application.

The equipment supplier should ensure the perpendicularity of the needle dropping assembly against the base of the unit.

An example of a suitable penetrometer is shown in Figure 1.

5.2 Timing device, capable of measuring the instant of release of the equipment and the duration of the test to 0,1 s. The timing device may be a separate device or integrated in the penetrometer.

5.3 Penetration needle, (see Figure 2).

5.3.1 Penetration needle specifications made from fully hardened, tempered and polished stainless steel of type X105CrMo17 (1.4125), conforming to EN 10088-3, taking into account that it is not necessary to comply with the minimum content of molybdenum specified in that standard, and of Rockwell hardness C54 to C60 determined in accordance with EN ISO 6508-1. One end of the needle shall be symmetrically tapered by grinding to a cone; the cone shall be co-axial with the cylindrical body of the needle. Further dimensional details of the penetration needle see Figure 2.

The conical tip of the needle shall be ground square to the axis of the needle as given in Figure 2.

For penetrations up to 330 mm × 0,1 mm the length of the needle shall be approximately 50 mm. For penetrations between 330 mm × 0,1 mm and 500 mm × 0,1 mm, use needles that shall conform to the requirements given for mass and dimensions, but which are longer in length so that the ferrule into which the needle is fixed does not penetrate the material undergoing testing.

The needle shall be rigidly mounted in a brass or stainless steel ferrule with 5 mm to 10 mm of the needle inside the ferrule. The run-out of the needle tip or any part of the needle relative to the ferrule axis shall not exceed 1,0 mm. The ferrule shall be (3,10 ± 0,15) mm in diameter and (38 ± 1) mm in length. The ferrule of the penetration needle shall fit firmly into the needle holder.

The mass of the ferrule and needle assembly shall be (2,50 ± 0,05) g.

NOTE 1 A drill hole at the end of the ferrule or a flat on the side is possible to control the mass.

Individual identification marking shall be engraved or stamped on the ferrule of each needle; the same marking shall not be repeated by the manufacturer within a 3-year period.

NOTE 2 Information concerning tolerances of the needle (Figure 2) can be found in EN ISO 286-1 [1] and in EN ISO 1101 [2].

5.3.2 Continuous check of penetration needle by lab

It is important that initial and continued compliance with the stringent requirements for the needle is maintained. Certification of compliance delivered by an external, preferably accredited body, shall be obtained through the needle supplier or a qualified agency.

Penetration needles shall be stored adequately in a protective box.

The edge of the ground tip shall be sharp and free from burrs.

The needle shall be inspected visually for corrosion and shape and the masses of the needle and spindle (needle holder) checked sufficiently regularly to ensure satisfactory condition.

A visual control of the run-out of the needle shall be performed by rolling the needle on a flat surface, e.g. a table. If the run-out is not compliant with the dimensions and radial run out given with Figure 2, the needle shall not be used.

The verification of the conical tip of the needle can be performed with a suitable optical device, e.g. binocular magnifying glasses or a microscope.

In case of corrosion or burrs, penetration needle shall be rejected.

The mass of the needle plus needle holder together with the additional mass of the weight provides a total applied moving load of (100,00 ± 0,10) g.

Visual verification of the needle shall to be done once per month. However, each needle should be checked before use for run out, damages or corrosion.

Changes in the surface of the needle can in the long run lead to incorrect results. To prevent the changes in surface of needle, it is suggested to pre-treat the penetration needles by immersing for 10 to 15 min in a 1 % solution of oleic acid in toluene or xylene prior to drying.

For storage of needles when not in use, see 7.6.

5.4 Test sample container, metal or glass, cylindrical, flat-bottomed. The internal depth of the container shall be appropriate in order to contain a bituminous sample of which the depth shall be at least 10 mm greater than the expected penetration, and not less than 35 mm and shall not exceed 60 mm. The internal diameter of the container shall be at least 55 mm and shall not exceed 70 mm.

5.4.1 In case of only small quantities of binder (e.g. if it was obtained by extraction of bituminous mix core or while monitoring short- or long-term ageing development), there can be a need to adapt the container sizes stated in 5.4. In this case, in order to fulfil the requirements of 7.4.2, either smaller containers (5.4.1.1) or standard containers with metal rings (5.4.1.2) shall be used.

These deviations from the standard test conditions shall be reported in the test report.

The precision of the penetration values determined with other than standard containers can be different from those given in Clause 9.

5.4.1.1 Small containers (5.4.1) shall allow to test as described in 7.4, and 7.4.2 explicitely, and:

— for penetration lower than 100 × 0,1 mm, the inner height of the container shall be at least 20 mm;

— for penetration from 100 × 0,1 mm up to 200 × 0,1 mm (including limits), the inner height of the container shall be at least 30 mm;

— to ensure a good stable temperature during testing, the container shall be placed in brass ring with an inner diameter within 0,5 mm of the outer diameter of the sample container and a height of (21 ± 1) mm or (31 ± 1) mm. and a thickness of at least (5 ± 1) mm.

5.4.1.2 Standard test container in which a metal ring is introduced in order to reduce the container volume shall allow to test as described in 7.4, and 7.4.2 explicitely, and:

— for penetration lower than 100 × 0,1 mm, the remaining inner height for binder to be tested shall be at least 20 mm;

— for penetration from 100 × 0,1 mm up to 200 × 0,1 mm (including limits) remaining inner height for binder to be tested shall be at least 30 mm.

5.5 Water bath (constant temperature bath), with a capacity of at least 10 l, and able to maintain the temperature of the test sample within ± 0,15 °C. The bath shall have a perforated shelf supported in a position not less than 50 mm from the bottom and not less than 100 mm below the liquid level in the bath. If penetration tests are to be made in the bath itself, an additional shelf, strong enough to support the penetrometer shall be provided.

The use of distilled or deionized water is recommended for the bath. Care should be taken to avoid contamination of the bath water by active surface agents or any other material that can affect the penetration values. It is recommended to cover the water bath when not doing the penetration itself.

5.6 Transfer equipment

5.6.1 Transfer dish, for tests outside the water bath. The dish shall have a capacity of at least 350 ml and shall be deep enough to ensure that the test sample container is completely covered with water.

The bottom of the transfer dish shall be constructed so that the dish cannot be rocked when it is placed on the stand of the penetrometer. Similarly, the surface on which the test sample container rests shall be made so that the test sample container cannot rock during penetration of the test sample.

For temperatures lower than 25 °C, the capacity of the transfer dish shall be at least 1,5 l.

5.6.2 Transfer bath, whose water temperature is continuously regulated to the required test temperature. The transfer bath can be connected to the water bath (5.4) or have an independent regulation of the temperature and it is positioned on the stand of the penetrometer.

The bath shall have a capacity of at least 350 ml and shall be deep enough to ensure that the test sample container is completely covered with water.

The bath is insulated to ensure good control of its temperature. It shall allow the positioning of a device for measuring the temperature (5.7) of the water it contains.

For the requirements on construction of the bottom of the transfer bath, surface on which the test sample container rests as well as minimum volume of the transfer bath, see 5.5.