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Geotekstilije - Natezni preskus na širokih preskušancih (ISO/DIS 10319:2023)

Geosynthetics - Wide-width tensile test (ISO/DIS 10319:2023)

Geokunststoffe - Zugversuch am breiten Streifen (ISO/DIS 10319:2023)

Géosynthétiques - Essai de traction des bandes larges (ISO/DIS 10319:2023)

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Geosynthetics — Wide-width tensile test

Géosynthétiques — Essai de traction des bandes larges

ICS: 59.080.70

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee *ISO/TC 221 Geosynthetics.*

This fourth edition cancels and replaces the third edition (ISO 10319:2015), which has been technically revised.

The main changes compared to the previous edition are as follows:

— The term “load” have been changed to “force” for all occurrences;

— Difference between strain and elongation has been clarified in Clause 3, and Fig. 1 has been modified accordingly;

— Difference between tensile strength at first and second peak has been clarified in Clause 3 and 9.2;

— Illustration of suitable jaws and grips has been introduced in Fig. 3;

— Testing of metallic products has been limited to woven steel wire meshes in Clause 6.3.6;

— Testing products narrower than 200 mm has been introduced in Clause 6.3.7;

— Testing at lower or higher temperatures has been introduced, with the related conditioning in Clause 7.3 and the related procedure added in Annex A (normative);

— Formulas for strain calculation have been introduced in Clause 9.1;

— Formula for tensile strength of products narrower than 200 mm have been introduced in Clause 9.2;

— Test report requirements have been updated in Clause 10.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html

Geosynthetics — Wide-width tensile test

1 Scope

This document describes an index test method for the determination of the tensile properties of geosynthetics (polymeric, glass, and metallic), using a wide-width strip. This document is applicable to most geosynthetics, including woven geotextiles, nonwoven geotextiles, geocomposites, knitted geotextiles, geonets, geomats, and metallic products. It is also applicable to geogrids and similar open-structure geotextiles, but specimen dimensions might need to be altered. It is not applicable to polymeric or bituminous geosynthetic barriers, while it is applicable to clay geosynthetic barriers.

This document specifies a tensile test method that covers the measurement of load elongation characteristics and includes procedures for the calculation of secant stiffness, maximum load per unit width and strain at maximum load. Singular points on the load-extension curve are also indicated.

Procedures for measuring the tensile properties of both conditioned and wet specimens are included in this document.

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.

ISO 554, *Standard atmospheres for conditioning and/or testing — Specifications*

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

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 9862, *Geosynthetics — Sampling and preparation of test specimens*

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

ISO 10321, *Geosynthetics — Tensile test for joints/seams by wide-width strip method*

EN 10223-3, *Steel wire and wire products for fencing and netting — Part 3: Hexagonal steel wire mesh products for engineering purposes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10318 and the following apply.

3.1
nominal gauge length
L_n
initial distance, normally 60 mm (30 mm on either side of the specimen symmetrical centre), between two reference points located on the specimen parallel to the applied force direction

3.2
elongation at pre-tension force
ΔL_p
measured increase in gauge length (mm) corresponding to an applied pre-tension force of 1 % of the expected maximum tensile force

Note 1 to entry: The elongation at pre-tension force is indicated in Figure 1.

3.3
true gauge length
L_0
nominal gauge length L_n (3.1) in millimetres plus the *elongation at pre-tension force* ΔL_p (3.2) in millimetres

3.4
maximum tensile force
F_{max}
maximum tensile force obtained during a test

Note 1 to entry: The maximum tensile force is expressed in kilonewtons (kN).

3.5
tensile strain
ε
increase in *true gauge length* L_0 (3.3) of a specimen during a test divided by true gauge length L_0

Note 1 to entry: Tensile strain is expressed as a percentage of the true gauge length L_0.

3.6
tensile strain at maximum tensile force
ε_{max}
tensile strain (3.5) exhibited by the specimen under maximum tensile force

Note 1 to entry: Tensile strain at maximum tensile force is expressed in percent.

3.7
tensile strain at nominal tensile strength
ε_{nom}
tensile strain at the nominal tensile strength as defined by the manufacturer

3.8
secant tensile stiffness
J
ratio of tensile force per unit width to an associated value of strain

Note 1 to entry: Tensile secant stiffness is expressed in kilonewtons per metre (kN/m).

3.9
tensile strength
T_{max}
maximum force per unit width observed during a test in which the specimen is stretched to rupture

Note 1 to entry: Tensile strength is expressed in kilonewtons per metre (kN/m).

Note 2 to entry: for products exhibiting a second peak on the tensile force per unit width — strain curves, the tensile strength is defined as the highest value between the two peaks, as shown in Fig. 2

3.10
strain rate
strain at maximum force, divided by the duration of the test, i.e. the time to attainment of maximum tensile force from pre-tension force

Note 1 to entry: Strain rate is expressed in percentage per minute.

3.11
tensile strength at second peak
T'_{max}
maximum force per unit width observed during a test in which the specimen is stretched to rupture, at the second peak observed on the tensile force per unit width — strain curve, occurring at a higher strain than that corresponding to the first peak

Note 1 to entry: Tensile strength at second peak is expressed in kilonewtons per metre (kN/m).

3.12
tensile strain at second peak
$\mathcal{E}'_{max}$
tensile strain exhibited by the specimen at the second peak observed on the tensile force per unit width — strain curve, occurring at a higher strain than that corresponding to the first peak

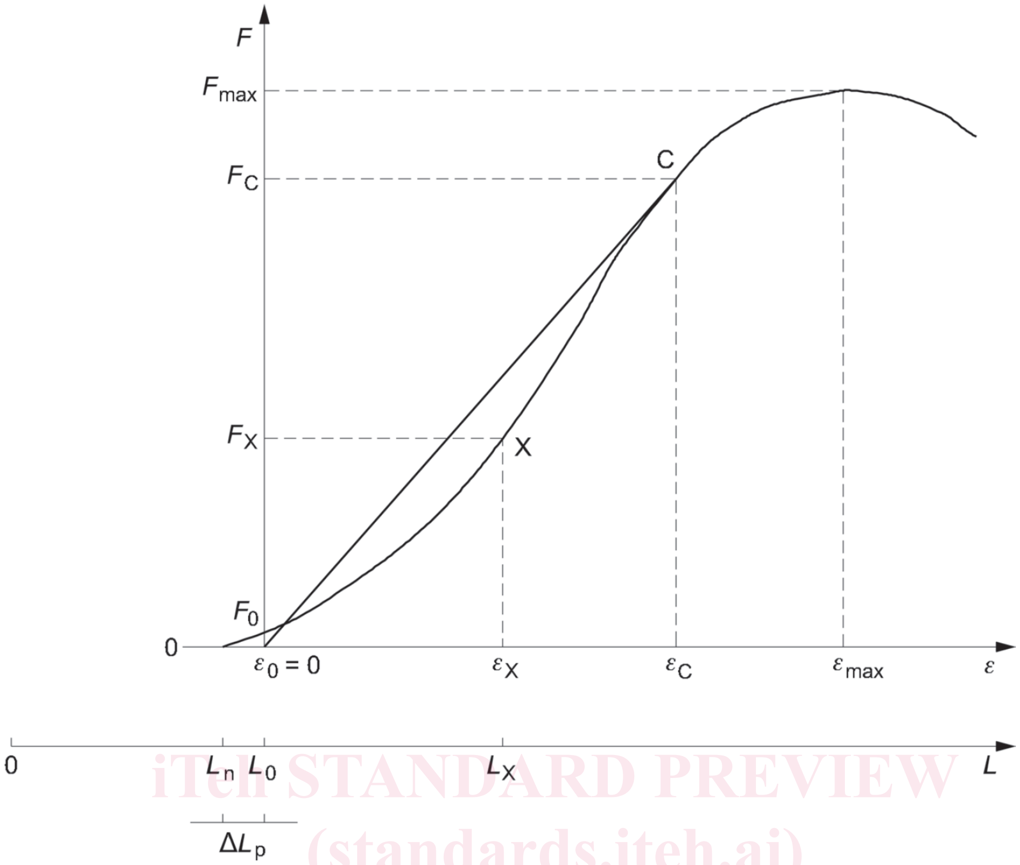
Note 1 to entry: Tensile strain at second peak is expressed in percent.

3.13
pre-tension force
F_p
tensile force equal to 1 % of the expected maximum tensile force, applied at the beginning of the test

Note 1 to entry: The pre-tension force is expressed in kilonewtons (kN).

3.14
tensile strain at pre-tension forceε_0
tensile strain at pre-tension force, in %

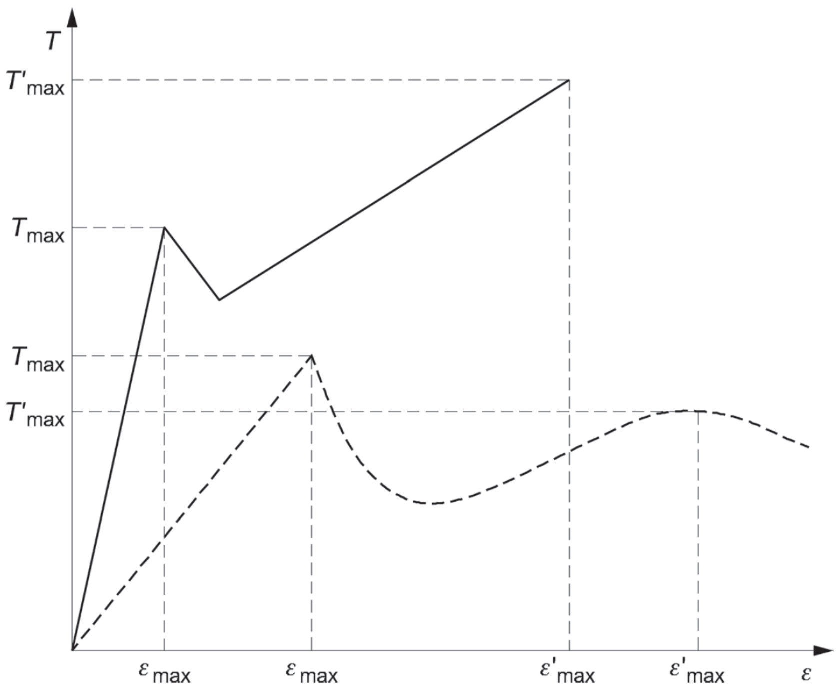
Note 1 to entry: Tensile strain at pre-tension force is equal to zero based on Formulas (1) and (2), as shown in Fig. 1



Key

F	tensile force, in kN
F_{max}	maximum tensile force, in kN
F_0	pre-tension force, in kN
F_c	tensile force for secant stiffness calculation at point C
C	selected point for the stiffness calculation
ε	tensile strain, in %
ε_0	tensile strain at pre-tension force, in %
ε_{max}	tensile strain at maximum tensile force, in %
ε_x	tensile strain corresponding to the generic length L_x, in %
ε_c	tensile strain for secant stiffness calculation at point C, in %
L	length, equal to the distance between the two reference points measured during the test in mm
L_n	nominal gauge length, in mm
L_0	true gauge length, in mm
L_x	generic length measured during the test, in mm
ΔL_p	elongation at pre-tension force, in mm

Figure 1 — Typical tensile force /strain curve



Key

T_{max}	tensile strength at first peak (kN/m)
ε_{max}	tensile strain at first peak (%)
T'_{max}	tensile strength (kN/m) at second peak
ε'_{max}	tensile strain (%) at second peak

Figure 2 — Typical tensile force per unit width — Strain curves of two geosynthetics showing a second peak

4 Principle

A specimen is held across its entire width in a set of clamps or jaws (see Figure 3) of a tensile testing machine operated at a constant rate of strain, and a longitudinal force is applied to the specimen until the specimen ruptures. The type of jaws is selected according to the type and tensile strength of the tested product: compressive hydraulic jaws (Fig. 3 a, c, d) and capstan grips (fig. 3 b, e, f) may be used. For capstan grips it could be useful to wind the specimen in a “S-shape” scheme around the capstan clamps or in a “B-shape” scheme, as shown in Fig. 3 f.

The tensile properties of the specimen are calculated from machine scales, dials, autographic recording charts, or an interfaced computer. A constant test speed is selected so as to give a strain rate of (20 ± 5) % per minute in the true gauge length of the specimen, except for products that exhibit a low strain, i.e. less than or equal to 5 %. For these products, e.g. glass, the speed is reduced so that the specimen breaks in 30 ± 5 s.

The basic distinction between the current method and other methods for measuring tensile properties of products is the width of the specimen. In the current method, the width is greater than the length of the specimen, as some geosynthetics have a tendency to contract (neck down) under tensile force in the gauge length area (see fig. 3 c).

The greater width reduces the contraction effect of such products and provides a relationship closer to the expected product behaviour in the field, as well as a standard for comparison of geosynthetics.

For information on strain, extension measurements are made by means of an extensometer, which follows the movement of two reference points on the specimen. These reference points are situated

