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Forestry machinery — Portable chain-saws — Non-manually actuated chain brake performance

Matériel forestier — Scies à chaîne portatives — Performance du frein de chaîne automatique

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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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For an explanation of the voluntary nature of the 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

This document was prepared by Technical Committee TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 17, *Manually portable forest machinery*.

This fourth edition cancels and replaces the third edition (ISO 13772:2009), which has been technically revised. Numerous improvements have been introduced for increased accuracy and reproducibility:

— electric-powered chain-saws have been added to the scope and requirements have been included accordingly;

— a maximum length has been stated for guide bars to be used;

— new low-pass filter characteristics have been specified;

— material of rocker spacer has been changed;

— a requirement that the throttle trigger or activation power switch (for electric chain-saws) be fixed in the fully activated position during the test has been added;

— the pulse length of the initial impulse has been specified and related instructions have been added.

Forestry machinery — Portable chain-saws — Non-manually actuated chain brake performance

1 Scope

This document specifies a method for checking the functioning and performance of the non-manually actuated chain brake on an electric or gasoline engine powered, portable hand-held chain-saw.

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 6531, *Machinery for forestry — Portable chain-saws — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6531 apply.

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

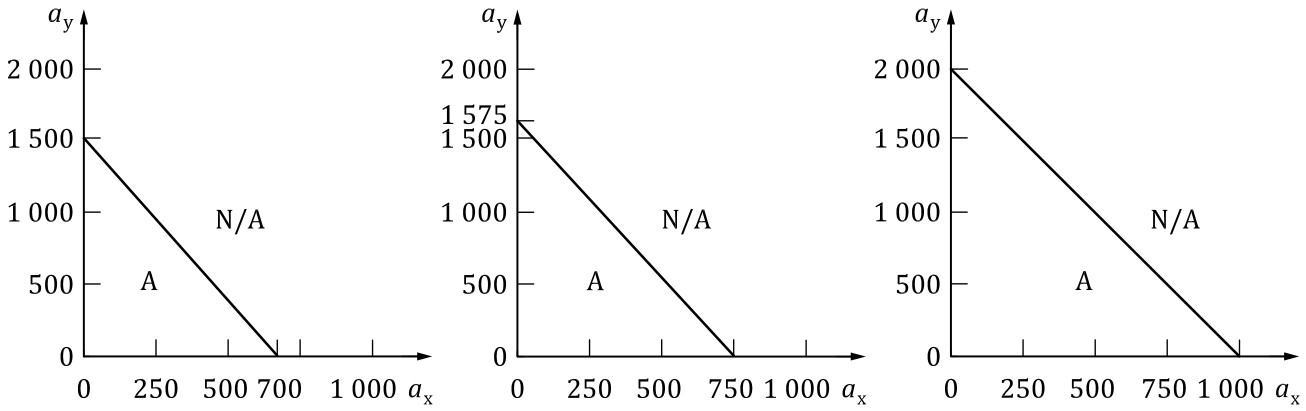
— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

4 Performance requirements

The non-manually actuated chain brake function shall be checked on a new normal production saw equipped with the shortest and longest guide bars specified in the instruction handbook, but no longer than 500 mm. Battery-powered chain-saws shall be checked with the lightest and heaviest battery packs.

When tested in accordance with Clause 8, the performance of the actuation function of a non-manually actuated chain brake is considered acceptable if each of the horizontal and vertical acceleration levels (a_x and a_y) at which the chain brake actuates is below the appropriate threshold level as shown in Figure 1 a), b) or c) for different chain-saw types and sizes.



a) Chain-saw for tree service, engine and electric-powered

b) Chain-saw for forest service with ≤ 40 cm³ engine displacement and electric-powered chain-saw

c) Chain-saw for forest service with > 40 cm³ engine displacement

Key

a_x	horizontal acceleration, expressed in m/s^2
a_y	vertical acceleration, expressed in m/s^2
A	acceptable
N/A	not acceptable

Figure 1 — Threshold acceleration levels for actuation of non-manually actuated chain brakes

5 Principle

The chain-saw shall be mounted on a test rig as shown in Figure 3. The drop mass falls from a defined height on the rocker and accelerates the chain-saw on the opposite side. The drop height shall be increased until the actuation of the non-manually actuated chain-brake occurs.

6 Test equipment

6.1 Acceleration measuring equipment

The total mass of the accelerometer(s) shall be as low as possible and shall not, in any case, exceed 50 g, including the mounting, but excluding the cables.

The signal from the accelerometer(s) shall be processed by a low-pass filter having characteristics in accordance with Annex A.

Care shall be taken when mounting the accelerometer(s) so that the transfer function is flat up to 300 Hz in both measuring directions. For general considerations concerning accelerometer mounting, see ISO 5348. The transfer function may be considered flat if an addition of mass to the accelerometer, equal to that of the accelerometer itself, does not have any significant influence on a_x and a_y. This additional mass should be placed between the accelerometer and its mounting if the mass is of metal, or around the accelerometer if the mass consists of materials such as clay or wax.

The accuracy of the measuring equipment, excluding accelerometer mounting and filter, shall be ±5 % of the registered value in the frequency range from 0 Hz to 300 Hz. See ISO 16063-1 for calibration methods.

6.2 Test rig

The design principles of the test rig shall be as shown in Figure 3.

The test rig shall be mounted solidly to the floor and designed so that deflection of the drop mass guide rod is restricted, e.g. by fixing both ends.

The guide rod shall be vertical within 2°.

The top surface of the steel spacer shall be horizontal within 1° in the lateral direction.

Both the length of the test rig cord and the longitudinal and lateral positioning of the pivoting pulley for the cord shall be adjustable.

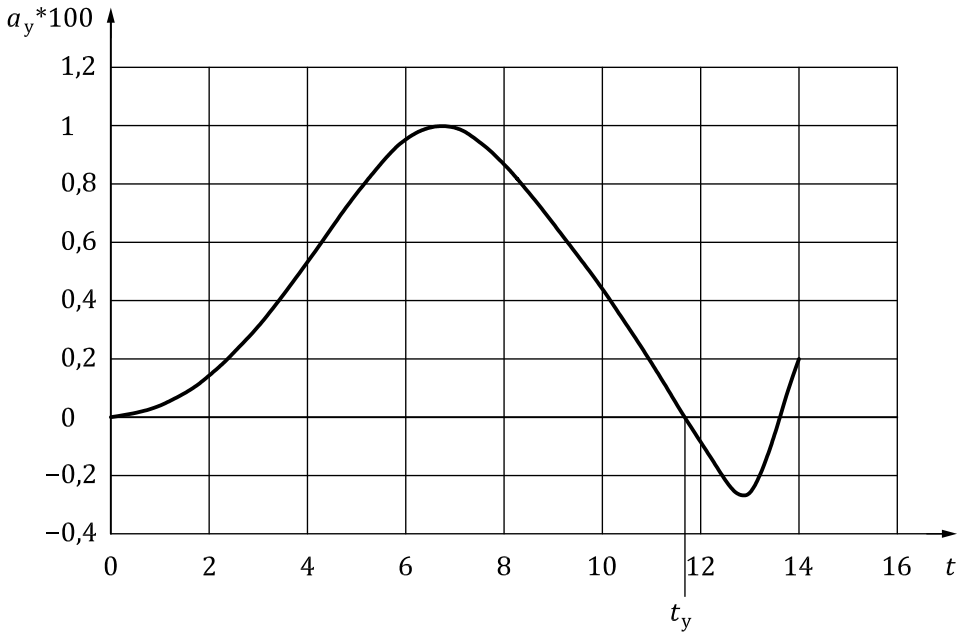
The test rig rocker shall be made of rectangular hollow section steel, 80 mm × 40 mm × 4 mm, and shall have a mass of 6 700 g ± 300 g and a moment of inertia of 0,45 kg·m^2 ± 0,02 kg·m^2.

The drop weight device shall have a drop mass of 15 000 g ± 20 g. It shall be possible to select drop heights in steps of 10 mm or less, at least for drop heights between 200 mm and 1 400 mm. The accuracy of the drop height shall be ±2 mm.

The dimensions of the spring between the drop weight and the rocker arm shall be such that a pulse length (t_y) of 11 ms ± 2 ms is achieved.

t_y shall be measured as the time of positive acceleration a_y of the initial pulse, i.e. from the moment when a_y increases from zero to the first time a_y returns to zero. See example in Figure 2.

The specified pulse length can be achieved by using seven conical disc springs (45 mm × 22,4 mm × 1,75 mm), with a characteristic of 640 N/mm ± 20 N/mm, each having an adverse orientation in relation to the next one. The spring defines the length and the characteristic of the impulse. If conical disc springs are used, they should be positioned and guided as precisely as possible. The diametrical play between the drop mass guide rod and the inner diameter of the conical disc springs should be 0,4 mm to 0,8 mm.



Key

a_y vertical acceleration, expressed in m/s^2

t time, expressed in ms

t_y pulse length

Figure 2 — Pulse length t_y of energy input

7 Preparation

Prepare the chain-saw for testing as follows.

a) Check that the chain-saw is in accordance with the product specification.

b) Precondition the saw by actuating the non-manually actuated chain brake ten times — for example, by dropping the saw while holding the rear handle, so that the bar tip hits a rigid, wooden surface.

c) Mount a saw-chain suitable for the guide bar and cut softwood for the time it takes to use one tank full of fuel at approximately maximum power speed (gasoline engine powered chain-saws) or for the time it takes to use one tank full of chain oil (electric-powered chain-saws). The chain brake shall not be activated during this cutting. Do not clean the chain-saw after cutting. Remove the chain with minimum disassembly and disturbance. The guide bar used for the cutting may also be, with minimum disturbance, replaced by a comparable, unused, guide bar having the same characteristics (i.e. length, bar nose radius, gauge).

d) Set the chain tension adjuster to its middle position and move the guide bar to its uppermost position, in order to eliminate play. Fasten the guide bar on the saw.

   The saw chain shall not be installed and the tanks shall be empty. The throttle trigger or power switch (for electric-powered chain-saws) shall be set to its fully activated position.

e) Attach the accelerometer(s) for measurement of the horizontal and vertical accelerations (a_x and a_y, respectively). The centrelines of the two active orthogonal directions of the accelerometer(s) shall intersect the guide bar tip radius centre point within ±2 mm. The centre of gravity of the respective accelerometer(s) shall be within ±10 mm from the guide bar tip radius centre point. The orientation of the accelerometer(s) shall be as shown in Figure 3.

f) Mount the chain-saw on the test rig using cord at attachment points A and B (see Figure 3), so that the longitudinal centreline for the guide bar is inclined downwards at 30° ± 2° and is parallel to the longitudinal, vertical plane of the test rig rocker.

   Attachment point A shall be on the grip area of the rear handle. For tree service chain-saws, it can be necessary to move the attachment point further back in order to meet the requirement for lift off for the stated normal force [see h)]. To do so, attach a backwards extension on the rear handle for attachment point A. This extension shall be as short and light as possible and shall in any case weigh no more than 100 g.

   Attachment point B shall be laterally adjusted so that the guide bar plane is vertical within ±3°. See dimension *l* in Figure 3.

   Attachment point B shall be placed high enough to ensure stable suspension of the chain-saw, i.e. the straight line between attachment points A and B shall pass above the centre of gravity of the chain-saw [see h)].

   The main supply cord of electric chain-saws shall hang down towards the ground.

g) Adjust the angular support so that the line perpendicular to the test rig rocker's longitudinal centreline and passing through the contact point between the rocker spacer and the guide bar tip also passes through the guide bar tip radius centre point within ±1 mm [see i)].

h) Attachment point B shall be positioned longitudinally along the guide bar so that the guide bar tip is lifted off the steel spacer when a normal force, F_n, of 3 N ± 0,4 N is applied (see Figure 3).

i) The pulley shall be positioned longitudinally so that the guide bar tip is pulled off the angular support when a tangential force, F_t, of 3 N ± 0,4 N is applied (see Figure 3).

j) Ensure sufficient lubrication of

   1) the contact points between the guide bar tip, the steel spacer and the angular support, and

2) contact surfaces from the drop mass, including the disc springs down to the spacer on the rocker.

8 Test procedure

Actuate the non-manually actuated chain brake using the acceleration that occurs after release of the drop mass.

Preferably start at a drop height of 200 mm, then increase in 100 mm steps to initiate actuation. After the first actuation, decrease the drop height again in steps of 20 mm to a point where the brake no longer actuates automatically.

Raise the drop height by 10 mm and repeat the test five times under the same conditions. If the brake actuates all five times, the conditions established shall be used to measure accelerations a_x and a_y (see Figure 1).

If the brake is not actuated five times, raise the drop height by 10 mm and repeat the test another five times. If necessary, repeat the procedure until a drop height at which the brake actuates five times is attained.

When the lowest drop height has been defined, measure and register five times the values of a_x and a_y under the same conditions, then calculate the average values of the accelerations.

9 Test report

The test report shall include the following information:

a) reference to this document, i.e. ISO 13772:2018;

b) date and place of measurement;

c) name of the operator;

d) description of the chain-saw, consisting of

   1) manufacturer,

   2) type, model and serial number,

   3) type and length of guide bar,

   4) mass of the chain-saw as measured (with bar, battery pack, without chain and with tanks empty), expressed in kilograms, and

   5) release force of the chain brake (see ISO 6535), expressed in newtons;

e) description of the measuring equipment;

f) description of the accelerometer mounting;

g) values of the recorded bar tip accelerations, a_x and a_y, expressed in metres per second squared, and the calculated average accelerations, $a_{x,av}$ and $a_{y,av}$, respectively, at the chain brake actuation limit.