INTERNATIONAL STANDARD

ISO 25619-2

Second edition
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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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Contents

Page

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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 221 *Geosynthetics*.

This second edition cancels and replaces the first edition (ISO 25619-2:2008), which has been technically revised.

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 documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 10318-1, *Geosynthetics — Part 1: Terms and definitions*

3 Terms and definitions

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

3.1
initial thickness
d_i
thickness measured in the direction of loading at a stress of 5 kPa

3.2
compressive strain
ε_mr
ratio of the decrease in thickness of the test specimen to its *initial thickness*, d_i (3.1) at failure/rupture, and expressed as a percentage

3.3
short-term compressive strength
σ_mr
ratio of the maximum compressive force, F_mr, reached when the pressure at collapse is less than 1 MPa, to the initial cross-sectional area of the test specimen

Note 1 to entry: See Figure 2.

4 Symbols and abbreviated terms

A_0	initial cross-sectional area of the specimen
d	thickness of the specimen
F	force
F_{mr}	maximum compressive force at failure/rupture
F_N	applied normal force
X	displacement
X_σ	displacement corresponding to a stress of 1 MPa
X_{max}	displacement corresponding to the maximum force reached
ε_{mr}	compressive strain
ε_σ	compressive strain at a given stress, σ
$\varepsilon_{1,0}$	compressive strain at a given stress of 1 MPa
σ_{mr}	short-term compressive strength

5 Principle

A compressive force is applied in a testing machine according to ISO 7500-1, at a given rate of displacement, perpendicular to the major faces of a square or rectangular cut test specimen and 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, σ_{mr}, 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.

6 Apparatus

6.1 Compression testing machine

Compression testing machine in accordance with ISO 7500-1, Class 2 or higher, 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 platens shall be fixed. The movable platen shall be capable of moving at a constant rate of displacement, in accordance with Clause 8.

6.2 Measurement of displacement

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

6.3 Measurement of force

Sensor fitted to one of the machine platens to measure the force produced by the reaction of the specimen upon the platens. 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 %.

6.4 Recording of 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 3).

7 Specimens

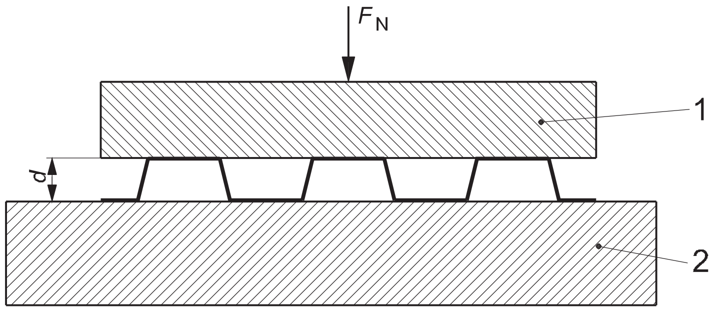
7.1 Dimensions of specimens

The specimens shall fulfil the following criteria:

a) the specimens shall be of rectangular or square 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 and 2.

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



Key

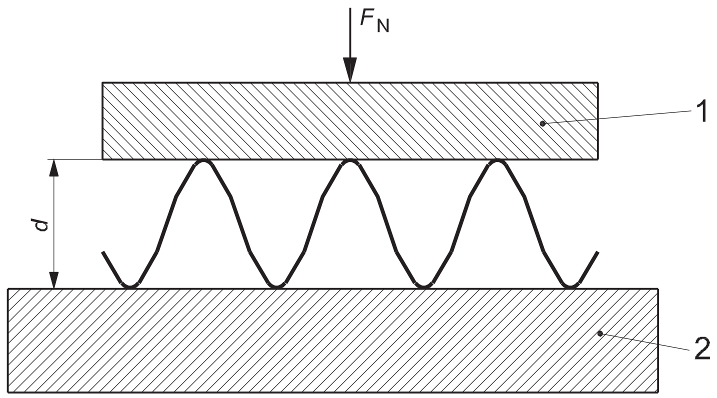
1 metal top plate, smooth surface (same size as specimen or bigger)

2 metal base plate, smooth surface (bigger than top plate)

d thickness of the specimen

F_N applied normal force

Figure 1 — Loading arrangement for e.g. single sided structured cores



Key

1 metal top plate, smooth surface (same size as specimen or bigger)

2 metal base plate, smooth surface (bigger than top plate)

d thickness of the specimen

F_N applied normal force

Figure 2 — Loading arrangement for e.g. double sided structured cores

7.2 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.

7.3 Number of specimens

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

7.4 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.

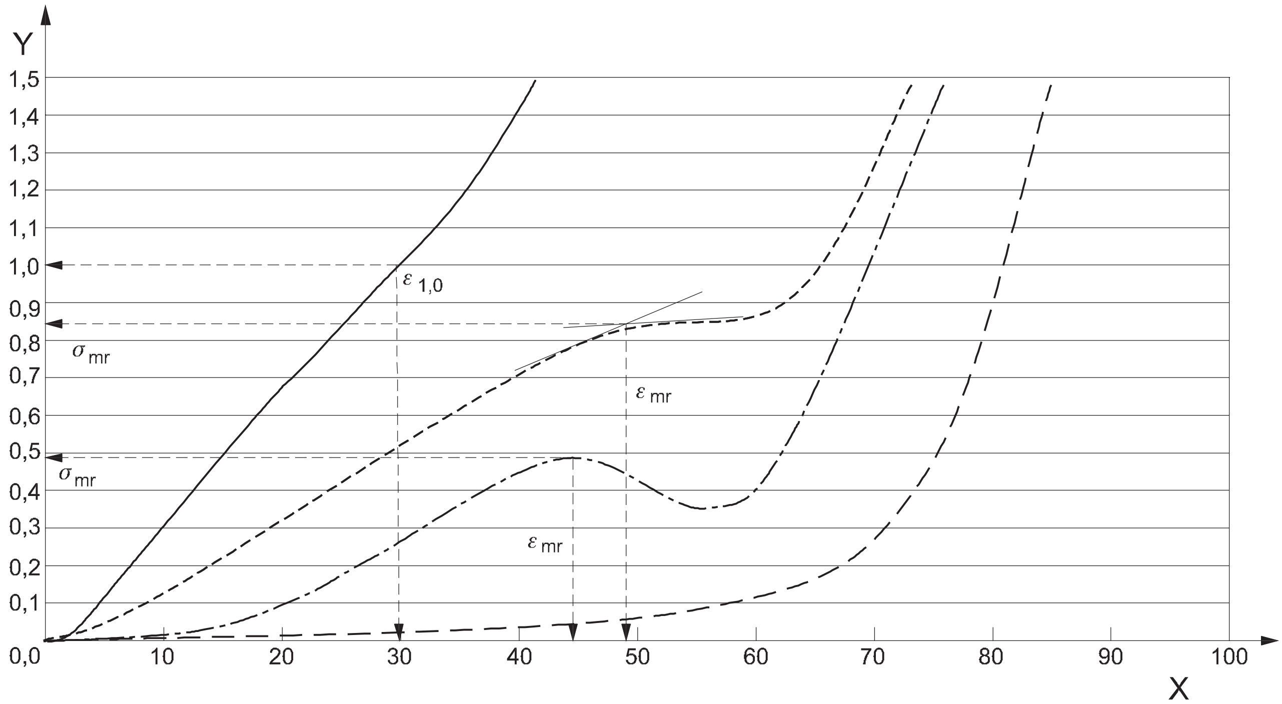
8 Test procedure

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

Compress the specimen with the movable platen at a constant rate of displacement equal to 0,1 d_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 3.



Key

(line styles)	curves relating to different products
Y	stress in MPa
X	strain in %
ε_{mr}	compressive strain
$\varepsilon_{1,0}$	strain at 1,0 MPa
σ_{mr}	short-term compressive strength

Figure 3 — Typical stress–strain curves of geospacers and determination of σ_{mr} and $\varepsilon_{1,0}$

9 Calculation and expression of results

9.1 General

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

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

9.2 Short-term compressive strength and corresponding strain

9.2.1 Short-term compressive strength

Calculate the short-term compressive strength, σ_{mr}, in kPa, using Formula (1):

$$\sigma_{mr} = 10^3 F_{mr}/A_0 \quad (1)$$

where

F_{mr} is the maximum force at failure/rupture, in Newton;

A_0 is the initial cross-sectional area of the specimen, in square millimetres.

For products with discrete load-supporting points [see 7.1 b)], calculate the stress in kPa (σ) by Formula (2):

$$\sigma = 10^{-3} F * N_u/N_{specimen} \quad (2)$$

where

F is the applied force in N;

N_u is the number of load-bearing elements per m^2 (at an accuracy of three significant figures);

$N_{specimen}$ is the number of load-bearing elements in the specimen.

9.2.2 Compressive strain

Deformation measurement is set to zero at preload F_p = 5 kPa.

Calculate the strain, ε_{mr}, as a percentage, using Formula (3):

$$\varepsilon_{mr} = 100 \frac{X_m}{d_i} \quad (3)$$

where

X_m is the displacement corresponding to the maximum force reached, in millimetres;

d_i is the initial thickness (as measured) of the specimen, in millimetres.

9.3 Compressive strain at 1 MPa

Calculate the compressive strain in % at the stress of 1 MPa, $\varepsilon_{1,0}$, using Formula (4):

$$\varepsilon_{1,0} = 100 \frac{X_\sigma}{d_i} \quad (4)$$

where

X_σ is the displacement corresponding to 1 MPa, in millimetres;

d_i is the initial thickness of the specimen, in millimetres.

10 Test report

The test report shall include the following information:

a) reference to this part of ISO 25619, i.e. ISO 25619-2;

b) product identification;

c) conditioning;

d) date of testing;

e) dimensions and number of test specimens;

f) all individual test results and the mean values of compressive strength and corresponding strain or compressive strain at a stress of 1 MPa;

g) any deviation from this part of ISO 25619;

h) any events which may have affected the results.

If required, include stress-strain curves in the report.

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