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Material za varovalno obleko, odporen proti obrabi - Preskusne metode

Abrasion resistance of protective clothing material - Test methods

Abriebfestigkeit von Schutzkleidungsmaterial - Prüfverfahren

Résistance a l'abrasion du matériau constitutif d'un vetement de protection - Méthode d'essai

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Abrasion resistance of protective clothing material - Test methods

Résistance à l'abrasion du matériau constitutif d'un vêtement de protection - Méthode d'essai

Abriebfestigkeit von Schutzkleidungsmaterial - Prüfverfahren

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

Contents list

Foreword

This European Standard has been prepared by the Technical Committee CEN/TC 162 "Protetive clothing including hand and arm protection and lifejackets" the secretariat of which is held by DIN.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EC Directive(s).

This European Standard shall be given the status of a National Standard, either by publication of an identical text or by endorsement, at the latest by May 1995, and conflicting national standards shall be withdrawn at the latest by May 1995.

The annex A is informative and contains recommendations of assembly, maintenance and calibration of the Martindale Abrasion Machine. The annex B is informative and contains a bibliography recommendation.

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

1 Scope

This European Standard describes two methods on abrasion resistance of materials using the same apparatus. This standard is applicable as reference standard on abrasion for standards and specifications on protective clothing.

The first method describes the determination of the abrasion resistance of protective clothing materials and the second method describes abrasion pretreatment of these materials where the test samples afterwards are used in evaluation of the remaining protective properties.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ISO 2231:1989 Rubber- or plastics- coated fabric.
Standard atmospheres for conditioning and testing .

3 Methods of test

3.1 Principles

The abrasion test using the Martindale abrasion machine is presented in two methods of operation.

Method 1: Determination of abrasion resistance
Determination of abrasion resistance employs the instrument in the conventional manner and produces an abraded disc of material 38 mm in diameter. This is convenient where only the loss of finish or appearance, or the mass or volume of abrasion loss, is to be determined and requires only small amounts of material to be tested.

Method 2: Pretreatment procedure
Pretreatment procedure employs the instrument in inverted mode, i.e. the test piece is placed on the abradant table instead of in the test piece holder and the abradant is mounted in the test piece holder. This provides an abraded area which enables post-abrasion testing to be carried out.

3.2 Apparatus

3.2.1 Abrasion machine

Abrasion machine, of the type described by Martindale, (see annex B), and fulfilling the following requirements :

Rotational speed of each of the outer pegs:	(47,5 ± 2,5) min^{-1}
Drive ratio outer pegs : inner pegs:	32 / 30
Dimensions of the Lissajous figure:	(60 ± 1) mm
Face diameter of specimen holder insert:	(28,65 ± 0,25) mm
Combined total mass of specimen holder, spindle and weight:	(595 ± 7) g or (795 ± 7) g

The specimen holders and abrading tables shall be plane and parallel over their entire surfaces. The drive from the motor to the machine shall be connected to a counter and switch so that the revolutions of the outer pegs are indicated and that the machine may be stopped after a predetermined number of cycles has been measured by the counter .

NOTE: Information concerning the assembly, maintenance and calibration of the abrasion machine is given in annex A. It is considered advisable that these recommendations are followed, if excessive variability of the test result is to be avoided.

3.2.2 Abradant

The abradant to be used will be specified in the specific product standard . It can be a crossbred worsted abradant, or a silicon carbide cloth, or an emery cloth .
The use of silicon carbide paper or emery paper is not recommended, they usually cause problems when mounting the abradant in the Martindale apparatus .

3.2.3 Foam

Polyurethane foam backing, (3 ± 1) mm thick, having a density of (30 ± 1) kg/m^3.

3.2.4 Felt

Felt backing, either a non-woven of (625 ± 50) g/m^2 and approximately 2,5 mm thick, or a woven felt of (750 ± 50) g/m^2 and approximately 2,5 mm thick .

3.2.5 Cutter

Punch or press cutter, to cut a circle of at least 38 mm in diameter.

3.3 Conditioning and testing atmosphere

Condition test pieces and the abradant in atmosphere A in according with ISO 2231, unless otherwise specified. Conduct the test in a room with a temperature not exceeding the range of 15°C to 30°C. Specimens are to be tested in their natural state.

3.4 Procedure of Method 1: Determination of abrasion resistance

3.4.1 Test pieces

Using the punch or press cutter (3.2.6) take at least four pieces at random from the entire material under test. These shall not include seams.

If the end point of the test, required by the relevant product specification, is expressed in terms of mass loss, determine the mass of each test piece taken, to an accuracy of 1 mg.

3.4.2 Setting up the machine

3.4.2.1 Mounting test pieces

Place the ring of the test piece holder in position on the mounting plate provided on the base of the machine. Insert the test piece face side downwards, centrally on the ring. Place the metal insert carefully and centrally on top of the test piece, so that its hollowed side faces upwards, and press down.
Ensure that the test piece is retained in a wrinkle-free condition during the further assembly with the test piece holder.

NOTE: When screws are used for this assembly the following procedure is recommended:
Hold the ring containing the test piece and the metal insert firmly in the mounting plate, start to screw the top of the test piece holder on to the ring, taking care that the screw threads are not crossed. Having started the screwing down operation, use both hands to maintain a continuous downward pressure on the assembly, against the mounting plate.

3.4.2.2 Mounting abradant

Mount a new piece of abradant on at least four of the tables with a piece of foam backing (3.2.3) when using silicon carbide or emery abradant, or with a piece of felt backing (3.2.4) when using crossbred worsted abradant, of the same dimensions beneath the abradant. Flatten the abradant by placing the weight supplied with the machine for this purpose on its surface, and then position and tighten the retaining frame evenly. Uniform clamping can be achieved by appropiate devices such as screws.

3.4.2.3 Wrinkles

If the test piece or the abradant cannot be mounted in a wrinkle-free position, the use of the foam or felt backing may be omitted, but this omission shall be stated in the test report.

3.4.2.4 Mounting test piece holders

Clamp the test piece holders on the top plate under a pressure of 9 kPa or 12 kPa. On a working area of 6,45 cm^2 a combined total mass of specimen holder, spindle and weight of (595 ± 7) g or (795 ± 7) g will produce nominal pressures of 9 kPa or 12 kPa respectively .

The pressure to be used is specified in the relevant product standard.

3.4.3 Procedure

After mounting the test piece holders switch on the machine.
Regular removal of abrasion debris and replacement of the abradant are necessary to obtain reproducible test results.

The intervals for the removal of the debris and the replacement of the abradant depend on the abradant itself and on the material under test; information is specified in the relevant product standard.

3.5 Procedure of Method 2

3.5.1 Test pieces

Select at least four test pieces suitably sized to fit the test clamps, from non-adjacent areas of the test sample.

3.5.2 Setting up the machine

3.5.2.1 Mounting test pieces

Carefully position the test pieces on the abrading table with a piece of felt backing (3.2.4) and arrange them,without stretching them,so that they are free from creases. Flatten the test pieces by placing the weight supplied with the machine for this purpose on its surface, and then tighten the retaining frame evenly. Uniform clamping can be achieved by appropiate devices such as screws.

3.5.2.2 Mounting abradant

Mount the abradant as described in 3.4.2.2, but back the abradant with foam (3.2.3). Ensure that the test piece is retained in a wrinkle-free condition during the further assembly with the test piece holder.

NOTE: When screws are used for this assembly the following procedure is recommended:
Hold the ring containing the test piece and the metal insert firmly in the mounting plate, start to screw the top of the test piece holder onto the ring taking care that the screw threads are not crossed. Having started the screwing down operation, use both hands to maintain a continuous downward pressure on the assembly, against the mounting plate.

3.5.2.3 Wrinkles

If the test piece or the abradant cannot be mounted in a wrinkle-free position, the use of the foam or felt backing may be omitted, but this omission shall be stated in the test report.

3.5.2.4 Mounting test piece holders

Clamp the test piece holders on the top plate under a pressure of 9 kPa or 12 kPa. On a working area of 6,45 cm^2 a combined total mass of specimen holder, spindle and weight of (595 ± 7) g or (795 ± 7) g will produce nominal pressures of 9 kPa or 12 kPa respectively.
The pressure to be used is specified in the relevant product standard.

3.5.3 Procedure

After mounting the test piece holders switch on the machine.
The number of cycles is specified in the relevant product standard.
Regular removal of abrasion debris and replacement of the abradant are necessary to obtain reproducible test results.

The intervals for the removal of the debris and the replacement of the abradant depend on the abradant itself and on the material under test; information is specified in the relevant product standard.

3.6 Method of assessment

The end of the testing has to be stated in the relevant product standard or specification.

Note: The following end points are recommended:

a) a judgement of deterioration in case of using method I;
b) a number of cycles in the case of using method 2.

3.7 Test report

The test report shall at least include following information:

a) the description of the material;
b) reference to this standard and the method of test;
c) the standard atmosphere;
d) the pressure applied, i.e. 9 kPa or 12 kPa;
e) details of abradant employed, as stated in the product specification;
f) details of any deviation from the standard test (i.e. omission of foam or felt);
g) in the case of method 1:

-the end point of each test piece and the mean value;

in the case of method 2:

- the number of cycles of abrasion applied;