
**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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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: 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.

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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.

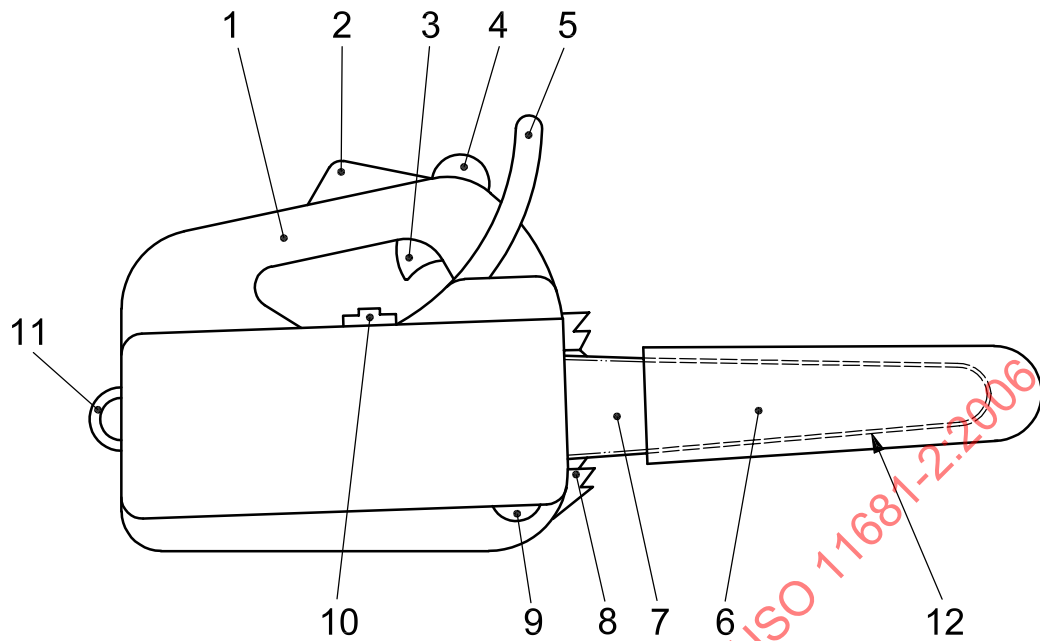
3.1
chain-saw for tree service
tree service chain-saw
specialized chain-saw of limited mass designed for use by a trained operator for pruning and dismantling standing tree crowns

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

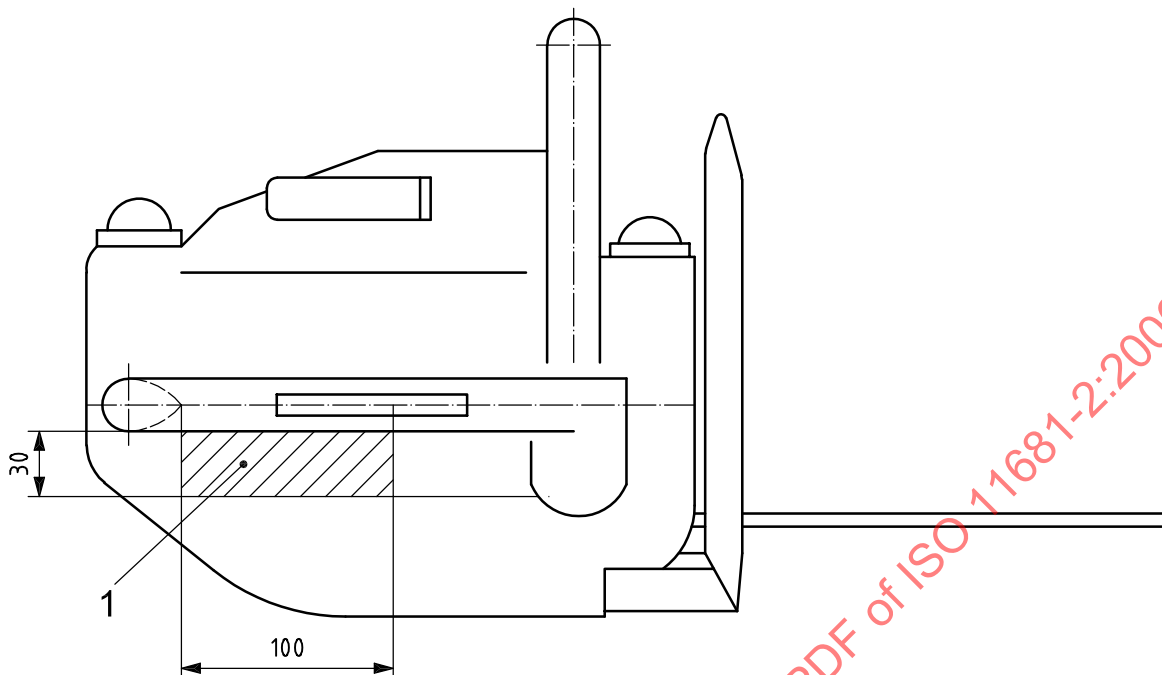
A guard shall be provided along the length of the right side of the bottom of the rear handle to protect the operator's hand from contact with a broken saw-chain.

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.

**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 $\pm 25^\circ$. The maximum angle between the guide bar plane and the vertical plane (lateral balance) shall be $0^\circ \pm 10^\circ$.

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.

5.5 Protection against injury by kickback

5.5.1 Chain brake

5.5.1.1 Requirements

The chain-saw shall be fitted with a chain brake. It shall be possible to activate the chain brake manually by means of the front-hand guard. The chain brake release force shall be between 20 N and 50 N.

The average braking time shall not exceed 0,12 s and the maximum braking time shall not exceed 0,15 s.

5.5.1.2 Verification

The chain brake release force shall be verified by functional testing in accordance with ISO 6535. The braking time shall be verified by functional testing in accordance with ISO 6535.

5.5.2 Non-manual chain brake system

5.5.2.1 Requirements

There shall also be a non-manual chain brake system that operates the chain brake when kickback occurs. This system shall meet the performance requirements for tree service chain-saws given in ISO 13772.

5.5.2.2 Verification

The performance of the non-manually activated chain brake shall be verified by functional testing in accordance with ISO 13772.

5.5.3 Kickback and chain stop angles

5.5.3.1 Requirements

The computed kickback angle and chain stop angle shall be determined for each guide bar and chain specified in the instruction hand book and shall not exceed 25°.

5.5.3.2 Verification

The computed kickback angle or chain stop angle shall be verified by functional testing in accordance with ISO 9518.

5.6 Chain catcher

5.6.1 Requirements

The chain-saw shall be fitted with a chain catcher located and with dimensions and strength in accordance with ISO 10726. The chain catcher shall be replaceable.

5.6.2 Verification

Dimensions shall be verified by measurement. Strength requirements shall be verified by functional testing in accordance with ISO 10726. Means for replacing the chain catcher shall be verified by inspection.

5.7 Spiked bumper

5.7.1 Requirements

The chain-saw shall have provision to mount a spiked bumper.

5.7.2 Verification

The provision to mount a spiked bumper shall be verified by inspection.

5.8 Chip discharge

5.8.1 Requirements

The chain-saw shall be designed so that wood particles are directed below the underside of the saw when it is in an upright position.

5.8.2 Verification

The direction of the discharge of wood particles shall be verified by inspection.

5.9 Guide-bar cover

5.9.1 Requirements

The chain-saw shall be provided with a guide-bar cover, which shall be so designed that it remains attached to the guide bar during transport and storage.

5.9.2 Verification

The attachment of the guide-bar cover to the guide bar shall be verified by inspection when holding the chain-saw in any direction.

5.10 Throttle trigger

5.10.1 Dimensions

5.10.1.1 Requirements

The throttle trigger shall be positioned so that it can be pressed and released with a gloved hand while holding the rear handle and fulfilling the dimensional requirements according to ISO 7914. See also 5.2.

5.10.1.2 Verification

The dimensions shall be verified by measurement.

5.10.2 Unintentional movement

5.10.2.1 Requirements

Unintentional movement of the saw chain shall be minimized by

- a throttle trigger which, when released, automatically reverts to the idling position and is retained in that position by the automatic engagement of a throttle trigger lock-out, unless the lock-out is already released, and
- a throttle control linkage so designed that a force applied on the rear handle will not increase the engine speed to a point where the clutch engages and chain movement begins.

5.10.2.2 Verification

The function of the throttle trigger and throttle trigger lock-out shall be verified by inspection while operating the machine. The throttle control linkage design shall be verified by applying a force in any direction on the rear handle equal to three times the weight, without guide bar or chain and with tanks empty, of the chain-saw unit.

5.10.3 Throttle lock

5.10.3.1 Requirements

If a throttle lock is provided for cold starting, it shall be such that the lock has to be engaged manually and is automatically released when the throttle trigger is operated.

5.10.3.2 Verification

The function of the throttle lock shall be verified by inspection while operating the machine.

5.11 Engine stopping device

5.11.1 Requirements

The machine shall be fitted with an engine stopping device by which the engine can be brought to a final stop and which does not depend on sustained manual effort for its operation. The control for this device shall be so positioned that it can be operated by either hand when the saw is held by one hand and by the right hand when held in both hands, whether or not the operator is wearing protective gloves. The purpose and method of operation of the device shall be clearly and durably marked in accordance with 6.2.

The colour of the control shall clearly contrast with the background.

5.11.2 Verification

The function of the engine stopping device shall be verified by inspection while operating the machine. The control location shall be verified by inspection.

5.12 Protection against contact with parts under high voltage

5.12.1 Requirements

All high-voltage parts of the circuit, including spark plug terminals, shall be located and/or insulated so that the operator cannot make accidental contact with them.

Ignition interruption or short-circuiting shall be provided and shall be fitted on the low voltage side.

5.12.2 Verification

The location and insulation of the parts under high voltage shall be verified by inspection and using a standard test finger, in accordance with IEC 60745-1:2001, Figure 1.

5.13 Clutch

5.13.1 Requirements

The chain-saw shall have a clutch so designed that the chain does not move when the engine rotates at any speed less than 1,25 times the idling speed.

5.13.2 Verification

The function of the clutch shall be verified by running the engine with any speed up to, but not including, 1,25 times the idling speed specified in the instruction handbook.

5.14 Carburettor adjustment

5.14.1 Requirements

The carburettor adjustment shall be clearly and indelibly marked. The markings used shall be illustrated and explained in the instruction handbook (see 6.2).

NOTE Examples of suitable symbols are given in ISO 3767-5^[1].

5.14.2 Verification

The markings shall be verified by inspection.

5.15 Protection against contact with hot parts

5.15.1 Requirements

Hot parts, with the exclusion of the guide-bar and saw chain, shall be protected against unintentional contact during normal operation of the machine. Such hot parts shall be considered accessible if they can be reached by the test cone as shown in Figure 3.

The temperature for the accessible parts of the machine as given above, as well as the guard for the cylinder, shall not cause a hazard to the operator.

NOTE For further information, see ISO 13732-1^[10].

5.15.2 Verification

The requirement shall be verified by determining accessibility, by applying the test cone in accordance with Figure 3, using minimum force.

Dimensions in millimetres

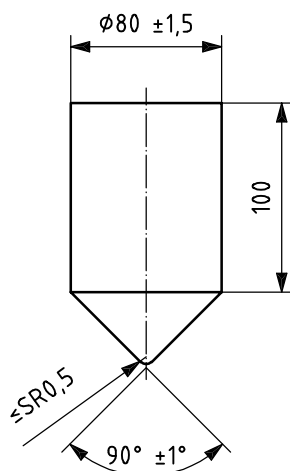


Figure 3 — Test cone

5.16 Exhaust gases

5.16.1 Requirements

The exhaust outlet shall be located such that it directs exhaust emissions away from the operator during cutting operations.

5.16.2 Verification

The location and direction of the exhaust outlet shall be verified by inspection.

5.17 Chain lubrication

5.17.1 Requirements

The saw chain and guide bar shall be automatically lubricated. If, additionally, a manual oiler is provided, it shall be located so it can be operated using the right hand while holding the saw.

5.17.2 Verification

The function of the saw chain oiling system shall be verified by inspection when operating the machine. The location of a manual oiler, if provided, shall be verified by inspection.

5.18 Tank openings

5.18.1 Requirements

The fuel cap shall have a retainer.

The fuel tank opening shall be at least 20 mm diameter and the oil tank opening at least 19 mm in diameter. Each opening or cap shall be clearly marked in accordance with 6.2. If only the caps are marked, they shall not be interchangeable.

The design of the cap shall be such that no leakage occurs while the saw is at the normal operating temperature and with the saw in all positions.

The filler openings shall be so located that the filling of the tanks is not obstructed by other components. It shall be possible to use a funnel.

5.18.2 Verification

The fuel cap retainer, opening dimensions and the possibility of using a funnel shall be verified by inspection. The tightness of the caps shall be verified by inspection while turning the saw in any direction. Seepage from fuel tank ventilation systems is not regarded as leakage.

5.19 Chain tensioning

5.19.1 Requirements

Chain-saws shall be provided with means for adjustment of chain tension.

5.19.2 Verification

The adjustment means shall be verified by inspection.

5.20 Attachment device

5.20.1 Requirements

The machine shall be equipped with an attachment device, enabling the unit to be attached to a rope or tool strap, as appropriate. The diameter of the opening shall be at least 10 mm. The device shall be capable of carrying a mass of at least six times the total chain-saw weight, with full tanks, longest guide bar and with a saw chain.

The attachment device shall be located so that the saw will hang with the guide bar down.

5.20.2 Verification

The attachment device shall be verified by inspection and measurement.

5.21 Vibration

5.21.1 Reduction by design and protective measures

The machine shall be designed to generate vibration levels as low as practicable. The main sources causing and influencing vibration are the dynamic forces from engine, cutting means, unbalanced moving parts, impact in gear sprockets, bearings and other mechanisms, and the interaction between operator, machine and material being worked.

NOTE 1 CR 1030-1^[11] gives general technical information on widely recognized technical rules and means and provides guidelines for the design of reduced hand-arm vibration machines.

NOTE 2 ISO/TR 22521^[9] provides useful information about comparative data on vibration levels of portable hand-held forestry machinery.

5.21.2 Reduction by information

Information on residual risks, after technical measures to control vibration emission at the design stage have been implemented, shall be given in the instruction handbook.

5.21.3 Verification

The effectiveness of the vibration reduction measures, implemented at the design stage, shall be verified by measurement. The vibration shall be measured and the equivalent vibration total value shall be calculated for each handle in accordance with ISO 22867.

5.22 Noise

5.22.1 Reduction by design (at source and by protective measures)

The machine shall generate noise levels as low as practicable. The main sources causing and influencing noise are air intake system, engine cooling system, engine exhaust system, cutting system and vibrating surfaces.

Special care shall be taken in the acoustical design of chain-saws.

NOTE 1 ISO/TR 11688-1^[3] gives general technical information on widely recognized technical rules and means to be followed in the design of low-noise machines.

NOTE 2 ISO/TR 11688-2^[4] gives useful information on noise generation mechanisms in machinery and ISO 14163^[7] provides guidelines for noise control by silencers. ISO 11691^[5] and ISO 11820^[6] contains requirements for the testing of the silencer.

NOTE 3 Information about comparative data on emission sound pressure levels of portable hand-held forestry machinery can be found in ISO/TR 22520^[7].

5.22.2 Reduction by information

Information on residual risks, after technical measures to control noise emission at the design stage have been implemented, shall be given in the instruction handbook.

5.22.3 Verification

The effectiveness of the noise reduction measures implemented at the design stage shall be verified by measurement. The equivalent A-weighted emission sound pressure level at the operator's position and the A-weighted sound power level shall be measured and calculated in accordance with ISO 22868.

6 Information for use

6.1 Instruction handbook

6.1.1 Technical data

The instruction handbook shall give the following technical information for each chain-saw model.

Mass

Chain-saw without guide bar and chain, empty tanks kg

Volume

Fuel tank cm³

Tank for chain lubricating oil cm³

Cutting length

Usable cutting lengths cm

Chain

Specified pitch mm (in)

Specified gauge (thickness of drive links) mm (in)

Type of chain and guide bar

Drive sprocket

Specified number of teeth and specified pitch

Engine

Engine displacement cm³

Maximum engine power (in accordance with ISO 7293) kW

Recommended maximum speed with guide bar and chain min⁻¹

Recommended speed at idling min⁻¹

Specific fuel consumption at maximum engine power (on request) g/kWh

Declared values for A-weighted sound power level and A-weighted emission sound pressure level at the operator position according to ISO 22868 dB

Declared values for equivalent vibration total value according to ISO 22867 m/s²

6.1.2 Other information

The instruction handbook shall contain comprehensive instructions and information on all aspects of operator/user maintenance and the use of the chain-saw, including type and use of personal protective equipment (PPE), suitable clothing and the need for training in all manual chain-saw operations. ISO 12100-2 gives guidance on the content of the information for use.

The importance of reading the instruction handbook thoroughly before using the chain-saw shall be stressed on the front of the instruction handbook.

A warning shall also be given that this is a special type of chain-saw, designed especially for tree service. It shall be stated that the saw is only to be used by a trained operator using a carefully designed, safe work system, and it shall be emphasised that the chain-saw is only intended for tree work under these defined conditions. It shall also be stated that for all other operations, the chain-saw is intended to be used with two hands in the same way as a conventional chain-saw.

NOTE Annex B gives useful guidance on a safe work system.

Terms used in all documentation shall be in accordance with ISO 6531.

The instruction handbook shall at least cover information relating to the following:

- a) transport, handling and storage of the chain saw, including
 - the use of guide-bar cover during transport and storage, and
 - cleaning and maintenance before storage;
- b) commissioning of the chain-saw, including
 - assembling instructions, initial adjustments and checks,
 - chain tensioning and sharpening techniques, including use of gloves,
 - information regarding regular maintenance, pre-operating procedures and daily maintenance routines,
 - guide bar and chain adjustments with the engine stopped, including regular testing of the chain brake, and
 - filling of fuel and oil, especially concerning fire precautions;
- c) information regarding the chain-saw, including
 - description, identification and nomenclature of principal parts including the safety devices of the saw, and an explanation of its function,
 - explanation of symbols and warnings,
 - mounting of a spiked bumper,
 - information regarding specified replacement saw chains and guide bars, and
 - declared values of the A-weighted emission sound pressure level at the operator's position and of the A-weighted sound power level in accordance with 5.22.3, including warning about the risks and measures to be taken to minimise those risks; an octave band analysis shall be supplied upon request to enable the selection of correct hearing protection,

- equivalent vibration in accordance with 5.21.3, including warning about the risks and measures to be taken to minimise those risks (including an explanation of white finger risks and means for the users to protect themselves);

d) use of the chain-saw, including

- hazards which can be encountered while using the saw and how to avoid them while doing typical tasks, including a warning that not following the instruction may lead to hazardous situations,
- instructions regarding starting procedure and that starting always shall be done with the chain brake activated,
- operating instructions and instruction for common cutting tasks and warning against the use of the unit while tired, ill or under the influence of alcohol or other drugs,
- instructions for selection and use of eye protection and protective clothing, including the use of gloves and foot protection suitable for tree climbing,
- instructions regarding exposure to noise, selection and use of hearing protection, including recommendations for limiting the duration of operation, if appropriate,
- instructions regarding exposure to vibration, including recommendations for limiting the duration of operation, if appropriate,
- instructions about regular testing of the chain brake,
- explanation of, and instruction in how to deal with, the phenomena of kickback, “skating” and “bouncing”, and dropping at the end of a cut,
- warning about the emission of exhaust gases, lubrication oil mist and sawdust,
- information regarding appropriate use of a spiked bumper (e.g. the advantage of using a spiked bumper when cutting thick branches),
- for the effects of vibration, instructions on the use of gloves,
- instruction that the chain-saw, when held in both hands, shall be held with the right hand on the rear handle and the left hand on the front handle, and
- description of how to use the saw, including the importance of the operator being trained in safe climbing techniques and in the use of all recommended additional safety equipment, such as harness, loops, straps, rope and carabiners, and other fall arrest systems for operator and saw (see Annex B for examples);

e) maintenance instructions, including

- servicing and replacement tasks for the user,
- drawings or diagrams to allow user maintenance and fault-finding tasks,
- procedure for sharpening the saw chain, with particular emphasis upon the effects of kickback behaviour that may result if specifications are not followed, and
- the provision of sufficient information to enable the user to maintain the safety system throughout the life of the product and explaining the consequences of improper maintenance, use of non-conforming replacement components, or the removal or modification of safety components, in particular, the requirement that the replacement saw chain have the same or lower kickback angle and vibration characteristics as the one originally supplied.

6.2 Markings

All chain-saws shall be marked with the following minimum information:

- name and address of the manufacturer;
- designation of series or type;
- serial number, if any.

Chain-saws shall also bear the following additional information:

- identification, preferably according to ISO 3767-5, of the control for engine stopping device, oiler control, choke control, primer control, fuel and/or oil caps and heated handle switch (if provided).

The markings shall be legible and located in a readily visible position and shall resist the anticipated service conditions, e.g. the effects of temperature, moisture, petrol, oil, abrasion and weathering exposure.

If symbols are used, they shall be explained in the instruction handbook.

6.3 Warnings

6.3.1 On the machine

All chain-saws shall be marked with the following warnings by text or pictorials, indicating

- that head, eye and hearing protection is necessary (an example of a pictorial is given in Annex A),
- that protective clothing is necessary e.g. for feet, legs, hands and fore-arms (an example is given in Annex A), and
- "WARNING: THIS CHAIN-SAW IS FOR TRAINED TREE SERVICE OPERATORS ONLY, SEE INSTRUCTION HANDBOOK!".

If pictorials are used, they shall be explained in the instruction handbook. Example of pictorials are given in Annex A.

The warnings shall be legible and located in a readily visible position on the chain-saw and shall resist the anticipated service conditions, e.g. the effects of temperature, moisture, petrol, oil, abrasion and weathering exposure.

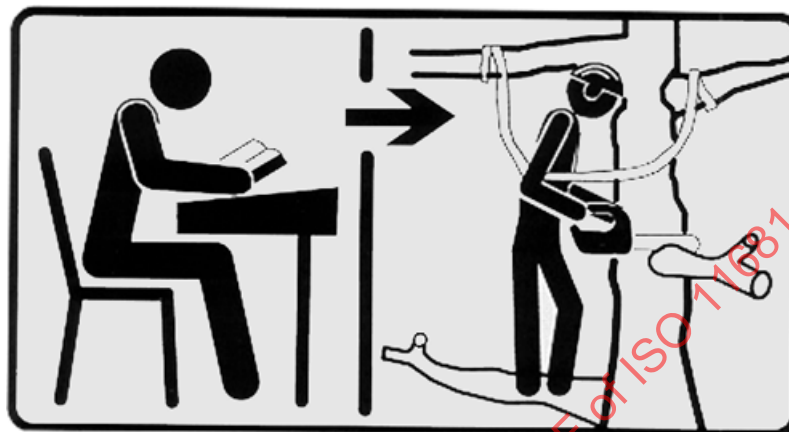
6.3.2 At the point of sale

Visible information or labelling shall be provided for the point of sale of the chain-saw such that it can be seen by the potential buyer, for example, by a hang tag and/or a carton sticker, giving, as a minimum, the following information in the language of the country of sale:

"WARNING: THIS CHAIN-SAW IS FOR TRAINED TREE SERVICE OPERATORS ONLY, SEE INSTRUCTION HANDBOOK!".

Annex A (informative)

Pictograms



NOTE Guidelines for the design of pictorials are also given in ISO 11684^[2].

Figure A.1 — Black figure on yellow background — “This chain-saw is for trained tree service operators only.”

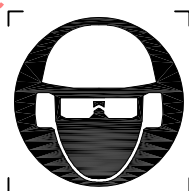


Figure A.2 — White on blue background — “Appropriate ear, eye, and head protection must be worn.”

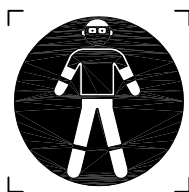


Figure A.3 — White figure on blue background — “Use appropriate protection for foot-leg and hand-arm.”

Annex B (informative)

Working with tree service chain-saws from rope and harness

B.1 Overview

This annex sets out working practices aimed at reducing the risk of injury from tree service chain-saws when working at height from a rope and harness. While it may form the basis of guidance and training literature, it should not be regarded as a substitute for formal training. The guidance given in this annex is only an example of best working practice. National laws and regulations should always be followed.

It presents

- general requirements that should be met before using a tree service chain-saw for work at height from a rope and harness,
- preparations for using a tree service chain-saw from a rope and harness, and
- use of a tree service chain-saw for pruning and dismantling, including secure work positioning for two-handed use, starting the chain-saw, cutting with the chain-saw, restrictions on one-handed use and freeing a trapped saw.

This annex does not deal with techniques to control sections of branches and stems cut by the saw. Nor does it cover those aspects of safe use already dealt with in 6.1 of this part of ISO 11681.

B.2 General requirements

Operators of tree service chain-saws working at height from a rope and harness should never work alone. A ground worker trained in appropriate emergency procedures should assist them.

Operators of tree service chain-saws for this work should be trained in general safe climbing and work positioning techniques and be properly equipped with harnesses, ropes, strops, carabiners and other equipment for maintaining secure and safe working positions for both themselves and the saw.

B.3 Preparing to use the saw in the tree

The chain-saw should be checked, fuelled, started and warmed up by the ground worker and then switched off before it is sent up to the operator in the tree.

The chain-saw should be fitted with a suitable strop for attachment to the operator's harness (see Figure B.1):

- a) secure the strop around the attachment point on the rear of the saw;
- b) provide suitable carabiners to allow indirect (i.e. via the strop) and direct attachment (i.e. at the attachment point on the saw) of the saw to the operator's harness;
- c) ensure the saw is securely attached when it is being sent up to the operator;
- d) ensure the saw is secured to the harness before it is disconnected from the means of ascent.

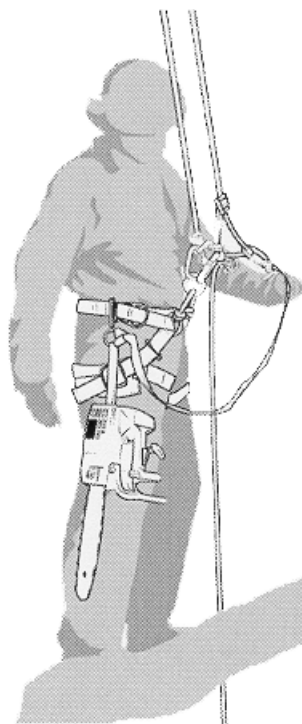


Figure B.1 — Example of attachment of tree service chain-saw to operator's harness

The ability to directly attach the saw to the harness reduces the risk of damage to equipment when moving around the tree. Always switch the saw off when it is directly attached to the harness.

The saw should only be attached to the recommended attachment points on the harness. These may be at mid-point (front or rear) or at the sides. Where possible, attach the saw to the centre rear mid-point to keep it clear of climbing lines and to support its weight centrally down the operator's spine. See Figure B.2.

When moving the saw from any one attachment point to another, operators should ensure it is secured in the new position before releasing it from the previous attachment point.