UL 62841-2-11

STANDARD FOR SAFETY

Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 2-11: Particular Requirements For Hand-Held Reciprocating Saws

UL Standard for Safety for Hand-Held Motor-Operated Electric Tools – Safety – Part 2-11: Particular Requirements for Hand-Held Reciprocating Saws, UL 62841-2-11

First Edition, Dated March 27, 2017

Summary of Topics

This revision of ANSI/UL 62841-2-11 dated January 10, 2020 includes revisions to Clauses 19, 20, and 21 to align with changes in IEC Amendment No. 1 for IEC 62841-2-11.

This standard is an adoption of IEC UL 62841-2-11, Edition 1 published November 2015, and includes IEC Amendment 1 to IEC 62841-2-11, published by the IEC in January 2018. There are no technical national differences for this standard.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated July 26, 2019 and October 18, 2019.

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CAN/CSA-C22.2 No. 62841-2-11:17
First Edition
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Underwriters Laboratories Inc.
UL 62841-2-11
First Edition

Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 2-11: Particular Requirements For Hand-Held Reciprocating Saws

March 27, 2017

(Title Page Reprinted: January 10, 2020)

This national standard is based on publication IEC 62841-2-11, First Edition (2015) and IEC Amendment 1 (2018).

ANSI/UL 62841-2-11-2020

Commitment for Amendments

This standard is issued jointly by the Canadian Standards Association (operating as “CSA Group”) and Underwriters Laboratories Inc. (UL). Comments or proposals for revisions on any part of the standard may be submitted to CSA Group or UL at any time. Revisions to this standard will be made only after processing according to the standards development procedures of CSA Group and UL. CSA Group and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.

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This Standard is subject to review within five years from the date of publication, and suggestions for its improvement will be referred to the appropriate committee. The technical content of IEC and ISO publications is kept under constant review by IEC and ISO. To submit a proposal for change, please send the following information to inquiries@csagroup. org and include "Proposal for change" in the subject line: Standard designation (number); relevant clause, table, and/or figure number; wording of the proposed change; and rationale for the change.

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This ANSI/UL Standard for Safety consists of the First Edition including revisions through January 10, 2020. The most recent designation of ANSI/UL 62841-2-11 as an American National Standard (ANSI) occurred on January 10, 2020. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface. The National Difference Page and IEC Foreword are also excluded from the ANSI approval of IEC-based standards.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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Preface

This is the harmonized CSA Group and UL Standard for Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 2-11: Particular Requirements For Hand-Held Reciprocating Saws. It is the First edition of CAN/CSA-C22.2 No. 62841-2-11 and the First edition of UL 62841-2-11. This harmonized Standard has been jointly revised on January 10, 2020. For this purpose, CSA Group and UL are issuing revision pages dated January 10, 2020.

At the time of publication, IEC Amendment 1:2018 is available from IEC in English only. CSA Group will publish the French version when it becomes available from IEC.

This harmonized standard is based on IEC Publication 62841-2-11: First edition Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 2-11: Particular Requirements For Hand-Held Reciprocating Saws issued November 2015, as revised by Amendment 1 issued January 2018. IEC 62841-2-11 is copyrighted by the IEC.

This harmonized standard was prepared by CSA Group and Underwriters Laboratories Inc. (UL). The efforts and support of the International Harmonization Committee (IHC) for the adoption of the IEC series of standards for Hand-Held, Motor-Operated, and Transportable Tools and Lawn and Garden Machinery UL are gratefully acknowledged.

This standard is considered suitable for use for conformity assessment within the stated scope of the standard.

This standard was reviewed by the CSA Subcommittee on Safety of Hand-Held Motor-Operated Electric Tools, under the jurisdiction of the CSA Technical Committee on Consumer and Commercial Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee. This standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

This CAN/CSA-C22.2 No. 62841-2-11, Standard for Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 2-11: Particular Requirements For Reciprocating Saws is to be used in conjunction with the First edition of CAN/CSA-C22.2 No. 62841-1. The requirements for hand-held reciprocating saws are contained in this Part 2 Standard and CAN/CSA-C22.2 No. 62841-1. Requirements of this Part 2 Standard, where stated, amend the requirements of CAN/CSA-C22.2 No. 62841-1. Where a particular subclause of CAN/CSA-C22.2 No. 62841-1 is not mentioned in CAN/CSA-C22.2 No. 62841-2-11, the CAN/CSA-C22.2 No. 62841-1 subclause applies.

This UL 62841-2-11, Standard for Safety for Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 2-11: Particular Requirements For Hand-Held Reciprocating Saws, is to be used in conjunction with the First edition of UL 62841-1. The requirements for hand-held reciprocating saws are contained in this Part 2 Standard and UL 62841-1. Requirements of this Part 2 Standard, where stated, amend the requirements of UL 62841-1. Where a particular subclause of UL 62841-1 is not mentioned in UL 62841-2-11, the UL 62841-1 subclause applies.

Level of harmonization

This standard adopts the IEC text with editorial national differences.

This standard is published as an equivalent standard for CSA Group and UL.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

All national differences from the IEC text are included in the CSA Group and UL versions of the standard. While the technical content is the same in each organization's version, the format and presentation may differ.

Reasons for Differences From IEC

National differences from the IEC are being added in order to address safety and regulatory situations present in the US and Canada.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

IEC Copyright

For CSA Group, the text, figures, and tables of International Electrotechnical Commission Publication IEC 62841-2-11 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 2-11: Particular Requirements For Hand-Held Reciprocating Saws, copyright 2015, are used in this standard with the consent of the International Electrotechnical Commission. The IEC Foreword is not a part of the requirements of this standard but is included for information purposes only.

NATIONAL DIFFERENCES

National Differences from the text of International Electrotechnical Commission (IEC) Publication 62841-2-11, Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 2-11: Particular Requirements for Hand-Held Reciprocating Saws, copyright 2015, are indicated by notations (differences) and are presented in bold text. The national difference type is included in the body.

There are five types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

DR – These are National Differences based on the **national regulatory requirements**.

D1 – These are National Differences which are based on **basic safety principles and requirements**, elimination of which would compromise safety for consumers and users of products.

D2 – These are National Differences from IEC requirements based on existing **safety practices**. These requirements reflect national safety practices, where empirical substantiation (for the IEC or national requirement) is not available or the text has not been included in the IEC standard.

DC – These are National Differences based on the **component standards** and will not be deleted until a particular component standard is harmonized with the IEC component standard.

DE – These are National Differences based on **editorial comments or corrections**.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

Addition / Add - An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base IEC text.

Modification / Modify - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base IEC text.

Deletion / Delete – A deletion entails complete deletion of an entire numbered clause, subclause, table, figure, or annex without any replacement text.

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FOREWORD

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRIC MOTOR-OPERATED HAND-HELD TOOLS, TRANSPORTABLE TOOLS AND LAWN AND GARDEN MACHINERY – SAFETY – PART 2-11: PARTICULAR REQUIREMENTS FOR HAND-HELD RECIPROCATING SAWS

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.

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5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.

6) All users should ensure that they have the latest edition of this publication.

7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.

8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62841-2-11 has been prepared by IEC technical committee 116: Safety of motor-operated electric tools.

The text of this standard is based on the following documents:

FDIS	Report on voting
116/246/FDIS	116/256/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This Part 2-11 is to be used in conjunction with the first edition of IEC 62841-1 (2014).

This Part 2-11 supplements or modifies the corresponding clauses in IEC 62841-1, so as to convert it into the IEC Standard: Particular requirements for hand-held reciprocating saws.

Where a particular subclause of Part 1 is not mentioned in this Part 2-11, that subclause applies as far as relevant. Where this standard states "addition", "modification" or "replacement", the relevant text in Part 1 is to be adapted accordingly.

The following print types are used:

– requirements: in roman type

– *test specifications: in italic type;*

– notes: in small roman type

The terms defined in Clause 3 are printed in **bold typeface**.

Subclauses, notes and figures which are additional to those in Part 1 are numbered starting from 101.

A list of all parts of the IEC 62841 series, under the general title: *Electric motor-operated hand-held tools, transportable tools and lawn and garden machinery – Safety*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore. iec. ch" in the data related to the specific publication. At this date, the publication will be

• reconfirmed,

• withdrawn,

• replaced by a revised edition, or

• amended.

NOTE The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.
It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 36 months from the date of publication.

101DV DE *Modification: Add the following to the IEC Foreword:*

The numbering system in the standard uses a space instead of a comma to indicate thousands and uses a comma instead of a period to indicate a decimal point. For example, 1 000 means 1,000 and 1,01 means 1.01.

102DV DE *Modification: Add the following to the IEC Foreword:*

For this Standard, all references to "Part 1" refer to CAN/CSA-C22.2 No. 62841-1 and UL 62841-1.

ELECTRIC MOTOR-OPERATED HAND-HELD TOOLS, TRANSPORTABLE TOOLS AND LAWN AND GARDEN MACHINERY – SAFETY – PART 2-11: PARTICULAR REQUIREMENTS FOR RECIPROCATING SAWS

1 Scope

This clause of Part 1 is applicable except as follows:

Addition:

This part of IEC 62841 applies to hand-held **reciprocating saws** such as **jig saws** and **sabre saws**.

2 Normative references

This clause of Part 1 is applicable except as follows:

Addition:

ISO 16893-1:2008,
Wood based panels – Particleboard – Part 1: Classifications

3 Terms and definitions

This clause of Part 1 is applicable except as follows:

Additional definitions:

3.101 **reciprocating saw:** tool intended for cutting various materials with a blade or blades acting in a reciprocating or oscillating motion

3.102 **jig saw: reciprocating saw** with a base plate that may allow bevel adjustments

Note 1 to entry: Typical designs of **jig saws** are shown in Figure 102.

3.103 **sabre saw: reciprocating saw** with a guide plate that may allow tilting movements

Note 1 to entry: Typical designs of **sabre saws** are shown in Figure 103.

4 General requirements

This clause of Part 1 is applicable.

5 General conditions for the tests

This clause of Part 1 is applicable except as follows

5.17 *Addition:*

The mass of the tool includes the dust extraction adapter, if any.

6 Radiation, toxicity and similar hazards

This clause of Part 1 is applicable.

7 Classification

This clause of Part 1 is applicable.

8 Marking and instructions

This clause of Part 1 is applicable except as follows:

8.14.1 *Addition:*

For **reciprocating saws**, the additional safety instructions as specified in 8.14.1.101 shall be given. This part may be printed separately from the “General Power Tool Safety Warnings”.

8.14.1.101 **Safety instructions for reciprocating saws**

a) **Hold the power tool by insulated gripping surfaces, when performing an operation where the cutting accessory may contact hidden wiring or its own cord.** *Cutting accessory contacting a "live" wire may make exposed metal parts of the power tool "live" and could give the operator an electric shock.*

b) **Use clamps or another practical way to secure and support the workpiece to a stable platform.** *Holding the workpiece by hand or against your body leaves it unstable and may lead to loss of control.*

NOTE The above warning is not applicable for garden saws for tree or hedge services.

8.14.2 b) *Addition:*

101) Instruction on the correct use of the dust collection system, if any;

102) Information regarding the cutting capacity;

103) Instruction on how to adjust the tool for different saw blade positions, if applicable.

8.14.2 c) *Addition:*

101) Instruction on how to properly clean/clear the chip ejection opening, if any.

9 Protection against access to live parts

This clause of Part 1 is applicable.

10 Starting

This clause of Part 1 is applicable.

11 Input and current

This clause of Part 1 is applicable.

12 Heating

This clause of Part 1 is applicable.

13 Resistance to heat and fire

This clause of Part 1 is applicable.

14 Moisture resistance

This clause of Part 1 is applicable.

15 Resistance to rusting

This clause of Part 1 is applicable.

16 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

17 Endurance

This clause of Part 1 is applicable.

18 Abnormal operation

This clause of Part 1 is applicable except as follows:

18.8 *Replacement of Table 4:*

Table 4
Required performance levels

Type and purpose of SCF	Minimum Performance Level (PL)
power switch – prevent unwanted switch-on	b
power switch – provide desired switch-off for jig saws	a
power switch – provide desired switch-off for sabre saws	b
Any electronic control to pass the test of 18.3	Not a **SCF**
Any speed limiting device	Not a **SCF**
Prevent exceeding thermal limits as in Clause 18	a
Prevent self-resetting as required in 23.3	b

19 Mechanical hazards

This clause of Part 1 is applicable except as follows:

19.1 *Replacement of the first paragraph:*

Moving and dangerous parts other than the saw blade shall be so positioned or enclosed to provide adequate protection against personal injury. Requirements for the saw blade are given in 19.101.

19.6 This subclause is not applicable.

19.101 **Saw blade barrier**

1) For **jig saws**

A barrier shall be provided to prevent inadvertent contact with the cutting edge of the saw blade above the plane of the base plate and from the front of the tool. The barrier shall not prevent the visual observation of the saw blade in contact with the workpiece.

Compliance is checked by inspection and by the following test.

*The **jig saw** is set for the right-angled cut. The test probe of Figure 101 a) is advanced in any single plane perpendicular to the saw blade and parallel to and above the plane of the base plate as shown in Figure 101 b) and Figure 101 c). The longitudinal axis of the test probe shall be perpendicular to the toothed edge of the saw blade. The test probe shall be equally shared about the central plane of the saw blade. When the test probe is moved towards the saw blade, it shall not be able to touch its toothed edge.*

2) For other types of **reciprocating saws**

If a **reciprocating saw** is designed with a grip zone adjacent and behind the saw blade, a barrier shall be provided to prevent inadvertent contact with the teeth of the saw blade in any saw blade position in accordance with 8.14.2 b) 103).

The barrier shall:

– be located between the grip zone and the teeth of the saw blade;

– have a minimum height of 6 mm above the grip surface; and

– extend a minimum of 6 mm on either side of the central plane of the saw blade, see Figure 104.

A barrier is not required if the tool is supplied with an auxiliary front handle.

Compliance is checked by inspection and by measurement.

20 Mechanical strength

This clause of Part 1 is applicable.

20.5 *Addition:*

Reciprocating saws are regarded as tools that are likely to cut into concealed wiring or their own cord.

21 Construction

This clause of Part 1 is applicable except as follows:

21.18.1 *Addition:*

For **jig saws**, power switches other than momentary power switches are permitted.

21.18.1.2 This subclause is not applicable.

21.30 *Addition:*

Reciprocating saws are regarded as tools that are likely to cut into concealed wiring or their own cord.

21.35 This subcluase is not applicable.

22 Internal wiring

This clause of Part 1 is applicable.

23 Components

This clause of Part 1 is applicable, except as follows:

23.3 *Replacement of the first paragraph:*

Protection devices (e.g. overload or over-temperature protection devices) or circuits that switch off the tool shall be of the non-self-resetting type unless the tool is equipped with a **momentary power switch** with no provision for being locked in the “on” position.

24 Supply connection and external flexible cords

This clause of Part 1 is applicable.

25 Terminals for external conductors

This clause of Part 1 is applicable.

26 Provision for earthing

This clause of Part 1 is applicable.

27 Screws and connections

This clause of Part 1 is applicable.

28 Creepage distances, clearances and distances through insulation

This clause of Part 1 is applicable.

Figure 101

Test probe

a) Details of test probe

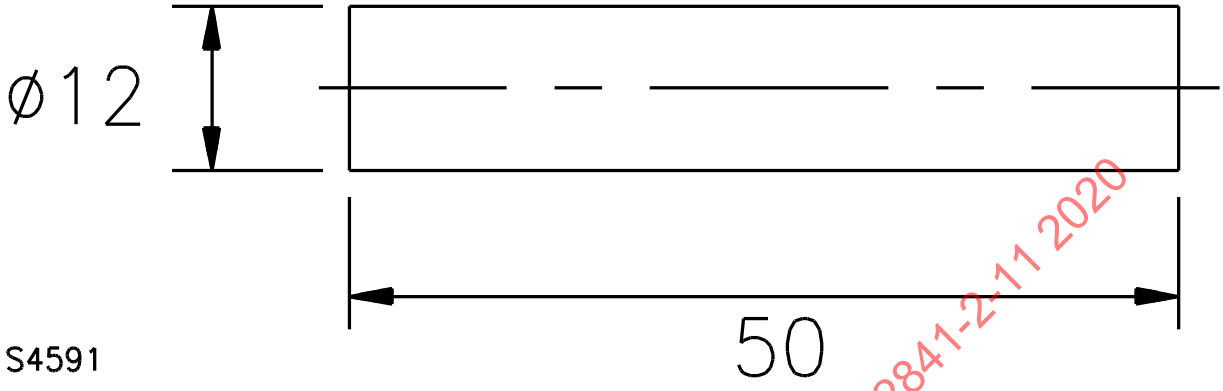
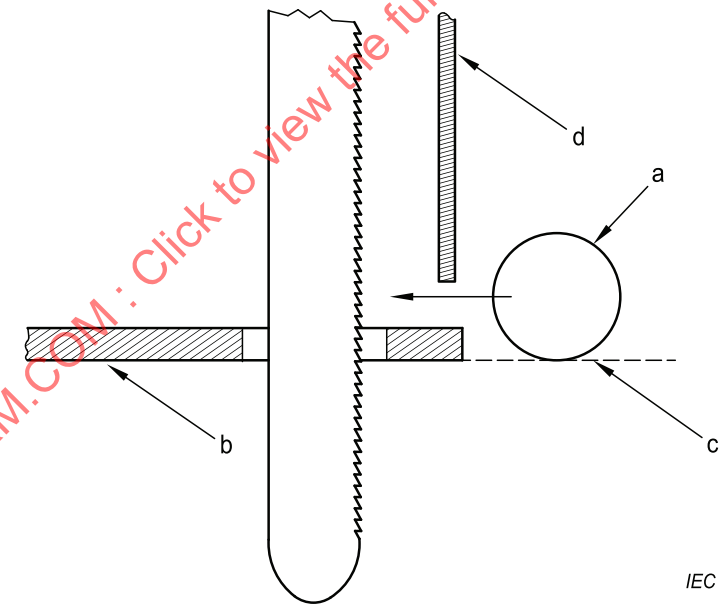


Figure 101

Test probe

b) Side section showing position and direction of movement of test probe

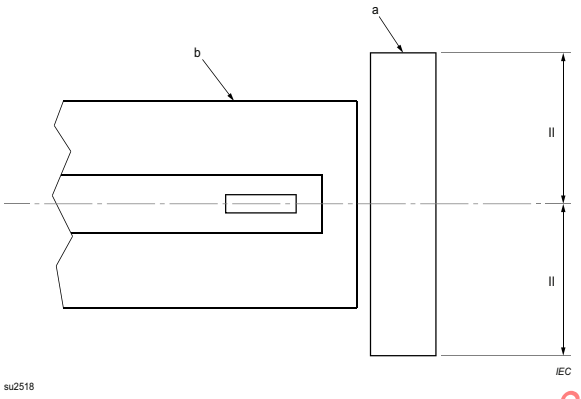


NOTE Upper structure of saw, which should prevent the test probe touching the saw blade, is omitted for simplicity.

Figure 101

Test probe

c) Plan view of guide plate showing position of test probe



NOTE Upper structure of saw is omitted for simplicity.

Key

a test probe

b base plate

c plane of base plate

d barrier

Figure 102

Typical designs of jig saws

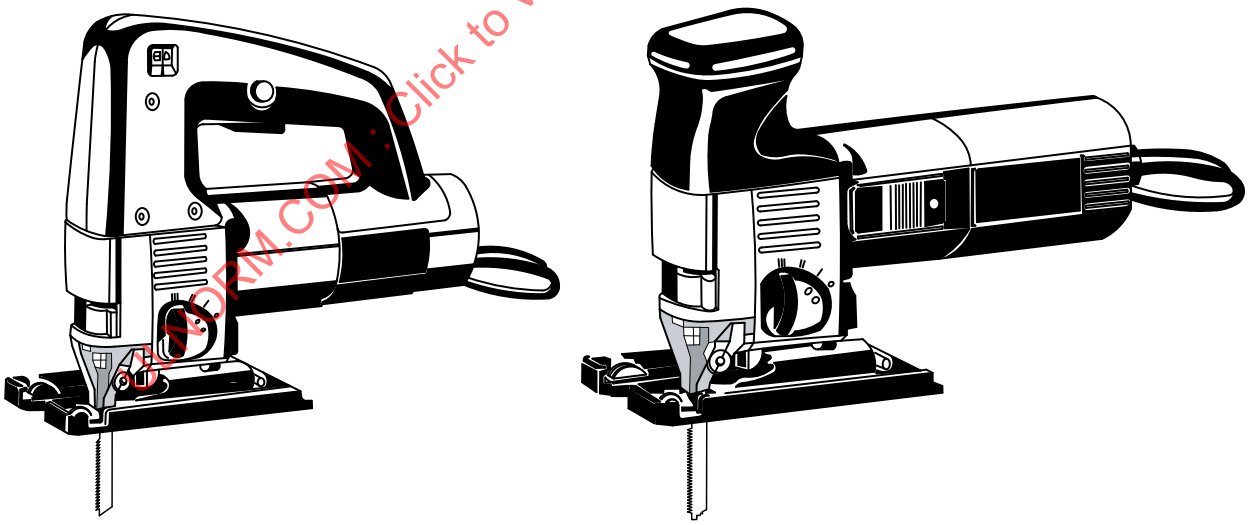


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Figure 103

Typical designs of sabre saws

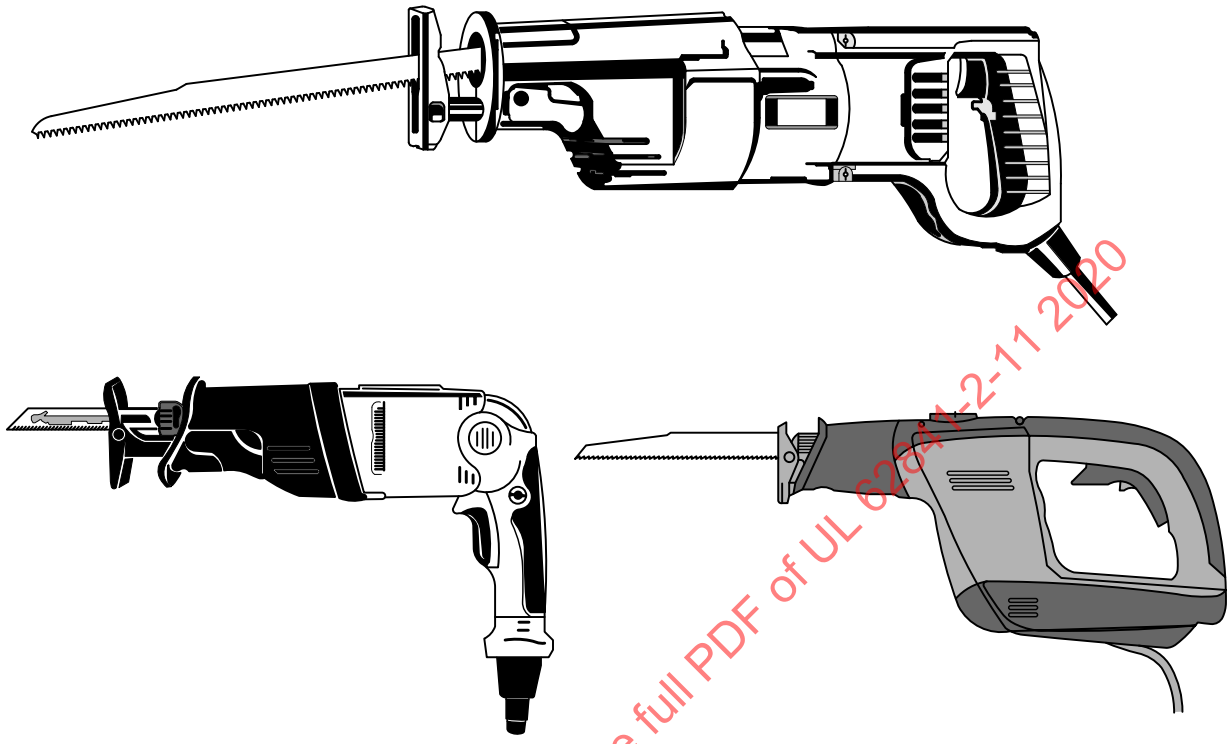

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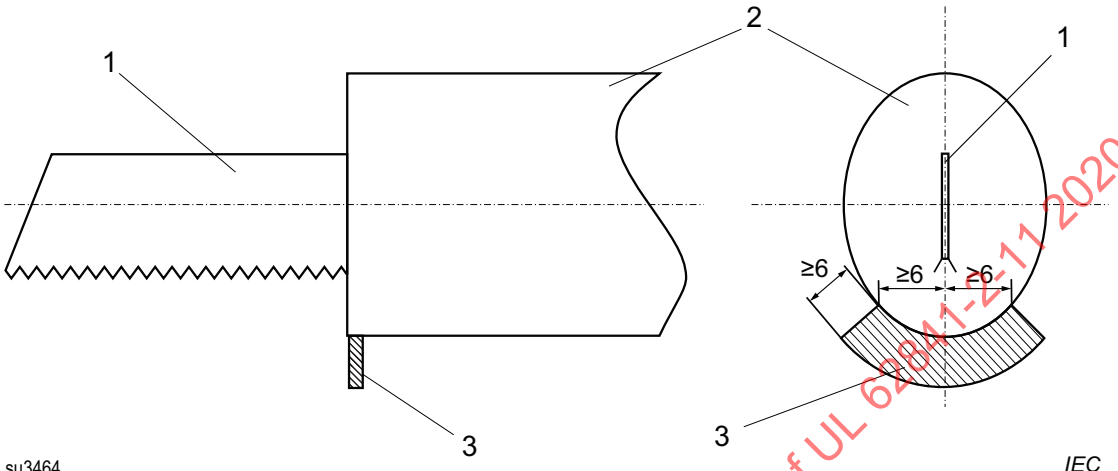
Figure 104

Minimum dimensions of barrier

Dimensions in millimetres



Key

1 saw blade

2 grip surface

3 barrier

Annexes

The annexes of Part 1 are applicable except as follows.

Annex I
(informative)

Measurement of noise and vibration emissions

NOTE In Europe (EN 62841-2-11), Annex I is normative.

I.2 Noise test code (grade 2)

This clause of Part 1 is applicable except as follows:

I.2.4 Installation and mounting conditions of the power tools during noise tests

Addition:

Reciprocating saws are suspended in such a way as to correspond to **normal use**.

I.2.5 Operating conditions

Addition:

Reciprocating saws are tested at no-load, fitted with the smallest saw blade as specified for sawing chipboard. Pendulum systems, if any, are set to the maximum. Speed settings, if any, are adjusted to the highest value.

NOTE Experimental investigations have shown that the noise emission values of **reciprocating saws** at no-load and under load are very similar. For reasons of simplification, the noise emission is therefore measured at no-load.

The temperature requirements of 5.6 are not applicable.

I.2.9 Declaration and verification of noise emission values

Replacement of the second paragraph:

For a standard deviation of reproducibility of the method σ_{R0} of 1,5 dB and for a typical standard deviation of production, the values for the uncertainties, K_{pA} and K_{WA} respectively, are expected to be 5 dB.

NOTE 101 The values K_{pA} and K_{WA} are higher, because they include the noise emission under load.

I.3 Vibration

This clause of Part 1 is applicable except as follows:

I.3.3.2 Location of measurement

Addition:

Figure I.103 and Figure I.104 show the positions for different saws.

I.3.5.3 Operating conditions

Addition:

Reciprocating saws are tested under load according to the conditions shown in Table I.101, Table I.102 and Table I.103.

Jig saws are tested sawing both board and sheet metal. **Sabre saws** are tested cutting board and, for saws with a cutting capacity greater than or equal 100 mm in accordance with 8.14.2 b) 4), also cutting wooden beams.

Sabre saws and **jig saws** with speed setting devices shall be adjusted, as specified by the manufacturer, to the settings to cut the work piece material required in the test. If there is no specification by the manufacturer, the speed is set to maximum.

Table I.101
Test conditions for sabre and jig saws cutting board

Orientation	**For jig saws:** Cutting a horizontal piece of particleboard (chipboard), class P-LB-Reg in accordance with ISO 16893-1:2008, density (610 ± 60) kg/m^3, (38 ± 2) mm thick with a minimum length of 500 mm and a width of approximately 600 mm. The board shall be supported on resilient material and fixed by screws, clamps, air cylinders or the like to a test rig, see Figure I.101. **For sabre saws:** Cutting a vertical piece of particleboard (chipboard), class P-LB-Reg in accordance with ISO 16893-1:2008, density (610 ± 60) kg/m^3, (38 ± 2) mm thick with a minimum length of 500 mm and a width of approximately 600 mm. The board shall be supported on resilient material and fixed vertically by screws, clamps, air cylinders or the like to a test rig, see Figure I.102. In all cases, the board excess end shall be approximately 250 mm from the clamp and shall be readjusted at the beginning of each series of tests, which consists of five test cycles. During the entire cut, the saw blade shall be perpendicular to the board.
Tool bit/settings	New saw blade for the entire series of tests as specified for sawing chipboard. The saw blade used shall be recorded. Pendulum systems, if any, being set as specified by the manufacturer for cutting chipboard. If not specified by the manufacturer, pendulum systems are set to maximum. For sabre saws, the guide plate shall be fitted.
Feed force	**For jig saws:** The horizontal feed force (force in direction of the cut) applied to the tool shall be (35 ± 5) N. Excessive gripping force shall be avoided. The downward force applied to the tool shall not exceed the force to ensure contact of the base plate with the workpiece by more than 30 N. The feed force and the downward force shall be determined e.g. by means of a scale and shall be recorded. **For sabre saws:** The vertical feed force (downward force in direction of the cut) applied to the tool in addition to its weight shall be (40 ± 5) N. Excessive gripping force shall be avoided. The horizontal force applied to the tool shall not exceed the force to ensure contact of the guide plate with the workpiece by more than 30 N. The feed force and the horizontal force shall be determined e.g. by means of a scale and shall be recorded.
Test cycle	Cutting off an approximately 30 mm wide strip across the 600 mm width of the chipboard. Measurement starts when the saw blade enters the chipboard and stops when the saw blade leaves the chipboard.

Table I.102
Test conditions for jig saws cutting sheet metal

Orientation	Cutting a horizontal piece of sheet mild steel with the minimum length of 300 mm, a minimum width of 100 mm and a thickness of approximately 3 mm. The workpiece shall be supported on resilient material and fixed by screws, clamps, air cylinders or the like to a test rig, see Figure I.101. The metal sheet excess shall be approximately 80 mm from the clamped area and shall be readjusted at the beginning of each series of tests, which consists of five test cycles.
Tool bit/settings	New saw blade for the entire series of tests as specified for sawing mild steel. The saw blade used shall be recorded. The pendulum system, if any, shall be in the "off" position.
Feed force	The horizontal feed force (force in direction of the cut) applied to the tool shall be (35 ± 5) N. Excessive gripping force shall be avoided. The downward force applied to the tool shall not exceed the force to ensure contact of the base plate with the workpiece by more than 30 N. The feed force and the downward force shall be determined e.g. by means of a scale and shall be recorded.
Test cycle	Cutting off an approximately 8 mm wide strip across the 100 mm width of the metal sheet. Measurement starts when the saw blade enters the metal sheet and stops when the saw blade leaves the metal sheet.

Table I.103
Test conditions for sabre saws cutting wooden beams

Orientation	Cutting a horizontal beam of construction wood such as fir with a cross-section of (100 ± 5) mm × (100 ± 5) mm and a minimum length of 500 mm. The beam shall be supported on resilient material and fixed by screws, clamps, air cylinders or the like to a test rig, see Figure I.102. In all cases, the beam excess end shall be approximately 250 mm from the clamp and shall be readjusted at the beginning of each series of tests, which consists of five test cycles. During the test, the operator may use swivel action to allow proper chip ejection.
Tool bit/settings	New saw blade for the entire series of tests as specified for sawing large wooden beams. The saw blade used shall be recorded. Pendulum systems, if any, being set as specified by the manufacturer for cutting wooden beams. If not specified by the manufacturer, pendulum systems are set to maximum. The guide plate shall be fitted.
Feed force	The vertical feed force (force in direction of the cut) applied to the tool in addition to its weight shall be (40 ± 5) N. Excessive gripping force shall be avoided. The horizontal force applied to the tool shall not exceed the force to ensure contact of the guide plate with the workpiece by more than 30 N. The feed force and the horizontal force shall be determined e.g. by means of a scale and shall be recorded.
Test cycle	Cutting off an approximately 30 mm thick slice. Measurement starts when the saw blade enters the wood and stops when the saw blade leaves the wood.

I.3.6.1 **Reported vibration value**

Replacement:

Three series of five consecutive tests shall be carried out using a different operator for each series. If it can be shown that the vibration is not affected by operator characteristics, it is acceptable to perform all 15 measurements with one operator only.

The measurements are made in three axes and the results of each direction shall be combined using formula (I.3) to obtain the vibration total value a_{hv}.

The measurement result a_h shall be determined as the arithmetic mean of vibration total values over the tests and operators.

For **jig saws**, the results a_h for two operation modes shall be reported:

– $a_{h,B}$ = mean vibration "cutting board" in accordance with Table I.101.

– $a_{h,M}$ = mean vibration "cutting sheet metal" in accordance Table I.102.

For **sabre saws**, the results a_h for two operation modes shall be reported:

– $a_{h,B}$ = mean vibration "cutting board" in accordance with Table I.101.

– $a_{h,WB}$ = mean vibration "cutting sheet metal" in accordance Table I.103.

I.3.6.2 **Declaration of the vibration total value**

Addition:

The vibration total value of the handle with the highest emission and the uncertainty *K* shall be declared together with the saw blade used:

– for **jig saws**

the value of $a_{h,B}$, with the work mode description "cutting boards with saw blade ..." and the value of $a_{h,M}$, with the work mode description "cutting sheet metal with saw blade ...";

– for **sabre saws**

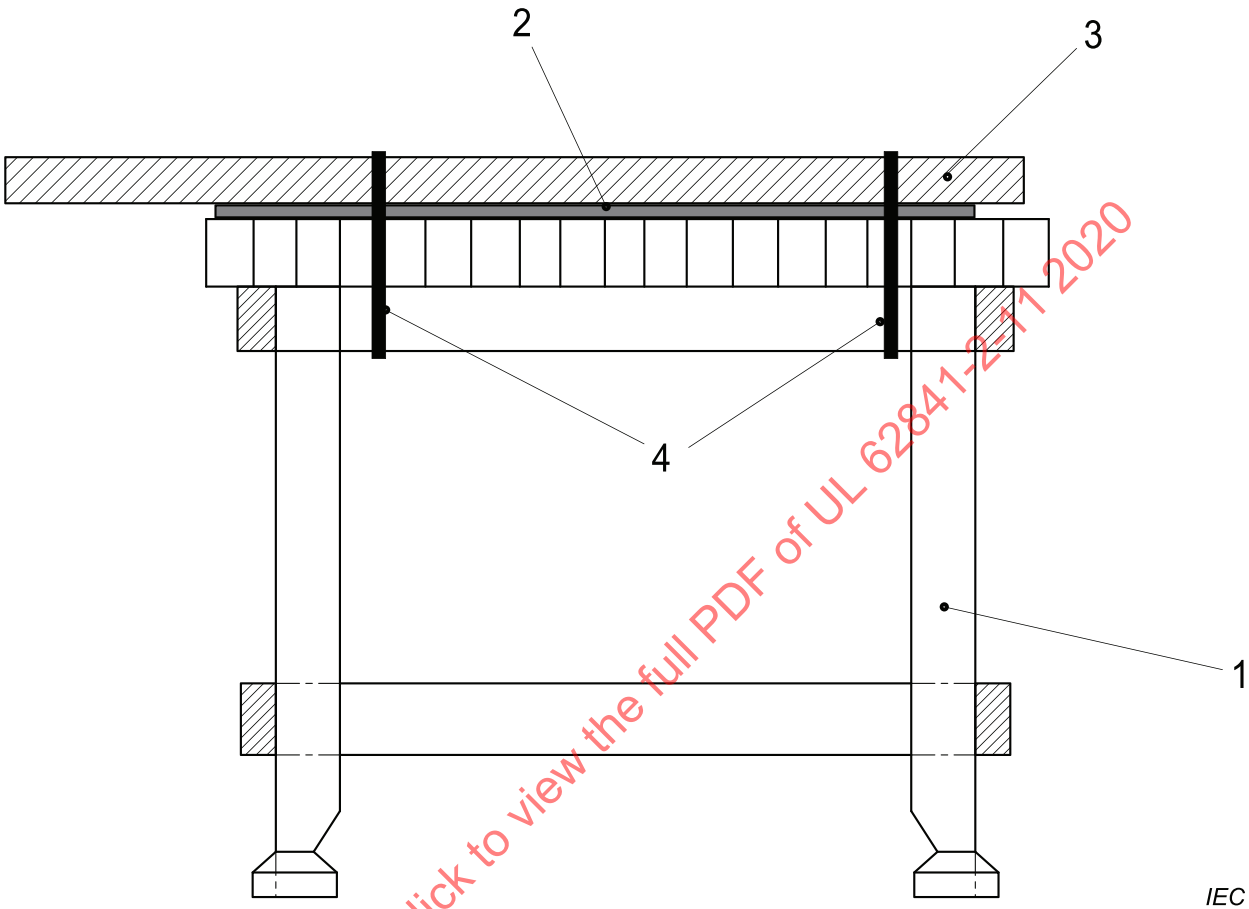
the value of $a_{h,B}$, with the work mode description "cutting boards with saw blade ..." and the value of $a_{h,WB}$, with the work mode description "cutting wooden beams with saw blade ...".

NOTE The saw blade significantly influences the vibration behaviour. Therefore the combination of the vibration value along with the saw blade used for the test provides important information.

Figure I.101

Test set-up for jig saws

a) Front view



Key

1 test bench of Figure I.1

2 resilient material

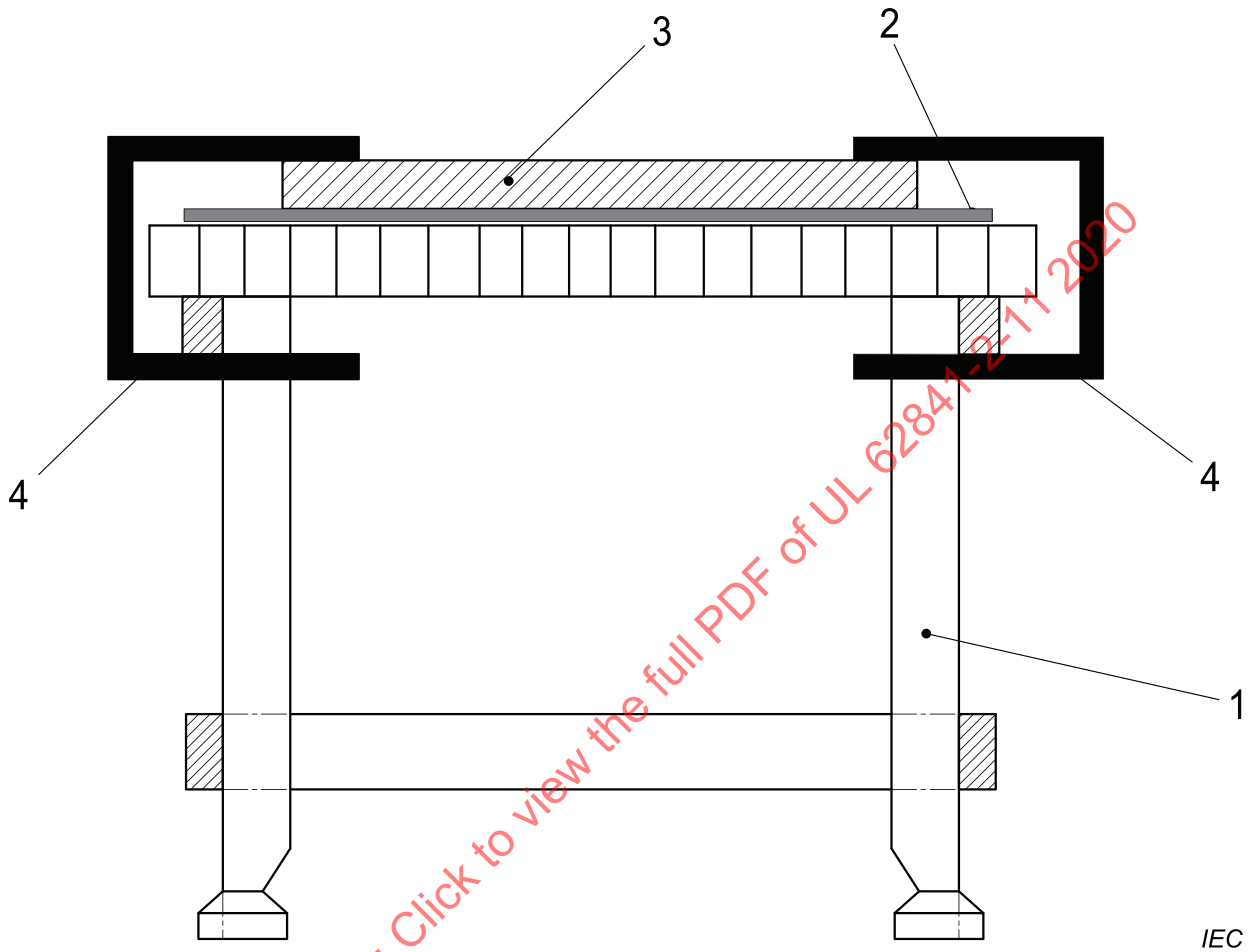
3 workpiece

4 fixing means (e.g. clamps)

Figure I.101

Test set-up for jig saws

b) Side view



Key

1 test bench of Figure I.1

2 resilient material

3 workpiece

4 fixing means (e.g. clamps)