

# EUROPEAN AND INTERNATIONAL GEOTEXTILE STANDARDS

## A SHORT GUIDE

(updated version 2014)

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### IMPORTANT NOTE:

This short guide means to be an introduction to European and international standards on geotextiles and geotextile-related products. This guide only reflects the main elements contained in the application-related product standards and the supporting test standards and has in no way the intention to replace the existing standards. The full text of the standards can be purchased from your national standardization body:

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Jozef II-straat 40  
B-1000 Brussel

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B-1000 Bruxelles

# GEOTEXTILE STANDARDS

## INTRODUCTION

European standards on geotextiles and geotextile-related products are developed by CEN/TC 189 Geosynthetics. International standards for the same materials are developed by ISO/TC 221 Geosynthetics.

Over the past 25 years both Committees have issued about 100 standards and amendments to standards, covering both geotextiles (and geotextile-related products) and geosynthetic barriers.







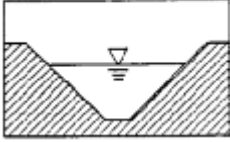



This guide only addresses standards on geotextiles and geotextile-related products, not on geosynthetic barriers (geomembranes).

European geotextile standards can be roughly divided in product specifications (related to applications) and test methods. This guide will give a summary of the content of the product specifications and a short description of the test methods.

**APPLICATION-RELATED PRODUCT SPECIFICATIONS**

**CONTEXT**

The geotextile product standards form a set of 11 standards, each of them specifying the requirements for geotextiles (and geotextile-related products) used in a given application:

<p>EN 13249 roads and other trafficked areas</p> 	<p>EN 13250 railways</p> 
<p>EN 13251 earthworks, foundations and retaining walls</p> 	<p>EN 13252 drainage systems</p> 
<p>EN 13253 erosion control works</p> 	<p>EN 13254 reservoirs and dams</p> 
<p>EN 13255 canals</p> 	<p>EN 13256 tunnels and underground structures</p> 
<p>EN 13257 solid waste disposals</p> 	<p>EN 13265 liquid waste containment</p> 
<p>EN 15381 asphalt reinforcement</p> <p>(no pictogram)</p>	

# GEOTEXTILE STANDARDS

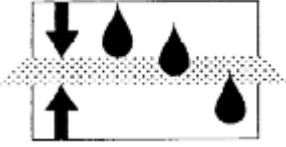
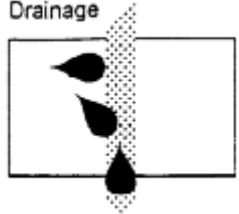
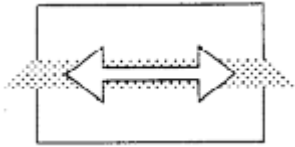
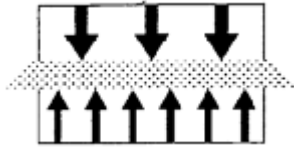
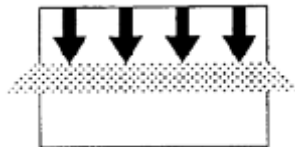
## STRUCTURE

Each of the 11 standards follows the same framework:

- Scope
- Normative references
- Definitions and abbreviations
- Requirements
- Evaluation of conformity
- Marking (not CE)
- Annexes
  - A: Factory production control (normative)
  - B: Durability aspects (normative)
  - C: Selection of the appropriate product standard (informative)
  - D: List of significant changes compared to the previous edition (informative)
  - Annex ZA : Relationship with the CPR
    - ZA.1 : Scope and relevant characteristics
    - ZA.2 : AVCP procedure for the given application
    - ZA.3 : CE-marking and labelling
  - Bibliography (informative)

**FUNCTIONS**

Geotextiles used in any of the above cited applications fulfil one or more of the following functions:

	<p>Drainage</p> 	
<p>FILTRATION (F)</p>	<p>DRAINAGE (D)</p>	<p>REINFORCEMENT (R)</p>
		<p>(no pictogram)</p>
<p>SEPARATION (S)</p>	<p>PROTECTION (P) (when used in combination with a geosynthetic barrier)</p>	<p>INTERLAYER BARRIER (B) STRESS RELIEF (STR) (in conjunction with a bitumen layer for asphalt reinforcement)</p>

NOTE: The function « separation » is never specified alone and hence shall only be used in combination with other functions (filtration, reinforcement) with regard to testing and to attestation of conformity.

**TABLE 1: FUNCTIONS AND APPLICATIONS**

Standard	Application	F	D	R	S	P	STR	B
EN 13249	Roads and other trafficked areas	x		x	x			
EN 13250	Railways	x		x	x			
EN 13251	Earthworks, foundation and retaining walls	x		x	x			
EN 13252	Drainage systems	x	x		x			
EN 13253	Erosion control	x		x	x			
EN 13254	Reservoirs and dams	x		x	x	x		
EN 13255	Canals	x		x	x	x		
EN 13256	Tunnels and underground structures					x		
EN 13257	Solid waste disposal	x		x	x	x		
EN 13265	Liquid waste containment	x		x		x		
EN 15381	Asphalt reinforcement			x			x	x

# GEOTEXTILE STANDARDS

## TEST METHODS AND RELEVANCE OF PROPERTIES FOR EACH FUNCTION

The manufacturer shall provide data on a set of properties, which are related to each function, as claimed in the manufacturer's product information.

These properties may be either imposed by the Mandates M/107 and M/386 of the European Commission (H-properties, for regulatory purposes), or be of a voluntary nature to be used in all conditions of use (A-properties) or some conditions of use (S-properties).

The H-properties are directly related to the function and independent from the application.

The A- and S-properties may vary with the application and the actual conditions of use. Their relevance is specified in the individual standards. Typical A- and S-properties are strength of seams and junctions, tensile and compressive creep, abrasion, damage during installation, friction.

General provisions on dangerous substances and on fire behaviour (for tunnels and waste disposal) are also included.

**TABLE 2: H-PROPERTIES AND TEST METHODS VS. FUNCTIONS**

Property	Test method	F	D	R	S	P	STR	B
Tensile strength	EN ISO 10319	x	x	x	x	x	x	x
Elongation (at break)	EN ISO 10319		x	x		x	x (**)	x
Static puncture (CBR) resistance	EN ISO 12236 (*)			x	x	x	x	x
Dynamic perforation resistance	EN ISO 13433	x	x	x		x		x
Water permeability (perpendicular to the plane)	EN ISO 11058	x						
Characteristic opening size	EN ISO 12956	x						
Water flow capacity (in the plane)	EN ISO 12958		x					
Durability (***)	EN 12224 EN 12225 EN 12447 EN 14030 EN ISO 13438	x	x	x	x	x	x	x

(\*) for a product fulfilling a protective function EN 13719 shall be used.

(\*\*) both elongation at breaking load and bitumen retention (according to EN 15381, annex C) shall be assessed

(\*\*\*) to be assessed in accordance with annex B of the standards - test methods depend on material type (polymer) and conditions of use

## DURABILITY ASSESSMENT

Durability of geotextiles is linked to a number of parameters:

- Duration of exposure to sunlight on site
- Soil conditions (pH, temperature, contamination)
- Expected lifetime of the construction
- Composition and structure of the geotextile

From the annex B the appropriate type of durability testing can be derived.

## EXPRESSION OF VALUES – VERIFICATION OF VALUES

The geotextile product standards do not specify minimum requirements, as these are related to the construction, in which the geotextile is used. The information the manufacturer has to provide should mention a nominal value and a tolerance value, corresponding to the 95% confidence interval. This system presumes the availability of sufficient statistical data from the manufacturer's factory production control.

In case of dispute a verification system is provided, in which two samples (A and B) are taken. Only sample A is used for testing. If the test result is within the tolerance values stated, the material is accepted, but if the result is outside more than 1.5 times the tolerance value the material is rejected. If the result is between 1 and 1.5 times the tolerance value a second test is made with sample B, which should give results within the tolerance values stated.

The initial type testing (for CE-marking and product information) comprises the properties imposed by the Mandate (see table 2).

## FACTORY PRODUCTION CONTROL

Factory production control (FPC) is a mandatory element in the attestation of conformity procedure. A normative annex in the standards specifies the main requirements to be met by a FPC system. These correspond to the requirements of an ISO 9001 system.

# GEOTEXTILE STANDARDS

## ZA-ANNEXES - LINK WITH THE CPR

The relevant properties, for which values and tolerances have to be declared, can be derived from table 2.

### EXAMPLES:

- Filtration and reinforcing layer: tensile strength, elongation, static puncture, dynamic perforation, water permeability, opening size, durability assessment
- Protection layer for a geomembrane: tensile strength, elongation, static puncture (according to EN 13719), dynamic perforation, durability assessment
- Drainage layer: tensile strength, elongation, dynamic perforation, water flow capacity, durability assessment.

The assessment and verification of constancy of performance system (AVCP system) for geotextiles is 4 for the separation function and 2+ for all other functions. A separation should be never specified alone, in practice only the system 2+ shall be used.

### SYSTEM 2+ IS BASED ON THE FOLLOWING DIVISION OF TASKS:

- Tasks for the manufacturer:
  - Factory production control
  - Product type determination
- Tasks for the approved body:
  - Certification of the FPC on basis of:
    - Initial audit and approval of the FPC system
    - Continuous surveillance, assessment and approval of the FPC system with regard to the H-properties of the product.

The approved body draws up a certificate of factory production control, whereas the manufacturer draws up a declaration of performance.



## CE-MARKING AND LABELLING

The CE marking symbol shall be affixed visibly, legibly and indelibly to the geotextile or to a label attached to it. Where this is not possible or not warranted on account of the nature of the product, it shall be affixed to the packaging or to the accompanying documents.

### THE CE MARKING SHALL BE FOLLOWED BY:

- the last two digits of the year in which it was first affixed;
- the name and the registered address of the manufacturer, or the identifying mark allowing identification of the name and address of the manufacturer easily and without any ambiguity;
- the unique identification code of the product-type;
- the reference number of the declaration of performance;
- the level or class of the performance declared;
- the dated reference to the harmonised technical specification applied;
- the identification number of the notified body;
- the intended use as laid down in the harmonised technical specification applied.

# GEOTEXTILE STANDARDS

## SUPPORTING TEST STANDARDS

The standards in table 3 were developed as test methods or otherwise in support of the geosynthetics product standards. Items printed in bold are summarised in a data sheet.

**TABLE 3: SUPPORTING STANDARDS**

Reference	Title
CEN/TR 15019:2005	Geotextiles and geotextile-related products - On-site quality control
CEN/TS 14416:2014	Geosynthetic barriers - Test method for determining the resistance to roots
CEN/TS 14417:2014	Geosynthetic barriers - Test method for the determination of the influence of wetting-drying cycles on the permeability of clay geosynthetic barriers
CEN/TS 14418:2014	Geosynthetic barriers - Test method for the determination of the influence of freezing-thawing cycles on the permeability of clay geosynthetic barriers
<b>EN 12224:2000</b>	<b>Geotextiles and geotextile-related products - Determination of the resistance to weathering</b>
<b>EN 12225:2000</b>	<b>Geotextiles and geotextile-related products - Method for determining the microbiological resistance by a soil burial test</b>
<b>EN 12226:2012</b>	<b>Geotextiles and geotextile-related products - General tests for evaluation following durability testing</b>
<b>EN 12447:2001</b>	<b>Geotextiles and geotextile-related products - Screening test method for determining the resistance to hydrolysis in water</b>
EN 13562:2000	Geotextiles and geotextile-related products - Determination of resistance to penetration by water (hydrostatic pressure test)
<b>EN 13719:2002</b>	<b>Geotextiles and geotextile-related products - Determination of the long term protection efficiency of geotextiles in contact with geosynthetic barriers</b>
EN 13738:2004	Geotextiles and geotextile-related products - Determination of pullout resistance in soil
<b>EN 14030:2001</b>	<b>Geotextiles and geotextile-related products - Screening test method for determining the resistance to acid and alkaline liquids (ISO/TR 12960:1998, modified)</b>
EN 14150:2006	Geosynthetic barriers - Determination of permeability to liquids
EN 14196:2003	Geosynthetics - Test methods for measuring mass per unit area of clay geosynthetic barriers
EN 14414:2004	Geosynthetics - Screening test method for determining chemical resistance for landfill applications
EN 14415:2004	Geosynthetic barriers - Test method for determining the resistance to leaching
EN 14574:2004	Geosynthetics - Determination of the pyramid puncture resistance of supported geosynthetics
EN 14575:2005	Geosynthetic barriers - Screening test method for determining the resistance to oxidation
EN 14576:2005	Geosynthetics - Test method for determining the resistance of polymeric geosynthetic barriers to environmental stress cracking
EN ISO 9862:2005	Geosynthetics - Sampling and preparation of test specimens (ISO 9862:2005)
EN ISO 9863-1:2005	Geosynthetics - Determination of thickness at specified pressures - Part 1: Single layers (ISO 9863-1:2005)
EN ISO 9863-2:1996	Geotextiles and geotextile-related products - Determination of thickness at specified pressures - Part 2: Procedure for determination of thickness of single layers of multilayer products (ISO 9863-2:1996)
EN ISO 9864:2005	Geosynthetics - Test method for the determination of mass per unit area of geotextiles and geotextile-related products (ISO 9864:2005)
EN ISO 10318:2005	Geosynthetics - Terms and definitions (ISO 10318:2005)

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Reference	Title
EN ISO 10319:2008	Geosynthetics - Wide-width tensile test (ISO 10319:2008)
EN ISO 10320:1999	Geotextiles and geotextile-related products - Identification on site (ISO 10320:1999)
EN ISO 10321:2008	Geosynthetics - Tensile test for joints/seams by wide-width strip method (ISO 10321:2008)
EN ISO 10722:2007	Geosynthetics - Index test procedure for the evaluation of mechanical damage under repeated loading - Damage caused by granular material (ISO 10722:2007)
<b>EN ISO 11058:2010</b>	<b>Geotextiles and geotextile-related products - Determination of water permeability characteristics normal to the plane, without load (ISO 11058:2010)</b>
<b>EN ISO 12236:2006</b>	<b>Geosynthetics - Static puncture test (CBR test) (ISO 12236:2006)</b>
<b>EN ISO 12956:2010</b>	<b>Geotextiles and geotextile-related products - Determination of the characteristic opening size (ISO 12956:2010)</b>
EN ISO 12957-1:2005	Geosynthetics - Determination of friction characteristics - Part 1: Direct shear test (ISO 12957-1:2005)
EN ISO 12957-2:2005	Geosynthetics - Determination of friction characteristics - Part 2: Inclined plane test (ISO 12957-2:2005)
<b>EN ISO 12958:2010</b>	<b>Geotextiles and geotextile-related products - Determination of water flow capacity in their plane (ISO 12958:2010)</b>
EN ISO 13426-1:2003	Geotextiles and geotextile-related products - Strength of internal structural junctions - Part 1: Geocells (ISO 13426-1:2003)
EN ISO 13426-2:2005	Geotextiles and geotextile-related products - Strength of internal structural junctions - Part 2: Geocomposites (ISO 13426-2:2005)
EN ISO 13427:2014	Geotextiles and geotextile-related products - Abrasion damage simulation (sliding block test) (ISO 13427:2014)
EN ISO 13428:2005	Geosynthetics - Determination of the protection efficiency of a geosynthetic against impact damage (ISO 13428:2005)
EN ISO 13431:1999	Geotextiles and geotextile-related products - Determination of tensile creep and creep rupture behaviour (ISO 13431:1999)
<b>EN ISO 13433:2006</b>	<b>Geosynthetics - Dynamic perforation test (cone drop test) (ISO 13433:2006)</b>
EN ISO 13437:1998	Geotextiles and geotextile-related products - Method for installing and extracting samples in soil, and testing specimens in laboratory (ISO 13437:1998)
<b>EN ISO 13438:2004</b>	<b>Geotextiles and geotextile-related products - Screening test method for determining the resistance to oxidation (ISO 13438:2004)</b>
EN ISO 25619-1:2008	Geosynthetics - Determination of compression behaviour - Part 1: Compressive creep properties (ISO 25619-1:2008)
EN ISO 25619-2:2008	Geosynthetics - Determination of compression behaviour - Part 2: Determination of short-term compression behaviour (ISO 25619-2:2008)
ISO/TR 13434:2008	Geosynthetics -- Guidelines for the assessment of durability
EN 14151:2010	Geosynthetics - Determination of burst strength
EN ISO 10769:2011	Clay geosynthetic barriers (GBR-C) - Determination of water absorption of bentonite (ISO 10769:2011)
EN ISO 10772:2012	Test method for pore size determination under turbulent water flow conditions (ISO 10772:2012)
EN ISO 10773:2011	Geosynthetic clay barriers - Determination of gas flow through a GCL or GCB (Geosynthetic Clay Liner or Geosynthetic Clay Barrier)(ISO 10773)
EN ISO 10776:2012	Geotextiles and geotextile-related products - Determination of water permeability characteristics normal to the plane, under load (ISO 10776:2012)

### EN ISO 10319:2008 – GEOSYNTHETICS – WIDE-WIDTH TENSILE TEST

*IMPORTANT: This information sheet is not a standard. The full text of the standard can be obtained from your national standardization body.*

*Revision of ISO 10319:1993*

#### **SCOPE:**

Index test method for the determination of the tensile properties of geotextiles and related products, using a wide-width strip (200 mm wide).

Applicable to most geotextiles, including woven fabrics, nonwovens, geocomposites, knitted fabrics and felts. Applicable to geogrids, provided specimen dimensions are altered.

Covers the measurement of load-elongation characteristics, including the calculation of secant stiffness, maximum load per unit width and strain at maximum load.

#### **PRINCIPLE:**

The test, for all kinds of geotextiles and geogrids, uses conditioned test specimens of 200 mm width and of 100 mm length

A test specimen is held in the jaws of a tensile testing machine, operated at a rate of strain of  $(20 \pm 5)$  % per minute, and a longitudinal force applied until the specimen ruptures.

Measurement of the extension of the test specimen is carried out by means of an extensometer.

Five specimens in both machine direction and cross direction are tested.

Tensile strength (in kN/m), strain at maximum load (in %) and secant stiffness (in kN/m at 2, 5 and 10 % strain) are measured:

Mean values, individual values and standard deviation or coefficient of variation of these properties are reported.

#### **COMMENT:**

- Specimens may be tested in wet or dry state.
- See also EN ISO 10321:2008 Geotextiles - Tensile test for joints/seams by wide-width method.

## EN ISO 11058:2010 – GEOTEXTILES AND GEOTEXTILE-RELATED PRODUCTS – DETERMINATION OF WATER PERMEABILITY CHARACTERISTICS NORMAL TO THE PLANE, WITHOUT LOAD

*IMPORTANT: This information sheet is not a standard. The full text of the standard can be obtained from your national standardization body.*

### SCOPE:

This standard specifies two test methods for the determination of the water permeability characteristics of a single layer geotextile (or geotextile-related product) normal to the plane:

- constant head method
- falling head method

### PRINCIPLE:

- Constant head method: a geotextile is subjected to a unidirectional flow of water normal to the plane under a range of constant heads. The water flow, needed to keep the hydrostatic head at a constant level, is calculated. Typically a hydrostatic head of 70 mm is used, plus four additional levels ranging from 20 to 80% of that value.
- Falling head method: a geotextile is subjected to a unidirectional flow of water normal to the plane under a falling hydrostatic head. The time is measured to equalize a head difference of 250 mm.

Number of specimens: 5.

### RESULTS:

- Constant head method: a flow velocity ( $v_{20}$ ) in m/s (volume per unit of time and area:  $\text{m}^3/\text{m}^2.\text{s}$ )
- Falling head method: a flow velocity ( $v_{20}$ ) in m/s (hydrostatic head difference divided by time)

Note: Results expressed in litre/ $\text{m}^2.\text{s}$  correspond to mm/s.

### COMMENTS:

- For control purposes it can be sufficient to determine the constant head flow velocity at a head of 50 mm only.
- This method is temperature dependent; hence all results are corrected to a water temperature of 20° C.
- No indication is given when one or the other method should be used.

### EN ISO 12236:2006 – GEOSYNTHETICS - STATIC PUNCTURE TEST (CBR TEST)

*IMPORTANT: This information sheet is not a standard. The full text of the standard can be obtained from your national standardization body.*

*Revision of EN ISO 12236:1996*

#### **SCOPE:**

Method for the determination of the puncture resistance by measuring the force required to push a flat-ended plunger through geosynthetics.

The test is normally carried out on dry conditioned specimens.

Applicable to most types of products, but not to materials with apertures greater than 10 mm.

#### **PRINCIPLE:**

The specimen is clamped between two steel rings. A plunger with a diameter of  $(50 \pm 0.5)$  mm is advanced at a constant rate of  $(50 \pm 5)$  mm/min on the centre of the specimen and perpendicularly to it. The push-through force, push-through displacement and force-displacement curve are recorded.

#### **NUMBER OF SPECIMENS:**

Five specimens are tested.

If the two faces of a product have different characteristics a complete set of specimens shall be tested from each face.

#### **RESULTS:**

- push-through force: in kN (3 significant figures)
- push-through displacement: in mm (to an accuracy of  $\pm 1$  mm)
- graphs of force versus displacement
- individual values, average and coefficient of variation are reported.

#### **COMMENT:**

- Specimens may be tested in wet or dry state.

## **EN ISO 12956:2010 – GEOTEXTILES AND GEOTEXTILE-RELATED PRODUCTS – DETERMINATION OF THE CHARACTERISTIC OPENING SIZE**

*IMPORTANT: This information sheet is not a standard. The full text of the standard can be obtained from your national standardization body.*

### **SCOPE:**

Method for the determination of the characteristic size of the openings of a single layer geotextile (or geotextile-related product), using the wet-sieving principle.

### **PRINCIPLE:**

A quantity of graded granular material (usually soil) is brought on the surface of the geotextile and washed through with water. The geotextile acts as a sieve and the granular material, which passes the geotextile, is analysed.

The characteristic opening size (O<sub>90</sub>) of the geotextile corresponds to a specified size of the granular material passed (d<sub>90</sub>).

### **NUMBER OF SPECIMENS:**

Five specimens are used. Three specimens are tested. If results vary by more than 25% from the average, the remaining two specimens are tested.

### **RESULTS:**

The results are expressed in  $\mu\text{m}$ , according to the formula  $O_{90}=d_{90}$ , where:

- O<sub>90</sub> = the characteristic opening size
- d<sub>90</sub> = particle size for which 90% (by mass) of the particles is smaller than that particle.

### **EN ISO 12958:2010 – GEOTEXTILES AND GEOTEXTILE-RELATED PRODUCTS – DETERMINATION OF WATER FLOW CAPACITY IN THEIR PLANE**

*IMPORTANT: This information sheet is not a standard. The full text of the standard can be obtained from your national standardization body.*

#### **SCOPE:**

Method for determining the constant-head water flow capacity within the plane of a geotextile or geotextile-related product.

#### **PRINCIPLE:**

The flow of water in the plane is measured under varying normal compressive stresses and typical hydraulic gradients, using defined contact surfaces (closed cell foam, unless required otherwise).

- gradients: 0.1 and 1.0
- compressive stresses: 20 kPa, 100 kPa, 200 kPa

#### **NUMBER OF SPECIMENS:**

3 in each direction of the product

#### **RESULTS:**

Are expressed as a flow per unit width (in  $\text{m}^2/\text{s}$ ) ( $\text{m}^3/\text{m}\cdot\text{s}$ )

The average and the individual values at the defined gradients and compressive stresses shall be reported.

#### **COMMENTS:**

- The term “transmissivity” refers to the water flow under laminar flow conditions at a hydraulic gradient equal to 1.0. The term “water flow” is preferred.
- For quality control purposes it is allowed to determine the water flow capacity at only two loads and gradients.
- The long term flow capacity should be assessed in conjunction with a compressive creep test (EN ISO 25619-1)
- This method is temperature dependent; hence results are corrected to a water temperature of 20° C.



## **EN ISO 13433:2006 – GEOSYNTHETICS – DYNAMIC PERFORATION TEST (CONE DROP TEST)**

*IMPORTANT: This information sheet is not a standard. The full text of the standard can be obtained from your national standardization body.*

*Supersedes EN 918:1995*

### **SCOPE:**

Method to determine the resistance of geosynthetics to penetration by a steel cone dropped from a fixed height, as a simulation of dropping sharp stones on their surface.

Generally applicable to geosynthetics. However, the test principle may not be applicable to some types of products.

### **PRINCIPLE:**

The specimen is clamped between two steel rings. A steel cone (45° tip angle, 1000 g) is dropped from a height of 500 mm onto the centre of the specimen. The degree of penetration is measured by insertion of a graduated cone into the hole.

Number of specimens: Five specimens are tested. If the material to be tested is known to have different characteristics on the two faces, then the complete test shall be carried out separately on each face

Results are expressed as the diameter of the hole, in mm, to an accuracy of 0.1 mm.  
Average and coefficient of variation are reported.

### **EN 12224:2000 – GEOTEXTILES AND GEOTEXTILE-RELATED PRODUCTS – DETERMINATION OF THE RESISTANCE TO WEATHERING**

*IMPORTANT: This information sheet is not a standard. The full text of the standard can be obtained from your national standardization body.*

*Supersedes EN 12224:1996*

#### **SCOPE:**

Methods for the exposure of geotextiles and geotextile-related products to weathering conditions more intense than those of natural weathering, using fluorescent UV lamps (ISO 4892-3).

Index test to differentiate between products with little or no resistance to weathering and those which do have this resistance.

#### **PRINCIPLE OF TEST:**

Specimens are exposed to a light source for a defined radiant exposure or exposure time and at recommended temperature and moisture conditions.

The radiant exposure shall be 50 MJ/m<sup>2</sup>, with alternating wet/dry cycles. After this exposure the change in performance of these specimens is determined.

Number of specimens:

As needed for tensile testing: five test specimens and five control specimens, in both main directions of the product, e.g. warp and weft for woven fabrics.

#### **EXPRESSION OF RESULTS:**

Percentage retained strength or elongation, compared to the control specimens

#### **COMMENT:**

Further guidance on durability assessment can be found in ISO/TS 13434:2008 Geosynthetics – Guidelines for the assessment of durability, and in the annexes B and E of the product standards.

## **EN 12225:2000 – GEOTEXTILES AND GEOTEXTILE-RELATED PRODUCTS – METHOD FOR DETERMINING THE MICROBIOLOGICAL RESISTANCE BY A SOIL BURIAL TEST**

*IMPORTANT: This information sheet is not a standard. The full text of the standard can be obtained from your national standardization body.*

*Supersedes ENV 12225:1996*

### **SCOPE:**

Method for the determination of the microbiological resistance by a soil burial test.

NOTE: Experience indicates that geotextiles made of synthetic materials are generally resistant against microbial initiated decay. However, if the requirements for appropriate functioning demand proof of microbiological resistance or if there is any doubt, e.g. use of newly developed polymers, the soil burial test should be performed.

### **PRINCIPLE OF TEST:**

Test specimens are exposed for 16 weeks to a microbial active soil under specified conditions.

At the end of the exposure, the test specimens are evaluated visually, both before and after cleaning, and tested by measuring their physical properties.

These test results are compared with those obtained on unexposed specimens.

### **NUMBER OF SPECIMENS:**

10 test specimens for each set of conditions (exposed and unexposed)

### **EXPRESSION OF RESULTS:**

Percentage retained strength or elongation, compared to the reference specimens

### **COMMENT:**

Further guidance on durability assessment can be found in ISO/TS 13434:2008 Geosynthetics – Guidelines for the assessment of durability, and in the annexes B and E of the product standards.

### **EN 12226:2012 – GEOTEXTILES AND GEOTEXTILE-RELATED PRODUCTS – GENERAL TESTS FOR EVALUATION FOLLOWING DURABILITY TESTING**

*IMPORTANT: This information sheet is not a standard. The full text of the standard can be obtained from your national standardization body.*

*Supersedes EN 12226:2000*

#### **SCOPE:**

This standard specifies test methods for determining the change in specific properties of aged geotextiles. It is applicable to both geotextiles and geotextile-related products.

#### **PRINCIPLE OF TEST:**

The test specimens are exposed to a durability test for geotextiles. The exposure is followed by visual and, if required, microscopic inspection and determination of changes in tensile properties.

#### **NUMBER OF SPECIMENS:**

For each durability test the number of test and control specimens shall be a minimum of five, in both the machine and the cross-direction, unless otherwise specified in the relevant test standard.

If several durability tests are carried out simultaneously, common control specimens may be used.

Where specimens are exposed for more than one time duration, control specimens shall be prepared for each duration.

#### **EXPRESSION OF RESULTS:**

Visual and microscopic examination, followed by tensile testing. Results expressed as percentage retained strength or elongation, compared to the reference specimens

#### **COMMENT:**

Further guidance on durability assessment can be found in:

- ISO/TS 13434:2008 Geosynthetics – Guidelines for the assessment of durability, and
- in the annex B of the product standards.

## **EN 12447:2001 – GEOTEXTILES AND GEOTEXTILE-RELATED PRODUCTS – SCREENING TEST METHOD FOR DETERMINING THE RESISTANCE TO HYDROLYSIS IN WATER**

*IMPORTANT: This information sheet is not a standard. The full text of the standard can be obtained from your national standardization body.*

*Supersedes ENV 12447:1996*

### **SCOPE:**

Screening test method for determining the resistance to hydrolysis by exposing test specimens to water at elevated temperatures, followed by an evaluation of the changes in properties resulting from such exposure.

In particular applicable to polyester and polyamide based materials, and in addition to the yarns from which these geotextiles are made. Reinforcing materials shall be tested without the coating and manufacturers shall ensure that the degradation of the coating will not attack or have any negative influence on the degradation of the yarns.

This method is not intended for determining the resistance of geotextiles to hydrolysis under highly acid or alkaline conditions.

### **PRINCIPLE OF TEST:**

Both test and control specimens are immersed in hot water for 28 days at 95 °C. The properties of the specimens are determined after immersion.

### **NUMBER OF SPECIMENS:**

Five test specimens and five control specimens

### **EXPRESSION OF RESULTS:**

Percentage retained strength or elongation, compared to the reference specimens

### **COMMENT:**

Further guidance on durability assessment can be found in ISO/TS 13434:2008 Geosynthetics – Guidelines for the assessment of durability, and in the annexes B and E of the product standards.

### **EN 14030:2001 – GEOTEXTILES AND GEOTEXTILE-RELATED PRODUCTS – SCREENING TEST METHOD FOR DETERMINING THE RESISTANCE TO ACID AND ALKALINE LIQUIDS**

*IMPORTANT: This information sheet is not a standard. The full text of the standard can be obtained from your national standardization body.*

*Supersedes ENV 12960:1996. Amended in 2003*

#### **SCOPE:**

Methods for screening the resistance of geotextiles to liquids while not subjecting them to external mechanical stress.

Applicable to all geotextiles and geotextile-related products.

Method A applies particularly to polyamides and method B to polyesters and polyamides.

The test results should be interpreted in the context of site conditions.

#### **PRINCIPLE OF TEST:**

Test specimens are completely immersed in a test liquid for 3 days at 60 °C.

The properties of the test specimens are tested before and after immersion and, if applicable, after drying.

If possible, the test results are compared with those of control specimens stored under reference conditions.

Number of specimens:

Five test specimens and five control specimens

#### **EXPRESSION OF RESULTS:**

Percentage retained strength or elongation, compared to the reference specimens

#### **COMMENT:**

Further guidance on durability assessment can be found in ISO/TS 13434:2008 Geosynthetics – Guidelines for the assessment of durability, and in the annexes B and E of the product standards.

**EN ISO 13438:2004 – GEOTEXTILES AND GEOTEXTILE-RELATED PRODUCTS – SCREENING TEST METHOD FOR DETERMINING THE RESISTANCE TO OXIDATION**

*IMPORTANT: This information sheet is not a standard. The full text of the standard can be obtained from your national standardization body.*

Supersedes ENV 13438:1996

**SCOPE:**

Test method for screening the resistance to oxidation, in particular applicable to polypropylene and polyethylene based products.

The data are suitable for screening in service up to 25 years, but not for deriving performance data such as lifetime unless supported by further evidence.

**PRINCIPLE OF TEST:**

Six test procedures are described (A1, A2, B1, B2, C1, C2).

Method	Temperature	Duration	Atmosphere
A1	110 °C	14 days	normal
A2	110 °C	56 days	normal
B1	100 °C	28 days	normal
B2	100 °C	56 days	normal
C1	80 °C	14 days	Oxygen (50 bar)
C2	80 °C	28 days	Oxygen (50 bar)

Method A is intended for PP, method B for PE.

The shorter test durations are used for non-reinforcing applications. The longer durations are for reinforcing applications.

**NUMBER OF SPECIMENS:**

Five test specimens and five control specimens

**EXPRESSION OF RESULTS:**

Percentage retained strength or elongation, compared to the reference specimens

**COMMENT:**

Further guidance on durability assessment can be found in ISO/TS 13434:2008 Geosynthetics – Guidelines for the assessment of durability, and in the annexes B and E of the product standards.

## GEOTEXTILE STANDARDS

### **EN 13719:2002 – GEOTEXTILES AND GEOTEXTILE-RELATED PRODUCTS – DETERMINATION OF THE LONG TERM PROTECTION EFFICIENCY OF GEOTEXTILES IN CONTACT WITH GEOSYNTHETIC BARRIERS.**

*IMPORTANT: This information sheet is not a standard. The full text of the standard can be obtained from your national standardization body.*

#### **SCOPE:**

Index test used to determine the efficiency with which geotextiles or geotextile-related products will protect a geosynthetic barrier or other contact surface against the mechanical long term effects of static point loads. The test measures the strains experienced by a geotextile or geotextile related product in contact with a deformable pad.

#### **PRINCIPLE:**

A load of 300, respectively 600 or 1200 kN/m<sup>2</sup>, is applied for 100 hours through a simulated standard aggregate (metal nuts M 16) on to a specimen, which is supported on a simulated standard subgrade (lead sheet). The local strain in the lower surface of the geotextile is measured and used to determine the protection efficiency.

#### **NUMBER OF SPECIMENS:**

3

#### **RESULTS:**

A curve of the strain at the different pressures is drawn and the protection efficiency expressed as the reciprocal of its slope (in kN/m<sup>2</sup>)

#### **COMMENT:**

A possible alternative to assess protection efficiency is EN 14574:2004 Geosynthetics – Determination of the pyramid puncture resistance of supported geosynthetics.