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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Hand-held motor-operated electric tools – Safety –
Part 2-5: Particular requirements for circular saws

Outils électroportatifs à moteur – Sécurité –
Partie 2-5: Règles particulières pour les scies circulaires

IEC 60745-2-5:2010

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

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Email: csc@iec.ch
Tél.: +41 22 919 02 11
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Outils électroportatifs à moteur – Sécurité – Partie 2-5: Règles particulières pour les scies circulaires

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HAND-HELD MOTOR-OPERATED ELECTRIC TOOLS – SAFETY –

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FOREWORD

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.
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International Standard IEC 60745-2-5 has been prepared by IEC technical committee 116: Safety of hand-held motor-operated electric tools.

This fifth edition cancels and replaces the fourth edition published in 2006, of which it constitutes a technical revision.

Main changes include: in Clause 17, Endurance: introduction of endurance tests in practical use for the guards of all types of saws; in Clause 19, Mechanical hazards: clarifications and editorial improvement in respect to the guarding; and in Annex M, Safety of working stands for operation with hand-held motor-operated electric tools: editorial improvements.

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

FDIS	Report on voting
116/41/FDIS	116/52/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 2-5 is to be used in conjunction with the fourth edition of IEC 60745-1, *Hand-held motor-operated electric tools – Safety – Part 1: General requirements*. It was established on the basis of the fourth edition (2006) of that standard.

NOTE 1 When "Part 1" is mentioned in this standard, it refers to IEC 60745-1.

This part 2 supplements or modifies the corresponding clauses of IEC 60745-1, so as to convert that publication into the IEC standard: Safety requirements for circular saws.

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

NOTE 2 The following numbering system is used:

– subclauses, items, tables and figures that are numbered starting from 101 are additional to those in Part 1;
– additional annexes are lettered AA, BB, etc.

NOTE 3 In this standard, the following print types are used:

– requirements: in roman type;
– *test specifications: in italic type*;
– notes: in smaller roman type.

A list of all parts of the IEC 60745 series, under the general title: *Hand-held motor-operated electric tools – 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.

HAND-HELD MOTOR-OPERATED ELECTRIC TOOLS – SAFETY –

Part 2-5: Particular requirements for circular saws

1 Scope

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

Addition:

This standard applies to circular saws, which hereinafter will be referred to as saws.

This standard does not apply to saws designed for use with abrasive wheels.

NOTE Saws designed for use with abrasive wheels as cut-off machines are covered by IEC 60745-2-22.

2 Normative references

This clause of Part 1 is applicable.

3 Terms and definitions

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

Additional definitions:

3.101
circular saw
tool intended for cutting various materials with a rotating toothed blade

3.102
cutting edge zone
the outer 20 % of the blade's radius

3.103
base plate
the part supporting the saw on the material being cut (see Figure 113)

3.104
lower guard
movable blade-covering device which, in the closed or rest position, is mainly situated below the base plate

3.105
upper guard
fixed and/or movable cover of the blade situated above the base plate

3.106
riving knife
metal part placed in the plane of the saw blade with the intent of preventing the workpiece from closing on the rear part of the saw blade

3.107
saw with outer pendulum guard
saw having a lower guard which swings outside the upper guard (see Figure 101)

3.108
saw with inner pendulum guard
saw having a lower guard which swings inside the upper guard (see Figure 102)

3.109
saw with tow guard
saw having a lower guard which slides along the upper guard (see Figure 103)

3.110
kickback
sudden reaction to a pinched, bound or misaligned saw blade, causing an uncontrolled saw to lift up and out of the workpiece

3.111
plunge type saw
saw having only an upper guard into which the saw blade retracts when not in use (see Figure 104)

4 General requirements

This clause of Part 1 is applicable.

5 General conditions for the tests

This clause of Part 1 is applicable.

6 Void

7 Classification

This clause of Part 1 is applicable.

8 Marking and instructions

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

8.1 *Addition:*

Saws shall be marked with:

– direction of rotation of the spindle, indicated on the tool by an arrow, raised or recessed or by any other means no less visible and indelible;
– rated no-load speed of the output spindle;
– specified blade diameter or blade diameter range.

Additional subclause:

8.12.1.101 The following additional safety instructions shall be given. If in English they shall be verbatim and in the following order as applicable and equivalent in any other language. This part may be printed separately from the general safety instructions.

All notes are not to be printed, they are information for the designer of the manual.

8.12.1.101.1 Safety instructions for all saws

Cutting procedures

a) **DANGER: Keep hands away from cutting area and the blade. Keep your second hand on auxiliary handle, or motor housing**. *If both hands are holding the saw, they cannot be cut by the blade.*

NOTE For circular saws with 140 mm or smaller diameter blades, the "Keep your second hand on auxiliary handle, or motor housing" may be omitted.

b) **Do not reach underneath the workpiece.** *The guard cannot protect you from the blade below the workpiece.*

c) **Adjust the cutting depth to the thickness of the workpiece.** *Less than a full tooth of the blade teeth should be visible below the workpiece.*

d) **Never hold piece being cut in your hands or across your leg. Secure the workpiece to a stable platform.** *It is important to support the work properly to minimize body exposure, blade binding, or loss of control.*

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

f) **When ripping, always use a rip fence or straight edge guide.** *This improves the accuracy of cut and reduces the chance of blade binding.*

g) **Always use blades with correct size and shape (diamond versus round) of arbour holes.** *Blades that do not match the mounting hardware of the saw will run eccentrically, causing loss of control.*

h) **Never use damaged or incorrect blade washers or bolt.** *The blade washers and bolt were specially designed for your saw, for optimum performance and safety of operation.*

8.12.1.101.2 Further safety instructions for all saws

Kickback causes and related warnings

– kickback is a sudden reaction to a pinched, bound or misaligned saw blade, causing an uncontrolled saw to lift up and out of the workpiece toward the operator;

– when the blade is pinched or bound tightly by the kerf closing down, the blade stalls and the motor reaction drives the unit rapidly back toward the operator;

– if the blade becomes twisted or misaligned in the cut, the teeth at the back edge of the blade can dig into the top surface of the wood causing the blade to climb out of the kerf and jump back toward the operator.

Kickback is the result of saw misuse and/or incorrect operating procedures or conditions and can be avoided by taking proper precautions as given below.

a) **Maintain a firm grip with both hands on the saw and position your arms to resist kickback forces. Position your body to either side of the blade, but not in line with the blade.** *Kickback could cause the saw to jump backwards, but kickback forces can be controlled by the operator, if proper precautions are taken.*

NOTE For circular saws with 140 mm or smaller diameter blades, the words "with both hands" may be omitted.

b) **When blade is binding, or when interrupting a cut for any reason, release the trigger and hold the saw motionless in the material until the blade comes to a complete stop. Never attempt to remove the saw from the work or pull the saw backward while the blade is in motion or kickback may occur.** *Investigate and take corrective actions to eliminate the cause of blade binding.*

c) **When restarting a saw in the workpiece, centre the saw blade in the kerf and check that saw teeth are not engaged into the material.** *If saw blade is binding, it may walk up or kickback from the workpiece as the saw is restarted.*

d) **Support large panels to minimise the risk of blade pinching and kickback.** *Large panels tend to sag under their own weight. Supports must be placed under the panel on both sides, near the line of cut and near the edge of the panel.*

e) **Do not use dull or damaged blades.** *Unsharpened or improperly set blades produce narrow kerf causing excessive friction, blade binding and kickback.*

f) **Blade depth and bevel adjusting locking levers must be tight and secure before making cut.** *If blade adjustment shifts while cutting, it may cause binding and kickback.*

g) **Use extra caution when sawing into existing walls or other blind areas.** *The protruding blade may cut objects that can cause kickback.*

8.12.1.101.3 Safety instructions for saws shown in Figures 101, 102 and 103

Lower guard function

a) **Check lower guard for proper closing before each use. Do not operate the saw if lower guard does not move freely and close instantly. Never clamp or tie the lower guard into the open position.** *If saw is accidentally dropped, lower guard may be bent. Raise the lower guard with the retracting handle and make sure it moves freely and does not touch the blade or any other part, in all angles and depths of cut.*

NOTE Alternate wording may be substituted for "retracting handle."

b) **Check the operation of the lower guard spring. If the guard and the spring are not operating properly, they must be serviced before use.** *Lower guard may operate sluggishly due to damaged parts, gummy deposits, or a build-up of debris.*

c) **Lower guard may be retracted manually only for special cuts such as "plunge cuts" and "compound cuts".** Raise lower guard by retracting handle and as soon as blade enters the material, the lower guard must be released. *For all other sawing, the lower guard should operate automatically.*

NOTE Alternate wording may be substituted for "retracting handle."

d) **Always observe that the lower guard is covering the blade before placing saw down on bench or floor.** *An unprotected, coasting blade will cause the saw to walk backwards, cutting whatever is in its path. Be aware of the time it takes for the blade to stop after switch is released.*

8.12.1.101.4 Safety instructions for saws shown in Figure 104

Guard function

a) **Check guard for proper closing before each use. Do not operate the saw if guard does not move freely and enclose the blade instantly. Never clamp or tie the guard so that the blade is exposed.** *If saw is accidentally dropped, guard may be bent. Check to make sure that guard moves freely and does not touch the blade or any other part, in all angles and depths of cut.*

b) **Check the operation and condition of the guard return spring. If the guard and the spring are not operating properly, they must be serviced before use.** *Guard may operate sluggishly due to damaged parts, gummy deposits, or a build-up of debris.*

c) **Assure that the base plate of the saw will not shift while performing the “plunge cut” when the blade bevel setting is not at 90°.** *Blade shifting sideways will cause binding and likely kick back.*

d) **Always observe that the guard is covering the blade before placing saw down on bench or floor.** *An unprotected, coasting blade will cause the saw to walk backwards, cutting whatever is in its path. Be aware of the time it takes for the blade to stop after switch is released.*

8.12.1.101.5 Additional safety instructions for all saws with riving knife

Riving knife function

a) **Use the appropriate saw blade for the riving knife.** *For the riving knife to function, the body of the blade must be thinner than the riving knife and the cutting width of the blade must be wider than the thickness of the riving knife.*

b) **Adjust the riving knife as described in this instruction manual.** *Incorrect spacing, positioning and alignment can make the riving knife ineffective in preventing kickback.*

c) **Always use the riving knife except when plunge cutting.** *Riving knife must be replaced after plunge cutting. Riving knife causes interference during plunge cutting and can create kickback.*

NOTE This warning is not applicable for plunge type saws with a spring loaded riving knife

d) **For the riving knife to work, it must be engaged in the workpiece.** *The riving knife is ineffective in preventing kickback during short cuts.*

e) **Do not operate the saw if riving knife is bent.** *Even a light interference can slow the closing rate of a guard.*

8.12.2 a) *Addition:*

101) Instructions not to use any abrasive wheels.

102) For saws with riving knife the instruction shall include the following:

– instructions to ensure that the riving knife is adjusted so that the distance between the riving knife and the rim of the blade is not more than 5 mm, and the rim of the blade does not extend more than 5 mm beyond the lowest edge of the riving knife;

– information about the allowed range of saw blade body thickness and the tooth set of the blade.

103) Instructions to use only blade diameter(s) in accordance with the markings.

8.12.2 b) *Addition:*

101) Instructions for the blade changing procedure.

102) Instruction how to check the function of all blade guard operations.

103) Information regarding what materials can be cut. Instructions to avoid overheating the blade tips and, if cutting plastics is permitted, to avoid melting the plastic.

104) Instruction on the correct use of the dust collection system.

8.12.2 c) *Addition:*

101) Instructions how to properly clean the tool and guarding system.

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 Leakage current

This clause of Part 1 is applicable.

14 Moisture resistance

This clause of Part 1 is applicable.

15 Electric strength

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, except as follows:

Additional subclauses:

17.101 To provide sufficient endurance for extended use, the lower guard as shown in Figures 101, 102 and 103, or the guarding system as shown in Figure 104, shall have a longevity of 50 000 operating cycles.

Compliance is checked by a new saw sample completing the following test.

The saw is to be set for 90° with the base plate in horizontal position and the blade removed. The lower guard, or the guarding system as shown in Figure 104, is retracted from the fully closed position to the maximum open working position and then released. This sequence is repeated at a rate not less than 10 cycles per minute.

The sample used for this test may be positioned in a manner other than horizontal provided that it can be shown that the alternate position is equal or more severe.

After completion of cycling test as specified above, the saw shall then comply with the tests of 17.101.1 and 17.101.2.

17.101.1 *The test and measurement is carried out at maximum depth of cut and 90°. The saw is held by the handles with the base plate in a horizontal position, the upper guard being at the top.*

Without any restoration or cleaning, the lower guard as shown in Figures 101, 102 and 103, or the guarding system as shown in Figure 104, is retracted fully and then allowed to close. The closing time from the fully open position to the fully closed position shall not exceed 0,3 s.

17.101.2 *The following tests and measurements are carried out at maximum depth of cut, at 90° and in the following positions:*

a) The saw is held with the base plate in the horizontal position, with the upper guard being at the top.

b) The saw is then held with the base plate in the vertical position, with the front of the saw pointing upwards.

For saws using a guarding system as shown in Figures 101 and 102, the lower guard is retracted fully and then allowed to close. Without any alteration, the final position of the lower guard in both cases shall be in contact with the lower guard stopper and shall not change as a result of moving the base plate to a minimum depth of cut setting and the guarding shall comply with the requirements of 19.102.3.

For saws using a guarding system as shown in Figures 103 and 104, the lower guard, or the guarding system as shown in Figure 104, is fully retracted, released and then shall lock in the blade covering position.

17.102 The lower guard, or the guarding system as shown in Figure 104, shall be resistant against environmental and foreseeable dust accumulation.

Compliance is checked by the tests of 17.102.1 and 17.102.2, as applicable.

17.102.1 *For a saw intended to cut wood based materials, a new saw sample is subjected to 1 000 cuts through each of the materials and in the order as specified below:*

d) crosscutting soft wood;

e) crosscutting plywood with a minimum of 5 layers;

f) cutting standard medium density fibreboard (MDF) with a density between 650 kg/m³ and 850 kg/m³.

The materials are stored indoors for 72 h prior to sawing. The thickness and length of each material to be cut may vary in size, provided the thickness of the material is minimum 10 mm and the cross sectional area of each cut is at least 30 mm × D, where D is the blade diameter.

During each cut, the lower guard or the guarding system shall cycle from the fully closed position to the maximum open working position for each cutting cycle, without manual assistance. Moreover, for plunge saws with a spring loaded riving knife, the riving knife shall cycle from its fully extended to the fully retracted position.

If the lower guard, guarding system or the riving knife fails to return to its normal position at any time during the test, this is considered a failure.

Each cut is made with the saw set to 90° and maximum depth of cut. The cutting is conducted with a general purpose combination blade or the blade provided with the tool. An external dust extraction system attached to the saw shall not be used. A non-detachable dust collection system shall be maintained per 8.12.2. b) 104).

NOTE Adequate room ventilation and use of personal protective equipment is recommended.

After completion of all cuts as specified above, the saw is conditioned for 24 h in air at a relative humidity of (93 ± 3) %. The temperature of the air is maintained within 1 K of any convenient value between 20 °C and 30 °C.

The saw shall then comply with the tests of 17.101.1 and 17.101.2.

17.102.2 *For a saw intended to cut materials such as plastic, metal or masonry, a new saw sample for each specified material is subjected to the tests as specified below.*

– *Plastics: 1 000 cuts through PVC. The thickness and length of the material may vary in size, provided the cross sectional area of each cut is at least $0{,}012 \times D^2$, where D is the blade diameter.*

NOTE 1 The above formula simulates the cross sectional area of typical PVC pipes of a diameter approximately equal to 2/3 of the maximum cutting capacity of the saw. Sawing of such pipes is the predominant application for plastic.

– *Metals: 200 cuts through soft steel. The thickness and length of the material may vary in size, provided the cross sectional area of each cut is at least $0{,}13 \times D^{1{,}46}$ in mm^2, where D is the blade diameter in mm.*

NOTE 2 The above formula simulates the cross sectional area of typical metal pipes of a diameter approximately equal to 1/2 of the maximum cutting capacity of the saw. Sawing of such pipes is the predominant application for metal.

– *Masonry: 500 cuts through masonry fibreboard (fibre cement board). The thickness and length of the fibreboard may vary in size, provided the thickness of the material is minimum 10 mm and the cross sectional area of each cut is at least 30 mm × D, where D is the blade diameter.*

During each cut, the lower guard or the guarding system shall cycle from the fully closed position to the maximum open working position for each cutting cycle, without manual assistance. Moreover, for plunge saws with a spring loaded riving knife, the riving knife shall cycle from its fully extended to the fully retracted position.

If the lower guard, guarding system or the riving knife fails to return to its normal position at any time during the test, this is considered a failure.

Each cut is made with the saw set to 90°. The depth of cut, the saw blade and the rate of sawing shall be as specified for the respective material. An external dust extraction system attached to the saw shall not be used. A non-detachable dust collection system shall be maintained per 8.12.2. b) 104).

NOTE 3 Adequate room ventilation and use of personal protective equipment is recommended.

After completion of all cuts as specified above, the saw is conditioned for 24 h in air at a relative humidity of (93 ± 3) %. The temperature of the air is maintained within 1 K of any convenient value between 20 °C and 30 °C.

The saw shall then comply with the tests of 17.101.1 and 17.101.2.

18 Abnormal operation

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

18.10.4 *Addition:*

During these tests, the speed of the spindle shall not exceed 130 % of the rated no-load speed.