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# Protective clothing for users of hand-held chainsaws —

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

*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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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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# Foreword

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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).

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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.

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.

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.



 

# 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.

# 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

### 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.