

Second edition  
2018-09

Corrected version  
2019-10

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**Protective clothing for users of hand-  
held chainsaws —**

**Part 6:  
Performance requirements and test  
methods for upper body protectors**

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

*Partie 6: Exigences de performance et méthodes d'essai pour  
protecteurs du haut du corps*

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Reference number  
ISO 11393-6:2018(E)

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Published in Switzerland

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 162, *Protective clothing including hand and arm protection and lifejackets*, in collaboration with ISO Technical Committee TC 94, *Personal safety — Personal protective equipment*, Subcommittee SC 13, *Protective clothing*, in accordance with the agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 11393-6:2007), which has been technically revised. The main changes compared to the previous edition are as follows:

- in the Introduction, the term “hand-held chainsaws primarily constructed for cutting wood” has been added;
- the normative references have been updated;
- the term and definition [3.1](#) has been added;
- [Clause 4](#) has been revised, design B jackets have been added in [4.5](#) and an evaluation of the protective insert after pre-treatment with 60 °C and spin-drying has been added in [4.6](#);
- in [Clause 6](#), the pre-treatment procedure has been revised;
- in [Clause 8](#), the definition has been specified;
- in [9.7](#), the cut test at the sleeve has been changed;
- in [Clause 10](#), descriptions have been specified and the test procedure has been revised;
- in [Clause 11](#), the test procedure has been revised and a test procedure has been added in [11.3](#);
- [Clauses 12, 13](#) and [14](#) have been specified;
- [Clause 15](#) has been revised;
- in [Annex A](#), the definition has been revised.

## ISO 11393-6:2018(E)

A list of all parts in the ISO 11393 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

This corrected version of ISO 11393-6:2018 incorporates the following corrections:

- The arrows on [Figures 5](#) and [6](#) have been corrected and the colour of shading improved on [Figures 1](#) to [6](#) and [Figure 9](#) for more readability.

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## Introduction

This document forms part of a series concerned with personal protective equipment (PPE) designed to protect against the risks arising from the use of hand-held chainsaws primarily constructed for cutting wood.

Accidents occur due to a number of complex reasons, but a common factor is incorrect use of the chainsaw. The importance of correct training and proper use of a chainsaw in preventing accidents cannot be underestimated.

All parts of the upper body have been shown to be at risk when using a chainsaw. In this document, specifications for the protective coverage and performance of the upper body protectors are given.

No PPE can ensure a 100 % protection against cutting from a hand-held chainsaw. Nevertheless, experience has shown that it is possible to design PPE that 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 in chainsaw protective clothing. Upper body protectors in accordance with this document are meant to be used while working off the ground, and where risk assessment shows that there is a significant risk of being cut by the moving chain on the upper part of the body, such as when working from a sky lift and carrying out tree surgery.

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# Protective clothing for users of hand-held chainsaws —

## Part 6: Performance requirements and test methods for upper body protectors

### 1 Scope

This document specifies the performance requirements, test methods, design requirements, identification and marking information for upper body protectors that offer protection against cutting by hand-held chainsaws.

It also specifies procedures for sampling and pre-treatment of upper body protectors, the measurement of the protective coverage, the apparatus and test methods for assessing resistance to cutting, and the practical performance test for evaluating ergonomic properties.

Guidance on chainsaw use and the selection of appropriate upper body protectors is given in [Annex A](#).

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 7000, *Graphical symbols for use on equipment — Registered symbols*

ISO 11393-1:2018, *Protective clothing for users of hand-held chainsaws — Part 1: Test rig driven by a flywheel for testing resistance to cutting by a chainsaw*

ISO 11393-3:2018, *Protective clothing for users of hand-held chainsaws — Part 3: Test methods for footwear*

ISO 13688:2013, *Protective clothing — General requirements*

ISO 13935-2, *Textiles — Seam tensile properties of fabrics and made-up textile articles — Part 2: Determination of maximum force to seam rupture using the grab method*

### 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

#### 3.1

##### cut-through

any visible change on the underside of the innermost layer of the test sample caused by the saw chain

**3.2  
damage**

<pre-treatment> condition where some yarns of the protective fabric lose their position in the structure due to a broken ladder during the pre-treatment cycle

Note 1 to entry: The broken ladder is often caused by a broken cross binder.

**3.3  
front**

part of a garment covering the forward half of the upper body circumference

**3.4  
joins**

place or line where two or more parts of the protective insert are connected or fastened together, e.g. by seams or zippers

**3.5  
protective coverage**

area of the garment that is covered by *protective material* (3.6)

**3.6  
protective material**

material that is designed to protect the wearer against the cutting effect of a hand-held chainsaw

Note 1 to entry: The protective material may include the cloth of the garment.

**3.7  
rear**

part of a garment covering the backside half of the upper body circumference

Note 1 to entry: Depending upon design and construction, and due to many layers of *protective material* (3.6), it can be difficult to establish the division between the *front* (3.3) and the rear of an *upper body protector* (3.11). It is nevertheless of great importance to establish this before pre-treatment and testing.

**3.8  
specified protective area**

minimum required *protective coverage* (3.5)

**3.9  
top of shoulder**

uppermost line of the shoulder of the *upper body protector* (3.11)

Note 1 to entry: The top of the shoulder is shown in [Figure 1](#).

**3.10  
unit of protective material**

cut-out piece or panel of *protective material* (3.6) consisting of all the fabric or other layers that constitute the protective material that goes into the construction of a garment without any joins within it

Note 1 to entry: Units can be joined together to provide the complete *protective coverage* (3.5) required, before insertion and attachment to garments, but such units retain their individuality for testing purposes.

**3.11  
upper body protector**

any type of protective garment that protects, at least, the specified area to the level of resistance against cutting by a chainsaw as specified for the upper part of the body

EXAMPLE Jacket.

## 4 Performance requirements

### 4.1 General

General requirements not specifically covered in this document shall be in accordance with ISO 13688.

Tested samples shall conform to all the requirements of this document.

### 4.2 Innocuousness

Upper body protectors shall not adversely affect the health or hygiene of the user. The materials shall not release or degrade to release substances generally known to be toxic, carcinogenic, mutagenic, toxic to reproduction or otherwise harmful in the foreseeable conditions of normal use. The specific innocuousness requirements of ISO 13688:2013, 4.2, shall be met.

### 4.3 Sizing

Upper body protectors shall be marked with their size in accordance with ISO 13688.

### 4.4 Ergonomic requirements

When tested according to [11.2](#), the upper body protector shall be free of rough surfaces, sharp edges, sharp points, etc., which could cause excessive irritation or injuries.

The protective garments shall be designed to minimize discomfort and restriction while wearing them. When tested according to [11.3](#), the average score of all series and all movements shall be 2 or less. The design shall be without appendages, which can become entangled in machinery or the undergrowth.

### 4.5 Specified minimum protective area for upper body protectors

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#### 4.5.1 General

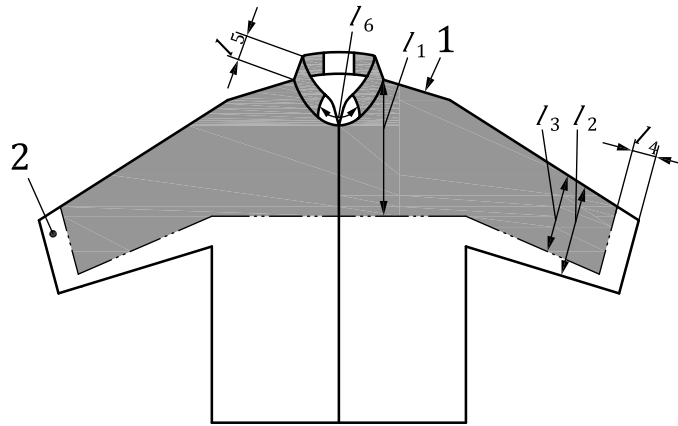
The protective coverage shall be measured in accordance with [Clause 8](#) and shall fulfil the requirements to the dimension of the protective area of [4.5.3](#), [4.5.4](#), [4.5.5](#) and [4.5.7](#). The requirements of [4.5.6](#) are optional.

#### 4.5.2 Designs of jackets

Two different designs of jackets may be manufactured. Design A jackets protect at the shoulder and the arms. Design B jackets additionally protect the front of the torso.

#### 4.5.3 Front design A

The specified protective area shall cover the front of the garment from the top of the shoulder downwards for a distance equivalent to at least 25 % of the chest girth of the largest intended user of the tested sample as given in the marking. The protective area shall include the upper 80 % of the surface of the front of the sleeve down to within 70 mm of the lower edge of the cuff of the sleeve. See [Figure 1](#).



**Key**

- 1 top of shoulder
  - 2 cuff
  - $l_1$  height of protective coverage at the front of the garment (minimum 25 % of the chest girth of the largest intended user of the tested sample)
  - $l_2$  width of sleeve
  - $l_3$  width of protective coverage on the front of the sleeve (minimum 80 % of  $l_2$ )
  - $l_4$  unprotected length including cuff less than 70 mm
  - $l_5$  height of protective coverage in collar, minimum of 30 mm
  - $l_6$  gap in the protective coverage in the collar, maximum of 80 mm
- shaded area is protective material

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**Figure 1 — Specified protective area of design A, front of garment**

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**4.5.4 Front design B**

The specified protective area shall cover the front of the garment from the top of the shoulder downwards to a distance of within 50 mm or less to the bottom of the hem. It shall cover the front half of the circumference of the jacket minus 50 mm on the left and right sides. The protective area shall include the upper 80 % of the surface of the front of the sleeve down to within 70 mm of the lower edge of the cuff of the sleeve. See [Figure 2](#).