
**Geosynthetics — Determination of
thickness at specified pressures —**

**Part 1:
Single layers**

*Géosynthétiques — Détermination de l'épaisseur à des pressions
spécifiées —*

Partie 1: Couches individuelles



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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 on 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 the following URL: www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces the first edition (ISO 9863-1:2005), which has been technically revised.

ISO 9863-1 consists of the following parts, under the general title *Geosynthetics — Determination of thickness at specified pressures*:

- *Part 1: Single layers*
- *Part 2: Procedure for determination of thickness of single layers of multilayer products*

Geosynthetics — Determination of thickness at specified pressures —

Part 1: Single layers

1 Scope

This part of ISO 9863 specifies a method for the determination of the thickness of geosynthetics at specified pressures and specified load plate areas or under specified point loads. It defines the pressures or the load at which the thickness is determined.

The test results are intended for identification purposes and for use in technical data sheets and/or as part of other test methods, e.g. tests of hydraulic properties.

The method is applicable to all geosynthetics.

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

ISO 25619-1, *Geosynthetics — Determination of compressive behaviour — Part 1: Compressive creep properties*

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 <http://www.iso.org/obp>

3.1

thickness

distance between a reference plate on which the specimen rests and the contacting face of a parallel pressure-foot applying a given pressure to the specimen or distance between two reference points applying a given load to the specimen

4 Principle

4.1 The thickness of a number of individual specimens of a geosynthetic is measured as the distance between the reference plate on which the specimen rests and the contacting face of a parallel, circular presser-foot exerting a specified pressure on an area of defined size within a larger area of the specimen or the thickness of a number of individual specimens of a GBR-P or a GBR-B is measured as the distance between two pressure points.

4.2 At each specified pressure, the result of the test is given as the mean of the values obtained.

5 Apparatus

5.1 **Thickness tester**, incorporating the following elements:

5.1.1 **Removable presser-foot**, having a plane and smooth surface with an area as defined in [Table 1](#) for testing materials of uniform thickness. For the determination of the overall thickness of materials of polymeric and bituminous geosynthetic barriers of non-uniform thickness, or the thickness of other parts of such materials, refer to [Annex A](#).

Table 1 — Pressure-foot sizes

Type of geosynthetic under test	Presser-foot size
Polymeric and bituminous geosynthetic barrier	Circular, $(10 \pm 0,5)$ mm diameter
Geospacer and drainage geocomposites	square, minimum size of 100 mm $\times$ 100 mm size of the load plate and size of the specimen shall satisfy the criteria in ISO 25619-1
Other geosynthetic products	Circular, $(25 \pm 0,2)$ cm ² area

The presser-foot shall be capable of exerting pressures of 2 kPa, 20 kPa and 200 kPa within a tolerance of $\pm 0,5$ % normal to the plane of the specimen.

To ensure that the presser-foot surface and the reference plate are parallel when determining the overall thickness of geosynthetics of non-uniform thickness, except for polymeric and bituminous geosynthetic barriers, the presser-foot shall be supported at not less than three points evenly distributed over the presser-foot surface, which may require that a presser-foot with an area not less than 25 cm² be used.

5.1.2 **Reference plate**, with a plane surface of minimum dimensions greater than 1,75 times the diameter of the presser-foot surface for testing material of uniform thickness. When testing thinner areas in materials of non-uniform thickness, the reference plate can be as small as the area of the presser-foot, or an alternative supporting device of these dimensions can be used, to ensure full contact with the lower surface of the specimen.

5.1.3 **Gauge**, for indicating the distance between the reference plate and the presser-foot to an accuracy of 0,01 mm.

5.2 **Means of measuring time**, with an accuracy of ± 1 s.

6 Specimens

6.1 Cut out no less than 10 specimens of minimum dimensions greater than 1,75 times the diameter of the presser-foot.

If new specimens are used for testing at each pressure, then not less than 30 specimens will be required.

6.2 Select and cut out the specimens in accordance with ISO 9862.

6.3 Condition the specimens for a period of 24 h unless it can be shown that the results are not affected by omitting this procedure.

7 Procedure

7.1 General

When determining the thickness of a material of non-uniform thickness, e.g. a geogrid, the part of the material to be tested shall be agreed between the interested parties. The part tested shall be identified in the test report.

Normally, the thickness of geosynthetics is determined by measuring one layer of the product. When two or more layers are used on top of each other in a design, the test may be made in accordance with this part of ISO 9863 with the agreed number of layers instead of one.

When testing structured geosynthetics, care should be taken to ensure that the results are meaningful for the particular product.

The thickness is determined by using the procedure A or C as specified in either [7.2](#) or [7.4](#), applying pressures of 2 kPa, 20 kPa and 200 kPa to an accuracy as stated in [Clause 3](#).

If agreed between the interested parties, procedure B, as specified in [7.3](#), may be used instead of procedure A in [7.2](#).

Other values of pressure may be used if agreed between the interested parties. If a pressure of more than 200 kPa is applied, a new, conditioned specimen shall be used for each test.

7.2 Procedure A (New specimens for each pressure)

7.2.1 Place a specimen between the clean surfaces of the reference plate and the presser-foot specified in [Clause 5](#). Gently lower the presser-foot applying a pressure of $(2 \pm 0,01)$ kPa to the specimen, and note the gauge reading after 30 s, unless a longer time is specified.

Release the pressure and remove the specimen.

7.2.2 Repeat the procedure in [7.2.1](#) until at least 10 specimens have been tested.

7.2.3 Repeat the procedure in [7.2.1](#) and [7.2.2](#) using a corresponding number of new specimens and applying a pressure of $(20 \pm 0,1)$ kPa.

7.2.4 Repeat the procedure in [7.2.1](#) and [7.2.2](#) using a corresponding number of new specimens and applying a pressure of (200 ± 1) kPa.

7.3 Procedure B (Incremental loading of individual specimens)

7.3.1 Carry out the procedure in [7.2.1](#) but without removing the specimen.

7.3.2 Increase the pressure to $(20 \pm 0,1)$ kPa on the same specimen and note the gauge reading after 30 s, unless a longer time is specified, without removing the specimen.

7.3.3 Repeat the procedure in [7.3.2](#) applying a pressure of (200 ± 1) kPa. Remove the specimen.

7.3.4 Repeat the procedures in [7.3.1](#) to [7.3.3](#) until at least 10 specimens have been tested.

7.4 Procedure C (Polymeric and bituminous geosynthetic barriers of uniform thickness)

Place a specimen between the clean surfaces of the reference plate and the presser-foot specified in [Clause 5](#). Gently lower the presser-foot applying a pressure of $(20 \pm 0,2)$ kPa to the specimen and note the gauge reading after 5 s.

Release the pressure and remove the specimen.

7.5 Procedure D (Polymeric and bituminous geosynthetic barriers of non-uniform thickness)

7.5.1 Place a specimen between the clean presser points as specified in [Annex A](#). Both pressure points shall be the same shape and size. Gently lower the upper presser point applying a force of $(0,6 \pm 0,1)$ N to the specimen and note the gauge reading after 5 s, unless a longer time is specified. Release the force and remove the specimen.

7.5.2 Repeat the procedure in [7.5.1](#) until at least 10 specimens have been tested.

7.5.3 The purpose of the test is to ascertain the thickness of the barrier and not of the texturing. The location of the presser points shall be chosen to ensure that this is the case.

8 Expression of results

Determine the mean thickness of the specimens, and the coefficient of variation, for each pressure given in [Clause 7](#) and to a precision of 0,1 mm for specimens with a thickness of >25 mm and to a precision of 0,01 mm for specimens with a thickness of <3 mm.

Upon request, the result of each individual determination may be given.

Upon request, a graphical plot of the mean value of the thickness against the applied pressure may be given. The x-axis (applied pressure) should be logarithmic. The y-axis (thickness) should be linear.

9 Test report

The test report shall include the following particulars:

- a) a statement that the test was performed in accordance with this part of ISO 9863, i.e. ISO 9863-1:2016;
- b) the number of specimens tested at each pressure given in [Clause 7](#);
- c) the conditioning atmosphere used (see [6.3](#)) and the time for which the pressure was applied;
- d) the presser-foot size;
- e) the procedure used (A, B, C or D);
- f) the results of the test (see [Clause 8](#): thickness in mm and coefficient of variation); mean thickness at other pressures tested and coefficient of variation, if required;
- g) details of any deviation from the specified test procedure;
- h) the date of the test.