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## Geosynthetics — Abrasion damage simulation (sliding block test)

*Géosynthétiques — Simulation de l'endommagement par abrasion  
(essai du bloc glissant)*

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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](http://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](http://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 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 13427:1998), which has been technically revised.

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# Geosynthetics — Abrasion damage simulation (sliding block test)

## 1 Scope

This International Standard specifies a test method used for the determination of the resistance of geosynthetics to abrasion using a sliding block, whereby after abrasion the loss in tensile properties is determined.

This test method is applicable to all geosynthetics used in the construction of railways.

## 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 6344-2, *Coated abrasives — Grain size analysis — Part 2: Determination of grain size distribution of macrogrits P12 to P220*

EN 12226, *Geosynthetics — General tests for evaluation following durability testing*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1

#### abrasion

wearing away of any part of a material by rubbing against another surface

## 4 Principle

A test specimen, mounted on a fixed platform, is rubbed by an abradant with specified surface characteristics. Under controlled conditions of pressure and abrasive action, the abradant is moved along on a horizontal axis with a uniaxial motion. Resistance to abrasion is expressed as the percentage retained tensile strength of the test specimen.

## 5 Apparatus

### 5.1 Abrasion tester

The abrasion tester (see [Figure 1](#)) shall consist of the following essential parts:

#### a) Balanced head and block assembly

The assembly shall consist of two parallel, smooth plates, 50 mm × 200 mm, one of which moves with a reciprocating motion. The frequency of the reciprocating plate shall be adjustable to a maximum of 90 double strokes per min. The stroke length shall be 25 ± 1 mm. The second plate is rigidly supported by a double-lever assembly to provide free movement in a direction perpendicular to

the reciprocating plate. This plate is held stationary during the test and is well balanced so that a vertical load can be maintained by means of dead weights.

Both plates are equipped with clamps at each end to hold the test specimen and the abrading medium. The clamps have rough surfaces to prevent slippage of the specimen or the abrading material during the test.

b) **Indicator**

An indicator for counting the number of cycles (one cycle = one double stroke) shall be used.

c) **Weights**

Weights shall be used for applying the vertical load to the specimen.

## 6 Test specimens

From the laboratory sample, prepare five pairs of test specimens in each direction for measuring tensile strength in accordance with EN 12226.

If the material to be tested presents different characteristics on the two sides (e.g. physical characteristics or as a consequence of the manufacturing process), or in the case of a specific request from the client, then five specimens in each direction shall be tested on each face. The test report shall include details of this extension of the test procedure, and separate results for each side shall be given.

## 7 Conditioning

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The test specimens shall be conditioned and tested in the standard atmosphere for testing ( $20 \pm 2$  °C at  $65 \pm 5$  % RH) as specified in ISO 554.

The specimens can be considered to have been conditioned when the change in mass in successive weightings 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 a standard atmosphere can 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. This information shall be included in the test report.

## 8 Procedure

- a) Test the conditioned specimens in the standard atmosphere for testing as described in [Clause 7](#).
- b) Place the specimen to be tested on one plate and secure it by means of the clamp at each end. Place the abrading medium on the other plate and secure it by means of the clamp at each end. Use emery cloth with abradant P 100 in accordance with ISO 6344-2.

NOTE 1 The specimen to be tested can be mounted on the upper or lower plate. Lower the top plate onto the bottom plate by releasing the support pin for the top plate. Be sure the abrading medium and the specimen are properly aligned.

- c) Load the pressure (top) plate with a ( $6 \pm 0,01$ ) kg load, including the top plate.
- d) Start the tester and operate at a maximum frequency of 90 cycles per minute.
- e) Operate the tester at the specified frequency for 750 cycles, or until the specimen ruptures.

NOTE 2 Some nonwoven materials may stretch as the test progresses, leading to sliding on the plate therefore resulting in less or no abrasion. This effect can sometimes be overcome with the use of an anti-slip underlay or similar product mounted between the specimen and the plate. Tapes or glues that change the properties of the material cannot be used.

NOTE 3 Where stretching occurs, the specimen can be repositioned between the clamps to give a smooth flat surface for abrasion. This repositioning can be repeated up to 150 cycles of abrasion. If the stretching still continues after this point, resulting in reduced/no abrasion, the test can be terminated. Additionally, if the repositioning of the specimen reduces the width of the specimen by more than 20 % (to less than 40 mm) the test can be terminated.

NOTE 4 With some materials, rolls or balls of fibres can be formed on the surface of the specimen during the test. Where this occurs, the test is allowed to continue to the end and the tensile tests performed as normal. However, the occurrence should be noted in the report.

NOTE 5 If a specimen ruptures before the specified number of cycles is reached, the rupture of the specimen and the number of cycles completed at the time of rupture are reported.

- f) If the specimen or the abrading medium slips in the clamps, discard the specimen and test another specimen after adjustments are made.
- g) Replace the abrading medium after each test.
- h) Determine the tensile strength of the test and control specimens in accordance with EN 12226.

## 9 Calculation and expression of results

Determine the retained tensile strength and report to the nearest 1 %:

Retained tensile strength (in %) =  $(B/A) \times 100$

where

A is the tensile strength of the reference specimen.

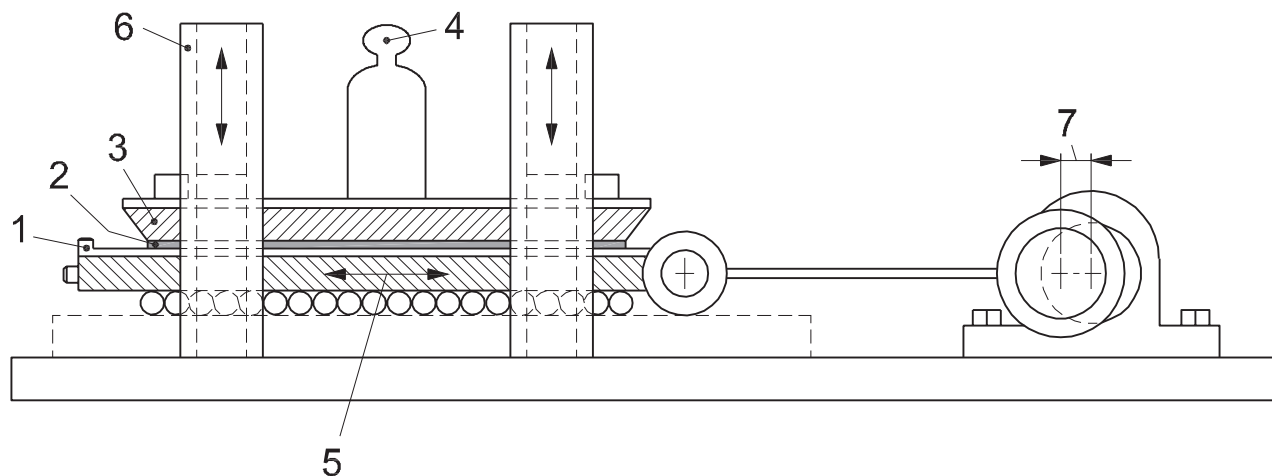
B is the tensile strength of the abraded specimen.

Calculate the average retained tensile strength and the coefficient of variation for the series of five specimens.

## 10 Test report

The test report shall include the following:

- a) identifier and year of publication of this International Standard (e.g. ISO 13427-2014);
- b) sample ID;
- c) average retained tensile strength (in %);
- d) coefficient of variation (in %);
- e) any deviation from the procedure, e.g. number of cycles, load, etc.;
- f) any unusual behaviour, such as rupture during test, formation of balls/rolls of fibre on the test surface, repositioning of the specimen, etc.;
- g) the use of underlays, etc.;
- h) if the test is terminated, the reason/s for termination.



**Key**

- 1 sliding block with emery abrasant
- 2 geosynthetic specimen (testing area 50 mm × 200 mm) ± 1 mm
- 3 top plate
- 4 total mass (6 ± 0,01) kg
- 5 (25 ± 1) mm linear motion
- 6 vertical guidance
- 7 eccentricity 12,5 mm

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**Figure 1 — Example of testing apparatus with sliding block**

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