



SLOVENSKI STANDARD

SIST EN 1082-3:2000

01-september-2000

Varovalna obleka - Rokavice in ščitniki rok za varovanje pred urezninami in vbodom ročnega noža - 3. del: Preskus z urezom za tkanine, usnje in druge materiale

Protective clothing - Gloves and arm guards protecting against cuts and stabs by hand knives - Part 3: Impact cut test for fabric, leather and other materials

Schutzkleidung - Handschuhe und Armschützer zum Schutz gegen Schnitt- und Stichverletzungen durch Handmesser - Teil 3: Fallschnittprüfung für Stoff, Leder und andere Werkstoffe

Vêtements de protection - Gants et protège-bras contre les coupures et les coups de couteaux à main - Partie 3: Essai de coupure par impact pour étoffes, cuir et autres matériaux

Ta slovenski standard je istoveten z: EN 1082-3:2000

ICS:

13.340.40 Varovanje dlani in rok Hand and arm protection

SIST EN 1082-3:2000 en

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EUROPEAN STANDARD

EN 1082-3

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2000

ICS 13.340.10; 13.340.40

English version

Protective clothing - Gloves and arm guards protecting against cuts and stabs by hand knives - Part 3: Impact cut test for fabric, leather and other materials

Vêtements de protection - Gants et protège-bras contre les coupures et les coups de couteaux à main - Partie 3: Essai de coupure par impact pour étoffes, cuir et autres matériaux

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This European Standard was approved by CEN on 17 March 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. 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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

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

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 October 2000, and conflicting national standards shall be withdrawn at the latest by October 2000.

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 EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

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

Annex A is informative.

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Introduction

This test is based on the impact penetration test in EN 412 "Protective aprons for use with hand knives". It differs in that the blade holding block and blade weigh 110 g rather than 1000 g. The sample support is also changed to suit the testing of fabric, leather, and other materials. The test is designed particularly to assess the stab resistance of materials for gloves and arm guards. The test is also suitable for assessing gloves exposed to severe abrasion and cutting threats such as motorcyclists' gloves, working gloves for handling concrete blocks or razor wire, or protective leggings and trousers for refuse collectors. Severe abrasion is a process involving multiple cuts and this test is a good indicator of abrasion resistance of the whole thickness of a material or sequence of materials.

It has been assumed in the drafting of this European Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people, for whose guidance it has been prepared. The apparatus described should only be used by competent persons and requires safeguards to prevent, as far as is reasonably practicable, injury to the operator and other persons.

1 Scope

This European Standard contains the specification for an impact cut test for use on fabric, leather and other materials.

2 Normative references

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

EN 340	Protective clothing – General requirements
EN 388	Protective gloves against mechanical risks
EN 412	Protective aprons for use with hand knives
EN 420	General requirements for gloves
EN 1082-1	Protective clothing – Gloves and arm guards protecting against cuts and stabs by hand knives – Part 1: Chain mail gloves and arm guards

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 1082-1 apply.

4 Requirements for the use of this standard

This European Standard describes a method of test for impact cut resistance of materials. When it is cited as a test method in a specific product standard that Standard shall contain the necessary information to permit the application of this European Standard to the particular products. The standard citing this European Standard shall include at least the following:

- 1) normative reference to this European Standard;
- 2) a description of the samples to be tested, their method of preparation and pre-treatment, if any, and the permitted size range of samples;
- 3) details of the clamping and stretching method to be used with the samples;
- 4) the energy(s) of impacts to be used in the test;
- 5) the orientations of blade impacts relative to a specified axis of the samples;
- 6) the number of tests to be performed, and where they are to be located;
- 7) details of any deviations from the method described in this European Standard;
- 8) the content of the test report to be provided;
- 9) the performance requirements for the product, and associated 'levels';
The performance required shall be given as 'a mean penetration through the sample of not more than XX mm when tested according to YYY';
- 10) the area of the product that is to meet the requirements.

NOTE: Information and guidance on using this European Standard in a product Standard are given in the informative Annex A.

5 Test apparatus and procedures

5.1 Cut testing apparatus

5.1.1 Principle

The leather or fabric gloves or materials are tested by impacts of standard knife blades held in a guided falling block. The component parts of a possible design of a test apparatus are shown in figure 1. The design of the stand is not normative. Details of the test sample support, falling block and test blade are given in subsequent clauses. Design details such as the means of allowing removal of the block and test blade after impact, and necessary safety guards are not shown.

5.1.2 Blade holding block

The blade holding block is shown in figure 2. The test blade shall be held in the block so that it protrudes by (55 ± 5) mm. The position of the blade tip shall be offset by the distance l_4 which is (8 ± 1) mm from the centre line of the block which shall pass through the centre of gravity of the block. The centre of gravity of the block and blade shall be (100 ± 10) mm above the blade tip level. The mass of the block with test blade shall be (110 ± 5) g.

The block shall be held in its initial position by an electromagnet. The block shall have four sliders made of polytetrafluorethylene or similar material, which guide its drop down the guide rods. There shall be 0,5 mm to 1,5 mm clearance between the sliders and the guide rods. The heights from which the block is released shall be set so that the appropriate energy of impact is achieved.

5.1.3 The test blade

The test blade shall have the profile and dimensions as shown in figure 3. It shall be made of cold-forged stainless steel with a degree of hardness greater than 45 HRC. Its edge shall be straight and sharp. Before every penetration test the blade shall conform to the specification.

NOTE: After machine grinding, the blade edge should be made smooth and sharp by hand finishing on an oilstone. Blades may be re-sharpened after use. When fabrics and leathers are tested re-sharpening is not required after every test. The calibration material results reveal the need for re-sharpening.

5.1.4 Sample support

Figure 4 illustrates the apparatus described below. The material sample or glove is supported on a horizontal arm which ends in a circular anvil with a hole in it which the knife enters during the test. It has been found convenient to make the support from mild steel.

The circular metal anvil shall be (50 ± 1) mm in diameter and have a vertical height of approximately 60 mm. The top surface shall be machined to be domed with a radius of curvature of (200 ± 5) mm. The anvil shall have a slot cut in it at its centre. The slot shall be $(3,5 \pm 0,05)$ mm wide and $(23 \pm 0,2)$ mm long. The ends shall be semi-circular. The slot shall be vertical and pass through the anvil. The anvil may be machined out from below so that the centre of the anvil is not less than 7 mm thick.

The anvil shall be attached to a horizontal arm such that the axis of the arm is at $(45 \pm 5)^\circ$ to the long axis of the slot. The arm shall be attached to the anvil so that its top surface is (30 ± 2) mm below the centre of the top of the anvil. The arm shall be (15 ± 2) mm wide and (35 ± 5) mm deep. The arm shall be attached to a rigid support such that there is at least 180 mm clearance below it, and the arm has an unobstructed length of at least 150 mm.

The sample support shall be firmly attached to the base plate of the apparatus which shall be provided with a hole at least 50 mm wide directly under the anvil so that a weight suspended on a string can be clipped to the lower side of the sample on the support.

5.1.5 Preparation of samples

Samples shall be prepared so that they have a shape and dimensions suitable for the test. Flat materials should be sewn, stapled, welded, or in some other way, joined to form a tube. The tube should be at least 100 mm in length, but not so long that its length impedes positioning of the sample as required in 5.2.2. The tube shall have a circular diameter of (100 ± 20) mm. Knitted materials should be prepared so that the area to be tested is representative of the material as used in products. The sample may need to be stabilised by a line of stretchable over-lock stitches around its edge to prevent the knitted structure breaking down.

Samples that consist of gloves or arm guards may be suitable to test complete. Very stiff products shall be cut and have their cut edges stabilised, so that they can be positioned as required in 5.2.2.

If washing and dry cleaning pre-treatments are to be conducted. Intact products, or on large material specimens, should be pre-treated before samples are prepared.

5.1.6 Mounting a sample

The sample is slid onto the anvil and arm so that the area to be tested lies over the anvil. A weight of (1000 ± 50) g is clipped to the dependant side of the sample pulling on it with a force of 10 N. The sample should be smoothed out over the anvil. By twisting the sample on the anvil cuts can be made parallel to the long axis of the sample, transversely across the sample and at any angle between these orientations.

5.2 Procedures

5.2.1 Setting up the apparatus

Ensure the guide rods are vertical (± 2 mm in 1 m), and the blade holding block runs freely on the guide rods from the electromagnetic catch to the sample support. The guide rods should end not more than 10 mm above the top of the anvil. The guide rods should be wiped with light oil and rubbed clean before use. Ensure that the sample support is horizontal (± 10 mm in 1 m).

Set up an instrument to measure the velocity of the falling block over at least 5 mm of travel within the last 100 mm of its fall before the knife tip strikes the sample. Carry out test drops of the block with a knife fitted. The velocity shall be measured to an accuracy of $\pm 0,05$ ms⁻¹. The mass of the block and knife shall be measured to an accuracy of $\pm 0,5$ g. Calculate the energy of impact the knife tip would make on a sample. Adjust the height of the electromagnet so that the mean impact energy of ten test drops is within 5 % of the specified energy.

NOTE: The normal impact energy used is 0,65 J and is provided by a drop from a height of 600 mm.

5.2.2 Conduct of tests

Set up a sample on the support in the test apparatus with the electromagnetic catch at the appropriate height. Line up the sample so that the knife blade is parallel to a defined axis of the sample.

Release the block with knife. Mark the knife blade with a pen level with the top of the sample. Measure the distance from this mark to the blade tip to the nearest 0,5 mm. Subtract the material thickness and record the result as the penetration of the knife through the sample. Wipe the blade and repeat the test at least 10 mm from any previous impact. Rotate the specimen through approximately 45° and do two more tests, repeat this sequence so that the sample is tested in cuts along its long axis across the sample and at 45° to these directions. Calculate the mean penetration in the six tests. Calculate the relative impact cut penetration for material with reference to the cotton canvas.

5.2.3 Use of the reference material

Variations in knife sharpness and performance of different test apparatus are allowed for by use of a reference material. Cotton canvas as specified in EN 388. "Protective gloves against mechanical risks", is used as the reference material. Samples are prepared as tubes which shall be at least 100 mm in length and have a circular diameter of (100 ± 20) mm, by stapling or sewing the fabrics together. Two layers of fabric shall be used with the warp fibres running in the same direction. Six impact cuts shall be made on the sample. Two along the weft, two along the warp, and two at 45° to these cuts. The mean penetration of the knife through the sample is calculated.

The reference penetration for a 0,65 J impact is 14 mm. The relative impact cut penetration of a test material is calculated with reference to the result on the canvas:

Relative impact cut penetration of sample $X = \frac{14}{\text{penetration of canvas}} \times \text{penetration of the sample } X$

For convenience a locally available cotton fabric can be used as a reference material after each batch has been calibrated against the reference canvas specified in EN 388.

NOTE: When fabrics of normal fibres and leathers are tested the knife sharpness should be calibrated at least every 50 cuts. If fabrics containing metal or ceramic fibres are tested, the knife sharpness should be checked more frequently. Some materials blunt the knife in a single impact and blades should be re-sharpened after each cut.

5.2.4 Estimation of the uncertainty of measurements

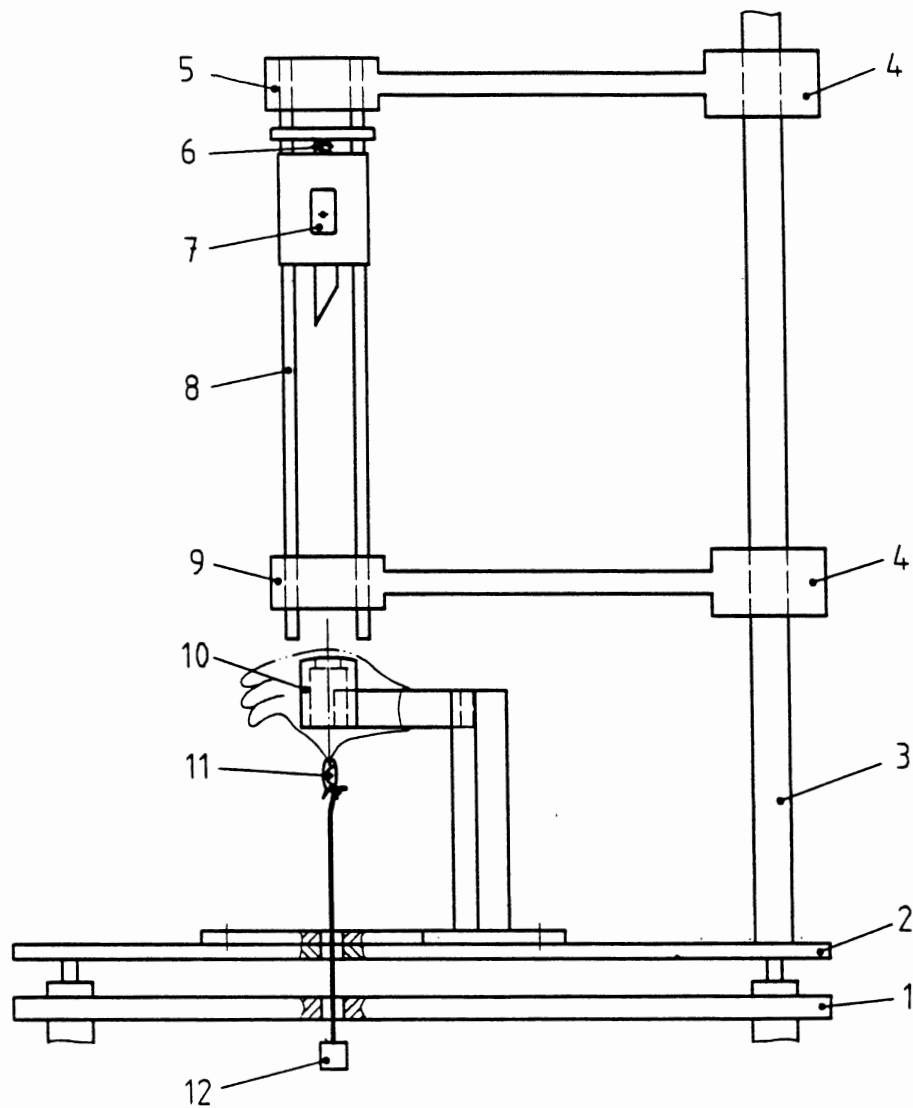
For each of the required sequences of measurements performed in accordance with this standard a corresponding estimate of the uncertainty of the final result shall be determined. This uncertainty (U_m) shall be given in the test report in the form $U_m = \pm X$. It shall be used in determining whether a "Pass" performance has been achieved.

For example if the final result plus U_m is above the pass level when the requirement is that a certain value shall not be exceeded, the sample shall be considered to have failed.

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**Key**

- 1 Table
- 2 Base plate
- 3 Support
- 4 Bracket
- 5 Fixing block for the upper end of the guide rods
- 6 Electromagnetic release mechanism
- 7 Falling block and test blade
- 8 Guide rods
- 9 Fixing block for the lower end of the guide rods (the falling block passes through it)
- 10 Sample support
- 11 Clip
- 12 Weight

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Figure 1 - Example of a penetration testing apparatus