SLOVENSKI STANDARD
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Varovalne rokavice za zaščito pred mehanskimi nevarnostmi

Protective gloves against mechanical risks

Schutzhandschuhe gegen mechanische Risiken

Gants de protection contre les risques mécaniques

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13.340.40	Varovanje dlani in rok	Hand and arm protection

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Protective gloves against mechanical risks

Gants de protection contre les risques mécaniques

Schutzhandschuhe gegen mechanische Risiken

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 162.

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

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Foreword

This document (prEN 388:2014) 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 document is currently submitted to the CEN Enquiry.

This document will supersede EN 388:2003.

This document 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 document.

1 Scope

This European Standard specifies requirements, test methods, marking and information to be supplied, for protective gloves against the mechanical risks of abrasion, blade cut, tear, puncture and impact.

This standard shall be used in conjunction with EN 420.

The test methods developed in this standard may also be applicable to arm protectors which are protective devices separate from the glove or the clothing.

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.

EN 420, *Protective gloves — General requirements and test methods*

EN ISO 12947-1, *Textiles — Determination of the abrasion resistance of fabrics by the Martindale method — Part 1: Martindale abrasion testing apparatus*

EN 13594:2002, *Protective glove for professional motorcycle riders — Requirements and test methods*

EN ISO 13997, *Protective clothing — Mechanical properties — Determination of resistance to cutting by sharp objects (ISO 13997)*

3 Terms and definitions

For the purposes of this standard the following definitions apply:

3.1
protective glove against mechanical risks
a glove that provides protection against at least one of the following mechanical risks: abrasion, blade cut, tear, puncture and impact

3.2
glove providing a specific protection
a glove that is designed to provide an area of improved protection for the whole hand or part of it (e.g. palm protection style)

3.3
glove series
a single glove style or glove type with the same palm material up to the wrist line where the only variants are size, length, left/right hand and colour

3.4
arm
part of the body between the wrist and the shoulder

3.5
Gloves made from several layers
- Unbonded layers: a glove that is made from 2 or more layers of materials which are not connected together, after preparing the sample for the test.
- Bonded layers: a glove that is made from 2 or more layers of materials which are connected together (e.g. glued, stitched, dipped, impregnated

3.6
Abrasion breakthrough
Breakthrough is reached:
- in knitted fabrics, when one thread is broken causing a hole to appear
- in other materials, when the first hole resulting from the wear is of a diameter at least equal to 1 mm
- in woven fabrics, when two separate threads are completely broken
- in bonded layers, when breakthrough is reached through all layers together

4 Requirements

The protective gloves according to this standard shall first meet all the applicable requirements of EN 420.

A protective glove against mechanical risks shall have performance level of 1 or above for at least one of the properties (abrasion, blade cut, tear and puncture) or at least level A for the ISO cut resistance test; classified according to the minimum requirements for each level shown in table 1.

NOTE Gloves meeting the requirements for resistance to puncture may not be suitable for protection against sharply pointed objects such as hypodermic needles.

Table 1 — Levels of performance

Test	Level 1	Level 2	Level 3	Level 4	Level 5
6.1 Abrasion resistance (number of cycles)	100	500	2000	8000	-
6.2 Blade cut resistance (index)	1,2	2,5	5,0	10,0	20,0
6.4 Tear resistance (N)	10	25	50	75	-
6.5 Puncture resistance (N)	20	60	100	150	-

	Level A	Level B	Level C	Level D	Level E	Level F	Level G	Level H	Level I
6.3 EN ISO cut resistance (N)	2	5	10	15	22	30	40	50	60
These Newton values are still to be validated									

4.1 Additional Protection

Additional protection can be claimed when the gloves is conform to the requirements defined in the following clause(s).

4.1.1 Impact protection

A protective glove against mechanical risks may be designed and constructed to provide specific impact attenuation. These gloves shall be conform to the following requirement.

When the tests are performed according to the clause 6.8.2 of EN 13594:2002, with an impact energy of 5J, the mean peak transmitted shall not be greater than 4 kN. In addition, no part of the glove shall crack or shatter producing sharp edges, and the chamois leather between the specimen and anvil shall not be torn or holed.

5 Sampling and conditioning

5.1 All specimens shall be taken from the palm of different gloves for classification purposes. For arm protectors, specimens shall be taken from the area for which protection is claimed.

5.2 If relevant, additional areas of the protective glove shall be tested, e. g. for specific protection or for areas which provide lower protection.

5.3 Conditioning of samples and all other test consumables (e.g. abrasive paper, EPDM, cotton canvas) is as follows:

— Temperature (23 ± 2) °C;

— Relative Humidity (50 ± 5) %.

The period of conditioning is at least 24 h. Tests shall preferably be performed in the above mentioned environment.

5.4 If the test is performed in a different environment, it shall be started within 5 min after removal from the conditioning.

5.5 If special applications require testing in a different environment, it is the responsibility of the manufacturer or his authorized representative to arrange for additional tests and to present the results including a full description of the testing environment in the information supplied by the manufacturer (clause 8).

6 Test methods

6.1. Abrasion resistance

6.1.1. Principle

Circular specimens of material are abraded under known pressure with a cyclic planar motion in the form of a Lissajous figure which is the result of the simple harmonic motions at right angles to each other.

The resistance to abrasion is measured by the number of cycles required for breakthrough to occur.

6.1.2. Abradant

A suitable abradant shall meet the requirements as laid down in Annex A.

NOTE An example of suitable abradant is Klingspor PL31B, Grit 180 (see Annex A)

A more robust calibration method for defining alternative papers is still under construction.

6.1.3 Apparatus

An abrasion machine of the type described in EN ISO 12947-1 as a Martindale Wear and Abrasion is required. It shall fulfil the following requirement:

Pressure on specimen: (9 ± 0.2) kPa

NOTE More detailed specifications relative to the apparatus can be found in EN ISO 12947-1.

6.1.4 Test specimens

Four test specimens shall be taken from four individual gloves of the same glove series. In case of an irregular design of the palm, the test specimen shall be taken in the area where the least protection is expected.

Where the test specimen is made of several unbonded layers, the test is performed on each layer, and the classification is based on the number of cycles for the layer with the highest performance.

6.1.5 Test procedure

Setting up the machine.

a) Mounting test specimens

Cut four test specimen to the correct dimensions (38^{+5}_{0}) mm. Secure the test specimen without tension carefully and centrally on the metal insert by means of double-sided adhesive tape under a weight of 10 kg applied for at least 5 minutes. Good adhesion can be achieved through the use of double-sided tape which prevents loosening of the test specimen and the inclusion of air bubbles. Place the ring of the specimen holder in position on the mounting plate provided on the base of the machine

NOTE Some materials might need a longer contact time to ensure maximum adhesion between the test specimen and the adhesive tape Surface treatment (e.g. removal of fluff) may be used in order to improve adhesion between the test specimen and the adhesive tape, provided this treatment will not affect the performance of the material during the test. If a different contact time (> 5 minutes) and/or if a surface treatment is used, this should be reported.

While ensuring that the ring containing the specimen and metal insert is held firmly in the mounting plate, start to screw the top of the specimen 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 downwards pressure on the assembly against the mounting plate.

This procedure will normally ensure that the specimen is securely retained in the holder in a wrinkle-free condition and that it is ready for testing.

NOTE It is important to use a sufficiently effective double-sided adhesive tape which prevents the movement of the test specimen during the duration of the test (appropriate double-side adhesive tapes can for example be found in the building and construction industry) . This information is given for the convenience of users of this standard and does not constitute an endorsement by CEN/TC 162 of the product named.

b) Mounting abradant

Secure carefully the abradant (1) by means of double-sided adhesive tape covering the whole surface of the mounting plate. Ensure the abradant is flat by on its surface, and if a retaining frame is used, then position and tighten it up evenly using diagonally opposite screws in sequence. Make sure that the abradant is held in place firmly and that there are no tucks or ridges.

c) Mounting specimen holders

Mount the test specimen holders on the top plate under a pressure of (9 ± 0.2) kPa and switch on the machine. 4 test specimens are preferably to be tested at the same time on the same machine. If differently, it shall be reported in the test report + the reason why.

Every time a specimen holder is taken from the machine to check the end point of the specimen for breakthrough, retighten the specimen holder before it is replaced on the machine.

If it is necessary to interrupt the test for an appreciable length of time (e. g. overnight or at the weekend) remove the specimens in their holders and store them face upwards. Protect the specimens by covering them with a clean card or piece of fabric.

d) Method of assessment

Each test will be performed with a new abradant. Begin the test and check the test specimens after 100 cycles. If there is no breakthrough continue the test until reaching 500 cycles (performance level 2). If there is no breakthrough, continue the test until the next performance level in table 1 is reached. Examine the test specimens at the required cycle number for each performance level.

At each examination of a specimen at a specified performance level, both the test specimens and the abradant shall be cleaned (e. g.) by clean compressed air and the specimen holder tightened before it is replaced on the machine.

If a breakthrough is found when examining the test specimens at a given performance level, the classification will be at the preceding inferior performance level.

When breakthrough occurs at less than 2 mm of the edge of one test specimen or when tearing occurs, this test specimen has to be discarded and the entire test has to be repeated. If in the second test, at least one test specimen fails, the lowest value of the test specimens that have not been discarded in both tests shall be recorded.

The report shall show the 4 individual results. The performance level is defined as the lowest of the 4 values.

6.1.6 Test report

The test report shall contain the following information:

— The reference of the sample;

— The results as per the test given in 6.1.5;

— Any deviation from the test method (in particular different contact time with the adhesive tape and surface treatment of test specimen);

— Any physical change observed on the test specimen;

— The performance level in accordance to table 1.

6.2. Blade cut resistance

6.2.1 Principle

Specimens are cut by a counter-rotating circular blade which moves with an alternating motion under a specified load

6.2.2 Equipment

The equipment (see figure 1, figure 2 and figure 3) consists of:

e) a test bench providing an alternating horizontal movement to a circular, rotating blade. The horizontal movement is 50 mm long and the blade rotates completely 360°; in the opposite direction to its movement. The resulting sinusoidal cutting speed of the blade is at 8 ± 2 cm/s.

f) a mass applied to the blade resulting in a force of (5 ± 0.5) N;

g) a circular blade with a diameter of (45 ± 0.5) mm, a thickness of (0.3 ± 0.03) mm and a total cutting angle of 30° to 35° (see figure 3). The blade shall be in steel with a Vickers Hardness of 740 to 800;

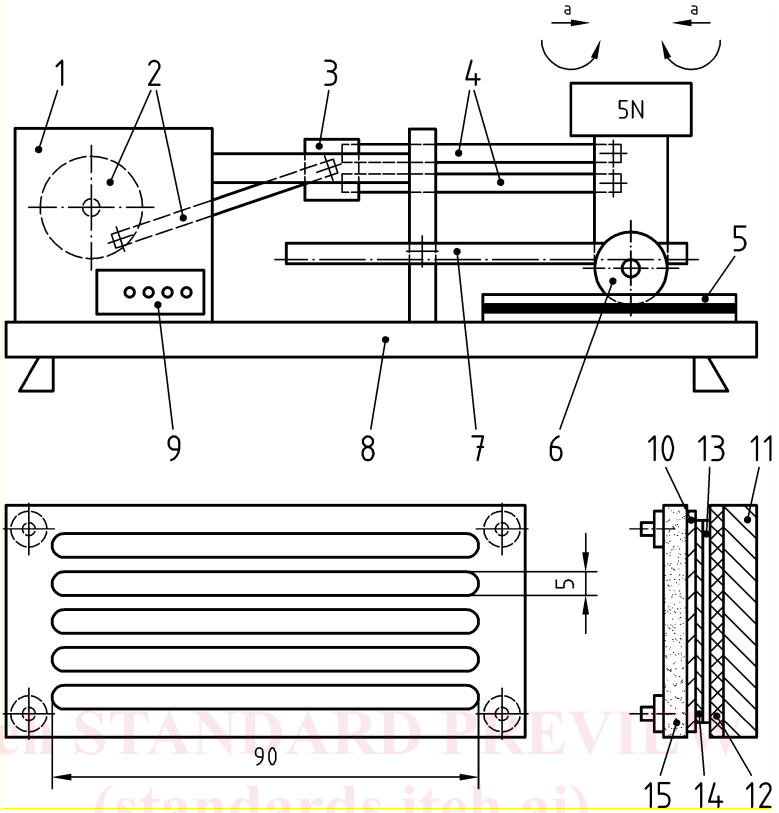
h) a support of conductive rubber (hardness (80 ± 3) IHRD), e.g. EPDM, on which the test specimen is placed;

i) a clamping frame for the test specimen as described in figure 1;

j) an automatic system to detect the moment of cut-through;

k) a cycle counter calibrated to one tenth of a cycle.

Dimensions in Millimetres



Key

1	Compartment of motor and electronic detection	9	Counter
2	Wheel and driving rod	10	Specimen
3	Sliding system	11	Insulated support
4	Rods	12	Conductive rubber
5	Test piece device	13	Aluminium foil
6	Circular blade	14	Filter paper
7	Toothed rack	15	Upper part
8	Support plate	a	Alternating motion of the blade

Figure 1 — Apparatus for testing blade cut resistance of protective gloves