
**Machinery for forestry — Saw chain shot
guarding systems — Test method and
performance criteria**

*Matériel forestier — Système de protection contre l'éjection d'éléments
de chaînes de scie — Méthode d'essai et critères de performance*

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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.

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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 11837 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 15, *Machinery for forestry*.

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Introduction

On the basis of a risk analysis, the types of saw chain breakage can be determined and a saw chain shot guarding system selected that protects against these risks.

Harvester heads and grip saws need an effective saw chain shot guarding system. However, no such system can give 100 % safety protection against a saw chain shot. This International Standard specifies a method for evaluating the performance of a guarding system for the prevention of saw chain shot from behind the drive sprocket and upwards, relative to the direction of movement of the saw chain.

The test apparatus specified in this International Standard is designed to simulate the situation in which the saw chain becomes stuck in the wood at a cut and is broken. The end of the saw chain passes the drive sprocket in the guide bar plane. At different saw chain speeds and combinations of distance to the saw chain breakage, the break force, guide bar geometry and saw chain preload will throw the saw chain in a curve, producing a whiplash that could create a chain shot.

The test procedures presented in this International Standard can be used to evaluate a guarding system's ability to prevent the saw chain from producing whiplash and chain shot.

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Machinery for forestry — Saw chain shot guarding systems — Test method and performance criteria

CAUTION — The test method specified in this International Standard involves the use of processes which could lead to a hazardous situation. The test creates saw chain shots. Under no circumstances shall the test be performed without the protective cover for the test apparatus in place. The protective cover is only to be removed when rotating parts are standing still.

1 Scope

This International Standard specifies performance requirements and a corresponding test method for saw chain shot guarding systems on the harvester heads and grip saws of forestry machines.

It is applicable only to saw chain breakage on the cutting side of the guide bar.

NOTE Other test methods and test apparatus can be used if shown to give equivalent performance results.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1

saw chain shot

object flying with high speed and consisting of one or more parts (drivelinks, sidelinks, cutters) of a broken saw chain

NOTE 1 A saw chain consists of parts in the form of drivelinks, cutters and sidelinks held together by rivets.

NOTE 2 The saw chain shot will have a weight of 1 g to 100 g, depending on the size of the saw chain and the broken saw chain parts.

NOTE 3 During a test run, more than one saw chain shot can be created by the same saw chain whiplash, in different directions.

2.2

maximum design saw chain speed

C

highest saw chain speed under no load, for a given combination of saw chain, guide bar and drive sprocket

2.3

cutting attachment

combination of saw chain, guide bar and drive sprocket mounted on the harvester head or grip saw

2.4

saw chain shot guarding system

system that prevents the saw chain from whiplashing and/or creating a saw chain shot after passing the drive sprocket in the event of a saw chain breakage

2.5

reference panel

plane panel consisting of plastic film, kraft paper or similar material to indicate a saw chain shot

3 Test equipment

3.1 Test apparatus

The saw chain shot guarding system, with all its component parts, shall be attached to the test rig as it would be on the respective harvester head or grip saw. Alternatively, the complete harvester head or grip saw shall be attached to the test rig.

3.2 Drive unit

The drive unit shall be maintained at constant speed to within 2 m/s during breakage, taking into account the increased force involved in the breakage of the saw chain.

NOTE One way to accommodate this is using an electric motor (15 kW and 50 r/s) with a belt transmission gearing up the speed four times and with a flywheel mass of 15 kg mounted on the drive shaft (360 mm in diameter and 19 mm in thickness).

3.3 Saw chain speed control

It shall be possible to adjust the saw chain speed within the range of 30 m/s to 60 m/s with a maximum tolerance of ± 2 m/s.

3.4 Drive shaft speed measurement

A drive shaft speed indicator shall be used to verify the saw chain speed with a maximum uncertainty of $\pm 1,0$ % of the reading.

3.5 Saw chain tensioning system

The saw chain tensioning system shall tension the saw chain according to the manufacturer's recommendations.

3.6 Saw chain lubrication system

The saw chain lubrication system shall lubricate the saw chain with oil flow and oil quality according to the manufacturer's recommendations.

3.7 Saw chain stopping device

The saw chain stopping device shall be as specified in Annex A.

3.8 Protective cover

A protective cover shall fully enclose the test equipment and the harvester head or grip saw under test. The protective cover shall have a strength at least equivalent to 6 mm steel sheet.

4 Cutting attachment

4.1 Guide bar

The longest available guide bar shall be chosen for the test runs. If a guide bar with a different shape is an option, it also shall be tested.

The mounting of the guide bar shall be on a unit with original mounting attachments, according to the manufacturer's specifications.

4.2 Drive sprocket

The test runs shall be performed within the manufacturer's operating specifications and with the drive sprocket available in the original cutting attachment that provides

- a) the highest saw chain speed, and
- b) the largest distance between the drive sprocket and the saw chain shot guarding system.

4.3 Saw chain

A saw chain that is recommended in the harvester-head or grip-saw manufacturer's instruction handbook for use together with the guide bar and drive sprocket shall be chosen. One of the following reference saw chain dimensions shall be preferred:

- saw chain with 0,404 inch pitch, thickness 1,6 mm;
- saw chain with 0,404 inch pitch, thickness 2,0 mm;
- saw chain with 3/4 inch pitch, thickness 3,1 mm.

The number of drive links is determined in relation to the guide bar length.

5 Reference panels

There shall be two reference panels (see items 1a and 1b in Figure 1) with a width of 400 mm \pm 20 mm and a length of 1 000 mm \pm 20 mm, consisting of plastic film, kraft paper or similar material. The location and orientation of the two reference panels shall be as described in Figure 1.

6 Pre-calibration of test arrangement

The pre-calibration is performed in order to secure the statistical confidence of the test results.

Ten test runs without the saw chain shot guarding system mounted shall be performed to evaluate the functioning of the test arrangement. Perform the test procedure specified in Clause 8, but without assembling the saw chain guarding system. Run five test runs at 0,8 times the maximum design saw chain speed, C , and five test runs at $1,2C$. At least four of the five test runs at each speed shall result in a saw chain shot through one of the reference panels.

If a complete harvester head or grip saw is tested, some parts of the saw chain shot guarding system and obstacles (see 7.3) will have to be removed prior to the pre-calibration tests, to ensure that saw chain shots are created.

If the criterion of at least four saw chain shots out of five test runs is not met, the test arrangement shall be modified and the pre-calibration repeated until this criterion is met.