UL 60745-2-23

STANDARD FOR SAFETY

Hand-Held Motor-Operated Electric Tools – Safety – Part 2-23: Particular Requirements for Die Grinders and Small Rotary Tools

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UL Standard for Safety for Hand-Held Motor-Operated Electric Tools – Safety – Part 2-23: Particular Requirements for Die Grinders and Small Rotary Tools, UL 60745-2-23

First Edition, Dated September 20, 2013

Summary of Topics

This revision of ANSI/UL 60745-2-23 dated June 17, 2020 is being issued to update the title page to reflect the most recent designation as a Reaffirmed American National Standard (ANS). No technical changes have been made.

As noted in the Commitment for Amendments statement located on the back side of the title page, UL and CSA are committed to updating this harmonized standard jointly. However, the revision pages dated June 17, 2020 will not be jointly issued by UL and CSA as these revision pages only address UL ANSI approval dates.

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 requirements are substantially in accordance with Proposal(s) on this subject dated March 27, 2020.

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Underwriters Laboratories Inc.
UL 60745-2-23
First Edition

Hand-Held Motor-Operated Electric Tools – Safety – Part 2-23: Particular Requirements for Die Grinders and Small Rotary Tools

September 20, 2013

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This national standard is based on publication IEC 60745-2-23, First Edition (2012).

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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 ANSI/UL Standard for Safety consists of the First Edition including revisions through June 17, 2020. The most recent designation of ANSI/UL 60745-2-23 as a Reaffirmed American National Standard (ANS) occurred on June 4, 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.

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CONTENTS

PREFACE **5**

NATIONAL DIFFERENCES **7**

FOREWORD **9**

1 Scope 13
2 Normative references 13
3 Terms and definitions 13
4 General requirements 14
5 General conditions for the tests 14
6 Void 14
7 Classification 14
8 Marking and instructions 14
8.1DV Modification: Add the following to Clause 8.1 of this Part 2: 15
8.12.1.101DV Modification: Replace Item (d) of Clause 8.12.1.101 of this Part 2 with the following: 17
9 Protection against access to live parts 20
10 Starting 20
11 Input and current 20
12 Heating 20
13 Leakage current 20
14 Moisture resistance 20
15 Electric strength 21
16 Overload protection of transformers and associated circuits 21
17 Endurance 21
18 Abnormal operation 21
19 Mechanical hazards 21
20 Mechanical strength 22
21 Construction 22
22 Internal wiring 23
23 Components 23
24 Supply connection and external flexible cords 23
24.4DV.1 Modification: Add the following to Clause 24.4 of the Part 1: 23
25 Terminals for external conductors 23
26 Provision for earthing 23
27 Screws and connections 23
28 Creepage distances, clearances and distances through insulation 23
29 Resistance to heat, fire and tracking 23
30 Resistance to rusting 23
31 Radiation, toxicity and similar hazards 24

Annexes

Annex K (normative) Battery Tools and Battery Packs

Bibliography

ULNORM.COM : Click to view the full PDF of UL 60745-2-23 2020

No Text on This Page

ULNORM.COM : Click to view the full PDF of UL 60745-2-23 2020

PREFACE

This is the harmonized CSA Group and UL standard for Hand-Held Motor-Operated Electric Tools – Safety – Part 2-23: Particular Requirements for Die Grinders and Small Rotary Tools. It is the first edition of CAN/CSA-C22.2 No. 60745-2-23 and the first edition of UL 60745-2-23.

This standard is based on IEC 60745-2-23, first edition published December 2012.

This harmonized standard was prepared by CSA Group and Underwriters Laboratories Inc. (UL). The efforts and support of the Harmonization Working Group for the Adoption of the IEC 60745 Series of Tool Standards 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.

This standard has been approved by the American National Standards Institute (ANSI) as an American National Standard.

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

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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

Differences from the IEC are being added in order to address basic safety requirements present in the USA 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.

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NATIONAL DIFFERENCES

In the CSA and UL publications of this standard, National Differences from the text of International Electrotechnical Commission (IEC) Publication 60745-2-23, Standard for Hand-Held Motor-Operated Electric Tools – Safety – Part 2-23: Particular Requirements for Die Grinders and Small Rotary Tools, copyright 2012 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**.

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

HAND-HELD MOTOR-OPERATED ELECTRIC TOOLS – SAFETY – Part 2-23: Particular Requirements for Die Grinders and Small Rotary Tools

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International Standard IEC 60745-2-23 has been prepared 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
116111/FDIS	116/120/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 is to be used in conjunction with the latest edition of IEC 60745-1 and its amendments. 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 in IEC 60745-1, so as to convert that publication into the IEC standard: Safety requirements for die grinders and small rotary tools.

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, tables and figures that are numbered starting from 101 are additional to those in Part 1;

– unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;

– 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.

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.

A list of all parts of the IEC 60745 series, published 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.

101DV DE *Modification: Add the following to Note 2 of the IEC Foreword of the Part 2:*

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.

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102DV DE ***Modification: Replace the paragraph after Note 3 of the IEC Foreword of the Part 2 with the following:***

Words in SMALL ROMAN CAPITALS in the text are defined in Clause 3.

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HAND-HELD MOTOR-OPERATED ELECTRIC TOOLS – SAFETY – PART 2-23: PARTICULAR REQUIREMENTS FOR DIE GRINDERS AND SMALL ROTARY TOOLS

1 Scope

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

Addition:

This standard applies to DIE GRINDERS and small ROTARY TOOLS for mounted accessories not exceeding 55 mm in diameter and mounted sanding accessories not exceeding 80 mm in diameter such as

– threaded CONES OR PLUGS that are threaded on a mandrel with an unrelieved shoulder flange,

– mandrel MOUNTED WHEELS, and

– rotary files

with a RATED SPEED not exceeding a peripheral speed of the accessory of 80 m/s at RATED CAPACITY.

This standard does not apply to straight and vertical grinders utilizing flanges for driving an abrasive accessory. Those tools are covered by IEC 60745-2-3.

2 Normative references

This clause of Part 1 is applicable except as follows:

Addition:

ISO 603-12,
Bonded abrasive products – Dimensions – Part 12: Grinding wheels for deburring and fettling on a straight grinder

3 Terms and definitions

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

3.101 CONES AND PLUGS: organic or inorganic bonded abrasives of various shapes and sizes with a threaded insert

3.102 DIE GRINDER: tool with the rotating spindle in-line with the motor shaft equipped with a collet or chuck intended for use with MOUNTED WHEELS or threaded mandrel mounted CONES AND PLUGS

3.103 MOUNTED WHEELS: organic or inorganic bonded abrasives of various shapes and sizes that are permanently mounted on a mandrel

3.104 RATED CAPACITY: maximum diameter of the rotating accessory to be fitted on the tool as specified by the manufacturer's instruction

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3.105 RATED SPEED: maximum attainable speed as designated by the manufacturer, with any accessory permitted by the manufacturer's instructions installed, at rated voltage or at the upper limit of the rated voltage range

3.106 ROTARY TOOL: tool having a collet or chuck capacity not exceeding 4 mm and without any gear or other mechanical speed reduction, to be fitted with a variety of accessories for grinding, cutting, drilling, carving, polishing, brushing, etc.

3.107 WHEEL TYPES: wheels for different applications in accordance with ISO 603-12

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:*

Tools shall also be marked with:

– **RATED SPEED** in revolutions per minute;

– **RATED CAPACITY** of accessories in mm;

– tools provided with a threaded spindle shall be marked with the spindle thread size;

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

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

– indication of direction of rotation of the spindle. This shall be indicated by an arrow, raised or sunk, or by any other means no less visible and indelible.

8.1DV D1 ***Modification: Add the following to Clause 8.1 of this Part 2:***

– "WARNING – To reduce the risk of injury, use only accessories rated at least equal to the maximum speed marked on the tool."

In Canada, the equivalent French wording is as follows: "AVERTISSEMENT – Pour réduire le risque de blessure, utiliser uniquement des accessoires convenant au moins à la vitesse maximale indiquée sur l'outil."

Alternatively, ROTARY TOOLS with an adjustable speed setting may use the following:

– "WARNING – To reduce the risk of injury, use accessories rated for the operating speed setting of the tool."

In Canada, the equivalent French wording is as follows: "AVERTISSEMENT – Pour réduire le risque de blessure, utiliser les accessoires convenant à la vitesse d'utilisation de l'outil."

If the above cautionary markings are included as part of a list of cautionary markings, the words "Warning – To reduce the risk of injury" need not be repeated.

8.6 *Addition:*

n.....RATED SPEED

8.12.1 *Addition:*

For the following safety instructions specified in 8.12.1.101 to 8.12.1.104, the terms such as grinding/grinder, sanding/sander, wire brushing/wire brush, polishing/polisher, carving/carving tool or

cutting-off/cut-off tool, are selected as recommended by the manufacturer. These terms in the warnings and headings shall be consistently used or deleted based on the selected operations. The "and"/"or" conjunctions may be used as appropriate.

If the power tool is recommended only for one of the listed operations, the heading of that section is to be used for all warnings.

8.12.1.101 **Safety instructions for all operations**

Safety warnings common for grinding, sanding, wire brushing, polishing, carving or abrasive cutting-off operations:

NOTE In the above heading those operations not applicable are omitted.

a) **This power tool is intended to function as a grinder, sander, wire brush, polisher, carving or cut-off tool. Read all safety warnings, instructions, illustrations and specifications provided with this power tool.** *Failure to follow all instructions listed below may result in electric shock, fire and/or serious injury.*

NOTE List only those operations that are applicable.

b) **Operations such as grinding, sanding, wire brushing, polishing or cutting-off are not recommended to be performed with this power tool.** *Operations for which the power tool was not designed may create a hazard and cause personal injury.*

NOTE List only those operations that were not included in the first warning. If all listed operations are applicable, then this warning is omitted, but all subsequent warnings are given without exclusion.

c) **Do not use accessories which are not specifically designed and recommended by the tool manufacturer.** *Just because the accessory can be attached to your power tool, it does not assure safe operation.*

d) **The RATED SPEED of the grinding accessories must be at least equal to the maximum speed marked on the power tool.** *Grinding accessories running faster than their RATED SPEED can break and fly apart.*

e) **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 controlled.*

f) **The arbour size of wheels, sanding drums or any other accessory must properly fit the spindle or collet of the power tool.** *Accessories that do not match the mounting hardware of the power tool will run out of balance, vibrate excessively and may cause loss of control.*

g) **Mandrel MOUNTED WHEELS, sanding drums, cutters or other accessories must be fully inserted into the collet or chuck.** *If the mandrel is insufficiently held and/or the overhang of the wheel is too long, the MOUNTED WHEEL may become loose and be ejected at high velocity.*

h) **Do not use a damaged accessory. Before each use inspect the accessory such as abrasive wheels for chips and cracks, sanding drum for cracks, tear or excess wear, wire brush for loose or cracked wires. If power tool or accessory is dropped, inspect for damage or install an undamaged accessory. After inspecting and installing an accessory, position yourself and bystanders away from the plane of the rotating accessory and run the power tool at maximum no-load speed for one minute.** *Damaged accessories 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 workshop apron capable of stopping small abrasive or workpiece fragments.** *The eye*

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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 accessory may fly away and cause injury beyond immediate area of operation.*

k) **Hold power tool by insulated gripping surfaces only, 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.*

NOTE The above warning is omitted if polishing is the only recommended operation.

l) **Always hold the tool firmly in your hand(s) during the start-up.** *The reaction torque of the motor, as it accelerates to full speed, can cause the tool to twist.*

m) **Use clamps to support workpiece whenever practical. Never hold a small workpiece in one hand and the tool in the other hand while in use.** *Clamping a small workpiece allows you to use your hand(s) to control the tool. Round material such as dowel rods, pipes or tubing have a tendency to roll while being cut, and may cause the bit to bind or jump toward you.*

n) **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 accessory.*

o) **Never lay the power tool down until the accessory has come to a complete stop.** *The spinning accessory may grab the surface and pull the power tool out of your control.*

p) **After changing the bits or making any adjustments, make sure the collet nut, chuck or any other adjustment devices are securely tightened.** *Loose adjustment devices can unexpectedly shift, causing loss of control, loose rotating components will be violently thrown.*

q) **Do not run the power tool while carrying it at your side.** *Accidental contact with the spinning accessory could snag your clothing, pulling the accessory into your body.*

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

s) **Do not operate the power tool near flammable materials.** *Sparks could ignite these materials.*

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

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

8.12.1.101DV D1 ***Modification: Replace Item (d) of Clause 8.12.1.101 of this Part 2 with the following:***

The RATED SPEED of the accessories 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.***

Alternatively, ROTARY TOOLS with an adjustable speed setting may use the following:

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The RATED SPEED of the accessories must be at least equal to the operating speed setting marked on the power tool. ***Accessories running faster than their RATED SPEED can break and fly apart.***

8.12.1.102 Further safety instructions for all operations

Kickback and related warnings

Kickback is a sudden reaction to a pinched or snagged rotating wheel, sanding band, brush or any other accessory. Pinching or snagging causes rapid stalling of the rotating accessory which in turn causes the uncontrolled power tool to be forced in the direction opposite of the accessory's rotation.

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. The wheel may either jump toward or away from the operator, depending on direction of the wheel's movement at the point of pinching. 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 kickback forces, if proper precautions are taken.*

b) **Use special care when working corners, sharp edges etc. Avoid bouncing and snagging the accessory.** *Corners, sharp edges or bouncing have a tendency to snag the rotating accessory and cause loss of control or kickback.*

c) **Do not attach a toothed saw blade.** *Such blades create frequent kickback and loss of control.*

d) **Always feed the bit into the material in the same direction as the cutting edge is exiting from the material (which is the same direction as the chips are thrown).** *Feeding the tool in the wrong direction causes the cutting edge of the bit to climb out of the work and pull the tool in the direction of this feed.*

e) **When using rotary files, cut-off wheels, high-speed cutters or tungsten carbide cutters, always have the work securely clamped.** *These wheels will grab if they become slightly canted in the groove, and can kickback. When a cut-off wheel grabs, the wheel itself usually breaks. When a rotary file, high-speed cutter or tungsten carbide cutter grabs, it may jump from the groove and you could lose control of the tool.*

NOTE Only those accessories are listed that are permitted to be used with the tool.

8.12.1.103 Additional safety instructions for grinding and cutting-off operations

Safety warnings specific for grinding and abrasive cutting-off operations:

a) **Use only wheel types that are recommended for your power tool and 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.*

b) **For threaded abrasive cones and plugs use only undamaged wheel mandrels with an unrelieved shoulder flange that are of correct size and length.** *Proper mandrels will reduce the possibility of breakage.*

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c) **Do not "jam" a cut-off 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 snagging of the wheel in the cut and the possibility of kickback or wheel breakage.*

d) **Do not position your hand in line with and behind the rotating wheel.** *When the wheel, at the point of operation, is moving away from your hand, the possible kickback may propel the spinning wheel and the power tool directly at you.*

e) **When wheel is pinched, snagged or when interrupting a cut for any reason, switch off the power tool and hold the power tool motionless until the wheel comes to a complete stop. Never attempt to remove the cut-off 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 pinching or snagging.*

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 panels or 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.*

h) **Use extra caution when making a "pocket cut" into existing walls or other blind areas.** *The protruding wheel may cut gas or water pipes, electrical wiring or objects that can cause kickback.*

8.12.1.104 **Additional safety instructions for wire brushing operations**

NOTE If wire brushing operation is not recommended by the manufacturer, this subclause is omitted.

Safety warnings specific for wire brushing operations:

a) **Be aware that wire bristles are thrown by the brush even during ordinary operation. Do not overstress the wires by applying excessive load to the brush.** *The wire bristles can easily penetrate light clothing and/or skin.*

b) **Allow brushes to run at operating speed for at least one minute before using them. During this time no one is to stand in front or in line with the brush.** *Loose bristles or wires will be discharged during the run-in time.*

c) **Direct the discharge of the spinning wire brush away from you.** *Small particles and tiny wire fragments may be discharged at high velocity during the use of these brushes and may become imbedded in your skin.*

8.12.2 a) *Addition:*

101) Types of accessories in accordance with 8.12.1.101a)

8.12.2 b) *Addition:*

101) Instruction on mounting of accessories and use and care of abrasive products

102) Instruction on proper insertion of the mandrels into the collet or chuck, information about the maximum allowable overhang and information about the maximum mandrel length

103) Instruction on the use of all the different types of wheels specified in the instructions in accordance with 8.12.2 a) 101), e.g. side grinding, peripheral grinding

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104) Instruction to properly support the workpiece

105) Instruction on proper handling of the tool depending on the operation (one or two handed control)

106) In case of CONES OR PLUGS with a threaded hole intended to be mounted on a threaded mandrel, critical dimensions and other data shall be given in order to prevent the mandrel end from touching the bottom of the hole of the abrasive product

107) Instruction that the maximum recommended diameter of MOUNTED WHEELS, threaded CONES AND PLUGS shall not exceed 55 mm and that the maximum recommended diameter of sanding accessories shall not exceed 80 mm

8.12.2 c) *Addition:*

101) Storage and handling of recommended accessories

8.101 Tools shall also be marked with an indication of direction of rotation of the spindle. This shall be indicated by an arrow, raised or sunk, or by any other means no less visible and indelible.

8.102 Tools designed for operation at more than one speed shall be marked with clearly identifiable symbols for each of the speed settings in such a way that in conjunction with the instruction manual it is clear which speed corresponds with each of the settings.

Compliance is checked by inspection.

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, except as follows:

12.4 *Replacement:*

The tool is operated at rated input or rated current for 30 min. The temperature rises are measured at the end of the 30 min.

13 Leakage current

This clause of Part 1 is applicable.

14 Moisture resistance

This clause of Part 1 is applicable.

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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.

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 120 % of the RATED SPEED. *The accessory in accordance with 8.12.2a) 101) that results in the maximum speed shall be installed.*

19 Mechanical hazards

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

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 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.

19.101 The tool shall be designed so as to prevent the accessory from coming loose under normal use.

The collets and chuck shall be designed to allow insertion of the mandrel to the full depth of the gripping jaws of the collet or chuck and at least 50 % of the maximum mandrel length specified by the manufacturer in accordance with 8.12.2 b) 2) to limit the amount of the wheel overhang as illustrated in Figure 101.

Compliance is checked by inspection.

19.102 Spindles shall be designed so that they provide for or aid in securing and driving the accessories designed for the tool.

The direction of spindle threads or the design of an equivalent securing means shall be such that any clamping device, collet, chuck or wheel with threaded hole tends to tighten during operation.

Threaded spindles intended for direct mounting of wheels with threaded holes shall be designed with unrelieved flange shoulders to prevent the spindle from bottoming out in the threaded hole of the wheel.

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