# UL 62841-3-10

## STANDARD FOR SAFETY

Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 3-10: Particular Requirements for Transportable Cut-Off Machines

UL Standard for Safety for Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 3-10: Particular Requirements for Transportable Cut-Off Machines, UL 62841-3-10

First Edition, Dated August 5, 2016

***Summary of Topics***

***The revisions to ANSI/UL 62841-3-10, dated June 22, 2018, were issued to incorporate the following into the standard and to reflect the latest ANSI approval date.***

***Revisions To Clause 19.101.2.1 To Clarify That Guarding Is Required If Any One Of The Three Elements Is Not Circular***

***This standard is an adoption of IEC 62841-3-10, Edition 1, published by the IEC September 2015. 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 revised requirements are substantially in accordance with Proposal(s) on this subject dated April 13, 2018.

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First Edition
(IEC 62841-3-10:2015, MOD)

Underwriters Laboratories Inc.
UL 62841-3-10
First Edition

# Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 3-10: Particular Requirements For Transportable Cut-Off Machines

August 5, 2016

(Title Page Reprinted: June 22, 2018)

This national standard is based on publication IEC 62841-3-10 First Edition (2015).



ANSI/UL 62841-3-10-2018

**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 anytime. 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 inquires@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 June 22, 2018. The most recent designation of ANSI/UL 62841-3-10 as an American National Standard (ANSI) occurred on June 22, 2018. 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.

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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 3-10: Particular Requirements for Transportable Cut-Off Machines. It is the First edition of CAN/CSA-C22.2 No. 62841-3-10 and the First edition of UL 62841-3-10. This harmonized Standard has been jointly revised on June 22, 2018. For this purpose, CSA Group and UL are issuing revision pages June 22, 2018.

This harmonized standard is based on IEC Publication 62841-3-10: First edition Standard For Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 3-10: Particular Requirements for Transportable Cut-Off Machines issued September 2015. IEC publication 62841-3-10 is copyrighted by the IEC.

Note: At the time of this publication, IEC 62841-3-10:2015, Edition 1 is available from IEC in English only. CSA Group will publish the French version when it becomes available from 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 approved as a National Standard of Canada by the Standards Council of Canada.



### 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. 62841-3-10, Standard For Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 3-10: Particular Requirements for Transportable Cut-Off Machines is to be used in conjunction with the First edition of CAN/CSA-C22.2 No. 62841-1. The requirements for hand-held transportable cut-off machines are contained in this Part 3 Standard and CAN/CSA-C22.2 No. 62841-1. Requirements of this Part 3 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. 62841-3-10, the CAN/CSA-C22.2 No. 62841-1 subclause applies.

This UL 62841-3-10 Standard For Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 3-10: Particular Requirements for Transportable Cut-Off Machines, is to be used in conjunction with the First edition of UL 62841-1. The requirements for

transportable cut-off machines are contained in this Part 3 Standard and UL 62841-1. Requirements of this Part 3 Standard, where stated, amend the requirements of UL 62841-1. Where a particular subclause of UL 62841-1 is not mentioned in UL 62841-3-10, the UL 62841-1 subclause applies.

**Level of harmonization**

This standard adopts the IEC text with 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 62841-3-10 Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 3-10: Particular Requirements for Transportable Cut-Off Machines, 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 IEC 62841-3-10, Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 3-10: Particular Requirements for Transportable Cut-Off Machines, 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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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## ELECTRIC MOTOR-OPERATED HAND-HELD TOOLS, TRANSPORTABLE TOOLS AND LAWN AND GARDEN MACHINERY – SAFETY – PART 3-10: PARTICULAR REQUIREMENTS FOR TRANSPORTABLE CUT-OFF MACHINES

# 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 nongovernmental 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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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 62841-3-10 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 |
|---|---|
| 116/240/FDIS | 116/253/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 3-10 is to be used in conjunction with the first edition of IEC 62841-1:2014.

This Part 3-10 supplements or modifies the corresponding clauses in IEC 62841-1, so as to convert it into the IEC Standard: Particular requirements for transportable cut-off machines.

Where a particular subclause of Part 1 is not mentioned in this Part 3-10, 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 SMALLER ROMAN TYPE

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

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.

A bilingual version of this publication may be issued at a later date.

**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.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

**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 3-10: PARTICULAR REQUIREMENTS FOR TRANSPORTABLE CUT-OFF MACHINES

## 1 Scope

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

*Addition:*

This part of IEC 62841 applies to transportable **cut-off machines** intended to cut materials such as metals, concrete and masonry and to be fitted with one abrasive

– **bonded reinforced wheel** of Type 41, or

– **diamond cut-off wheel** with the peripheral gaps, if any, not exceeding 10 mm

and with

– a **rated no-load speed** not exceeding a peripheral speed of the wheel of 100 m/s with the maximum wheel diameter and

– a wheel diameter range of 250 mm to 410 mm.

This standard does not apply to:

– transportable mitre saws;

– transportable tile saws;

– transportable metal saws.

**NOTE 101 Transportable mitre saws are covered by IEC 62841-3-9. Transportable tile saws will be covered by a future part of IEC 62841-3. Transportable metal saws will be covered by a future part of IEC 62841-3.**

## 2 Normative references

This clause of Part 1 is applicable except as follows:

*Addition:*

ISO 603-15,
*Bonded abrasive products – Dimensions – Part 15: Grinding wheels for cuttingoff on stationary or mobile cutting-off machines*

ISO 630 (all parts),
*Structural steels*

## 3 Terms and definitions

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

3.101 **inner flange:** part that contacts and provides support to the back side of the wheel and is located on the spindle between wheel and tool

3.102 **bonded reinforced wheel:** wheel for different applications and of a type in accordance with ISO 603-15

3.103 **cut-off machine:** tool designed to cut by means of a rotating abrasive cut-off wheel (bonded reinforced or diamond), where the wheel is fixed on a spindle which is mounted on a **cutting unit**, the machine is equipped with a table which supports and positions the workpiece fixed in a vice and the **cutting unit** is fitted to an arm which projects over the table from a pivot located at the table or on part of the frame of the machine

**Note 1 to entry: See Figure 101.**

3.104 **cutting unit:** device with an affixed cut-off wheel, capable of generating a cutting action

3.105 ***D:*** maximum specified diameter of the wheel

3.106 **diamond wheel:** wheel made of metal with a continuous or segmented abrasive rim

3.107 **fence:** device to position the workpiece and absorb the horizontal forces from the wheel during the cutting process

3.108 **outer flange:** part that supports the front side of the wheel and secures and clamps the wheel to the spindle and the **inner flange**

3.109 **rest position:** uppermost position of the **cutting unit** intended by design

3.110 **wheel guard: guard** which partly encloses the wheel and gives protection to the operator

## 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 shall include the **wheel guard** and the **fence**.*

*Further parts such as carrying means that are required in accordance with the user instructions shall be included in the mass.*

## 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:

*8.1 Addition:*

Tools shall also be marked with:

– the **rated no-load speed** of the output spindle.

8.2 *Addition:*

Tools shall also be marked with the following safety warning:

⚠ ″**WARNING** – Always wear eye protection” or the sign M004 of ISO 7010 or the following safety sign:

su0995

The eye protection symbol may be modified by adding other personal protective equipment such as ear protection, dust mask, etc.

**8.2DV D1** ***Modification: Add the following to Clause 8.2 of the Part 3:***

**WARNING – Use only bonded reinforced or diamond cut-off wheels, never use a toothed saw blade″.**

**Note: For Canada, the equivalent French wording for the warnings in this clause is ″AVERTISSEMENT — Toujours porter une protection pour les yeux″ and ″AVERTISSEMENT — N'utiliser que des disques à couper renforcés ou diamantés ; n'utiliser jamais une lame de scie dentée″.**

*8.3 Addition:*

Tools shall also be marked with additional information as follows:

– the wheel diameter ***D***;

– the direction of rotation of the wheel indicated on the tool by an arrow raised or sunk or by any other means no less visible and indelible.

*8.14.1 Addition:*

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″.

For all warnings in 8.14.1.101, the term ″**cutting unit**″ may be replaced by another appropriate term at the discretion of the manufacturer.

8.14.1.101 **Safety instructions for cut-off machines**

**1) Cut-off machine safety warnings**

a) **Position yourself and bystanders away from the plane of the rotating wheel.** *The guard helps to protect the operator from broken wheel fragments and accidental contact with wheel.*

b) **Use only bonded reinforced or diamond cut-off wheels for your power tool.** *Just because an accessory can be attached to your power tool, it does not assure safe operation.*

NOTE 1 The wording ″bonded reinforced″ or ″diamond″ is used as applicable depending on the designation of the tool.

c) **The rated speed of the accessory must be at least equal to the maximum speed marked on the power tool.** *Accessories running faster than their rated speed can break and fly apart.*

d) **Wheels must be used only for recommended applications. For example: do not grind with the side of a cut-off wheel.** *Abrasive cut-off wheels are intended for peripheral grinding, side forces applied to these wheels may cause them to shatter.*

e) **Always use undamaged wheel flanges that are of correct diameter for your selected wheel.** *Proper wheel flanges support the wheel thus reducing the possibility of wheel breakage.*

f) **The outside diameter and the thickness of your accessory must be within the capacity rating of your power tool.** *Incorrectly sized accessories cannot be adequately guarded or controlled.*

g) **The arbour size of wheels and flanges must properly fit the spindle of the power tool.** *Wheels and flanges with arbour holes that do not match the mounting hardware of the power tool will run out of balance, vibrate excessively and may cause loss of control.*

h) **Do not use damaged wheels. Before each use, inspect the wheels for chips and cracks. If the power tool or wheel is dropped, inspect for damage or install an undamaged wheel. After inspecting and installing the wheel, position yourself and bystanders away from the plane of the rotating wheel and run the power tool at maximum no load speed for one minute.** *Damaged wheels will normally break apart during this test time.*

i) **Wear personal protective equipment. Depending on application, use face shield, safety goggles or safety glasses. As appropriate, wear dust mask, hearing protectors, gloves and shop apron capable of stopping small abrasive or workpiece fragments.** *The eye protection must be capable of stopping flying debris generated by various operations. The dust mask or respirator must be capable of filtrating particles generated by your operation. Prolonged exposure to high intensity noise may cause hearing loss.*

j) **Keep bystanders a safe distance away from work area. Anyone entering the work area must wear personal protective equipment.** *Fragments of workpiece or of a broken wheel may fly away and cause injury beyond immediate area of operation.*

k) **Position the cord clear of the spinning accessory.** *If you lose control, the cord may be cut or snagged and your hand or arm may be pulled into the spinning wheel.*

l) **Regularly clean the power tool's air vents.** *The motor's fan can draw the dust inside the housing and excessive accumulation of powdered metal may cause electrical hazards.*

m) **Do not operate the power tool near flammable materials. Do not operate the power tool while placed on a combustible surface such as wood.** *Sparks could ignite these materials.*

n) **Do not use accessories that require liquid coolants.** *Using water or other liquid coolants may result in electrocution or shock..*

NOTE 2 The above warning does not apply for power tools specifically designed for use with a **liquid system**

**2) Kickback and related warnings**

Kickback is a sudden reaction to a pinched or snagged rotating wheel. Pinching or snagging causes rapid stalling of the rotating wheel which in turn causes the uncontrolled **cutting unit** to be forced upwards toward the operator.

For example, if an abrasive wheel is snagged or pinched by the workpiece, the edge of the wheel that is entering into the pinch point can dig into the surface of the material causing the wheel to climb out or kick out. Abrasive wheels may also break under these conditions.

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

a) **Maintain a firm grip on the power tool and position your body and arm to allow you to resist kickback forces.** *The operator can control upward kickback forces, if proper precautions are taken.*

b) **Do not position your body in line with the rotating wheel.** *If kickback occurs, it will propel the cutting unit upwards toward the operator.*

c) **Do not attach a saw chain, woodcarving blade, segmented diamond wheel with a peripheral gap greater than 10 mm or toothed saw blade.** *Such blades create frequent kickback and loss of control.*

d) **Do not "jam" the wheel or apply excessive pressure. Do not attempt to make an excessive depth of cut.** *Overstressing the wheel increases the loading and susceptibility to twisting or binding of the wheel in the cut and the possibility of kickback or wheel breakage.*

e) **When the wheel is binding or when interrupting a cut for any reason, switch off the power tool and hold the cutting unit motionless until the wheel comes to a complete stop. Never attempt to remove the wheel from the cut while the wheel is in motion otherwise kickback may occur.** *Investigate and take corrective action to eliminate the cause of wheel binding.*

f) **Do not restart the cutting operation in the workpiece. Let the wheel reach full speed and carefully re-enter the cut.** *The wheel may bind, walk up or kickback if the power tool is restarted in the workpiece.*

g) **Support any oversized workpiece to minimize the risk of wheel pinching and kickback.** *Large workpieces tend to sag under their own weight. Supports must be placed under the workpiece near the line of cut and near the edge of the workpiece on both sides of the wheel.*

8.14.2 a) *Addition:*

101) Information about the permitted **accessories** (diamond or bonded reinforced wheels), wheel diameter, wheel thickness and bore diameter.

For diamond wheels, instruction that

– the maximum peripheral gap between segments shall be 10 mm;

– the rake angle shall be negative.

See Figure 102.

102) Explanation of the term "**bonded reinforced wheel**" or type designation, if applicable;

103) Instruction to ensure that the **cut-off machine** is always used on a stable and level surface and instruction how to secure the machine if used on a workbench or the like;

104) Information about maximum cutting capacities at zero and maximum mitre angles.

8.14.2 b) *Addition:*

101) Instruction for proper use of blotters, when they are provided with a bonded reinforced product;

102) Instruction on mounting of **accessories** and use of the correct flanges, use and care of the abrasive product. For reversible flanges, instruction for the correct method of fitting the flanges;

103) Instruction to the operator on the use of all the different types of wheels specified in the instructions in accordance with 8.14.2 a) 101), e.g. bonded wheel, **diamond wheel**;

104) Instruction how to secure and support the workpiece;

105) Instruction to wear personal protection equipment:

– hearing protection;

– gloves when handling wheels.

8.14.2 c) *Addition:*

101) Instruction for the storage and handling of **accessories**

**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 by the following:*

**Table 4 – Required performance levels**

| Type and purpose of SCF | Minimum Performance Level (PL) |
|---|---|
| **Power switch** – prevent unwanted switch-on | Shall be evaluated using the fault conditions of 18.6.1 without the loss of this **SCF** |
| **Power switch** – provide desired switch-off | Shall be evaluated using the fault conditions of 18.6.1 without the loss of this **SCF** |
| Any electronic control to pass the test of 18.3 | c |
| Overspeed prevention to prevent output speed above 120 % of **rated no-load speed** | c |
| Provide desired direction of rotation | b |
| Lock-off function as required by 21.18.2.3 | b |
| Prevent exceeding thermal limits as in Clause 18 | a |
| Prevent self-resetting as required in 23.3 | a |

## 19 Mechanical hazards

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

*19.1 Addition:*

This subclause is not applicable for providing adequate protection against personal injury by the wheel.

**NOTE Requirements for the wheel guarding are specified in 19.101.**

*19.6 Replacement:*

The tool shall be designed so as to prevent excessive speed under **normal use**. The speed of the tool shall not exceed the **rated no-load speed** under any operating condition.

*Compliance is checked by inspection and by measuring the speed after the tool is operated for a period of 5 min. The recommended **accessory** that produces the maximum speed shall be installed.*

*If the tool is provided with a load sensitive speed control, then an **accessory** need not be installed to load the tool to find maximum speed.*

*19.7 Additional subclauses:*

19.7.101 The **cut-off machine** shall be constructed so that during foreseeable misuse operation it will not tip over.

*Compliance is checked by the following test. The tool is assembled in accordance with 8.14.2 a) 2).*

*The* ***cut-off machine****, without being fixed to the supporting surface, is placed on a horizontal medium density fibreboard (MDF) with a density of 650 kg/m$^3$ to 850 kg/m$^3$. The* **fence** *is secured in the position closest to the pivot. Without any workpiece mounted, the* ***cutting unit*** *is moved down to its lowest cutting position, and then the handle is released. The* ***cut-off machine*** *shall not tip over.*

19.7.102 **Cut-off machines** shall be provided with means to facilitate the fixing of the machine to a bench to prevent sliding, e.g. by providing holes or clamping surfaces in the base.

*Compliance is checked by inspection.*

**19.101 Wheel guarding**

19.101.1 **General**

Tools shall be provided with a guarding system to protect the user during **normal use** against:

– accidental contact with the abrasive product;

– ejection of fragments of the abrasive product;

– sparks and other debris.

The **wheel guard** shall fulfill the following requirements:

– to change the wheel, it shall not be necessary to remove the **wheel guard** from the tool;

– be designed to facilitate easy replacement of the wheel. For this purpose, parts of the **wheel guard** may be opened without the aid of a tool provided these parts remain attached to the **wheel guard** together with any fasteners;

– be designed so that the risk of an accidental contact between the operator and the wheel during **normal use** is minimized.

The installation of an oversized wheel shall be restricted in at least one location by a device fixed in relation to the spindle. The clearance between the periphery of a new wheel with diameter ***D*** and this device shall be 12 mm maximum.

The guarding system shall comply with the requirements of 19.101.2 and 19.101.3.

*Compliance is checked by inspection and by measurement.*

### 19.101.2 Wheel guard design requirements

19.101.2.1 Tools shall be provided with a combination of fixed and movable **wheel guards** that covers the areas 1, 2 and 3 of the tool as shown in Figure 103.

When the **cutting unit** is in the fully down position, area 1 is the area above a line parallel with the base which intersects the centre of the wheel. For any position of the **cutting unit**, the sides and periphery of the wheel, except the spindle end, the nut and the **outer flange**, shall be guarded in area 1.

If the spindle end, the nut or the **outer flange** are not circular, they shall also be guarded.

When the **cutting unit** is in the **rest position**, area 2 is the area at the front of the tool between area 1 and at least 15° (angle β in Figure 103 b) below a line parallel with the base which intersects the centre of the wheel. In **rest position**, the area 2 shall be guarded by a **wheel guard** which protects the periphery and both sides of at least the outer 20 % of the radius of the wheel.

When the **cutting unit** is in the fully down position, area 3 is the area at the back of the tool between area 1 and at least 15° (angle α in Figure 103a) below a line parallel with the base which intersects the centre of the wheel. In the fully down position, the area 3 shall be guarded by a **wheel guard** which protects the periphery and both sides of at least the outer 10 % of the radius of the wheel.

*Compliance is checked by inspection and by measurement.*

When for technical reasons an overlapping occurs between the fixed and the movable **wheel guard**, care shall be taken to prevent access to the wheel in the overlapping area.

*Compliance is checked by applying the test probe of Figure 104 with a force not exceeding 5 N between the fixed **wheel guard** and the movable **wheel guard** in all positions. It shall not be possible to contact the wheel with the test probe.*

The movable **wheel guard** shall be either:

– ″link activated″ complying with the requirements of 19.101.2.2; or

– ″workpiece activated″ complying with the requirements of 19.101.2.3.

When the handle is released, the **cutting unit** shall return automatically to its **rest position** and the guarding of area 2 shall be restored.

**NOTE Movable guards of this type are also known as self-restoring guards.**

19.101.2.2 For a link activated **wheel guard**, the movement of the movable **wheel guard** shall be linked with or controlled by the motion of the **cutting unit**. The down directed plunging action of the **cutting unit's** motion shall cause the opening stroke of the movable **wheel guard**. However, the movable **wheel guard** shall be free to open further independent of the link, provided this additional movement is self-restoring.

*Compliance is checked by inspection.*

19.101.2.3 A workpiece activated **wheel guard** shall open when it makes contact with the base or the workpiece and may remain in contact with the base or the workpiece during the cutting action.

**NOTE In some cases, such as when cutting a small workpiece, the wheel guard will not be activated.**

**Compliance is checked by inspection and by measurement.**

19.101.3 **Guarding of wheel below the table**

**Cut-off machines** shall be guarded so that access to the cutting wheel below the table is prevented.

*Compliance is checked by placing the tool on a horizontal flat surface and applying the test probe of Figure 104 with a force not exceeding 5 N with the **cutting unit** in its fully down position. It shall not be possible to contact the wheel with the test probe.*

*Compliance is checked by inspection and by measurement.*

19.102 **Spark deflection**

Sparks emitted in a rearward direction that occur in the area specified by the angle β which is between the two tangent lines 1 (T1) and 2 (T2) as shown in Figure 105 shall be contained or deflected downwards.

Sparks emitted in a rearward direction that occur in the area specified by the angle α as shown in Figure 105 shall be contained or deflected downward. The angle α shall be minimum 18°. The vertex of the angle α is the point where a vertical line through the centre of the abrasive wheel intersects the plane of the base, with the **cutting unit** in the fully down position.

Containment or deflection of the sparks may be achieved by the **wheel guard**, the body of the machine, a spark deflector or any combination thereof.

*Compliance is checked by inspection and by measurement.*

19.103 **Securement of the workpiece**

Tools shall be equipped with a **fence** secured to the table for positioning the workpiece during the cutting operation. The **fence** may be adjustable to enable mitre cuts. The **fence** shall have a height at least 0,6 times of the maximum cutting depth.

A workpiece clamp shall be provided to secure the workpiece during the cutting operation. The workpiece clamp shall apply a clamping force either horizontally against the **fence**, vertically against the base or a combination thereof. The contact plate of a horizontal clamp, if any, shall have a height at least 0,6 times of the maximum cutting depth.

*Compliance is checked by inspection and by measurement.*

19.104 **Mounting of accessories**

The **accessory** may be mounted directly on the spindle or a locating device such as a bushing or as part of the flange.

The total eccentricity of the combination of the spindle, the diameter of the flange bore and the diameter of the part of the flange, as applicable, which locates and guides the **accessory** shall be less than 0,30 mm.

*Compliance is checked by measurement.*

*For tools with flanges, the eccentricity of the flange in the worst off-centre position allowed by the mounting procedure is measured.*

**19.105 Flanges**

19.105.1 **General**

Flanges shall be flat and have no sharp edges. One of the flanges shall be keyed to the output spindle.

Flanges shall meet the dimensions of 19.105.2.

For tools that are intended to be used with **diamond wheels**, an additional set of flanges may be provided that meet the dimensional requirements in 19.105.3.

The **inner flange** and the **outer flange** shall have the same diameter $D_f$ or the overlap of the **inner flange** and **outer flange** bearing surfaces shall be at least equal to dimension *C*, with

$$C \geq 1{,}5 \text{ mm}.$$

*Compliance is checked by inspection and by measurement.*

19.105.2 Flanges shall comply with the minimum dimensions shown in Table 101 and Figure 106.

**Table 101 – Flange dimensions**

| ***D*** mm | ***$D_f$*** mm | ***C*** mm | ***G*** mm | ***W*** mm |
|---|---|---|---|---|
| 250 | 64 | 10 | 1,5 | 1,5 |
| 300 | 75 | 13 | 1,5 | 1,5 |
| 350 to 356 | 89 | 16 | 1,5 | 1,5 |
| 400 to 410 | 100 | 17 | 1,5 | 1,5 |

**Key**
***D*** specified maximum diameter of the wheel
$D_f$ diameter of the flange clamping surface
*C* width of the clamping surface
*G* depth of the recess
*W* width of the recess

*Compliance is checked by measurement.*

19.105.3 Flanges for **diamond wheels** shall have the following dimensions illustrated in Figure 106, where ***D*** is the maximum outside diameter of the wheel, *G* and *W* are the dimensions of the recess and $D_f$ is the outside diameter of the flange clamping surface.

$$D_f \geq 0{,}15\ \boldsymbol{D}$$

Dimensions *G* and *W* shall be:

$$W \geq 0,\ G \geq 0$$

*Compliance is checked by measurement.*

19.105.4 Flanges shall be so designed that they are of adequate strength.

*Compliance is checked by the following test.*

*The **cut-off machine** is fitted with a steel disc having an equal thickness and shape as the abrasive cutting wheel.*

*The clamping nut is tightened with a first test torque according to Table 102. A feeler gauge of a thickness of 0,05 mm is used to test whether the flanges are in contact with the disc all around the circumference.*

*The test is satisfactory if at no place the feeler gauge can be pushed underneath the flanges.*

*The clamping nut is further tightened to the second test torque according to Table 102. A feeler gauge of a thickness of 0,05 mm is used to test the deflection of the flanges. The result is satisfactory if at no place the feeler gauge can be pushed underneath the flanges by more than 1 mm.*

**Table 102 – Torques for testing flanges**

| Thread | | First test torque | Second test torque |
|---|---|---|---|
| Metric | UNC | Nm | Nm |
| 8 | 2 | 2 | 8 |
| 10 | 3/8 | 4 | 15 |
| 12 | 1/2 | 7,5 | 30 |
| 14 | | 11 | 45 |
| 16 | 5/8 | 17,5 | 70 |
| 20 | 3/4 | 35 | 140 |
| > 20 | > 3/4 | 75 | 300 |

19.106 **Tool spindle**

If a thread is used on the spindle, it shall be such that it is self-tightening during the cutting operation.

*Compliance is checked by inspection.*

The wheel retaining fastener(s) in conjunction with the spindle shall not loosen under any operations including wheel acceleration during start-up and rapid wheel deceleration induced by motor braking devices, if any.

*Compliance is checked by the following test.*

*A 3 mm thick abrasive wheel of diameter **D** is mounted to the **cut-off machine**. The **cut-off machine** is started from the **rest position**, allowed to reach operating speed and shut down. This cycle is repeated ten times. The wheel shall not become loose during and at conclusion of the test.*

**20 Mechanical strength**

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

20.5 This subclause of Part 1 is not applicable.

20.101 **Strength of wheel guards**

**Wheel guards** shall either:

a) be made of steel with a minimum ultimate tensile strength of 300 N/mm$^2$, a thickness of the periphery of the **wheel guard** of not less than 2,5 mm and a thickness of the side of the **wheel guard** of not less than 2,0 mm or,

b) if not in accordance with a), have adequate strength.

*Compliance is checked by:*

*– in case of a) by inspection and by measurement; or,*

*– in case of b) by the test of 20.102.*

**20.102 Strength test**

*20.102.1 The tool is assembled as for **normal use**.*

*A bonded wheel with the maximum thickness recommended in 8.14.2 a) 101) and with a diameter **D** is mounted to the spindle in accordance with the instructions.*

*The **cut-off machine** is operated at **rated voltage** and at no-load for a minimum of 5 min. The speed of the wheel is measured and recorded.*

*The tool is then subjected to the test specified in 20.102.2.*

*20.102.2 The wheel as specified in 20.102.1 is slotted into four equal segments (quadrants). The cut is directed from the outer edge radially towards the centre. The width of each slot shall not exceed 3 mm. The length of each slot shall be as long as possible, but the wheel shall not yet disintegrate before impacting.*

*The wheel is impacted as close as possible to the flange so as to cause a complete breakage of the wheel, care being taken that the impactor automatically retracts so that it does not affect the outcome of the test.*

*The elements of the impacting test are as follows:*

*– make a hole in the **wheel guard** to line up with the impacting tool of the test fixture as per Figure 107;*

*– mount the tool in the test box of Figure 108, securely fixed to the bottom of the box;*

*– secure the cover of the test box and operate the tool at no-load for at least 30 s;*

*– hit the impactor sharply with one quick blow;*

*– switch off the tool.*

*20.102.3 After the test of 20.102.2, the **wheel guard** and the fasteners or the **wheel guard**'s mounting hardware shall remain in place. Deformation, hairline cracks or scratches and gouges to the **wheel guard** and mounting hardware are acceptable.*

## 21 Construction

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

*21.18.2.1 Replacement:*

**Cut-off machines** shall be equipped with a **momentary power switch** and there shall be no means for locking the switch in the "on" position.

*Compliance is checked by inspection.*

21.18.2.2 This subclause of Part 1 is not applicable.

21.18.2.4 This subclause of Part 1 is not applicable.

21.30 This subclause of Part 1 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 Addition:*

**Cut-off machines** are regarded as tools having a risk associated with inadvertent starting.

## 24 Supply connection and external flexible cords

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

*24.4 Replacement of the first paragraph:*

**Supply cords** shall be not lighter than heavy polychloroprene sheathed flexible cable (code designation 60245 IEC 66) or equivalent.

## 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 – Example of cut-off machine**

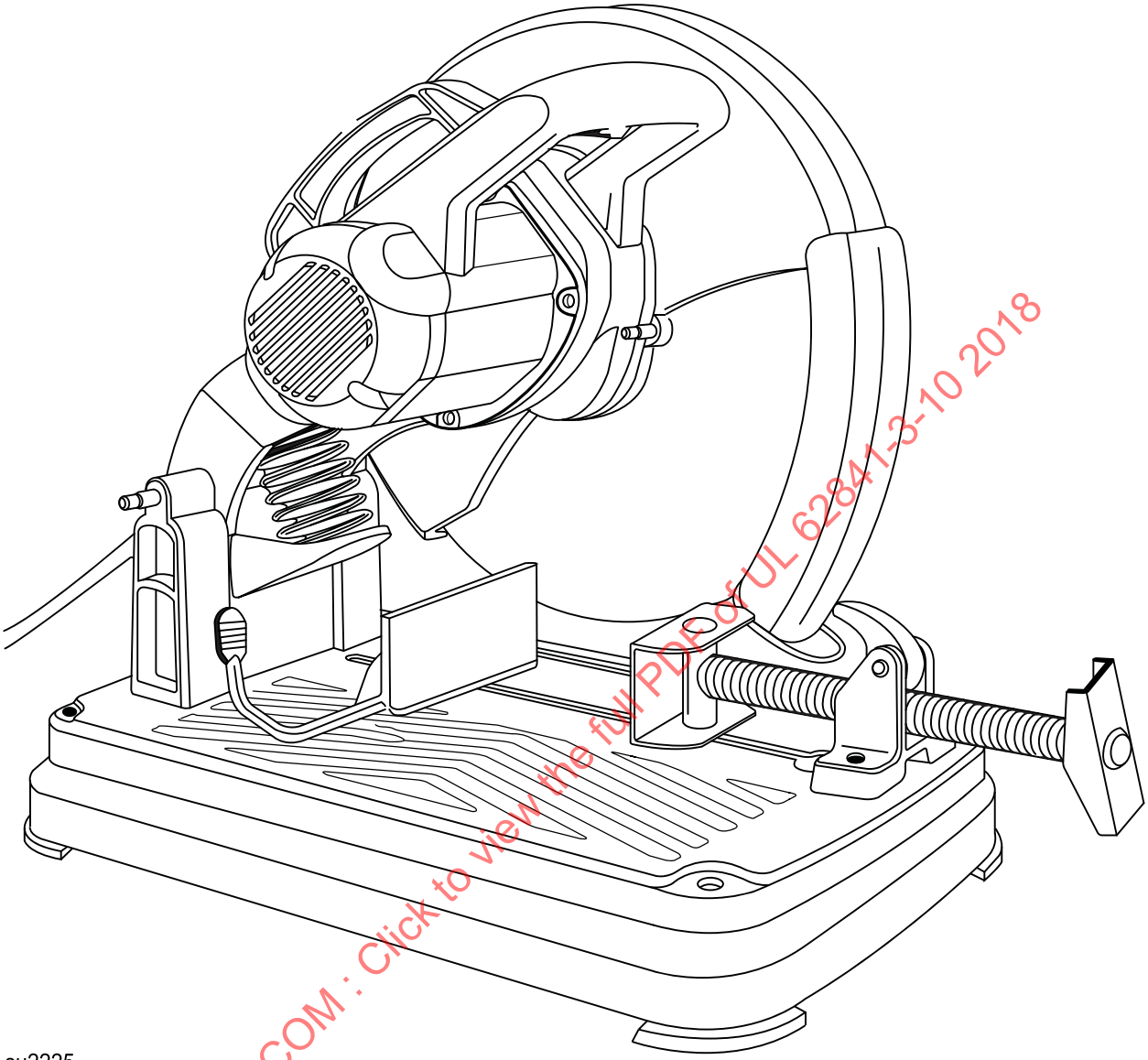

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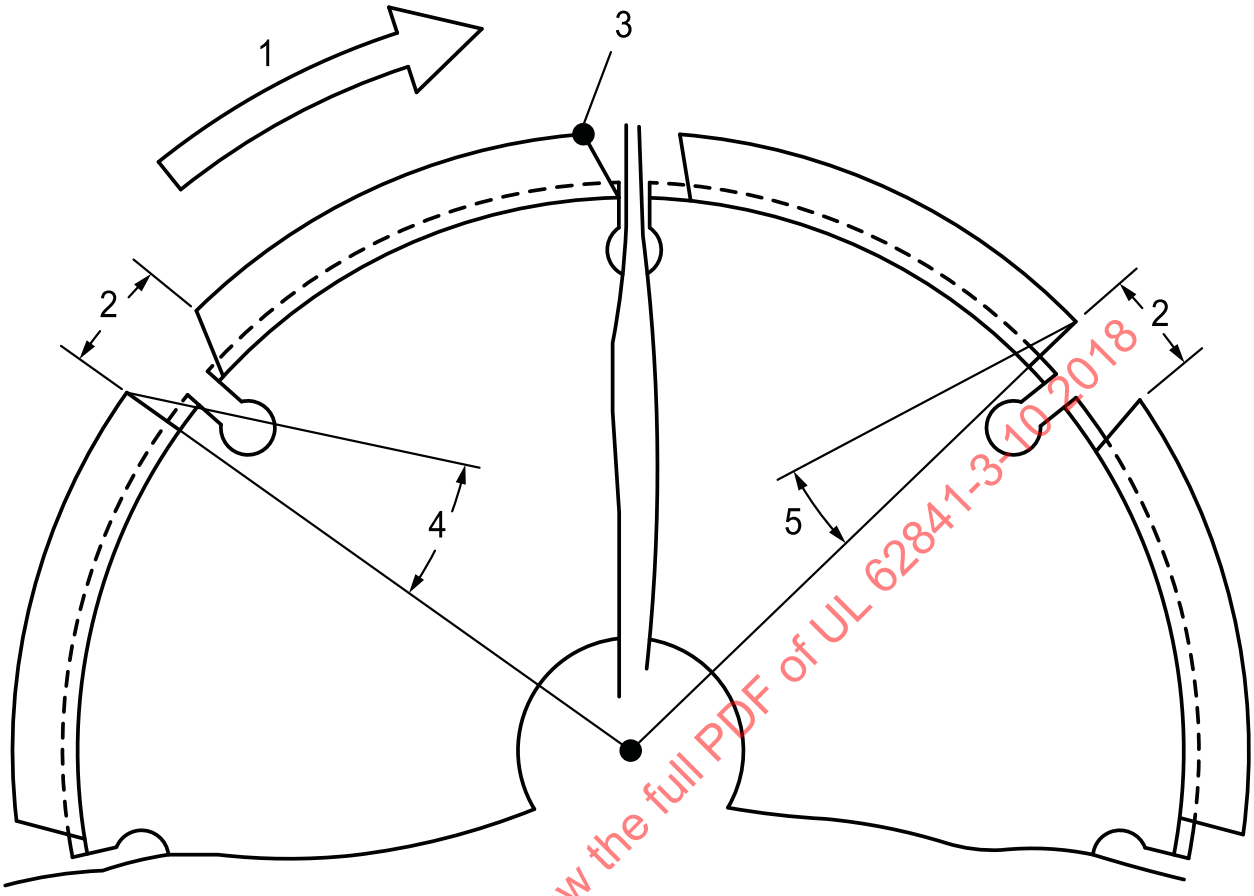
**Figure 102 – Examples of gaps and rake angles**

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**Key**

1 direction of rotation

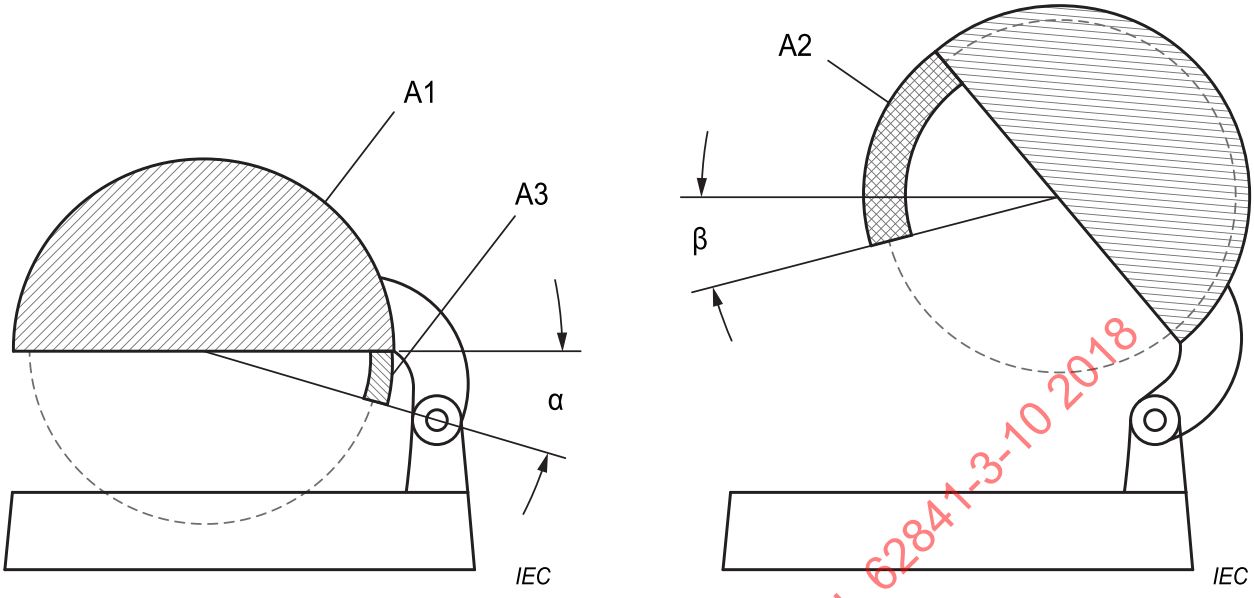
2 gap

3 leading tip of segment

4 negative rake angle

5 positive rake angle

**Figure 103 – Wheel guards**

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**a) Cutting unit in fully down position**

**b) Cutting unit in rest position**

**Key**

A1 area 1

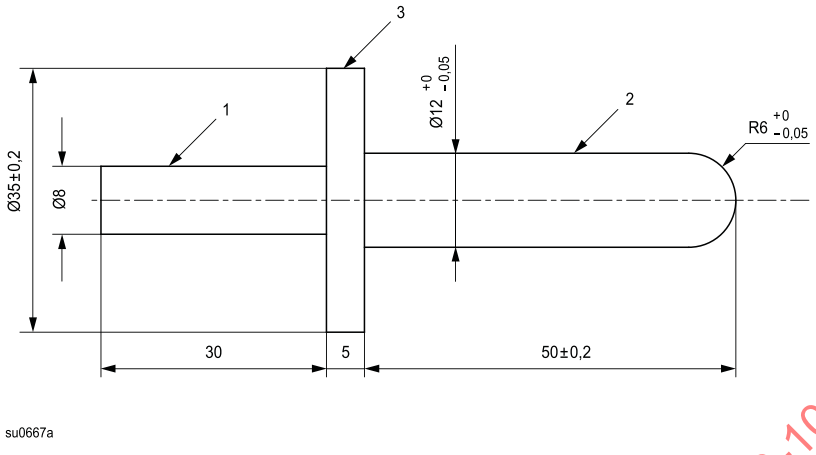
A2 area 2, at least outer 20 % of the radius of the wheel

A3 area 3, at least outer 10 % of the radius of the wheel

$\alpha \geq 15°$

$\beta \geq 15°$

**Figure 104 – Test probe**



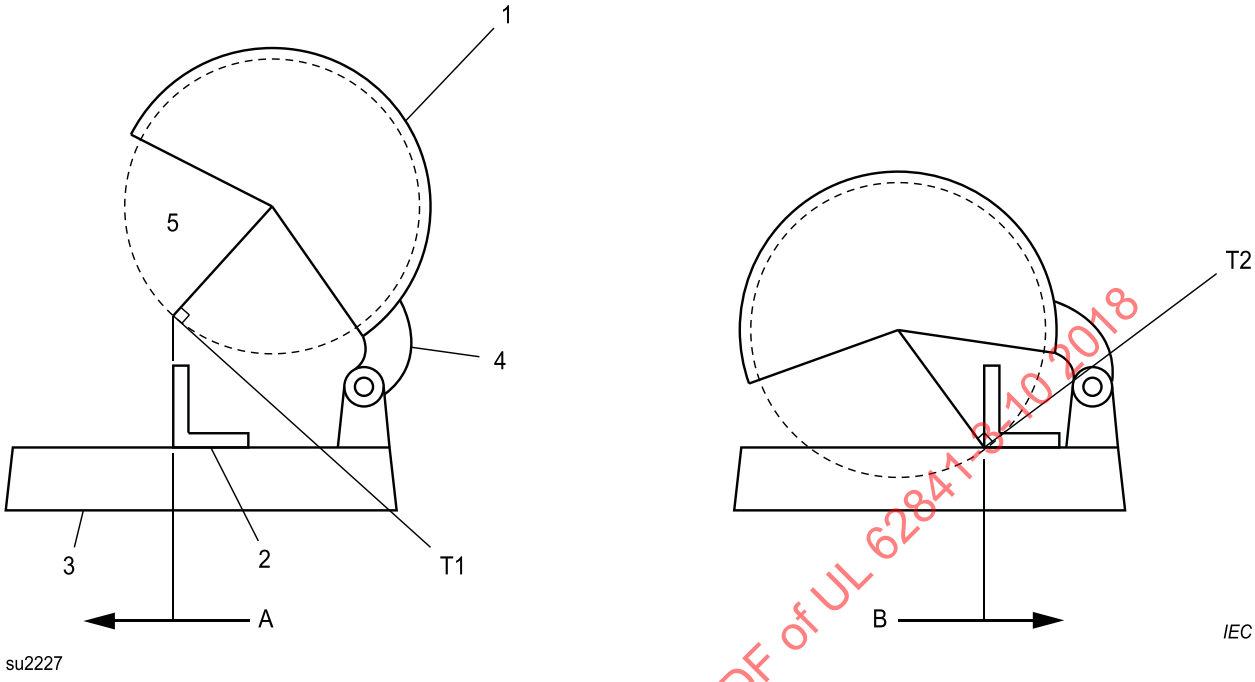

**Key**

1 handle section

2 test section

3 probe's guard

**Figure 105 – Spark deflection**
**a) Cutting unit in rest position and in fully down position**






**Key**

1 fixed **wheel guard**
2 **fence**
3 base
4 machine arm
5 cut-off wheel with diameter ***D***
6 **cutting unit** in the **rest position**
7 **cutting unit** in the fully down position

A position of the **fence** nearest to the operator
B position of the **fence** furthest from the operator
$\alpha$ horizontal spark deflection angle
$\beta$ vertical spark deflection angle
T1 tangent line 1
T2 tangent line 2