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EN 388

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English version

Protective gloves against mechanical risks

Gants de protection contre les risques mécaniques

Schutzhandschuhe gegen mechanische Risiken

This European Standard was approved by CEN on 2 July 2003.

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 Management Centre 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 Management Centre has the same status as the official versions.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

Foreword

This document (EN 388:2003) 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of an identical text or by endorsement, at the latest by March 2004, and conflicting national standards shall be withdrawn at the latest by March 2004.

This document supersedes EN 388:1994.

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 EC Directive(s)

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

The Annex A is normative and the Annex B is informative.

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

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 and puncture.

This standard is only applicable in conjunction with EN 420.

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

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 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 (including amendments).

EN 420, *General requirements for gloves*

EN ISO 12947-1, *Textiles - Determination of the abrasion resistance of fabrics by the Martindale method - Part 1: Martindale abrasion testing apparatus (ISO 12947-1:1998)*

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

3 Terms and definitions

For the purposes of this European Standard 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 and puncture

NOTE Tear resistance provides information on the mechanical resistance of the glove, but is not indicative of protection against a specific risk. Whilst a high value is normally considered as better, a low value is required in case of possible entanglement with moving machinery.

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

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

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 a performance level of 1 or above for at least one of the properties (abrasion, blade cut, tear and puncture) 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
6.3 Tear resistance (N)	10	25	50	75	-
6.4 Puncture resistance (N)	20	60	100	150	-

5 Sampling and conditioning

5.1 Unless otherwise stated all specimens shall be taken from the palm of different gloves for classification purposes.

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

5.3 Conditioning of samples is as follows:

— Temperature (23 ± 2) °C;

— Relative Humidity (50 ± 5) %.

The period of conditioning is 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. Breakthrough is understood to mean when a hole is worn through the test specimen.

6.1.2 Abradant

The abradant shall meet the following specifications:

a) Backing: The backing shall be of a suitable quality paper with a minimum weight of 125 g/m² ± 5 %;

b) Adhesive: The adhesive shall be water soluble, of good quality and suitable for purpose;

c) Abrasive: The glass used shall be of good quality, suitable for purpose and shall meet the sieve analysis requirements given in table 2.

Table 2 — Sieve analysis for the abrasive

Requirement	Sieve aperture μm
All to pass	212
No more than 25 % to be retained on	180
At least 50 % to be retained on	125
Not more than 5 % to pass	106

The finished glass paper shall have the following characteristics:

1) The breaking strength shall not be less than:

— Machine direction: 392 N/50 mm;

— Cross direction: 215 N/50 mm;

2) The weight of the glass paper shall be 300 g/m² ± 10 %.

6.1.3 Apparatus

An abrasion testing machine of the type described in EN ISO 12947-1 as a Martindale Wear and Abrasion machine 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. The model number 103 (four places) is appropriate.

6.1.4 Test specimens

Four test specimens shall be taken from four individual gloves of the same glove series.

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

6.1.5 Test procedure

Setting up the machine.

A. General

Check that the top plate and abrading tables are parallel. Insert a dial gauge through the spindle bearing and move the top plate by turning the drive shaft by hand. The needle movement of the dial gauge shall be within ± 0,05 mm over the whole surface of an abrading table.

If machines are being used in which the specimen holders are connected to the weights by spindles, assemble each empty specimen holder and place each one in position on the appropriate abrading table and insert the spindles. Use a feeler gauge to check for any gap between the face of the specimen holder insert and the table. The gap shall not be greater than 0,05 mm. Rock the spindle from side to side and re-check with the feeler gauge. To avoid damaging abrading tables and metal inserts, do not run the testing apparatus with metal inserts in contact with the uncovered abrading table.

B. Mounting test specimens

Place the ring of the specimen holder in position on the mounting plate provided on the base of the testing apparatus. Secure without tension carefully and centrally the test specimen on the metal insert by means of double-sided adhesive tape under a weight of 10 kg applied during 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.

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 downward 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 An example of appropriate double-sided adhesive tape is product ref. 465 from 3M. 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. Equivalent products may be used if they can be shown to lead to the same results.

C. Mounting abradant[1)]

Secure carefully the abradant [1)] by means of double-sided adhesive tape. Ensure the abradant is flat by placing the weight supplied with the testing machine for this purpose on its surface, and then position and tighten up the retaining frame 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.

D. Mounting specimen holders

Mount the test specimen holders on the top plate under a pressure of (9 ± 0,2) kPa and switch on the testing machine.

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.

E. Method of assessment

Each test shall 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,

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[1)] An example of suitable abradant is OAKEY Glass Quality Cabinet Paper Grade F2, Grit 100 – Self-adhesive abradant is acceptable.
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. Equivalent products may be used if they can be shown to lead to the same results.

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 shall 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.

6.2 Blade cut resistance

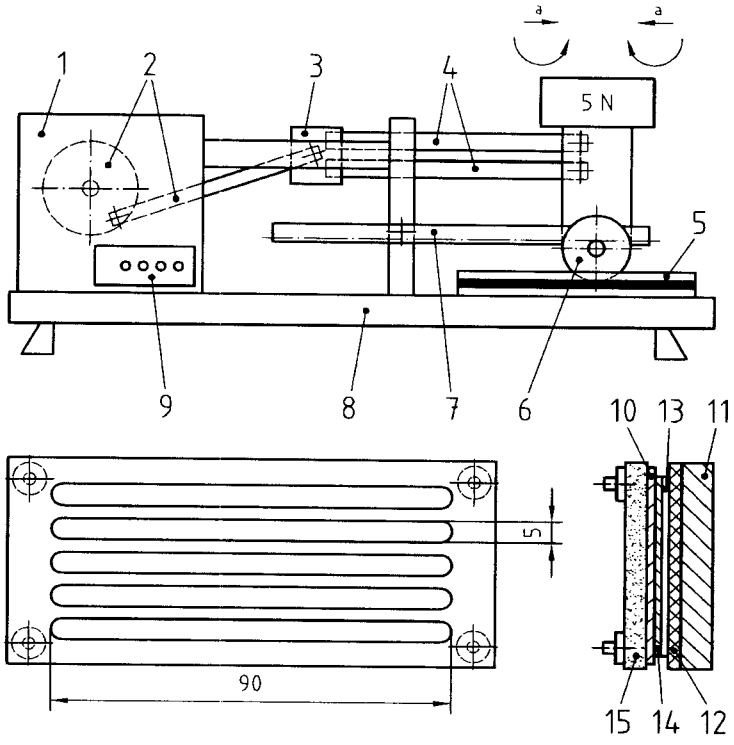
NOTE This test is not applicable to gloves made from very hard materials such as chain mail materials.

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

Dimensions in millimetres



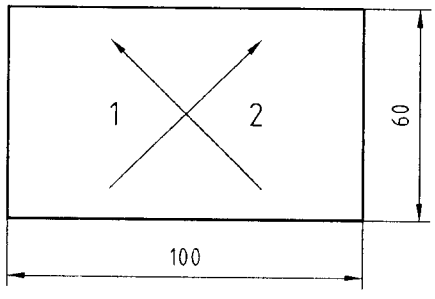
Key

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

a Alternating motion of the blade

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

Dimensions in millimetres



Key

1 Warp or longitudinal direction
2 Weft or transversal direction

Figure 2 — Control specimen dimensions

Dimensions in millimetres

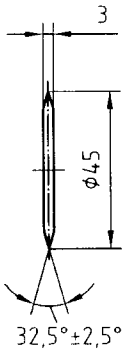


Figure 3 — Circular blade specifications

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

a) 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 in the opposite direction to its movement. The resulting sinusoidal maximum cutting speed of the blade is at maximum 10 cm/s;

b) a mass applied to the blade resulting in a force of (5 ± 0,05) N;

c) a circular blade [2]) with a diameter of (45 ± 0,5) mm, a thickness of (3 ± 0,3) mm and a total cutting angle of 30° to 35° (see figure 3). The blade shall be in tungsten steel with a hardness of 740 HV to 800 HV;

d) a support of conductive rubber (hardness (80 ± 3) IHRD) on which the test specimen is placed;

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

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

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

6.2.3. Test specimen

Each consists of a strip (60 ± 6) mm wide and (100 ± 10) mm long cut on the bias. In the case of a specimen made of several unbonded layers; the complete specimen shall be tested with all layers together.

For each glove series two test specimens shall be taken.

6.2.4 Control specimen

The dimensions of the control specimen are identical with those of the test specimen, cut from a cotton canvas[3]) with the technical specifications given in 6.2.5.

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[2]) A blade Ref OLFA RB of 45 mm diameter is suitable for this test (Manufactured in Japan by the OLFA CORPORATION. Osaka 537).
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. Equivalent products may be used if they can be shown to lead to the same results.

6.2.5 Canvas

Fabric warp and weft:	cotton spun from open end fibres
Linear mass warp and weft:	161 tex
Twist warp:	double twist s 280 t/m
Single yarn:	z 500 t/m
Twist weft:	same as warp
Warp:	18 threads per cm
Weft:	11 threads per cm
Crimp warp:	29 %
Crimp weft:	4 %
Tensile strength in warp:	1400 N
Tensile strength in weft:	1000 N
Mass per unit area:	540 g/m²
Thickness:	1,2 mm

The control specimen is cut on the bias to the warp. For additional specifications see annex A.

6.2.6 Test method

On the rubber support, place an aluminium foil of about 0,01 mm covered with a filter paper sheet of (65 ± 5) g/m² and less than 0,1 mm thick. The purpose of this sheet is to limit displacements of the specimens during the trial and to avoid unexpected cut-through detections due to steel yarns in certain fabrics or due to gaps in the structure of thin knitted fabrics. The control specimen is placed without stretching on top of the foil within the clamping frame.

The clamping frame is positioned on the table. The arm holding the blade is lowered onto the control specimen.

Before any test, the sharpness of the blade is checked as follows: at cut-through with the control specimen, the number of cycles (*C*) is recorded. The number of cycles shall be between 1 and 4 if the expected performance level is less than 3, between 1 and 2 if the expected performance level is equal or more than 3.

If the number of cycles is inferior to 1, the sharpness of the blade shall be reduced by performing cutting motions on three layers of the control fabric or any appropriate cut resistant material.

The test specimen is subjected to the same test and the number of cycles (*T*) is recorded.

Five tests shall be made on each test specimen according to the following sequence for each test:

1) Test on control specimen;

2) Test on test specimen;

3) Test on control specimen.

If a result is on the limit between two performance levels, the test is repeated with a new blade. The lowest mean value is recorded.

For high cut resistant materials, if after the first sequence the number of cycles performed on the control specimen is greater than 3, the blade shall be changed. The sequence is repeated 2 times, each time with a new blade and the

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[3]) Such a canvas made by Collamtis, BP 3, F-59930 LA CHAPELLE D'ARMENTIERES, under the reference: LEM 6 coton écru, can be purchased after verification from IFTH, Avenue Guy de Collongue, F-69134 ECULLY Cedex.

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. Equivalent products may be used if they can be shown to lead to the same results.

calculation of the index *i* is made according to 6.2.7. The final index value (*I*) is the minimum value of the two specimen tests.

NOTE An alternative test method for high cut resistant materials is described in EN ISO 13997. This test method may be used providing that it has been cross-validated against the blade cut method described above. Table 3 shows the correspondence between the highest performance level of the current method and the equivalent cutting load of EN ISO 13997. These estimated data still have to be confirmed.

Table 3 — Comparison between this standard and EN ISO 13997 performance levels

Performance level for blade cut in this standard	EN ISO 13997 cutting load
4	≥ 13 N
5	≥ 22 N

6.2.7 Calculation of test results

The results shall be presented in accordance with table 4.

Table 4 — Blade cut test - Calculation of index

Sequence	*C* Control specimen	*T* Test specimen	*C* Control specimen	*I* Index
1	C_1	T_1	C_2	i_1
2	C_2	T_2	C_3	i_2
3	C_3	T_3	C_4	i_3
4	C_4	T_4	C_5	i_4
5	C_5	T_5	C_6	i_5

$$\overline{C_n} = \frac{(C_n + C_{n+1})}{2}$$

represents the average value of cycles on control specimen before and after the cut of the test specimen

Tn and is calculated as follows:

$$\overline{C_n} = \frac{(C_n + C_{n+1})}{2} \qquad (1)$$

For each test specimen the final index value (*I*) is calculated as follows:

$$I = \frac{1}{5}\sum_{n=1}^{5} i_n \qquad (2)$$

with

$$i_n = \frac{(\overline{C_n} + T_n)}{\overline{C_n}} \qquad (3)$$

The minimum value of I is 1 if $T = 0$. I is a number without unit.

The report shall show the 10 results i_n. The performance level is defined as the lowest of the two calculated index values.

6.3 Tear resistance

6.3.1 Principle

The resistance to tear is defined as the force necessary to propagate a tear in a rectangular specimen slit half way along its length.

6.3.2 Equipment

Only tensile testers equipped with low inertia force measurement systems shall be used.

6.3.3 Test specimen

The test specimen dimensions are defined in figure 4. Dimensions of the specimen to be tested: (100 ± 10) mm × (50 ± 5) mm. A (50 ± 5) mm incision is made in the longitudinal direction of the sample, (25 ± 2,5) mm from the edge. The last millimetre of the incision is to be made with a sharp unused blade straight and perpendicular to the specimen surface.

Dimensions in millimetres

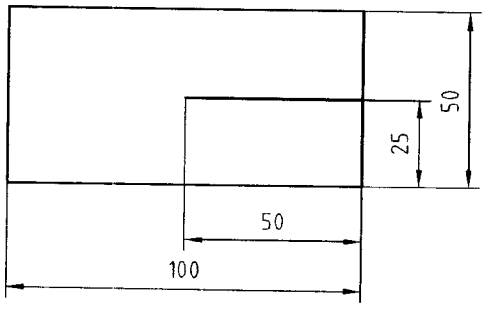
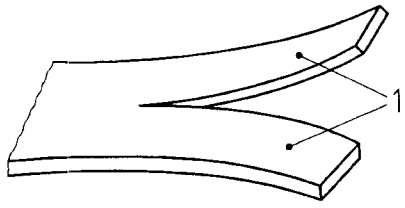


Figure 4 — Test piece

6.3.4 Setting up the test specimen

At least 20 mm of each pre-cut defined strip (see figure 5) is clamped in a tensile tester with the jaws at least 10 mm apart such as to guarantee a pulling direction parallel to the longitudinal direction of the specimen.



Key

1 Strips

Figure 5 — Test strips

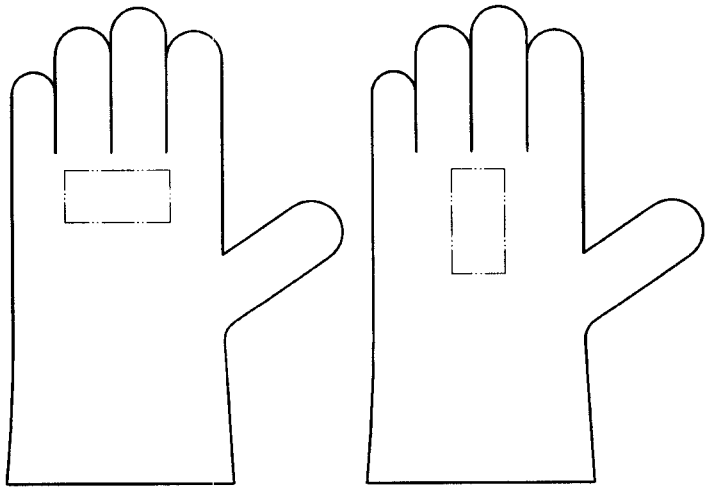
6.3.5 Test method

6.3.5.1 The tearing force is recorded on a X-Y recorder at a tensile test speed of (100 ± 10) mm/min. The specimen shall be torn totally apart. Note that in some cases the tearing may not be in the longitudinal direction of the specimen.

6.3.5.2 If the specimen is not fully torn apart under a force in excess of 75 N, then the test may be stopped and the maximum force reached is recorded.

6.3.5.3 The test shall be performed on one specimen cut from each of four different gloves of the same glove series. In case the test specimen is made of several unbonded layers, the test is performed on each layer, and the classification is based on the highest value obtained.

6.3.5.4 Two specimens shall be tested in the direction of the glove from cuff to finger tips, and two specimens shall be tested across the palm width (see Figure 6).



a) b)

Key

a) in the direction of the glove
b) across the palm width of the glove

Figure 6 — Tear test - Test area

6.3.5.5 The tear resistance for each specimen is taken as the highest peak recorded, and the classification is determined by taking the lowest of the four values.

6.4 Puncture resistance

6.4.1 Principle

Puncture resistance is defined by the force exerted by a steel stylus of defined dimensions to puncture a test specimen held on a retaining device. It should not be confused with piercing exerted by thin tips or needles.

6.4.2 Equipment

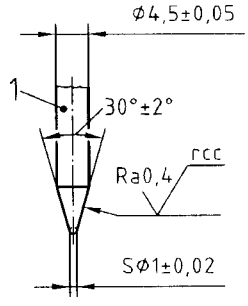
The equipment consists of:

— a low inertia compression tool equipped to measure forces from 0 N to 500 N;

— a steel stylus centred in the axis of the tool, shaped to the requirements and dimensions of figure 7;

— a retaining device for the test specimen centred in the axis of the tool, as given in figure 8.

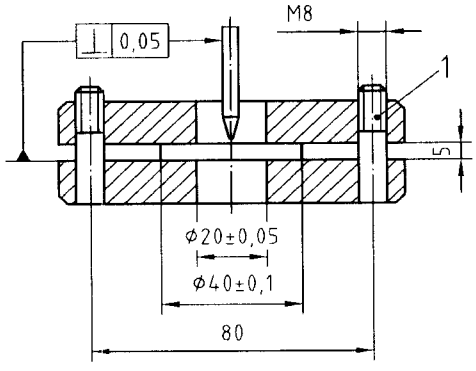
Dimensions in millimetres



Key
1 Steel 60 HRC Rockwell

Figure 7 — Stylus

Dimensions in millimetres



Key

1 Tightening stud

Figure 8 — Retaining device

6.4.3 Test specimen

A circular specimen with a minimum diameter of 40 mm is taken in such a way that seams, reinforcements or extra thicknesses are located outside the clamping area and the point of perforation. In the case of several unbonded layers, these layers are tested together.

6.4.4 Test method

a) Clamp the test specimen centrally in the retaining device with the exterior surface towards the stylus.

b) Move the stylus downwards onto the test specimen at 100 mm/min and up to a displacement of 50 mm cf the test specimen. Record the highest value of the force even if the test specimen is not punctured.

c) The test shall be performed on four specimens cut from four different gloves of the same glove series.

d) The profile and measurements of the stylus shall conform to figure 7 for every test. For most materials checking the stylus at least every 500 uses is recommended but for hard and abrasive materials that can damage the stylus, checking more frequently is necessary.

e) The classification is determined by the lowest value recorded.

7 Marking

7.1 General

Marking of the protective glove shall be in accordance with the applicable clause of EN 420.

7.2 Pictograms

The mechanical properties of the glove shall be shown by the pictogram for the mechanical risks followed by four performance levels numbers.

The first number corresponds to the abrasion resistance, the second one to the blade cut resistance, the third one to the tear resistance and the fourth one to the puncture resistance (as shown in table 1).

The positioning of the pictogram and performance levels in relation to each other shall be in accordance to EN 420.

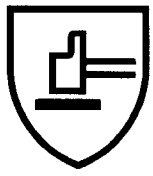


Figure 9 — Pictogram for mechanical risks

8 Information supplied by the manufacturer

The information shall be in accordance with the applicable clause of EN 420.

Details of any special tests carried out in a different environment shall be given (see 5.5).

If relevant, a warning shall be included that for gloves with two or more layers the overall classification does not necessarily reflect the performance of the outermost layer.

A warning shall be included that gloves not be worn when there is a risk of entanglement by moving parts of machines.

Annex A
(normative)

Additional specifications

A.1 General

The Table A.1 presents additional characteristics and specifications of the cotton canvas from which are cut the control specimens used in the blade cut resistance test as defined in 6.2.

These values are achieved with the method and the apparatus known world-wide as KESF (Kawabata Evaluation System for Fabrics).

The polymerization degree of the cotton used is 2000 ± 50.

Table A.1 — Identification sheet - Reference sample - Cotton weave fabric

KES F		Characteristic values			Settings for the tests		
Tests	Para-meters	Units	Warp	Weft	Size	Stress	Speed
Tensile	LT	-	0,98 to 1,04	0,98 to 1,04	200 mm × 50 mm	Maximum strain =	
	WT	J/m	15 to 25	7 to 8		1000,00 gf/cm	0,02000 cm/s
	RT	%	49 to 50	52 to 53			
Bending	B	μN m	300 to 350	430 to 530	10 mm × 50 mm	Maximum curvature	0,5 cm^{-1}/s
	2HB	mN	40 to 50	45 to 55		= ± 2,5 cm^{-1}	
Shearing	G	N/m degree	20 to 30	20 to 30	200 mm × 50 mm	Tension = 1000 g	
	2HG	N/m	45 to 60	45 to 60		Maximum angle	0,478 degrees
	2HG5	N/m	45 to 55	45 to 55		= ± 8,0 degrees	
Compression	LC	-	0,43 to 0,49			Maximum pressure	
	WC	J/m^2	0,21 to 0,25		2 cm^2	= 5,00 kPa	0,00200 cm/s
	RC	%	32 to 35				
Surface	MIU	-	0,200 to 0,210	0,200 to 0,210	5 mm × 20 mm	Tension = 600 g	
	MMD	-				P = 50 gf/25 mm^2	1 mm/s
	SMD	μm	0,035 to 0,050	0,035 to 0,050	5 mm × 20 mm	P = 10 gf/5 mm	
			160 to 200	80 to 100			
Thickness	To	mm	1,2 to 1,35		2 cm^2	P = 0,05 kPa	0,00200 cm/s
Weight	W	g/m^2	520 to 540				

A.2 KES F: KAWABATA Evaluation System for Fabrics

A.2.1 Tensile

(Tensile cycle, maximum tensile stress limit of which is – 1000 gf/cm)

LT: Linearity. (characterizes elasticity, 1 for a spring)

WT: Tensile energy in J/m

RT: Resiliency, i. e. percentage of recovered energy

A.2.2 Bending

(Alternate bending cycle on a sample placed vertically)

B: Bending stiffness

2HB: Bending hysteresis at 1 cm^{-1} of curvature

A.2.3 Shear

(Alternate deformation of a rectangular sample in a parallelogram, the angle of which is 8°)

G: Shear stiffness

2HG and 2HG5: Shear hysteresis at 0,5 and 5 degrees of deformation

A.2.4 Compression

(Compression cycle of the thickness, the maximum limit of which is 5,0 kPa)

LC: Linearity (characterizes elasticity, 1 for a spring)

WC: Compression energy in J/m^2

RC: Resiliency, i. e. the percentage of recovered energy

A.2.5 Surface

(Characterization of a surface with sensors of 25 mm^2 (friction coefficient) and 5 mm width (roughness))

MIU: Mean value of the friction coefficient

MMD: Mean deviation of the friction coefficient

SMD: Mean value of the surface roughness in µm

Annex B
(informative)

Test results - Uncertainty of measurement

For each of the required measurements performed in accordance with this standard, a corresponding estimate of the uncertainty of measurement should be evaluated. This estimate of uncertainty should be applied and stated when reporting test results, in order to enable the user of the test report to assess the reliability of the data.

Annex ZA
(informative)

Clauses of this European standard addressing essential requirements or other provisions of EU Directives

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 Directive 89/686/EEC.

WARNING : Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

The following clauses of this standard are likely to support requirements of Directive 89/686/EEC, Annex II.

Table ZA.1 – Relationship between this European Standard and Directive 89/686/EEC

Clauses of this standard	Directive 89/686/EEC, Annex II	
8	1.4	Information supplied by the manufacturer
7	2.12	PPE bearing one or more identification or recognition marks directly or indirectly relating to health and safety
4; 6.1; 6.2; 6.3; 6.4	3.3	Protection against physical injury (abrasion, perforation, cuts, bites)

Compliance with the clauses of this standard provides one means of conforming with the specific essential requirements of the Directive concerned and associated EFTA regulations.