
Varovalna obleka za uporabnike ročnih verižnih žag - 8. del: Metode za preskušanje zaščitnih dokolenic (gamaš) za uporabnike verižnih žag

Protective clothing for users of hand-held chain saws - Part 8: Test methods for chain saw protective gaiters

Schutzkleidung für Benutzer handgeführter Kettensägen - Teil 8: Prüfverfahren für Schutzgamaschen für Kettensägen

Vêtements de protection pour utilisateurs de scies à chaîne tenues à la main - Partie 8: Méthodes d'essai des guêtres de protection pour l'utilisation de scies à chaîne

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**Protective clothing for users of hand-held chain
saws - Part 8: Test methods for chain saw
protective gaiters**

Vêtements de protection pour utilisateurs de
scies à chaîne tenues à la main - Partie 8:
Méthodes d'essai des guêtres de protection pour
l'utilisation de scies à chaîne

Schutzkleidung für Benutzer handgeführter
Kettensägen - Teil 8: Prüfverfahren für
Schutzgamaschen für Kettensägen

This European Standard was approved by CEN on 1997-02-13. 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.

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Foreword

This European Standard has been prepared by the 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of an identical text or by endorsement, at the latest by October 1997, and conflicting national standards shall be withdrawn at the latest by October 1997.

EN 381 "Protective clothing for users of hand held chainsaws" includes the following parts:

Part 1: Test rig for testing resistance to cutting by a chains

Part 2: Test rig for leg protection

Part 3: Test methods for footwear

Part 4: Test method for chainsaw protective gloves

Part 5: Requirements for leg protection

Part 7: Requirements for chainsaw protective gloves

Part 8: Test methods for chainsaw protective gaiters

Part 9: Requirements for chainsaw protective gaiters

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 European 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, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

0 Introduction

This European Standard forms part of a series concerned with personal protective equipment designed to protect against the risks arising from the use of hand-held chain saws.

No personal protective equipment can ensure 100% protection against cutting from a hand-held chain saw.

Nevertheless, experience has shown that it is possible to design personal protective equipment which offers a certain degree of protection.

Different functional principles may be applied in order to give protection.

These include:

- a) chain slipping: on contact the chain does not cut the material;
- b) clogging: fibres are drawn by the chain into the drive sprocket and block chain movement;
- c) chain braking: fibres have a high resistance to cutting and absorb rotational energy, thereby reducing the chain speed.

Often more than one principle is applied.

1 Scope

This European Standard specifies the test methods to be used to assess the resistance of gaiters to cutting by hand-held chain saws. A test method of assessing the strength of underfoot straps of gaiters is also included.

This European Standard is applicable to gaiters used together with safety footwear according to EN 345:1992 and EN 345:1992/A1 with a metallic toecap, because gaiters offer only partial protection against chain saw cutting.

Gaiters according to this European Standard are not intended for use in situations where there is a significant risk of tripping such as tree climbing or in forests.

The requirements associated with the test methods in this European Standard are given in EN 381-9.

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 amendments or revision. For undated references the latest edition of the publication referred to applies.

EN 345:1992, EN 345:1992/A1

Specification for safety footwear for professional use

EN 381 - 1:1993

Protective clothing for users of hand-held chain saws - Part 1: Test rig for testing resistance to cutting by a chain saw

EN 381 - 3

Protective clothing for users of hand-held chain saws - Part 3: Test methods for footwear

EN 381 - 9 :1997

Protective clothing for users of hand-held chain saws - Part 9: Requirements for chain saw protective gaiters

ISO 868

Plastics and ebonite - Determination of indentation hardness by means of a durometer (Shore hardness)

ISO 3175:1995

Textiles - Evaluation of stability to machine dry-cleaning

EN ISO 6330

Textiles - Domestic washing and drying procedures for textile testing (ISO 6330:1984)

3 Definition

For the purposes of this European Standard the following definition applies:

3.1 Gaiter

A removable covering intended to protect the front part of the foot, ankle and lower leg against cutting by a hand-held chain saw.

4 Pre-treatment

Except in the specific cases detailed below, all the test specimens shall be washed and dried 5 times before testing.

This washing shall be according to EN ISO 6330 procedure 2A, and the drying by tumble-drying at a temperature not exceeding 70°C (procedure E).

Exceptions to this treatment are permitted in the following cases :

- a) where the gaiters are marked as unsuitable for washing or dry-cleaning.

In such cases, the gaiters shall be immersed in water (20°C) for 10 min and then allowed to line-dry until more than 95% of the water has evaporated, measured by weight.

- b) where the gaiters are marked as unsuitable for washing, but suitable for dry-cleaning.

In such cases, the test specimens shall be dry-cleaned 3 times before testing. The dry-cleaning shall be performed principally in accordance with the conditions described in 9.1 of ISO 3175:1995, i.e. using conditioned specimens, perchloroethylene with surfactant, addition of emulsified water, cleaning for 15 min at $(30 \pm 3)^\circ\text{C}$, draining and extracting, rinsing for 5 min with pure solvent, and draining and final extraction. Tumble dry with an outlet temperature not exceeding 60°C. No restorative finishing procedure.

- c) where the gaiters are marked as suitable for both washing and dry-cleaning.

In such cases, the test shall be carried out on both washed specimens and dry-cleaned specimens, (2 sets of specimens) or, at the request of the manufacturer, on one set of specimens first dry-cleaned and then washed.

- d) where the gaiters are marked as unsuitable for tumbling drying.

In such cases, the specimens shall be washed by the method described above, then line-dried until more than 95% of the water has evaporated, measured by weight.

5 Testing of chain saw resistance

5.1 Principle

Each gaiter is mounted on an artificial boot and its chain saw resistance is then assessed by applying a moving chain of known speed and inertia characteristics and determining whether or not the chain cuts through.

NOTE: For the purpose of testing gaiters it is recommended that the test rig is fitted with some means of limiting the depth of cut into the artificial boot in cases where the gaiter fails to resist the chain.

5.2 Test specimens

Three pairs of gaiters are required for each pre-treatment method applied. All the specimens shall be of a size suitable for wear over a Paris point (stitch) size 42 boot (UK size 8).

5.3 Apparatus

5.3.1 Test rig

Test rig as described in EN 381-1. (standards.iteh.ai)

5.3.2 Mounting device for gaiter

5.3.2.1 Left and right artificial boots

These are moulded from a rigid polyurethane.¹⁾
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Density $1,1 \times 10^3 \text{ kgm}^{-3}$

Hardness 95 Shore A

Determination of indentation hardness according to ISO 868.

Their shape and dimensions are shown in Figures 1, 2 and 3.

Figures 1, 2 and 3 show a left boot. Right boots have the same dimensions, but their cross-sectional shapes are mirror images of those shown. In addition the boots shall be covered with a layer of $(1,6 \pm 0,1) \text{ mm}$ full-chrome side upper leather. The area covered by the leather shall correspond at least to the specified protective area described in 4.2 of EN 381-9:1997.

¹⁾ Suitable artificial boots are obtainable from SATRA Footwear Technology Centre, Kettering, Northants, United Kingdom. This information is given for the convenience of user of this European Standard and does not constitute an endorsement by CEN of the product. Equivalent products may be used if they can be shown to lead to the same results.

5.3.2.2 Base for mounting artificial boots.

The same base as used for mounting normal boots, described in EN 381-3.

5.4 Test procedure

5.4.1 General

Calibration procedures are as in EN 381-1. After calibration the following changes are introduced.

- a) The chain saw unit is arranged as in part 1 of this standard, but the load shall be $(30 \pm 0,5)$ N instead of 15 N (see 5.3.5 in EN 381-1:1993).
- b) The horizontal distance from the point of contact to the centre of the sprocket shall be (300 ± 2) mm (see figure 3 in EN 381-1:1993).

5.4.2 Mounting of gaiter on artificial boot

Attach the gaiter securely to the appropriate artificial boot (ie. either left or right) in the same manner as it would be in wear, ie. by means of its own fastening devices (eg. straps, buckles, etc).

5.4.3 Cutting

5.4.3.1 General

Test cuts are performed on both right and left gaiters at the positions shown in Figure 4, i.e.

- on the vamp (position 1)
- at the throat (position 2)
- at the leg front (position 3)

Where possible, avoid cutting into any fastenings which may be fitted to the gaiters as this could lead to anomalous results. However, should this not be possible, then this fact should be recorded in the test report.

A total of six cuts should be made for each complete test, with no more than one cut being made on any one gaiter.

Test cuts according to this European Standard shall be carried out with the following chain speeds:

Class of protection 0 : 16 m/s
 Class of protection 1 : 20 m/s
 Class of protection 2 : 24 m/s
 Class of protection 3 : 28 m/s

NOTE: Class of protection 0 is valid until 1999-12-31.

After each test the specimen is checked for cut through and the result is reported.

5.4.3.2 Cuts on the vamp area

The gaiter is first attached to the boot as in 5.4.2. The combined assembly is then securely fixed to the base in such a way that :

- a) the sole of the artificial boot is in contact with the base in both the heel and forepart positions.
- b) the central plane of the artificial boot coincides with that of the base.

Care shall be taken to ensure that no part of the gaiter or its fastenings are trapped between the artificial boot and the base.

The base is then orientated at 0° to the horizontal and the central plane of the artificial boot is at an angle of 90° to the guide bar.

This arrangement is shown in Figure 5.

Test cuts are performed in the positions indicated in Figure 4, Position 1 (ie. on the left side of the gaiter, (90 ± 10) mm to the rear of the extreme toe position of the artificial boot (as measured along its centre line).

5.4.3.3 Cuts on the throat area

The combined assembly of gaiter and artificial boot are securely fixed to the base as in 5.4.3.2.

The base is then orientated at 45° to the horizontal in such a manner that the heel of the artificial boot is lowermost, and the central planes of the base and artificial boot are vertical and at an angle of 90° to the guide bar of the test rig.

As in 5.4.3.2, the right side of the artificial boot should be nearest to the pivot.

This arrangement is shown in Figure 6.

Test cuts are performed in the position marked in Figure 4, Position 2.

5.4.3.4 Cuts on the leg region

The combined assembly of gaiter and artificial boot is securely fixed to the base as in 5.4.3.2.

The base is then orientated at 90° to the horizontal in such a manner that the front of the leg of the artificial boot is uppermost, and the central planes of the base and artificial boot are vertical and at an angle of 90° to the guide bar of the test rig.

As in 5.4.3.2, the right side of the artificial boot should be nearest to the pivot.

This arrangement is shown in Figure 7.

Test cuts are performed in the position marked in Figure 4, Position 3 (i.e. across the front of the leg, at an angle of 90° to the line of the leg and at a distance of (180 ± 30) mm from the base, as measured along a perpendicular line joining the cut position to the base.) The chain speed shall be one of the speeds specified in 4.3 of EN 381-9:1997, as required by the client. If no information is available 20 m/s shall be used.

6 Testing the strength of the underfoot straps

6.1 Principle

Each gaiter is mounted on an artificial boot and the ultimate tensile strength of any underfoot straps (or the strength of their anchorage to the gaiters) is then determined.

6.2 Test specimens

One pair of gaiters is required for each underfoot strap fitted to the gaiters.

6.3 Apparatus

6.3.1 Left and right artificial boots

These are described in 5.3.2.1

6.3.2 Tensile testing machine (or other means of applying a known variable force)

Minimum load range 0 to 1000 N. Accuracy 1%.

6.3.3 Mounting device

The mounting device shall be capable of securely holding the artificial boots within the tensile testing machine and maintaining them in an upright position even when under load.

6.3.4 Hook for applying load to straps

This shall contain a horizontal bar of circular cross-section (diameter (15 ± 1) mm) and extending at least 25 mm either side of the centre of pull. A suitable hook is shown in Figure 8.

6.4 Test method for underfoot straps

6.4.1 Mounting of samples for testing

First attach the gaiter securely to the appropriate artificial boot as in 5.4.2. Note, however, that the particular underfoot strap under test shall not be fastened at this stage.

The combined assembly of gaiter and artificial boot is then securely fitted into the tensile testing machine in such a way that the sole of the boot will remain in the horizontal plane even when under load.

6.4.2 Application of load to straps

The underfoot strap under test is passed about the hook and secured in place by means of its own fastening devices (eg. buckles, press-studs, etc).

A vertical tensile force is then applied at a rate of (100 ± 10) mm/min until either the strap or one of its anchorage points (or fastening devices) breaks.

The maximum force measured during the test shall be recorded as the breaking strength.

The test shall then be repeated on the corresponding strap of the other gaiter of the pair, and the result reported shall be the lower breaking strength value recorded.

If the gaiter has more than one underfoot strap, then the test shall be repeated on each strap.

7 Test report

The report shall include :

- a) identification of the test specimen, eg. manufacturer, style no., dimensions;
- b) pre-treatment;
- c) results of assessment of chain saw resistance including:
 - test results for each test areas (ie. whether or not cut-through occurred);
 - evaluation of damage and chain-stopping mechanism;
 - chain speed;
- d) results of assessment of strength of underfoot straps, if any.

The report shall also include any other information required in EN 381-9.

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