# SLOVENSKI STANDARD
# SIST EN 12697-21:2020

**01-maj-2020**

**Nadomešča:**
**SIST EN 12697-21:2012**

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**Bitumenske zmesi - Preskusne metode - 21. del: Preskus z vtiskanjem na plošče**

Bituminous mixtures - Test methods - Part 21: Indentation using plate specimens

Asphalt - Prüfverfahren - Teil 21: Eindringversuch an Platten

Mélanges bitumineux - Méthodes d'essai - Partie 21: Essai de pénétration de plaques



**Ta slovenski standard je istoveten z:** **EN 12697-21:2020**



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**ICS:**

93.080.20 Materiali za gradnjo cest Road construction materials

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EUROPEAN STANDARD

NORME EUROPÉENNE

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# EN 12697-21

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ICS 93.080.20

Supersedes EN 12697-21:2012

English Version

# Bituminous mixtures - Test methods - Part 21: Indentation using plate specimens

Mélanges bitumineux - Méthodes d'essai - Partie 21 : Essai d'indentation de plaques

Asphalt - Prüfverfahren - Teil 21: Eindringversuch an Platten

This European Standard was approved by CEN on 18 November 2019.

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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 CEN-CENELEC Management Centre has the same status as the official versions.



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

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

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## European foreword

This document (EN 12697-21:2020) has been prepared by Technical Committee CEN/TC 227 “Road materials”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by August 2020, and conflicting national standards shall be withdrawn at the latest by August 2020.

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

This document supersedes EN 12697-21:2012.

The following is a list of significant technical changes since the previous edition:

— the title no longer makes the method exclusively for hot mix asphalt;

— [ge] editorial update according to current standard template;

— [Clause 3] new clause: 3 Terms and definitions introduced according ISO/IEC Directives – Part 2. Following clauses renumbered accordingly;

— [Bibliography] standards not referred to in the test method deleted.



A list of all parts in the EN 12697 series can be found on the CEN website.



According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

# 1 Scope

This document specifies a test method for measuring the indentation of mastic asphalt when it is penetrated at a given temperature, load and for a fixed time period by a standardized cylindrical indentor pin with a circular flat-ended base. This document applies to mastic asphalt with aggregates of maximum nominal size less than or equal to 16 mm.

# 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 12697-27, *Bituminous mixtures — Test methods — Part 27: Sampling*

# 3 Terms and definitions

No terms and definitions are listed in this document.

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

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

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



# 4 Apparatus

## 4.1 Moulding of test plates of mastic asphalt



**4.1.1 Moulds** of 100 mm to 150 mm diameter and 25 mm height or sample moulds 150 mm × 150 mm × 25 mm. Approximate dimensions are sufficiently accurate.

**4.1.2 Oven** capable of maintaining temperature of (250 ± 10) °C.

**4.1.3 Spatula**.

**4.1.4 Thermometer** capable to measure 300 °C accurate to 2 °C.

## 4.2 Apparatus for the indentation test

### 4.2.1 System for the load transmission

#### 4.2.1.1 General

A system able to apply the load under the conditions of Table 1 for the selected type of test.

The load is applied differently according to the type of apparatus used. The following load application systems are suitable:

**4.2.1.2 Lever arm and counterweight:** After balancing of lever arm, with help of a balance weight, place a weight into a mark situated on the arm, at such a distance, that the chosen load is applied on the pin.

**4.2.1.3 Direct charge system:** Comprising a plate, fixed to a vertical axis.

**4.2.1.4 Transmission by pneumatic actuator:** Pressure of compressed air permits the desired force to be obtained. This pressure is preliminarily adjusted by means of a pressure gauge and released at the moment of the test.

**4.2.1.5 Flat ended, cylindrical stainless steel, indentor pins** of the following diameters:

— (25,2 ± 0,1) mm for a surface of 500 mm²;

— (11,3 ± 0,1) mm for a surface of 100 mm²;

— (6,35 ± 0,1) mm for a surface of 31,7 mm².

### 4.2.2 Apparatus for measuring indentation

#### 4.2.2.1 General

The depth of penetration of the pin into the specimen is measured as follows:

**4.2.2.2 Displacement transducer** with an accuracy of ± 0,05 mm, comprising the measurement of test duration.

**4.2.2.3 System permitting registration of penetration** in relation to the time passed with an accuracy of ± 0,05 mm, comprising the measurement of test duration.

### 4.2.3 Apparatus for temperature regulation



**4.2.3.1 A thermostatic water bath** capable of maintaining the temperature in the vicinity of the sample with an accuracy of ± 1 °C.



**4.2.3.2 A thermometer** with an accuracy of ± 0,1 °C.

## 5 Sampling and preparation of laboratory sample

### 5.1 Sampling

The sampling shall take place at fixed plants or at mobile equipment and shall be taken from laid or finished material according to EN 12697-27.

The required mass to form laboratory samples is at least three increments of 1 kg.

### 5.2 Preparation of the samples

If the sample is to be tested in a laboratory, the material has to be cleaned and freed from packaging material and from loose particles.

Then reheat the mixture up to the pouring temperature and homogenize the molten material by stirring thoroughly. If the sample is to be tested immediately, a homogeneous sample at the pouring temperature shall be taken. The temperature shall never excess the maximum temperature according to the local regulations.

The toughly liquid bituminous mixture shall be filled into the moulds and cooled down only in air. Accelerate cooling with cold water shall not be used. Whether or not the samples were reheated shall be reported.

NOTE The reheating of samples in the laboratory is the preferred method.

At least two samples shall be prepared.

Prior to the start of testing, the specimens shall be stored on a flat surface at a temperature of not more than 25 °C for between 12 h and 42 days from the time of their manufacture.

## 6 Procedure

**6.1** Immerse the samples for at least 60 min in the thermostatic bath regulated at the test temperature while taking care, that the water circulates over both flat surfaces.

**6.2** Place the specimen under the measuring apparatus, the non-moulded surface facing upward.

**6.3** The indentor-pin shall be adjusted to be in contact with the surface of the specimens.

**6.4** Apply carefully the load. Release the total load at the beginning of the measurements. Measure the penetration in relation to the time elapsed.

**6.5** Repeat test on same specimen:

— five times in case of the W-test;

— three times in case of tests A, B and C.

The indentor-pin shall never be placed less than 30 mm away from the edge but it shall be placed at least 30 mm apart from the location of the test performed previously.

### 6.6 Test conditions



The test conditions shall be in accordance with Table 1.

**Table 1 — Test conditions**



| Parameter | Type | | | |
|---|---|---|---|---|
| | Test W [a] | Test A [a] | Test B [a] | Test C [b] |
| Temperature | 25 °C, 35 °C, 45 °C | 25 °C | 40 °C | 25 °C, 35 °C, 40 °C |
| Surface of pin | 31,7 mm² | 500 mm² | 500 mm² | 100 mm² |
| Applied load | (311 ± 2) N | (515 ± 3) N | (515 ± 3) N | (515 ± 3) N |
| Duration of loads application | 70 s | 6 min | 31 min | 31 min |
| Measuring between | 10 s and 70 s | 1 min and 6 min | 1 min and 31 min | 1 min and 31 min |

[a] The test W, A and B concerning mastic asphalts are used for paving and roofing layers.

[b] The test C concerning mastic asphalts is used for floor-screeds and *in situ* floorings in buildings and certain paving applications.

## 7 Calculation and expression of results

Calculate the mean of the five (test W) or three (tests A, B or C) test results and compare with the individual results. Reject any result that differs from the calculated mean by more than 15 % of the mean and at least 0,2 mm. If more than one result is rejected, discard the specimen and test the duplicate specimen. If the test on the duplicate specimen fails to provide four (test W) or two (tests A, B or C) acceptable results, repeat the test on freshly cast specimens.

Report the mean of the acceptable test results in units of 1/10 of a millimetre as the hardness number.

## 8 Precision

**Table 2 — Precision**

| Hardness number (1/10 mm) | Repeatability | | Reproducibility | |
|---|---|---|---|---|
| | Standard deviation, $\sigma_r$ | Repeatability | Standard deviation, $\sigma_R$ | Reproducibility |
| ≤ 40 | 15 % | 42 % | 25 % | 69 % |
| > 40 | 10 % | 28 % | 20 % | 56 % |

NOTE The precision data are estimated from NF T 66-002.



## 9 Test report



The test report shall include the following information:

a) number code to identify the part of this document;

b) letter code to identify the type of test;

c) whether or not the material sampled was reheated during sample preparation;

d) test temperature:

- 25 signifying (25 ± 1) °C;
- 35 signifying (35 ± 1) °C;
- 40 signifying (40 ± 1) °C;
- 45 signifying (45 ± 1) °C;

e) hardness number in [1/10 mm];

f) age of test specimen at test and storage conditions under which it was kept;

g) any deviation from this test method.

NOTE Example of the designation of an indentation test performed on plates, test W at a test temperature of (35 ± 1) °C:

— Test EN 12697-21 — W — 35