



**SLOVENSKI STANDARD**  
**SIST EN 388:2016+A1:2019**

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**Nadomešča:**  
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**Rokavice za zaščito pred mehanskimi tveganji**

Protective gloves against mechanical risks

Schutzhandschuhe gegen mechanische Risiken

Gants de protection contre les risques mécaniques

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EUROPEAN STANDARD

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## Protective gloves against mechanical risks

Gants de protection contre les risques mécaniques

Schutzhandschuhe gegen mechanische Risiken

This European Standard was approved by CEN on 29 July 2016 and includes Amendment 1 approved by CEN on 24 October 2018.

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

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

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**EN 388:2016+A1:2018 (E)****European foreword**

This document (EN 388:2016+A1:2018) 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of an identical text or by endorsement, at the latest by June 2019, and conflicting national standards shall be withdrawn at the latest by June 2019.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document includes Amendment 1 approved by CEN on 2018-10-24.

This document supersedes A1 EN 388:2016 A1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

A1 This document has been prepared under a standardization request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of Regulation (EU) 2016/425. **iTeh STANDARD PREVIEW**

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document. A1 **(standards.iteh.ai)**

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## 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, if applicable, impact.

This standard is intended to be used in conjunction with EN 420.

The test methods developed in this standard may also be applicable to arm protectors.

## 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*

☐A1 EN 1049-2, *Textiles — Woven fabrics — Construction — Methods of analysis — Part 2: Determination of number of threads per unit length (ISO 7211-2:1984 modified)* ☐A1

☐A1 EN 12127, *Textiles — Fabrics — Determination of mass per unit area using small samples* ☐A1

EN 13594:2015, *Protective gloves for motorcycle riders — Requirements and test methods*

☐A1 EN ISO 5084, *Textiles — Determination of thickness of textiles and textile products (ISO 5084:1996)* ☐A1

EN ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system (ISO 7500-1)*

EN ISO 11644, *Leather — Test for adhesion of finish (ISO 11644)*

☐A1 CEN ISO/TR 11827, *Textiles — Composition testing — Identification of fibres* ☐A1

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

EN ISO 13934-1, *Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method (ISO 13934-1)*

EN ISO 13997:1999, *Protective clothing — Mechanical properties — Determination of resistance to cutting by sharp objects (ISO 13997:1999)*

☐A1 ISO 1139, *Textiles — Designation of yarns* ☐A1

ISO 4649:2010, *Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using a rotating cylindrical drum device*

ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

☐A1 ISO 7211-1, *Textiles — Woven fabrics — Construction — Methods of analysis — Part 1: Methods for the presentation of a weave diagram and plans for drafting, denting and lifting*

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ISO 7211-4, *Textiles — Woven fabrics — Construction — Methods of analysis — Part 4: Determination of twist in yarn removed from fabric*

ISO 7211-5, *Textiles — Woven fabrics — Construction — Method of analysis — Part 5: Determination of linear density of yarn removed from fabric* <sup>(A1)</sup>

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

ISO/IEC Guide 98-4, *Uncertainty of measurement — Part 4: Role of measurement uncertainty in conformity assessment*

**3 Terms and definitions**

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

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

**3.2 glove providing a specific protection**  
glove that is designed to provide an area of improved protection for the whole hand or part of it

Note 1 to entry: For example, palm protection style or protection against impact.

**3.3 glove series**  
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) after preparing the sample for the test

**3.6 abrasion cycle**  
completion of all the translational abrasion movements tracing a Lissajous figure comprising 16 rubs, i.e. 16 revolutions of the two outer drives and 15 revolutions of the inner drive of the Martindale abrasion tester

[SOURCE: EN ISO 12947-1]

Note 1 to entry: An abrasion rub is one revolution of the outer drives of the Martindale abrasion tester (see EN ISO 12947-1).



**3.7****arm protector**

protective sleeve separate from the glove or the clothing that provides protection against at least one of the following mechanical risks: abrasion, blade cut, tear and puncture

**4 Requirements****4.1 General**

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

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.

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 of the EN ISO 13997:1999 TDM cut resistance test; classified according to the minimum requirements for each level shown in Tables 1 and 2.

NOTE 1 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 rubs)	100	500	2 000	8 000	-
6.2 Coupe test: 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	-

**Table 2 — Levels of performance for materials tested with EN ISO 13997**

	Level A	Level B	Level C	Level D	Level E	Level F
6.3 TDM: cut resistance (N)	2	5	10	15	22	30

NOTE 2 There is no correlation between the levels of performance obtained with the 6.2 and 6.3 test methods.

NOTE 3 Uncertainty of measurement, see Annex B.

If relevant, additional areas of the protective glove shall be tested (e.g. for specific protection or for areas which provide lower protection) and the results shall be reported in the user instructions.

**4.2 Additional Protection****4.2.1 General**

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

## EN 388:2016+A1:2018 (E)

### 4.2.2 Impact protection

Each area where impact protection is claimed shall be tested. Due to the test method (test specimens dimensions), protection against impacts on fingers cannot be tested.

A protective glove against mechanical risks may be designed and constructed to provide specific impact attenuation (for example, impact protection of knuckles, back of the hand, palm,). These gloves shall comply with the following requirement.

When the tests were carried out according to 6.6, performance shall conform to Level 1 of EN 13594:2015, Table 7.

## 5 Sampling and conditioning

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

- temperature ( $23 \pm 2$ ) °C;
- relative humidity ( $50 \pm 5$ ) %.

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

**5.2** If the test is performed in a different environment and if the testing duration does not exceed 15 min, it shall be started within 5 min after removal from the conditioning.

**5.3** 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 rubs required for breakthrough to occur.

#### 6.1.2 Consumables

##### 6.1.2.1 Abradant

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

NOTE 1 A suitable abradant has been tested by the standardization group, the Klingspor PL31B, Grit 180<sup>1)</sup> (see Annex A).

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1) Klingspor PL31B, Grit 180 is the trade name of a product supplied by KLINGSPOR Schleifsysteme GmbH & Co. KG, Hüttenstraße 36, D-35708 Haiger. This information is given for the convenience of users of this European Standard and does not constitute an endorsement by CEN of the product named. Equivalent products may be used if they can be shown to lead to the same results.

NOTE 2 At the present time, only one calibration procedure is available using textile reference material. A more robust calibration method for other reference material is still under construction.

### 6.1.2.2 Double-sided adhesive tape

The double sided adhesive tape shall be used to provide adhesion of the sample during the test to achieve reproducible results. The mean adhesion value shall be of minimum 0,20 N/mm.

Tests are carried out according to the method given in Annex C.

NOTE 1 If the adhesion is not sufficient, the sample will move during the test and in this case a tear phenomenon can be observed rather than abrasion.

NOTE 2 Examples of suitable double sided adhesive tapes are provided in C.5. Alternative tapes can be verified for suitability using the test method defined in Annex C.

### 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:  $(9,0 \pm 0,2)$  kPa.

### 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 (remove the reinforcements that do not cover the whole palm).

Where the test specimen is made of several unbounded layers, the test is performed on each layer. When the specimen is made of bonded layers if the layers can be separated without damaging the material, the test must be performed on each layer independently. Otherwise, the test must be performed on all layers, taking care not to have a seam in the test area.

### 6.1.5 Test procedure

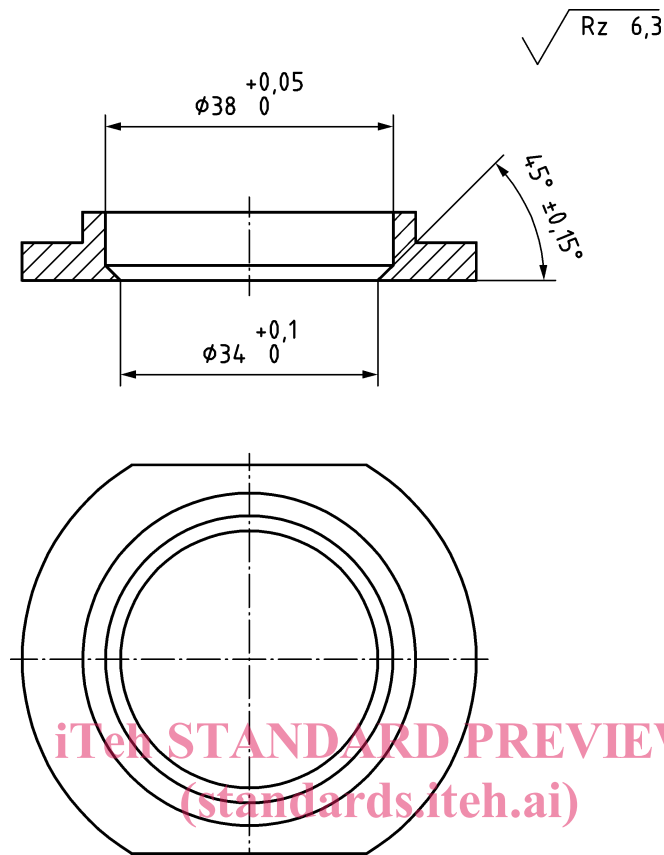
#### 6.1.5.1 Setting up the machine

##### 6.1.5.1.1 Mounting test specimens

Cut four test specimens to the correct dimensions, diameter  $(38,0 \pm 0,5)$  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 approximately 10 kg applied for at least 5 min. 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.

In order to test the materials that are thicker than the standard ring (for example leather with a thickness greater than 1,2 mm), the diameter of the opening of the clamping ring should be increased (see Figure 1).

Dimensions in millimetres



**Figure 1** — Alternative clamping ring for thick material

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 min) 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 in Annex C.

#### 6.1.5.1.2 Mounting abradant

Secure carefully the abradant (6.1.2.1) by means of double-sided adhesive tape covering the whole surface of the mounting plate. Ensure the abradant is flat by placing the weight supplied with the testing machine for this purpose on its surface, and if a retaining frame is used, then position and tighten it up