



SLOVENSKI STANDARD

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Podloge za športne dejavnosti - Preskusne metode za ugotavljanje nateznih lastnosti športnih podlog iz umetnih snovi

Surfaces for sports areas - Test method for the determination of tensile properties of synthetic sports surfaces

Sportböden - Prüfverfahren für die Bestimmung der Zugfestigkeitseigenschaften von Kunststoffflächen

Sols sportifs - Méthode d'essai pour la détermination des caractéristiques de traction des surfaces sportives synthétiques

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Surfaces for sports areas - Test method for the determination of tensile properties of synthetic sports surfaces

Sols sportifs - Méthode d'essai pour la détermination des caractéristiques de traction des surfaces sportives synthétiques

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

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European foreword

This document (EN 12230:2023) has been prepared by Technical Committee CEN/TC 217 “Surfaces for sports areas”, 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of an identical text or by endorsement, at the latest by July 2023, and conflicting national standards shall be withdrawn at the latest by July 2023.

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.

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EN 12230:2023 (E)**1 Scope**

This document specifies three methods for the determination of the tensile properties of materials used as surfaces, elastic layers and shockpads for sports areas.

Method 1 measures the tensile strength of homogenous test specimens that are less than 25 mm in thickness.

Method 2 measures the transversal tensile strength of homogenous test specimens that are more than 25 mm in thickness.

Method 3 measures the tensile strength of sports surfaces or shockpads that are non-homogenous and contain slots or grooves cut into their structure.

This document is applicable both to prefabricated sheet materials and to materials formed by casting of liquid systems cured in-situ.

If the nature of the sports surface is such that a properly representative test piece cannot be prepared in the manner described in this document, then determination of tensile properties should not be attempted for quality control purposes, or as a predictor of performance in use. With such materials, it can be more appropriate to determine their compressive properties or other dynamic characteristics for these purposes.

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 ISO 291, *Plastics - Standard atmospheres for conditioning and testing (ISO 291)*

3 Terms and definitions

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

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

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1**peak-to-valley height**

geometric measure of the roughness of the top of surfacing; the magnitude of regularly or irregularly recurring vertical deviations of a surface

3.2**point of failure**

maximum force less 10%

3.3**rupture**

peak load, less 10%

4 Method 1 – Determination of the tensile properties of homogenous test specimens less than 25 mm thick

4.1 Principle

A test specimen of a given shape is subjected to tensile stress transmitted to it by means of a suitable device. The resulting stress-strain curve is plotted, from which various parameters are subsequently deduced.

4.2 Apparatus

4.2.1 Test machine

A test machine, such that:

- a) the test specimen may be held in the fixing grips of the test apparatus. These fixing grips shall meet the following conditions:
 - 1) The test specimen may be held sufficiently tight to avoid slipping.
 - 2) No localized pressure that could tear or rupture the ends is exerted on any part of the test specimen.
- b) under no load the movable grip may be moved away from the fixed grip at a constant speed of (50 ± 5) mm/min in a direction parallel to the longitudinal axis of the test piece;
- c) the force exerted on the test specimen may be read with a maximum error of 1 % and may be recorded; and
- d) if an extensometer is used, it exerts a minimal force on the test specimen, and the elongation of the test specimen shall be read to an accuracy of 0,1 mm.

4.2.2 Thickness gauge

Thickness gauge, accurate to 0,01 mm with a plunger and a flat measuring surface of nominally 4 mm diameter applied to the surface under a load of $(0,9 \pm 0,1)$ N.

4.2.3 Dial gauge and measuring plate

Dial gauge capable of reading to 0,1 mm with a plunger, having a flat circular contact surface with a diameter of nominally 1,5 mm applied to the surface under a load of $(0,9 \pm 0,1)$ N. to be used in conjunction with a tempered glass plate measuring 80 mm x 80 mm $\pm 2,0$ mm and having a thickness of 4,0 mm $\pm 0,5$ mm and a weight of 60 g ± 5 g.

4.3 Test specimens

4.3.1 Dimensions

Cut the test specimens in accordance with the shape and dimensions shown in Figure 1.

If the distance between the parallel surfaces of the extensometer gauge length varies by more than 5 % (tolerance on parallelism), discard the test specimen and cut a further specimen.

Dimensions in millimetres

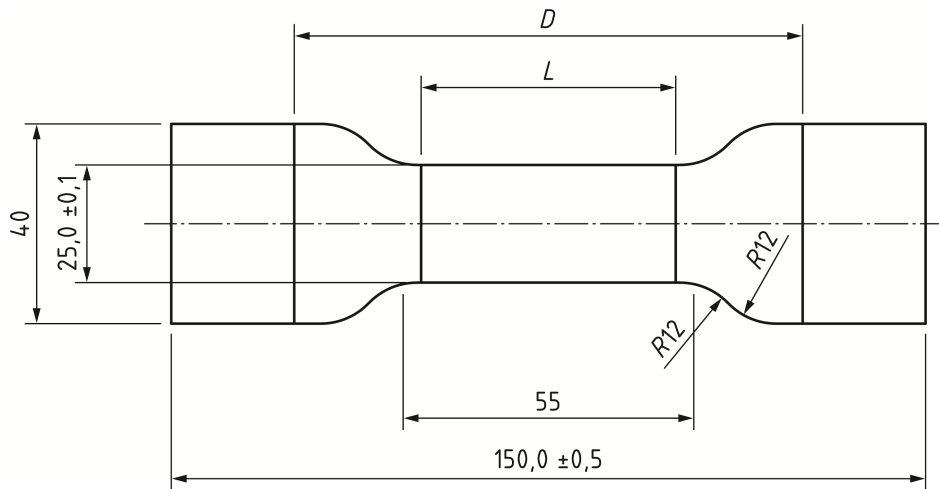


Figure 1 — Dimensions and shape of tensile test specimen - Method 1

4.3.2 Thickness

Ensure that the thickness of the test specimen equals the thickness of the installed surfacing, except in the following cases, where further preparation is required:

- Where the thickness of the installed sports surface and/or the sample provided for test is greater than 25 mm, reduce the thickness of the test specimen by machining or cutting to between 20 mm and 25 mm, taking care during this operation that the structure of the material is not altered, and the test specimen remains as representative as possible of the installed sports surface.
- Where the material carries a surface texture, embossing or granular finish, prepare the upper surface and underside of the test specimen as described in 4.4.

Preparation of the underside of the test specimen to remove irregularities is necessary, for example, where a once-liquid system has been removed from a textured or porous substrate.

After preparation, measure the thickness of each test specimen using the thickness gauge (4.2.2) and a measurement force of between 0,8 N and 1,0 N. Measure the thickness of the test piece at a minimum of five positions along the extensometer gauge length and calculate the average thickness to the nearest 0,1 mm. If any one reading differs from the average thickness by more than 5 % of the average value, discard the test specimen.

4.4 Preparation and conditioning

4.4.1 Remove any surface embossing or granular texture from the two parallel surfaces of the extensometer gauge length by grinding the irregular surface with abrasive paper (grain 60) to enable the thickness of the test specimen to be measured. Grind until a peak-to-valley height of $(0,5 \pm 0,1)$ mm is achieved, or 50 % of the surface texture height has been worn away or until further rubbing no longer produces any change in the surface condition.

4.4.2 Measure the peak-to-valley height by means of a dial gauge (4.2.3) and using the tempered glass plate (4.2.3) as the reference surface placed on the test surface.

4.4.3 On the prepared area, make measurements at nine evenly distributed points and take the mean of the nine measurements as the peak-to-valley height of the surface being examined.

4.4.4 Where necessary, mark the test specimens to indicate their orientation in relation to the direction of anisotropy.

4.4.5 Condition the test specimens in accordance with one of the standard atmospheres given in EN ISO 291, for a period of not less than 24 h.

4.4.6 Where the material of the test specimens has been formed by curing or chemical cross-linking of liquid constituents, prepare the test specimen under conditions which represent as closely as possible the conditions under which the sports surface was, or is to be, installed. Do not test specimens from such materials until at least five days have elapsed from mixing the constituents.

4.5 Number of test specimens

Carry out the test on at least six test specimens. In the case of prefabricated sheet materials, cut at least three test specimens from the longitudinal (machine) direction and at least three from the transverse direction. For materials formed in-situ, take at least three test specimens from each of the two directions at 90 °.

4.6 Procedure

Carry out the test under the same atmospheric conditions as that used for conditioning the test specimens (4.3).

Clamp a test specimen in the fixing grips. Mark the original gauge length on the test specimen (see Figure 1).

Apply the force to be exerted on the test specimen so that it is uniformly distributed by means of the movable grip, at a rate of displacement of (50 ± 5) mm/min until rupture occurs.

Reject any test specimen that breaks outside the extensometer gauge length and prepare and test a further specimen so that the number of valid results is not less than six.

If an extensometer is not used, record the elongation corresponding to a given force, at suitable intervals. Plot the resulting stress-strain curve.

Repeat the procedure for the remaining test specimens until six valid results are obtained.

4.7 Calculation and expression of results

4.7.1 Tensile stress at rupture

4.7.1.1 Calculate the tensile stress at rupture, O_r , expressed in megapascal, from the following formula:

$$O_r = \frac{F_r}{b \times d}$$

where

O_r is the tensile stress at rupture, expressed in megapascals (MPa);

F_r is the force applied to the test piece at the moment of rupture, expressed in newtons (N);

b is the original width of the parallel length of the narrow section of the test piece, expressed in millimetres (mm);

d is the original thickness of the parallel length of the narrow section of the test piece, expressed in millimetres (mm).

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4.7.1.2 Calculate the mean tensile strength at rupture of the six tests.

4.7.2 Maximum tensile strength

4.7.2.1 Calculate the maximum tensile stress from the following formula:

$$O_m = \frac{F_m}{b \times d} \quad O_m = \frac{F_m \times 10^{-6}}{b \times d}$$

where

O_m is the maximum tensile stress at rupture, expressed in megapascals (MPa);

F_m is the maximum force applied to the test piece during the test, expressed in newtons (N);

b is the original width of the parallel length of the narrow section of the test piece, expressed in millimetres (mm);

d is the original thickness of the parallel length of the narrow section of the test piece, expressed in millimetres (mm).

4.7.2.2 Calculate the mean maximum tensile strength of the six test specimens.

4.7.3 Relative elongation at rupture

Calculate the relative elongation at rupture, E , expressed as a percentage of the original gauge length, from the following formula:

$$E = \frac{\Delta_L \times 100}{L}$$

where

Δ_L is the variation in length corresponding to a given force, measured by the variation in distance between gauge marks, expressed in millimetres;

L is the original gauge length of the test piece, expressed in millimetres (mm).

After determination on the stress-strain curve of the corresponding elongations, calculate:

- a) the relative elongation, E_m for the maximum stress, if applicable, as a percentage of the original gauge length; and
- b) the relative elongation, E_r , at rupture, as a percentage of the original gauge length.

The values at maximum stress and at rupture shall be recorded.

4.8 Test report

The test report shall contain the following information:

- a) reference to this document;
- b) the type and designation of the material;
- c) the conditioning procedure used;
- d) record number of individual tests if required;