BRITISH STANDARD

BS ISO 13772:2009

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

ICS 65.060.80

British Standards

National foreword

This British Standard is the UK implementation of ISO 13772:2009. It supersedes BS ISO 13772:1997 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee AGE/29, Forestry machinery.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Foreword

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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 13772 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 17, *Manually portable forest machinery*.

This third edition cancels and replaces the second edition (ISO 13772:2004), which has been technically revised. In particular, pre-running of the chain-saw before testing is now specified, a specification for the rocker has been added, and additional advice is given on attachment point A for tree-service chain-saws.

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

1 Scope

This International Standard specifies a method for checking the functioning and performance of the non-manually actuated chain brake on a portable hand-held chain-saw used for forest or tree service.

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

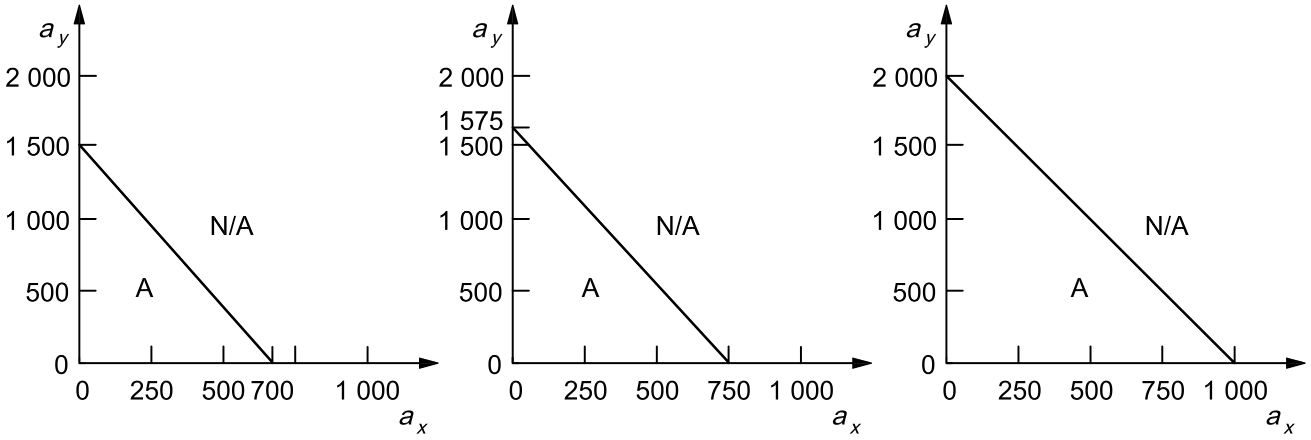
3 Terms and definitions

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

4 Performance requirements

The non-manually actuated chain brake function shall be checked on a normal production saw equipped with the shortest and longest guide bars specified in the instruction handbook.

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 according to Figure 1 a), b) or c), depending on chain-saw type and size.



a) Chain-saw for tree service

b) Chain-saw for forest service with ⩽ 40 cm³ engine displacement

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

Key

a_x horizontal acceleration, m/s^2

a_y vertical acceleration, m/s^2

A acceptable

NA not acceptable

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

5 Principle

The chain-saw shall be mounted on a test rig as shown in Figure 2. 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 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 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 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 registered value in the frequency range 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 2.

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 kgm^2 ± 0,05 kgm^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 between a drop height of 200 mm to 1 400 mm. The accuracy of the drop height shall be ± 2 mm.

The spring in the drop weight device shall have a characteristic of 640 N/mm ± 20 N/mm for an increasing spring load.

NOTE The specified spring rate can be achieved by seven leaf springs (45 mm × 22,4 mm × 1,75 mm), each having an adverse orientation in relation to the next. The spring defines the length and the characteristic of the impulse. The pulse of the simulated kickback will then be approximately 10 ms.

7 Preparation

Prepare the chain-saw for testing as follows.

a) Check that the chain-saw is in accordance with the product specification. If no guide bar length has been specified, choose one according to Table 1.

b) Precondition the saw by actuating the non-manually actuated chain brake 10 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. The chain brake shall not be activated during this cutting. No cleaning of the chain-saw is permitted after the cutting sequence. Remove the chain with minimum disassembly and disturbance. The guide bar used in the cutting may also be, with minimum disturbance, replaced by a comparable, un-used, guide bar.

d) Adjust the chain tension adjuster to its mid-position and move the guide bar to its uppermost position, in order to eliminate play, and fasten the guide bar on the saw.

   The saw chain shall not be installed and the tanks shall be empty.

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 accelerometers shall intersect the guide bar tip radius centre point within ± 2 mm. The centre of gravity of the respective accelerometers 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 2.

f) Mount the chain-saw on the test rig using cord at attachment points A and B (see Figure 2), so that the longitudinal centreline for the guide bar is inclined downwards at 30° ± 2° and is parallel to the longitudinal 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 be able to meet the requirement for lift-off for a stated normal force. If that is the case, attach a backwards extension on the rear handle for attachment point A. This extension shall be as 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°.

Attachment point B shall be placed high enough to ensure stable suspension of the chain-saw, i.e the straight line between points A and B shall pass above the centre of gravity of the chain-saw, and shall be along the longitudinal centre plane of the guide bar chosen, so that the guide bar tip will be lifted off the aluminium spacer when a normal force, F_n, of 2 N ± 0,4 N is applied (see Figure 2).

g) Adjust the angular support so that the line perpendicular to the test-rig rocker longitudinal centreline passing through the contact point between the rocker spacer and the guide bar tip will pass through the guide bar tip radius centre point within ± 1 mm. The pulley shall be longitudinally positioned so that the guide bar tip will be pulled off the angular support when a tangential force F_t of 2 N ± 0,4 N is applied (see Figure 2).

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 the height 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 is attained at which the brake actuates five times.

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 International Standard (i.e. “ISO 13772:2009”);

b) date and place of measurement;

c) name of the operator;

d) description of the chain-saw, consisting of

— manufacturer,

— type, model and serial number,

— type and length of guide bar,

— mass of the chain-saw as measured (with bar, without chain and with tanks empty), in kilograms, and

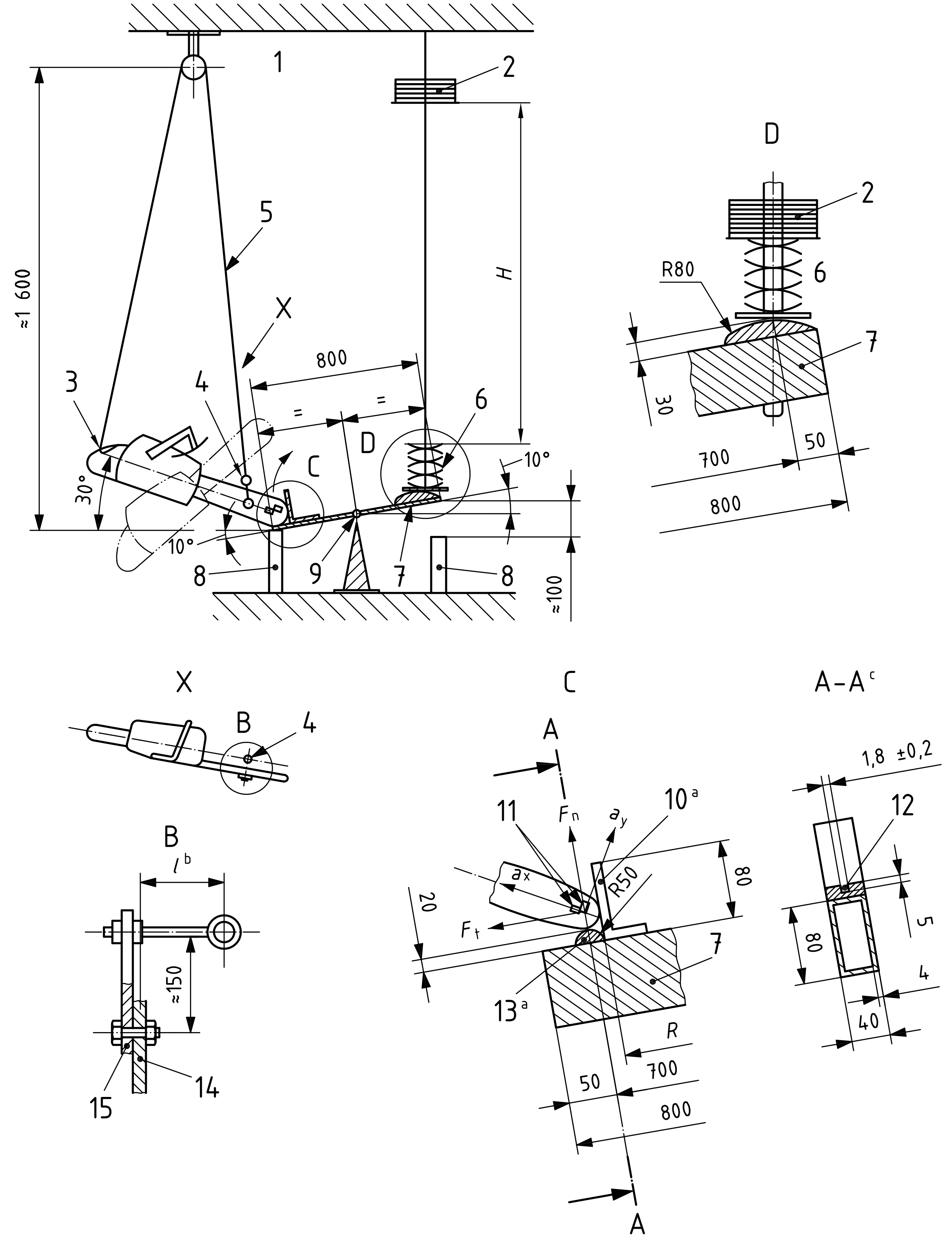
— release force of the chain brake (see ISO 6535), in newtons;

e) description of the measuring equipment;

f) description of the accelerometer mounting;

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

Dimensions in millimetres



Key

H drop height

F_n normal force

F_t tangential force

1 pivoting pulley adjustable in longitudinal and lateral direction

2 drop mass

3 attachment point A

4 attachment point B

5 cord

6 spring

7 rocker

8 shock absorber

9 ball bearing

10 adjustable angular support

11 accelerometer

12 notch

13 aluminium spacer

14 guide bar

15 rigid arm fixed to guide bar

[a] The acceleration of the chain-saw shall not be induced over the teeth of the sprocket into the guide bar. This can be avoided by a notch in the spacer and the angular support or by removing the sprocket (see detail A–A).

[b] Adjustable distance, l, for attachment point B is to coincide with the vertical plane through the centre of gravity of the chain-saw.

[c] The chain-saw has been omitted from the drawing for clarity.

Figure 2 — Test rig with mounted chain-saw

Annex A
(normative)

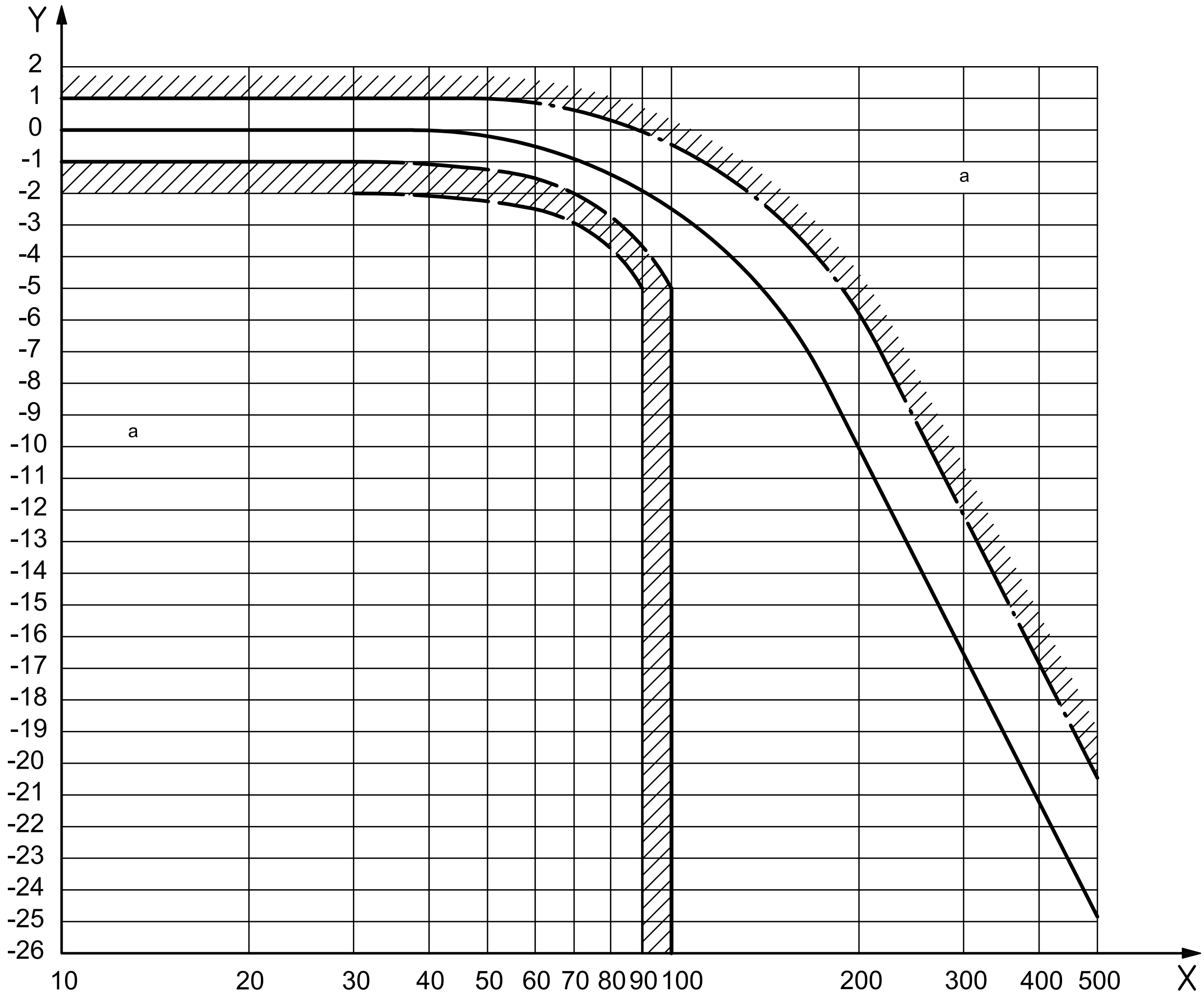
Frequency range and low-pass filter characteristics

The low-pass filter characteristics to be used when measuring the acceleration (a_x and a_y) shall be within the upper and lower boundaries defined in Table A.1.

Table A.1 — Filter frequency response boundaries

Frequency f Hz	**Lower tolerance boundary** a_l dB	**Upper tolerance boundary** a_u dB
$f \leqslant 100$	$a_l = 20\lg\left[\frac{1}{\sqrt{1+\left(\frac{f}{100}\right)^4}}\right]+1$	$a_u = 20\lg\left[\frac{1}{\sqrt{1+\left(\frac{f}{140}\right)^4}}\right]+1$
$100 < f \leqslant 255$	$a_l = -\infty$	—
$f > 255$	$a_l = -\infty$	$a_u = -9{,}8 - 36{,}54\lg\frac{f}{255}$

Tolerance boundaries for low-pass filter frequency response and theoretical filter characteristics for a cut-off frequency of 120 Hz and a – 12 dB/octave slope are shown in Figure A.1.



Key

X frequency, Hz

Y attenuation, dB

As an example, a theoretical low-pass filter with cut-off frequency of 120 Hz and a slope of – 12 dB/octave are shown.

[a] Restricted area.

Figure A.1 — Tolerance boundaries for filter frequency response

Bibliography

[1] ISO 5348, *Mechanical vibration and shock — Mechanical mounting of accelerometers*

[2] ISO 6535, *Portable chain-saws — Chain brake performance*

[3] ISO 16063-1, *Methods for the calibration of vibration and shock transducers — Part 1: Basic concepts*

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