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भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDRADS

Draft For Comments Only

भारतीय मानक मसौदा

भूकृत्रिम — चौड़ी-पट्टी तन्यता परीक्षण
(आई एस 16635 : 2017 का *पहला पुनरीक्षण)*

Draft Indian Standard

GEOSYNTHETICS — WIDE-WIDTH TENSILE TEST
(First Revision of IS 16635 : 2017 *)*

ICS : 59.080.70

Geosynthetics Sectional Committee, TXD 30	Last date for receipt of comments is **23 September 2025**

NATIONAL FOREWORD

(*Formal clauses will be added later*)

This Indian Standard intended to be adopted is identical with ISO 10319 : 2017 'Geosynthetics — Wide-width tensile test' issued by the International Organization for Standardization (ISO).

This standard was originally published in 2017. The present revision has been undertaken to align it with the latest version of ISO 10319 : 2024.

The conditioning temperature of (20 ± 2)°C as specified in International Standard is not suitable for tropical countries like India where the atmospheric temperature is normally much higher than 20 °C. It is almost impossible to maintain this temperature specially during summer when the atmospheric temperature rises even up to 50°C. In view of the above, IS 6359 : 2023 'Method for conditioning of textiles (first revision)' which specifies a temperature of (27 ± 2) °C for conditioning of the test specimens for the tropical countries like India shall be referred.

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In the standard intended to be adopted, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their respective places are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
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	IS 1828 (Part 1) : 2022 Metallic Materials — Calibration and Verification of Static Uniaxial Testing Machines Part 1 Tension/Compression Testing Machines — Calibration and Verification of the Force-Measuring System *(fifth revision*)	Identical
ISO 9862 Geosynthetics — Sampling and preparation of test specimens	IS 14706 : 2024 Geosynthetics — Sampling and preparation of test specimens (*first revision*)	Identical
ISO 9863-1 Geosynthetics — Determination of thickness at specified pressures — Part 1: Single layers	IS 13162 (Part 3) : 2021 Geosynthetics — Determination of thickness at specified pressures (Part 3) : Single layers (*first revision*)	Identical
ISO 10318-1 Geosynthetics — Part 1 : Terms and definitions	IS 13321 (Part 1) : 2022 Geosynthetics — (Part 1) : Terms and definitions (*first revision*)	Identical
ISO 10321 Geosynthetics — Tensile test for joints/seams by wide-width strip method	IS 15060 : 2018 Geosynthetics – Tensile test for joint seams by wide-width strip method (*first revision*)	Identical

The technical committee has reviewed the provisions of the following International Standards referred in this standard intended to be adopted and has decided that these are acceptable for use in conjunction with this standard:

International Standard	*Title*
ISO 554	Standard atmospheres for conditioning and/or testing — Specifications
EN 10223-3	Steel wire and wire products for fencing and netting — Part 3: Hexagonal steel wire mesh products for civil engineering purposes

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

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'.

EXTRACT OF ISO 10319 : 2017 'GEOSYNTHETICS — WIDE-WIDTH TENSILE TEST'

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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 189, Geosynthetics, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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

The main changes are as follows:
— the term “load” changed to “force” in all instances;
— difference between strain and elongation clarified in Clause 3 and Figure 1 modified accordingly;
— difference between tensile strength at first and second peak clarified in Clause 3 and 9.2;
— illustration of suitable jaws and grips introduced in Figure 3;
— testing of metallic products limited to woven steel wire meshes in 6.4.6;
— testing products narrower than 200 mm introduced in 6.4.7;
— testing at lower or higher temperatures introduced, with the related conditioning in 7.3 and the related procedure added in Annex A;
— formulae for strain calculation introduced in 9.1;
— formulae for tensile strength of products narrower than 200 mm introduced in 9.2;
— test report requirements 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.

1 Scope

This document specifies 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 will possibly need to be altered. It is not applicable to polymeric or bituminous geosynthetic barriers, but it is applicable to clay geosynthetic barriers.
This document specifies a tensile test method that covers the measurement of tensile force, elongation characteristics and includes procedures for the calculation of secant stiffness, maximum load per unit width and strain at maximum force. Singular points on the tensile force-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 10318-1, Geosynthetics — Part 1: Terms and definitions

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 civil engineering purposes

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10318-1and the following apply.

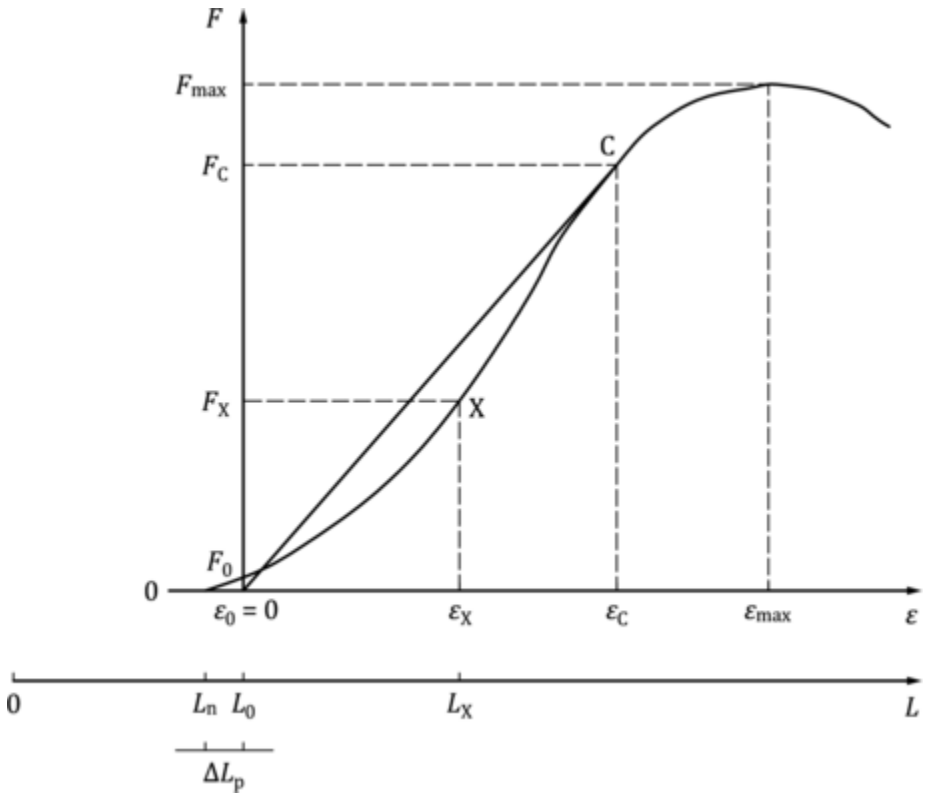
ISO and IEC maintain terminology databases for use in standardization at the following addresses:
— ISO Online browsing platform: available at https://www.iso.org/obp
— IEC Electropedia: available at https://www.electropedia.org/

3.1
nominal gauge length
Ln

initial distance between two reference points located on the specimen parallel to the applied force direction
Note 1 to entry: The nominal gauge length is normally 60 mm (30 mm on either side of the specimen symmetrical centre).

3.2
elongation at pre-tension force
ΔLp

measured increase in gauge length (mm) corresponding to an applied pre-tension force of 1 % of the expected maximum tensile force (3.4)
Note 1 to entry: The elongation at pre-tension force is indicated in Figure 1.
Figure 1 — Typical tensile force–strain curve



Key

F	tensile force, in kN
Fmax	maximum tensile force, in kN
F0	pre-tension force, in kN
Fc	tensile force for secant stiffness calculation at point C
Fx	tensile force at strain εx
C	selected point for the stiffness calculation
ε	tensile strain, in per cent
ε0	tensile strain at pre-tension force set as the origin of the abscissa, in per cent
εmax	tensile strain at maximum tensile force, in per cent
εx	tensile strain corresponding to the generic length Lx, in per cent
εc	tensile strain for secant stiffness calculation at point C, in per cent
L	length, equal to the distance between the two reference points measured during the test, in mm
Ln	nominal gauge length, in mm
L0	true gauge length, in mm
Lx	generic length measured during the test, in mm
ΔLp	elongation at pre-tension force, in mm

3.3
true gauge length
L0

nominal gauge length (3.1) in millimetres plus the elongation at pre-tension force (3.2) in millimetres

3.4
maximum tensile force
Fmax

maximum value 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 (3.3) of a specimen during a test divided by true gauge length
Note 1 to entry: Tensile strain is expressed as a percentage of the true gauge length.

3.6
tensile strain at maximum tensile force
εmax

tensile strain (3.5) exhibited by the specimen under maximum tensile force (3.4)
Note 1 to entry: Tensile strain at maximum tensile force is expressed in per cent.

3.7
tensile strain at nominal tensile strength
εnom

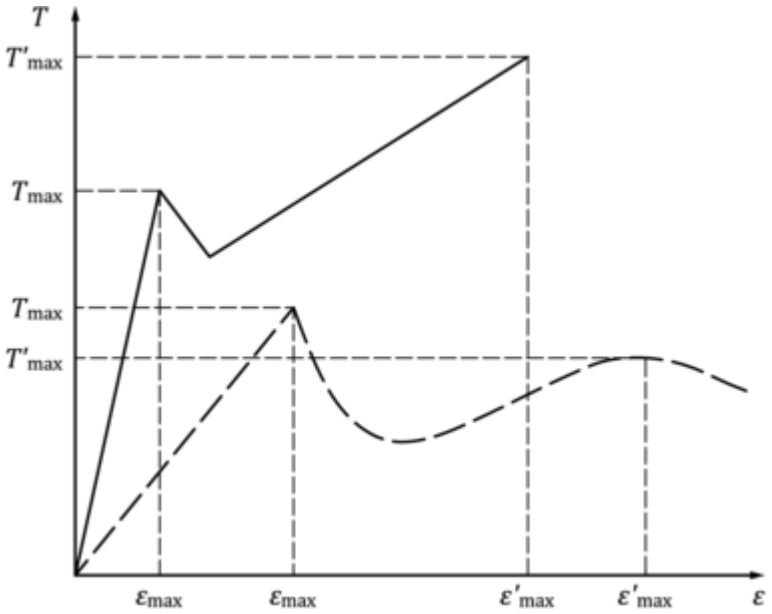
value at the nominal tensile strength (3.9) as defined by the manufacturer

3.8
secant tensile stiffness
J

ratio of tensile force per unit width to an associated value of strain
Note 1 to entry: Secant tensile stiffness is expressed in kilonewtons per metre (kN/m).

3.9
tensile strength
Tmax

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



Key

Tmax	tensile strength at first peak, in kN/m
Ɛmax	tensile strain at first peak, in per cent
T'max	tensile strength at second peak (kN/m)
Ɛ'max	tensile strain at second peak, in per cent

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 (3.4) 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
Ɛ'max

tensile strain (3.5) 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 per cent.

3.13
pre-tension force

F0

tensile force equal to 1 % of the expected maximum tensile force (3.4), 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 force
ε0

tensile strain (3.5) corresponding to the pre-tension force, set as the origin of the abscissa in Figure 1, in per cent
Note 1 to entry: Tensile strain at pre-tension force is equal to zero based on Formulae (1) and (2), as shown in Figure 1.

FORMAT FOR SENDING COMMENTS ON BIS DOCUMENTS

(Please use A4 size sheet of paper only and type within fields indicated. Comments on each clause/sub clause/table/fig etc. be started on a fresh box. Information in column 3 should include reasons for the comments and suggestions for modified working of the clauses when the existing text is found not acceptable. Adherence to this format facilitates Secretariat's work)

Please e-mail your comments to txd@bis.gov.in

NAME OF THE COMMENTATOR/ORGANIZATION:

DOCUMENT NO: TXD 30 (28452) WC

BIS LETTER REFERENCE NO. : TXD 30 (28452)

Item, Clause Sub-Clause No. Commented upon (Use Separate Box afresh)	**Comments**	**Specific Proposal (Draft clause to be add/amended)**	**Remarks**	**Technical References and justification on which (2), (3), (4) are based**
(1)	**(2)**	**(3)**	**(4)**	**(5)**
