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Machinery for forestry — Portable chain-saw safety requirements and testing —

Part 2: Chain-saws for tree service

Matériel forestier — Exigences de sécurité et essais des scies à chaîne portatives —
Partie 2: Scies à chaîne pour l'élagage des arbres

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Contents

Page

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 2.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 11681-2 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 17, *Manually portable forest machinery*.

This second edition cancels and replaces the first edition (ISO 11681-2:1998), of which it forms the subject of a technical revision, principally by the incorporation of ISO 11681-2:1998/Amd 1:2003 and other modifications made necessary by the revision of ISO 11681-1.

ISO 11681 consists of the following parts, under the general title *Machinery for forestry — Portable chain-saw safety requirements and testing*:

— *Part 1: Chain-saws for forest service*

— *Part 2: Part 2: Chain-saws for tree service*

Introduction

The structure of safety standards in the field of machinery is as follows.

a) **Type-A standards** (basis standards) give basic concepts, principle for design, and general aspects that can be applied to machinery;

b) **Type-B standards** (generic safety standards) dealing with one or more safety aspect(s) or one or more type(s) of safeguards that can be used across a wide range of machinery:

   — type-B1 standards on particular safety aspects (e.g. safety distances, surface temperature, noise);

   — type-B2 standards on safeguards (e.g. two-hands controls, interlocking devices, pressure sensitive devices, guards);

c) **Type-C standards** (machinery safety standards) dealing with detailed safety requirements for a particular machine or group of machines.

This document is a type-C standard as stated in ISO 12100-1.

When provisions of this type-C standard are different from those which are stated in type-A or type-B standards, the provisions of this type-C standard take precedence over the provisions of the other standards for machines that have been designed and built according to the provisions of this type-C standard.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document. These hazards are specific to self-propelled, trailed, semi-mounted and mounted agricultural machines.

This part of ISO 11681 has been prepared for a special type of chain-saw used by trained persons for tree service work up in trees.

This part of ISO 11681 differs from ISO 11681-1 in the following respects:

— Clause 1, the tree service chain-saws are limited in size by the maximum allowed dry mass of 4,3 kg;

— Clause 3, a definition of trained operator has been added and that of chain saws for tree service revised;

— 5.2.1, the required handle dimensions have been altered;

— 5.4.1, a requirement for the sideways balance has been added with a limited holding moment of 6 N·m;

— 5.5.2.1, the non-manual chain-brake system must meet stricter requirements;

— 5.5.3.1, the allowed kickback angle has been reduced to 25°;

— 5.12.1, the requirement for protection from contact with parts under high voltage has been enlarged to include a requirement for an ignition interruption or short-circuiting device on the low voltage side;

— 5.15.1, the requirement for protection from hot parts has been enlarged to all parts of the machine, except the guide bar and saw chain;

— 5.20, a requirement and verification for an attachment point has been added;

— 6.1.2, additional information including how to use the saw up in trees using the example in Annex B is required;

— 6.3, new safety warnings and markings on the saw and information at the point of sale are requested, with examples of the symbols to be used given in Annex A.

Machinery for forestry — Portable chain-saw safety requirements and testing —

Part 2: Chain-saws for tree service

1 Scope

This part of ISO 11681 specifies safety requirements and their verification for the design and construction of portable combustion-engine, hand-held chain-saws for tree service, having a maximum mass, without guide bar or saw chain and with tanks empty, equal to 4,3 kg, and designed for use by a trained operator for pruning and dismantling standing tree crowns.

It gives methods for the elimination or reduction of hazards arising from the use of the chain-saws. In addition, it specifies the type of information on safe working practices to be provided by the manufacturer.

It deals with all significant hazards. The environmental aspects, except for noise, have not been considered.

Chain-saws covered by this part of ISO 11681 are designed to be operated with the right hand on the rear handle and the left hand on the front handle by persons having read and understood the safety requirements in the instruction handbook and using the appropriate personal protective equipment (PPE).

This part of ISO 11681 is not applicable to chain-saws manufactured before its date of publication.

2 Normative references

The following referenced documents are indispensable for the application 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 6531:1999, *Machinery for forestry — Portable hand-held chain-saws — Vocabulary*

ISO 6533:2001, *Forestry machinery — Portable chain-saw front hand-guard — Dimensions and clearances*

ISO 6534:—[1)], *Forestry machinery — Portable chain-saw hand guards — Mechanical strength*

ISO 6535:1991, *Portable chain-saws — Chain brake performance*

ISO 7293:1997, *Forestry machinery — Portable chain-saws — Engine performance and fuel consumption*

ISO 7914:2002, *Forestry machinery — Portable chain-saws — Minimum handle clearance and sizes*

ISO 7915:1991, *Forestry machinery — Portable chain-saws — Determination of handle strength*

1) To be published. (Revision of ISO 6534:1992)

ISO 8334:—[2], *Forestry machinery — Portable chain-saws — Determination of balance and maximum holding moment*

ISO 9518:1998, *Forestry machinery — Portable chain-saws — Kickback test*

ISO 10726:1992, *Portable chain-saws — Chain catcher — Dimensions and mechanical strength*

ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology*

ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles*

ISO 13772, *Forestry machinery — Portable chain-saws — Non-manually actuated chain brake performance*

ISO 22867:2004, *Forestry machinery — Vibration test code for portable hand-held machines with internal combustion engine — Vibration at the handles*

ISO 22868:2005, *Forestry machinery — Noise test code for portable hand-held machines with internal combustion engine — Engineering method (Grade 2 accuracy)*

IEC 60745-1:2001, *Hand-held motor-operated electric tools — Safety — Part 1: General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6531, ISO 12100-1, with the exception of ISO 6531:1999, definition 2.2.1.2, and the following apply:

3.1
chain-saw for tree service
tree service chain-saw

specialized chain-saw of limited mass designed for use by a trained operator for pruning and dismantling standing tree crowns

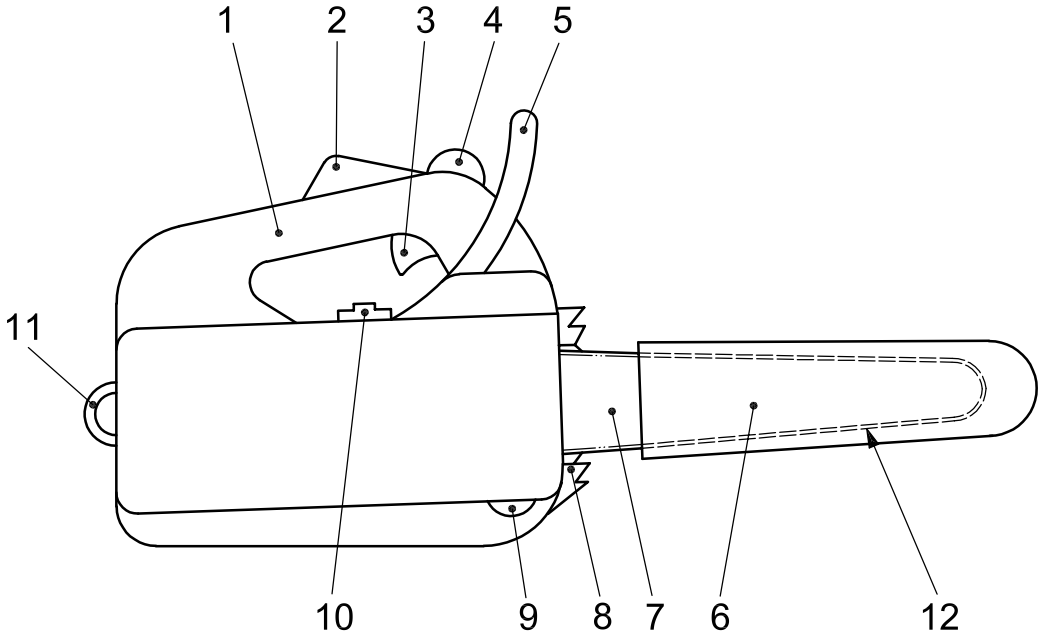
NOTE For an example, see Figure 1.

3.2
trained operator
person who has competence and knowledge in

— the use of, and particular hazards associated with using, a chain-saw (for tree service work) manufactured in accordance with the requirements of this part of ISO 11681, and

— the precautions to be taken to limit these hazards, including the wearing of the recommended personal protective equipment (PPE)

2) To be published. (Revision of ISO 8334:1985)



Key

1 rear handle
2 throttle trigger lockout
3 throttle trigger
4 front handle
5 front-hand guard
6 guide-bar cover
7 guide bar
8 spiked bumper
9 chain catcher
10 stopping device
11 attachment point
12 chain

Figure 1 — Example of chain-saw for tree service

4 List of significant hazards

This clause specifies the significant hazards, hazardous situations and events in as far as they are dealt with in this part of ISO 11681 (see Table 1), identified by risk assessment as significant for this type of machinery, and which require action to eliminate or reduce the risk.

Table 1 — Significant hazards, hazardous situations and events covered by this part of ISO 11681

Hazard		Subclause/Annex
1	Mechanical hazards created by cutting and impact, related to the saw chain.	5.3; 5.5; 5.6; 5.9; 5.19
2	Electrical hazards from contact with parts under high voltage (direct contact) or parts which have become under high voltage under faulty conditions (indirect contact).	5.12
3	Thermal hazards, which can result in burns, scalds and other injuries, created by possible contact of persons with objects or materials with high temperature including the radiation of heat sources.	5.15
4	Noise hazards, which can result in hearing losses (deafness) and other physiological disorders (e.g. loss of balance, loss of awareness), and interference with auditory signals and speech communication.	5.22; 6.1; 6.3
5	Vibration hazards, which can result in peripheral circulatory and nervous functional disturbances in the hand-arm system, such as white finger disease.	5.21; 6.1; 6.3
6	Hazards from contact with or inhalation of harmful fluids, gases, mists, fumes and dusts related to exhaust gases.	5.16
7	Fire hazards related to fuel spillage.	5.18; 6.1
8	Hazards from unhealthy postures or excessive efforts related to machine use.	5.2; 5.4; 5.7; 5.10; 5.20; 6.1; Annex B
9	Hazards from unexpected start-up, unexpected overrun/over-speed from failure/disorder of the control system related to failure in the handles and position of the controls.	5.2; 5.10; 5.11; 5.13
10	Hazards from failure of the control system related to handle strength, position of controls and marking.	5.2; 5.10; 5.11; 5.13; 6.2
11	Hazards from break up (chain) during operation related to saw chain.	5.2; 5.3; 5.6; 5.17
12	Hazards from ejection of objects or fluids related to chip discharge and fuel spillage.	5.8; 5.18
13	Hazards from dropping the chain-saw while working in a tree.	5.20; 6.1; Annex B

5 Safety requirements and verification

5.1 General

The safe running of chain-saws depends on both the safety requirements as given in this clause, and the safe working conditions associated with the use of adequate personal protection equipment (PPE), such as gloves, arm and leg protection, boots, and eye, ear and head protective equipment.

The chain-saw shall comply with the safety requirements and/or protective measures of this clause. The chain-saw shall also be marked according to 6.2 and carry warnings according to 6.3. In addition, the machine shall be designed according to the principles of ISO 12100-2 for hazards relevant but not significant that are not dealt with by this document.

The instruction handbook to be provided with the chain-saw shall comply with 6.1.

5.2 Handles

5.2.1 Requirements

The chain-saw shall have a handle for each hand. These handles shall be designed such that

— they can be fully gripped by an operator when wearing protective gloves,

— they provide the necessary sureness of grip by their shaping and surface, and

— they conform to the dimensions given for tree service chain saws in ISO 7914 (see also 5.10.1).

The strength of both handles shall comply with ISO 7915.

Those chain-saws having a system for isolating the machine vibration from the handles shall be designed so that the operator is able to stop the engine in a controlled manner with the engine stopping device (see 5.11), even in the case of a failure of the vibration isolation system.

5.2.2 Verification

Dimensions shall be verified by measurement. Strength requirements shall be verified by functional testing in accordance with ISO 7915. The possibility of stopping the chain-saw engine when a failure has occurred in the vibration isolation system shall be verified by inspection of the design.

5.3 Hand protection

5.3.1 Protection at front handle

5.3.1.1 Requirements

A guard shall be fitted in the vicinity of the front handle to protect the operator's fingers and hand from injury by contact with the saw chain.

The dimensions of this front hand-guard shall comply with ISO 6533. Its strength shall comply with ISO 6534.

5.3.1.2 Verification

Dimensions shall be verified by measurement. Strength requirements shall be verified by functional testing in accordance with ISO 6534.

5.3.2 Protection at rear handle

5.3.2.1 Requirements

A guard shall be provided along the length of the right side of the bottom of the rear handle to protect the operator's hand from contact with a broken saw-chain.

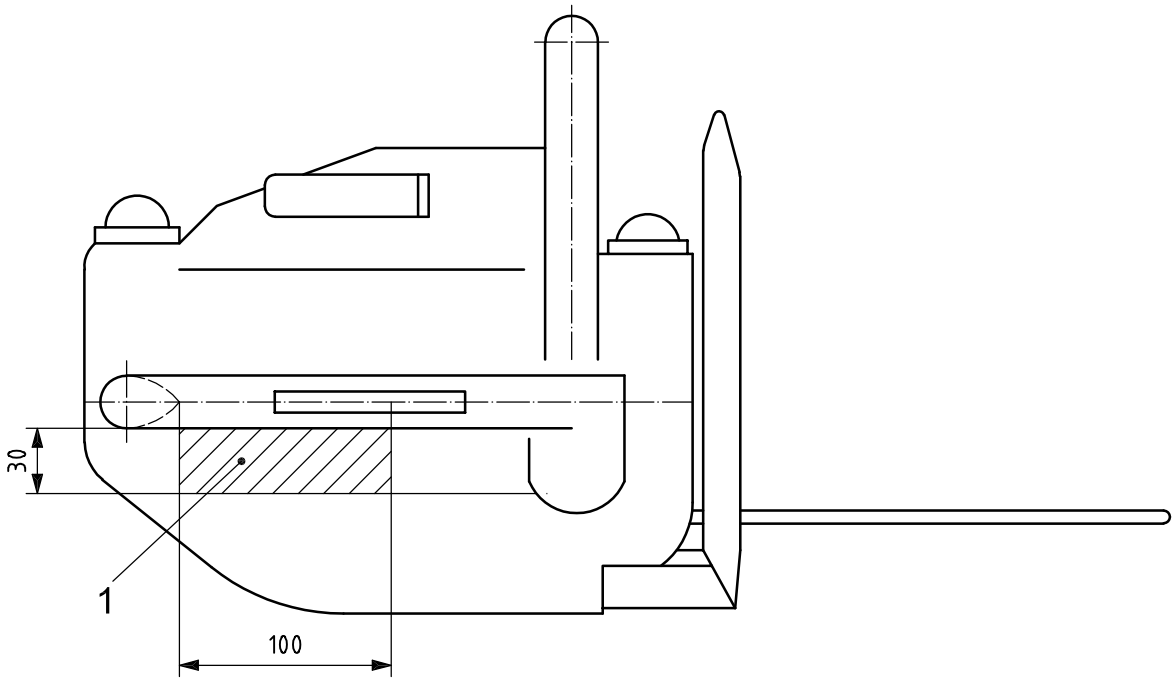
This guard shall extend from the right edge of the handle for at least 30 mm at the guide bar side and at least 100 mm lengthwise from the inner rear part of the handle, in accordance with Figure 2. This requirement may also be fulfilled by parts of the machine.

The strength of the rear hand guard shall comply with ISO 6534.

5.3.2.2 Verification

Dimensions shall be verified by measurement. Strength requirements shall be verified by functional testing in accordance with ISO 6534.

Dimensions in millimetres



Key

1 minimum area covered or guarded to protect hand from broken saw chain

Figure 2 — Minimum dimensions of protection at the rear handle

5.4 Balance and holding moment

5.4.1 Requirements

The chain-saw shall be evenly balanced.

The maximum angle between the centreline of the guide bar and the horizontal plane (longitudinal balance) shall not exceed ± 25°. The maximum angle between the guide bar plane and the vertical plane (lateral balance) shall be 0° ± 10°.

The maximum holding moment shall not exceed 6 N·m.

5.4.2 Verification

These limits shall be met with the shortest and longest guide bar. The range of guide bars shall be described in the instruction handbook.

The angles for longitudinal and lateral balance and the holding moment shall be verified by functional testing in accordance with ISO 8334.