
**Protective clothing for users of hand-held
chain-saws —**

Part 2:

Test methods and performance requirements
for leg protectors

iTeh STANDARD PREVIEW

*Vêtements de protection pour utilisateurs de scies à chaîne tenues à
la main*

*Partie 2: Méthodes d'essai et exigences de performance pour
protège-jambes*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11393 was prepared by Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 13, *Protective clothing*.

ISO 11393 consists of the following parts, under the general title *Protective clothing for users of hand-held chain-saws*:

- Part 1: Test rig driven by a flywheel for testing resistance to cutting by a chain-saw
- Part 2: Test methods and performance requirements for leg protectors
- Part 3: Test methods for footwear
- Part 4: Test methods and performance requirements for protective gloves
- Part 5: Test methods and performance requirements for protective gaiters
- Part 6: Test methods and performance requirements for jackets with protection against cuts by hand-held chain-saws

Annex A of this part of ISO 11393 is for information only.

Introduction

This part of ISO 11393 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 a 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.

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Protective clothing for users of hand-held chain-saws —

Part 2:

Test methods and performance requirements for leg protectors

1 Scope

This part of ISO 11393 defines the design and specifies the requirements and test methods for leg protectors which offer protection against cutting from a hand-held chain-saw, including requirements for identification, marking and information for the user.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 11393. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 11393 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 3175-1:1998, *Textiles — Dry cleaning and finishing — Part 1: Method for assessing the cleanability of textiles and garments.*

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ISO 3175-2:1998, *Textiles — Dry cleaning and finishing — Part 2: Procedures for tetrachlorethene.*

ISO 3759:1994, *Textiles — Preparation, marking and measuring of fabric specimens and garments in tests for determination of dimensional change.*

ISO 5077:1984, *Textiles — Determination of dimensional change in washing and drying.*

ISO 5082:1982, *Textiles — Woven fabrics — Determination of breaking strength — Grab method.*

ISO 6330:1984, *Textiles — Domestic washing and drying procedures for textile testing.*

ISO 11393-1:1998, *Protective clothing for users of hand-held chain-saws — Part 1: Test rig driven by a flywheel for testing resistance to cutting by a chain-saw.*

ISO 13688:1998, *Protective clothing — General requirements.*

3 Terms and definitions

For the purposes of this part of ISO 11393, the following terms and definitions apply.

3.1

leg protectors

any type of protective garment which protects at least the specified protective area to the level of resistance specified within this part of ISO 11393 for the leg

EXAMPLES Trousers, leggings, etc.

3.2

protective material

material which is designed to protect the wearer against the cutting effect of the hand-held chain-saw

NOTE This protective material may include the cloth of the garment.

3.3

protective coverage

area of the garment which is covered by protective material

3.4

specified protective area

required protective coverage

3.5

front (of a leg protector)

forward 50 % of the leg circumference

3.6

rear (of a leg protector)

backwards 50 % of the leg circumference

NOTE Depending upon the design and construction, and due to many layers of clogging material, it may be difficult to establish the front and the rear of a leg protector. It is nevertheless of great importance to establish the front and the rear before pretreatment and testing.

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4 Designs

4.1 Designs of leg protectors

ISO 11393-2:1999

This part of ISO 11393 defines three designs, design A, design B and design C, for leg protectors. Design A, design B and design C have different specified protective areas as stated in 4.2, 4.3 and 4.4.

4.2 Design A

4.2.1 Specified protective area for design A

The specified protective area for design A is described under a), b) and c) and is shown in Figure 1.

- a) Front: the specified protective area fully covers the front of the garment from 50 mm above the lower end of the legs to 200 mm above the crotch. It is permitted to leave out protective material at the fly.
- b) Rear, left leg: the specified protective area covers, on the outer side of the leg, a 50-mm wide strip extending from 50 mm above the lower end of the leg to 200 mm below the crotch and then tapering to zero at a height of 200 mm above the crotch.
- c) Rear, right leg: the specified protective area covers, on the inner side, a 50-mm wide strip from 50 mm from the bottom of the leg to 50 mm below the crotch.

It is permitted to extend the protective coverage provided that the protection level is at least the same as in the specified protective area. There shall be no joints in the protective material within the specified protective area.

4.2.2 Other design requirements for design A

The leg protectors shall have a specified protective area as identified in 4.2.1 and they shall fully enclose both the front and the rear of the user's leg from 50 mm below the crotch to the bottom end of the legs of the garment. The bottom end of the leg of each garment shall be designed to facilitate easy overlap of protective material with safety footwear worn by the user.

4.3 Design B

4.3.1 Specified protective area for design B

The specified protective area for design B is described under a), b) and c) and is shown in Figure 2.

- a) Front: the specified protective area fully covers the front of the garment from 50 mm above the lower end of the legs to 200 mm above the crotch. It is permitted to leave out protective material at the fly.
- b) Rear, left leg: the specified protective area covers on the inner side of the leg a 50-mm wide strip from 50 mm from the bottom to 50 mm below the crotch. On the outer side of the leg, it covers a 50-mm wide strip extending from 50 mm above the lower end of the leg to 200 mm below the crotch and then tapering to zero at a height of 200 mm above the crotch.
- c) Rear, right leg: the specified protective area covers, on the inner side, a 50-mm wide strip from 50 mm from the bottom of the leg to 50 mm below the crotch.

It is permitted to extend the protective coverage provided that the protection level is at least the same as in the specified protective area. There shall be no joints in the protective material within the specified protective area.

4.3.2 Other design requirements for design B

The leg protectors shall have a specified protective area as identified in 4.3.1 and they shall fully enclose both the front and the rear of the users leg from 50 mm below the crotch to the bottom end of the legs of the garment. The bottom end of each leg of the garment shall be designed to facilitate easy overlap of protective material with safety footwear worn by the user.

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4.4 Design C

4.4.1 Specified protective area for design C

The specified protective area for design C is described under a) and b) and is shown in Figure 3.

- a) Front: the specified protective area fully covers the front of the garment from 50 mm above the lower end of the legs to 200 mm above the crotch. It is permitted to leave out protective material at the fly.
- b) Rear: the specified protective area fully covers the rear of the garment from 50 mm above the lower end of the legs to 50 mm below the crotch on the inner side of each leg and to the level of the crotch on the outside of each leg.

No more than two joints are allowed in the protective material.

No gaps shall be more than 4 mm wide, and shall run along the leg.

4.4.2 Other design requirements for design C

The bottom end of each leg of the garment shall be designed to facilitate easy overlap of protective material with chain-saw protective footwear worn by the user.

5 Ergonomic considerations

The protective clothing shall be as lightweight as possible.

Between the crotch and fly, a break of 30 mm is allowed, but it is recommended to keep this break as small as possible.

The design shall be without appendages which could become entangled in the machinery or undergrowth.

Braces shall have a minimum width of 30 mm.

The construction around the knee shall facilitate bending of the leg.

If the leg protectors are leggings, they shall be capable of being securely connected in the fly area. For zippers, buttons, etc., an opening break of 30 mm is allowed.

6 Requirements

6.1 Dimensional change

The dimensional change as measured in accordance with 9.1 shall be less than 6 %.

6.2 Protective coverage

The protective coverage measured in accordance with 9.2 shall fulfil the requirements given in 4.2 for design A, 4.3 for design B, or 4.4 for design C.

6.3 Resistance to cutting by a chain saw

6.3.1 Classification according to chain speed

Testing according to this part of ISO 11393 can be made with the following three speeds with classes designated as follows:

- class 1: 20 m/s;
- class 2: 24 m/s; and
- class 3: 28 m/s.

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6.3.2 Requirements to cut resistance

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When tested according to 9.3, no cut through is allowed in any tested specimen.

6.4 Requirements for attachment of protective padding

The protective material shall be permanently attached to the garment. For designs A and B it shall be along the edges of the protective padding along the leg. When tested according to 9.4, the attachment should resist at least a force of 200 N.

7 Test specimens

7.1 Number of test specimens

The total number of test specimens for testing are as follows.

a) Designs A and B:

- 1) If only cleaned by washing: four pairs of complete leg protectors.
- 2) If only cleaned by dry-cleaning: four pairs of complete leg protectors.
- 3) If cleaned both by washing and dry-cleaning: eight pairs of complete leg protectors.

Depending on construction and pretreatment more test specimens may be needed.

b) Design C:

- 1) If only cleaned by washing: five pairs of complete leg protectors.

- 2) If only cleaned by dry-cleaning: five pairs of complete leg protectors.
- 3) If cleaned both by washing and dry-cleaning: ten pairs of complete leg protectors.

Depending on construction and pretreatment more test specimens may be needed.

It is permitted to use the same test specimens for cutting as were used for testing dimensional change.

7.2 Size designation of test specimens

For trousers, the size designation according to Table 1 of ISO 13688:1998 shall be: waist girth 92 to 96.

For other leg protectors a size designation comparable to waist girth 93 shall be chosen.

8 Pretreatment

Except in the specific cases detailed below, all the test specimens are washed and dried five times before testing.

This washing shall be according to procedure 2A of ISO 6330:1984 and the drying shall be 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 leg protectors are marked as unsuitable for washing, but suitable for dry-cleaning:

In such cases, the test specimens shall be dry cleaned five times before testing. In principle the dry cleaning shall be performed in accordance with the conditions described in 8.1 "Process for normal materials" of ISO 3175-2:1998, i.e. using conditioned test specimens, perchlorethylene with surfactant, addition of emulsified water, cleaning for 15 min at (30 ± 3) °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.

- b) Where the test specimens are marked as suitable for both washing and dry-cleaning:

In such cases, the test shall be carried out on both washed test specimens and dry-cleaned test specimens, (two sets of test specimens).

- c) Where the test specimens are marked as unsuitable for tumble-drying:

In such cases, the test specimens shall be washed by the method described above, then line-dried (procedure A of ISO 6330:1984).

9 Test methods

9.1 Measurement of dimensional change

Number of test specimens is one test specimen for each pretreatment.

Follow the test procedure for determination of dimensional stability in washing and drying as stated in ISO 6330, and follow the manufacturer's care labelling regarding cleaning information.

One test specimen shall be subjected to five washing processes, or the alternative processes mentioned under 8a), 8b) or 8c).

After each washing the leg protectors shall be reshaped by hand, but not reshaped by ironing.

Dimensional change is assessed in accordance with ISO 3759:1994, 7.2.2, for measuring, ISO 5077 for washing, and ISO 3175-1 for dry-cleaning, where it is noted that complete garments are used as test specimens. The measurements shall be made at a place with protective material.