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Geosynthetics — Determination of compression behaviour —

Part 2: Determination of short-term compression behaviour

Géosynthétiques — Détermination du comportement en compression —
Partie 2: Détermination du comportement à la compression à court terme

Reference number
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 25619-2 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 189, *Geosynthetics*, in collaboration with ISO Technical Committee ISO/TC 221, *Geosynthetics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

ISO 25619 consists of the following parts, under the general title *Geosynthetics — Determination of compression behaviour*:

— *Part 1: Compressive creep properties*

— *Part 2: Determination of short-term compression behaviour*

Geosynthetics — Determination of compression behaviour —

Part 2:
Determination of short-term compression behaviour

1 Scope

This part of ISO 25619 specifies an index test method for determining the short-term compressive behaviour of geosynthetics. It can be used to determine the deformation behaviour under short-term compressive stress, e.g. after exposure to stress, liquids or light.

This part of ISO 25619 can be used for quality control purposes. It is not intended to be used for design purposes.

2 Normative references

The following referenced documents are indispensable for the application 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 7500-1, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system*

ISO 10318, *Geosynthetics — Terms and definitions*

3 Terms, definitions and symbols

3.1 Terms and definitions

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

3.1.1
compressive strain
ε
ratio of the decrease in thickness of the test specimen to its initial thickness, d_i, measured in the direction of loading at a pressure of 5 kPa

NOTE Compressive strain is expressed as a percentage.

3.1.2
short-term compressive strength
$\sigma_{max,r}$
ratio of the maximum compressive force, $F_{max,r}$, to the initial cross-sectional area of the test specimen

NOTE The maximum compressive force, $F_{max,r}$, is reached when the pressure at collapse (see Figure 2) is less than 1 MPa.

3.2 Symbols

A_0 initial cross-sectional area of the specimen

d thickness of the specimen

F force

$F_{max,r}$ maximum compressive force at failure/rupture

F_N applied normal force

X displacement

$X_{1,0}$ displacement corresponding to a stress of 1 MPa

X_{max} displacement corresponding to the maximum force reached

ε_σ compressive strain at a given stress, σ

$\varepsilon_{1,0}$ compressive strain at a given stress of 1 MPa

4 Principle

A compressive force is applied in a testing machine in accordance with ISO 7500-1, at a given rate of displacement, perpendicular to the major faces of the test specimen. The maximum stress supported by the specimen is recorded.

When the value of the maximum stress is lower than 1 MPa, it is designated as short-term compressive strength, $\sigma_{max,r}$, and the corresponding strain is reported. If no failure is observed before 1 MPa has been reached, the compressive strain at 1 MPa is calculated and its value reported.

5 Apparatus

5.1 Compression testing machine.

Compression testing machine in accordance with ISO 7500-1, designed to suit the range of force and displacement involved and having two rigid, plane, parallel loading platens with smooth surfaces and a minimum side length equal to the side length of the test specimen. One of the loading platens shall be fixed. The movable loading platen shall be capable of moving at a constant rate of displacement, in accordance with Clause 7.

5.2 Measurement device for displacement.

Displacement measuring device, fitted to the compression testing machine, which allows continuous measurement of the displacement of the movable loading platen to an accuracy of ± 5 % or ± 0,1 mm, whichever is smaller (see 5.3).

5.3 Measurement device for force.

Sensor fitted to one of the machine loading plates to measure the force produced by the reaction of the specimen upon the plates. This sensor shall be such that its own deformation during the measuring operation is negligible compared with that being measured or, if not, it shall be taken into account by calculation. In addition, it shall allow continuous measurement of the force to an accuracy of ± 1 %.

5.4 Recording device for measured values.

Device for the simultaneous recording of the force, F, and the displacement, X, which provides a curve of F as a function of X or as stress versus strain (see Figure 2).

6 Specimens

6.1 Dimensions of specimens

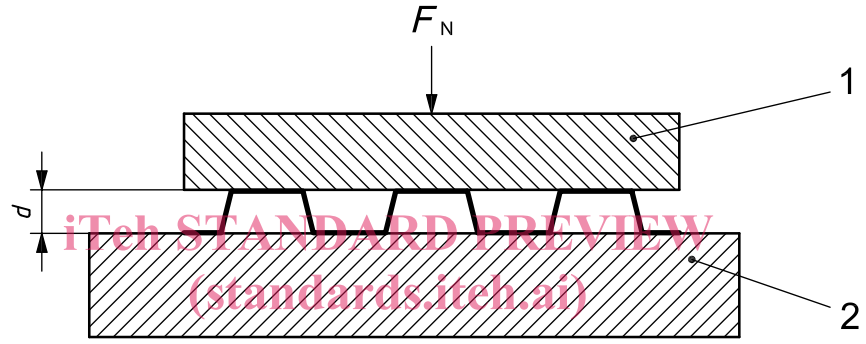
The specimens shall fulfil the following criteria:

a) the specimens shall be of rectangular shape and have a minimum size of 100 mm by 100 mm;

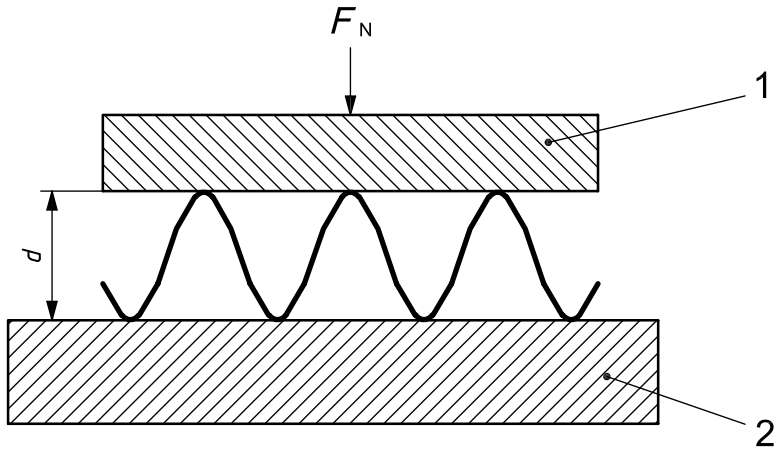
b) if the product is structured in such a way that compressive loads are supported only at discrete points or areas, a minimum of three complete points or areas in each direction shall be covered by the loading plate; see Figures 1 a) and 1 b);

c) the specimens shall be cut parallel to machine direction and cross-machine direction.

Specimens shall not be layered to produce a greater thickness for testing.



a) Example for single-sided structured cores



b) Example for double-sided structured cores

Key

1 metal top plate, smooth surface (same size as specimen or larger)
2 metal base plate, smooth surface (larger than top plate)
d thickness of the specimen
F_N applied normal force

Figure 1 — Loading arrangements

6.2 Preparation of specimens

Specimens shall be cut so that their base is normal to the direction of compression of the product in its intended use. The specimen shall be cut by methods that do not change the structure with regard to that of the original product.

6.3 Number of specimens

At least five specimens shall be used. Use a new specimen for each test.

6.4 Conditioning of specimens

The test specimens shall be conditioned and tested in the standard atmosphere for testing (20 °C ± 2 °C at 65 % ± 5 % relative humidity), as specified in ISO 554.

The specimens can be considered to have been conditioned when the change in mass in successive weighings made at intervals of not less than 2 h does not exceed 0,25 % of the mass of the test specimen.

Conditioning and/or testing in the standard atmosphere may only be omitted when it can be shown that results obtained for the same specific type of product (both structure and polymer type) are not affected by changes in temperature and humidity exceeding the limits.

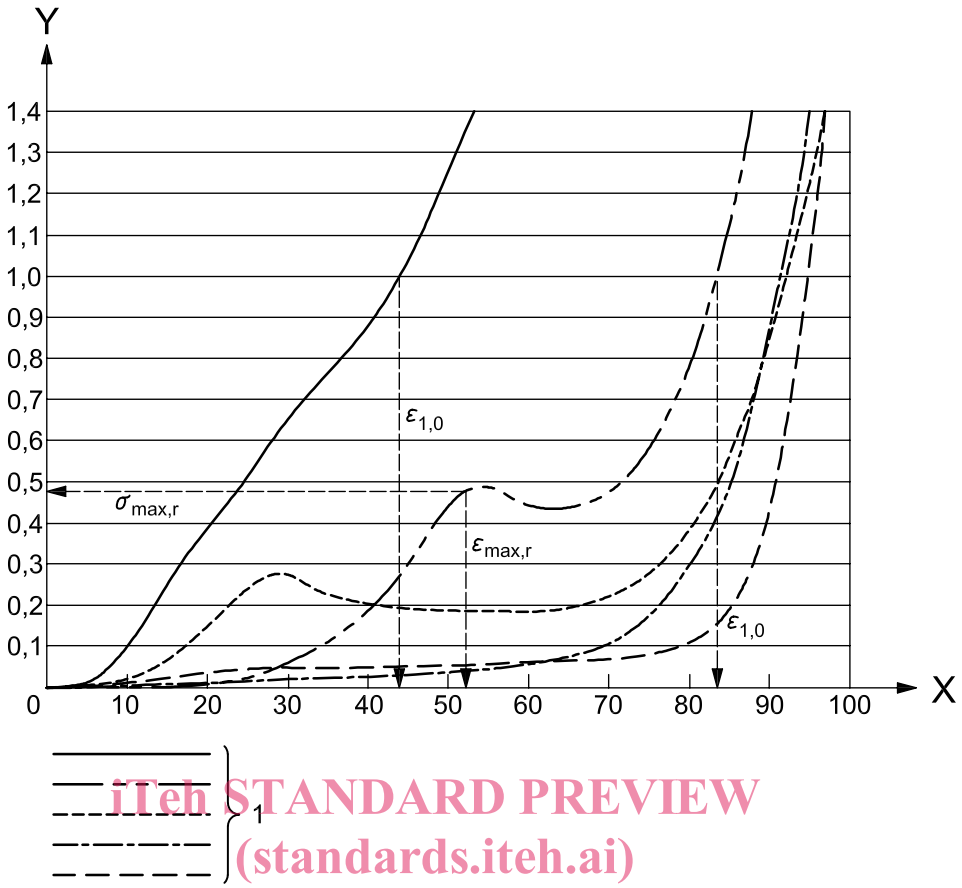
7 Test procedure

Place the specimen centrally between the two loading plates of the compression testing machine. Preload with a pressure of (5 ± 0,5) kPa.

Compress the specimen with the movable loading plate at a constant rate of displacement equal to $0{,}1d_i$ per minute (to within ± 25 %), where d_i is the initial thickness of the specimen.

Continue compression until the specimen collapses, providing a compressive strength value, or until the defined stress has been reached.

Plot the force–displacement or stress–strain curve. An example is presented in Figure 2.



Key

X	compressive strain, in percent (%)
Y	stress, in megapascals (MPa)
1	curves relating to different products
$\varepsilon_{max,r}$	strain at rupture
$\varepsilon_{1,0}$	strain at 1,0 MPa
$\sigma_{max,r}$	short-term compressive strength

Figure 2 — Typical stress–strain curves of geospacers and determination of $\sigma_{max,r}$ and $\varepsilon_{1,0}$

8 Calculation and expression of results

8.1 General

The results are the mean values of the measurements, which shall be expressed to three significant figures.

Depending on the deformation behaviour, $\sigma_{max,r}$ and $\varepsilon_{max,r}$ or $\varepsilon_{1,0}$ at 1 MPa (see Clause 3) shall be calculated.