SLOVENSKI STANDARD
SIST EN 17323:2020

01-julij-2020

Geosintetika - Ugotavljanje nateznih lastnosti polimernih geosintetičnih ovir

Geosynthetics - Determination of tensile properties of Polymeric Geosynthetic Barriers

Geokunststoffe - Geosynthetische Kunststoffdichtungsbahnen - Bestimmung von Zugeigenschaften

Géosynthétiques - Détermination des propriétés en traction des géomembranes polymériques

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ICS:

59.080.70	Geotekstilije	Geotextiles

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Geosynthetics - Determination of tensile properties of Polymeric Geosynthetic Barriers

Géosynthétiques - Détermination des propriétés en traction des géomembranes polymériques

Geokunststoffe - Geosynthetische Kunststoffdichtungsbahnen - Bestimmung von Zugeigenschaften

This European Standard was approved by CEN on 14 March 2020.

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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 17323:2020) has been prepared by Technical Committee CEN/TC 189 “Geosynthetics”, the secretariat of which is held by NBN.

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of an identical text or by endorsement, at the latest by November 2020, and conflicting national standards shall be withdrawn at the latest by November 2020.

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1 Scope

This document specifies test methods for the determination of tensile properties of polymeric geosynthetic barriers PE (e.g. PE-HD and PE-LLD), FPO (e.g. EVA, FPP, and PE-VLD), PVC-P and EPDM.

Method A is suitable for testing polymeric geosynthetic barriers (GBR-P), made of PVC-P, EPDM and FPO (e.g. EVA, FPP and PE-VLD), non-reinforced (including maximum 80 g/m² glass fleece) and without backing.

Method B is suitable for testing polymeric geosynthetic barriers (GBR-P) made of PE (e.g. PE-HD and PE-LLD), non-reinforced and without backing.

Method C is suitable for testing polymeric geosynthetic barriers (GBR-P), reinforced and/or with backing.

Method D is suitable for measuring modulus (if required) of all non-reinforced GBR-P.

NOTE For homogenous polymers not listed above, method A and D can be used.

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 1849-2, *Flexible sheets for waterproofing - Determination of thickness and mass per unit area - Part 2: Plastics and rubber sheets for roof waterproofing*

EN ISO 7500-1, *Metallic materials - Calibration and verification of static uniaxial testing machines - Part 1: Tension/compression testing machines - Calibration and verification of the force-measuring system (ISO 7500-1)*

EN ISO 9862, *Geosynthetics - Sampling and preparation of test specimens (ISO 9862)*

EN ISO 9863-1, *Geosynthetics - Determination of thickness at specified pressures - Part 1: Single layers (ISO 9863-1)*

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 http://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
thickness
d
distance between the upper and lower surfaces of a geosynthetic, measured normal to the surfaces and under a specified pressure, expressed in mm

3.2
width
b
the initial dimension of the parallel sided portion of the specimen, expressed in mm

3.3
cross sectional area
A
product of initial width b (mm) and thickness d (mm) of a test specimen, expressed in square millimetres (mm^2)

3.4
gauge length
l_0
distance between two reference points, when using an extensometer, located on the specimen parallel to the applied load, expressed in mm

3.5
reference length
l_r
distance for calculating tensile elongation, when not using an extensometer, expressed in mm

3.6
yield point
point on the stress-elongation curve, other than the failure point, at which an increase in strain (elongation) occurs without an increase in stress

Note 1 to entry: For semi-crystalline polymers the first occurrence in the tensile test where there is an increase in strain (elongation) without an increase in stress.

3.7
tensile stress at yield point
σ_y

first stress at which an increase in strain (elongation) occurs without an increase in stress, expressed in N/mm^2

Note 1 to entry: It may be less than maximum attainable stress.

3.8
elongation at yield
ε_y
strain (elongation), expressed as a percentage, at the first occurrence in the tensile test where there is an increase in strain (elongation) without an increase in stress

3.9
tensile stress at break
σ_b
stress, at the highest value of stress, just before break on the stress /elongation curve, expressed in N/mm^2

Note 1 to entry: It may be less than the maximum attained stress.

3.10
elongation at break
ε_b
strain (elongation), expressed as a percentage, at the highest value of stress, just before break on the stress /strain curve

3.11
maximum tensile strength (related to specimen width)
T_{max}
maximum tensile strength sustained by the test specimen during a tensile test**,** expressed in N/specimen width (mm)

Note 1 to entry: Where there is more than one peak value, the first distinct peak shall be reported as the maximum tensile strength. Further peaks can be reported; however, these shall be reported separately and numbered (e.g. 2, 3, 4). See Annex A for examples of stress/elongation curves.

3.12
elongation at maximum tensile strength
ε_p
strain (elongation) measured at maximum tensile strength sustained by the specimen during the tensile test**,** expressed as a percentage

Note 1 to entry: Where there is more than one peak value, the elongation at the first distinct peak shall be reported as the strain (elongation) at maximum tensile strength. Further peaks can be reported; however, these shall be reported separately and numbered (e.g. 2, 3, 4). See Annex A for examples of stress/elongation curves.

3.13
secant modulus
$E_{1\text{-}2}$
slope of the stress/elongation curve in the elongation interval between 1 and 2 %, expressed in N/mm^2

4 Principle

The test specimen is extended along its major longitudinal axis at a constant speed until the specimen ruptures. The force and increase in specimen length are continuously recorded throughout the test.

5 Apparatus

5.1 Testing machine

Tensile testing machine (constant rate of extension) complying with EN ISO 7500-1, class 1 or better, in which the rate of increase in specimen length is uniform with time, fitted with a set of clamps or jaws which are sufficiently wide to hold the entire width of the specimen and equipped with appropriate means to limit slippage or damage.

5.2 Extensometer (where required)

Capable of measuring the distance between gauge marks on the specimen without any damage to the specimen or slippage, ensuring that the measurement represents the true movement of the gauge marks. Example: mechanical, optical, infrared or other types. All with an electrical output.

The extensometer shall be capable of measuring to an accuracy of ± 2 % of the indicated reading.

If any irregularity of the stress/strain (elongation) curve due to the extensometer is observed, this result shall be discarded and another specimen shall be tested.

6 Test specimens

6.1 Preparation of test specimens

Prepare the test specimens over the full roll width and in accordance with EN ISO 9862.

The test specimens shall be punched so that the edges are smooth and free from notches: examination with a low-power magnifier is recommended to check the absence of notches. Punch dies shall be kept sharp by regular honing, and a suitable backing material shall be used with punch dies to ensure a clean-cut edge.

A set of test specimens (machine and cross machine direction) with a mesh or fabric internal layer, backing or laminated reinforcement shall have the same number of threads. Cutting of threads should be avoided.

The test specimens shown in Figures 1, 2 and 4 shall be obtained by the use of punch dies.

6.2 Number of test specimens

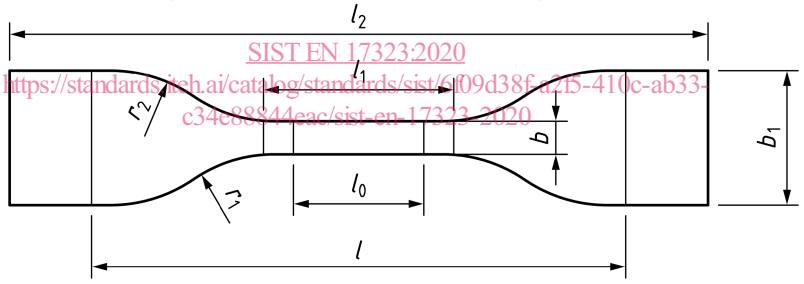
Prepare a minimum of five test specimens in both the machine and cross-machine directions.

6.3 Dimensions of test specimens

6.3.1 Method A

Prepare test specimens in accordance with Figure 1.

Dimensions in millimetres



Key

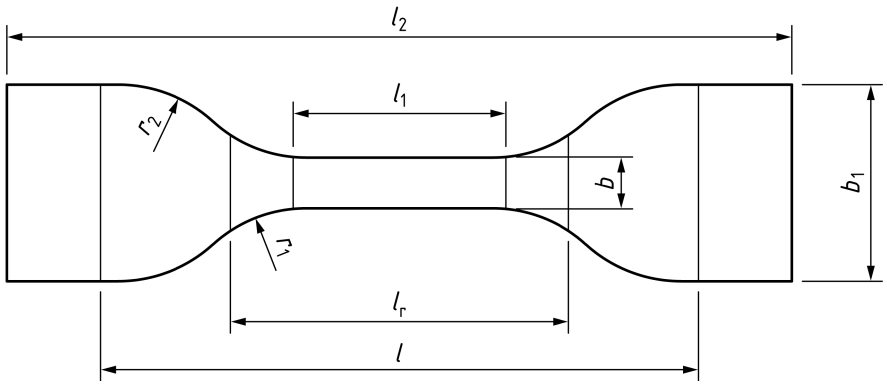
b	width of narrow parallel-sided portion: 6 mm ± 0,4 mm	l	initial distance between grips: 80 mm ± 2 mm
b	width of ends: 25 mm ± 1 mm	l_2	overall length: ≥ 115 mm
l_0	gauge length for extensometer: 25 mm ± 0,25 mm	r_1	small radius: 14 mm ± 1 mm
l_1	length of narrow parallel-sided portion: 33 mm ± 2 mm	r_2	large radius: 25 mm ± 2 mm

Figure 1 — Test specimen for Method A

6.3.2 Method B

Prepare test specimens in accordance with Figure 2.

Dimensions in millimetres



Key

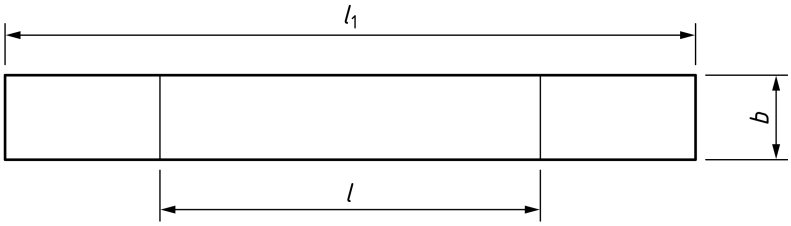
b	width of narrow parallel-sided portion: 6 mm ± 0,4 mm	l	initial distance between grips: 80 mm ± 2 mm
b_1	width of ends: 25 mm ± 1 mm	l_2	overall length: ≥ 115 mm
l_r	reference length for measurement of yield and break elongation, 50 mm	r_1	small radius: 14 mm ± 1 mm
l_1	length of narrow parallel-sided portion: 33 mm ± 2 mm	r_2	large radius: 25 mm ± 2 mm

Figure 2 — Test specimen for Method B

6.3.3 Method C

Prepare specimens in accordance with Figure 3.

Dimensions in millimetres



Key

b width: 50 mm ± 0,5 mm

l_1 overall length: ≥ 200 mm

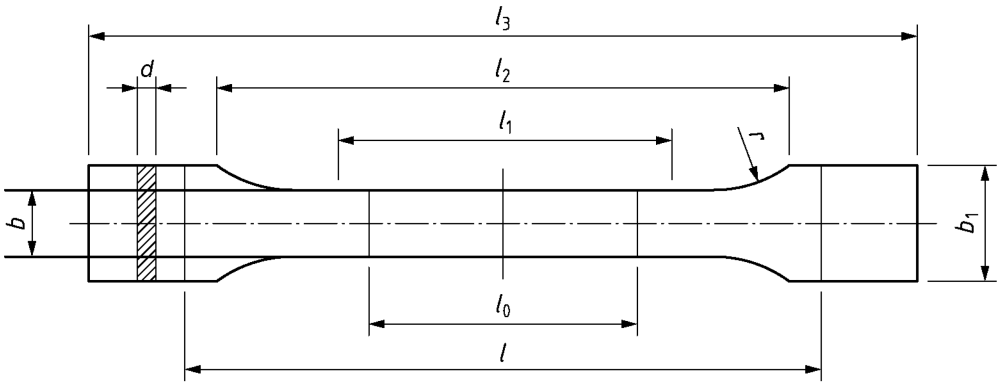
l initial distance between grips: 120 mm ± 2 mm

Figure 3 — Test specimen for Method C

6.3.4 Method D

Prepare specimens in accordance with Figure 4.

Dimensions in millimetres



Key

b	width of narrow parallel-sided portion: 10 mm ± 0,2 mm	l	initial distance between grips: 115 mm ± 2 mm
b_1	width of ends: 20 mm ± 0,5 mm	l_3	overall length: ≥ 150 mm
l_0	gauge length (for extensometer): 50 mm ± 0,5 mm	r	radius ≥ 60 mm (recommended radius: 60 mm ± 0,5 mm)
l_1	length of narrow parallel-sided portion: 60 mm ± 0,5 mm	l_2	distance between the shoulders (108 mm recommended)
d	thickness in mm		

Figure 4 — Test specimen for Method D

7 Conditioning

The test specimens shall be conditioned for at least 16 h, prior to testing and tested in a standard atmosphere of (23 ± 2) °C and (50 ± 10) % relative humidity.

8 Procedure - Method A

Measure the width of the narrow portion of the dumbbell, e.g. using a calliper, to an accuracy of 0,03 mm.

Measure the thickness of the specimen at one end of the specimen in accordance with EN ISO 9863-1. In case of a profiled GBR-P determine the effective thickness d_{eff} of the GBR-P according to EN 1849-2.

Use the measured width and thickness to calculate the cross-sectional area of the test specimen.

Place the test specimen in the grips, set 80 mm (± 2 mm) apart, taking care to align the longitudinal axis of the test specimen with the axis of the testing machine. Tighten the grips evenly and firmly to avoid slippage of the test specimen. Gripping pressure shall not cause fracture of the test specimen.

Position the extensometer at gauge length (25 mm).

Set the speed of testing at a rate of 100 mm/min and with a maximum preload of 5 N record the load-extension curve of the specimen. FPO and PVC geomembranes must be preloaded by a force of 2 N and EPDM geomembranes must be preloaded by a force of 1 N.