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INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

Hand-held motor-operated electric tools – Safety –
Part 2-3: Particular requirements for grinders, polishers and disk-type sanders

Outils électroportatifs à moteur – Sécurité –
Partie 2-3: Règles particulières pour les meuleuses, lustreuses et ponceuses du type à disque

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FOREWORD

This amendment has been prepared by IEC committee 116: Safety of hand-held motor-operated electric tools.

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

FDIS	Report on voting
116/53/FDIS	116/56/RVD

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

This amendment modifies the present part 2-3 to ensure its conformity with the fourth edition (2006) of IEC 60745-1, *Hand-held motor-operated electric tools – Safety – Part 1: General requirements*.

The committee has decided that the contents of this amendment and the base 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- withdrawn,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.

The contents of the corrigendum of February 2011 have been included in this copy.

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1 Scope

Replace the existing text of this clause by the following:

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

Addition:

This standard applies to grinders, polishers and disk-type sanders, including angle, straight and vertical tools, with a rated capacity not exceeding 230 mm. For grinders, the rated speed does not exceed a peripheral speed of the accessory of 80 m/s at rated capacity.

This standard does not apply to dedicated cut-off machines which are covered by IEC 60745-2-22.

This standard does not apply to random-orbit polishers and random-orbit sanders which are covered by IEC 60745-2-4.

3 Definitions

Replace the title of this clause by the following:

3 Terms and definitions

Replace the existing definition 3.108 by the following:

3.108
rated speed
maximum attainable speed as designated by the manufacturer, with any recommended accessory installed, at rated voltage or at the upper limit of the rated voltage range

8 Marking and instructions

Replace the existing Subclause 8.1 by the following:

8.1 *Addition:*

Tools shall also be marked with:

– rated speed in revolutions per minute;
– rated capacity in mm;
– tools provided with a threaded spindle shall be marked with the spindle thread size;
– "**WARNING** Always wear eye protection" or sign M004 of ISO 7010 or the following safety sign:

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

Replace the existing Subclause 8.12.1 by the following:

8.12.1 *Addition:*

For the following safety instructions specified in 8.12.1.101 to 8.12.1.107, terms such as grinding/grinder, sanding/sander, wire brushing/wire brush, polishing/polisher 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

*Add the following new note after the heading “*Safety Warnings Common for Grinding, Sanding, Wire Brushing, Polishing or Abrasive Cutting-Off Operations”:

NOTE In the above heading, those operations not applicable may be omitted.

Replace the existing items b) and j) in 8.12.1.101 by the following:

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 recommended, then this warning may be omitted, but all subsequent warnings are to be given without exclusion.

j) **Hold the 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 may be omitted if polishing or sanding are the only recommended operations.

8.12.1.103 Additional safety instructions for grinding and cutting-off operations

Replace the existing item b) in 8.12.1.103 by the following:

b) **The guard must be securely attached to the power tool and positioned for maximum safety, so the least amount of wheel is exposed towards the operator.** *The guard helps to protect the operator from broken wheel fragments, accidental contact with wheel and sparks that could ignite clothing.*

NOTE The above warning may be omitted for grinders or cut-off grinders with a rated capacity of less than 55 mm.

8.12.1.104 Additional safety instructions for cutting-off operations

Replace the existing item d) in 8.12.1.104 by the following:

d) **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.*

Replace the existing text of 8.12.2 a) by the following:

8.12.2 a) *Addition:*

101) Types of accessories in accordance with 8.12.1.101 a)

102) Thickness and diameter of grinding wheels

8.12.2 b) *Replace the existing items 102), 103) and 104) by the following new items:*

102) Mounting of accessories and use of the correct flanges, use and care of the abrasive product. For reversible flanges, 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 8.12.2 a) 101), e.g. side grinding, peripheral grinding

104) Instruction for the proper type of guard for the type of wheel being used

Add the following text after item 104) and renumber the subsequent items:

105) Instruction for the mounting and securing of the guard identifying allowable adjustments to ensure maximum protection of the operator

Add the following additional subclause:

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.

18 Abnormal operation

Replace the existing Subclause 18.10 by the following:

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 8.12.2 a) 101) that results in the maximum speed shall be installed.

19 Mechanical hazards

Replace the existing Subclauses 19.101, 19.102, 19.103 and 19.104 by the following:

19.101 Grinders with a rated capacity exceeding 55 mm shall be provided with a wheel guard 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 (hereafter referred to as a guard) may be removable either with the aid of a tool or by fulfilling the following requirements:

– two separate and dissimilar actions shall be required to remove the guard, e.g. pushing a lever and turning the guard;

– for removal, the guard shall be turned to a position that does not occur in normal operation.

The guard shall fulfil the following requirements:

– be designed so that, in case of a wheel burst, the guard shall reduce the risk of injury to the operator and remain attached to the grinder by effective and secure means and comply with the test of 20.101;

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

– be designed so that the risk of an accidental contact between the operator and the wheel during normal use is minimized e.g. by a possibility of adjustment.

To prevent the installation of an oversized wheel, the clearance between the inside of the guard and the periphery of a new abrasive product in accordance with 8.12.2 a) 101) shall in at least one location be 8 mm maximum for tools with a rated capacity not exceeding 130 mm and 10 mm maximum for tools with a rated capacity exceeding 130 mm.

For wheel Type 1 (grinding wheels) and wheel Types 41 and 42 (cutting-off wheels), the guard shall cover at least 175° of the abrasive wheel periphery and both sides of the wheel. The front curtain shall be designed to facilitate easy replacement of the wheel. Enclosure of the spindle end, nut and the locking flange is not required. See Figure 101.

For wheel Types 27, 28 and 29, the guard shall cover at least 175° of the abrasive wheel periphery and shall have a front lip of at least 3 mm from the intersect line of the top surface of the thickest recommended wheel with the inner surface of the guard, measured radially to the inner edge of the lip.

For diamond cutting-off wheels, either one of the two guards above is acceptable.

The face of the thickest recommended wheel shall be at least 2 mm axially from the inner surface of the lip. The ends of the lip protruding the thickest recommended wheel may be chamfered by not more than 45°. See Figure 102.

For wheel Types 6 and 11 (straight and flaring cup wheels), the guard shall cover at least 240° of the abrasive wheel periphery, see Figure 103. The guard shall be adjustable axially to compensate for the wear of the largest permitted wheel and restrict the axial exposure of the wheel to less than 3 mm.

Compliance is checked by inspection and by measurement.

19.102 The tool shall be designed so as to prevent the abrasive product coming loose under normal use.

Grinders shall be provided with flanges for mounting the grinding wheels to the spindle. The flanges shall meet the requirements of 19.104 and 19.105.

Flanges are not required with the following designs:

- organic or inorganic bonded wheels secured to plain or threaded mandrels;
- non-reusable plate mount or threaded nut affixed to the wheel by the manufacturer;
- hole or modified cup wheels.

Compliance is checked by inspection.

19.103 Spindles shall be designed so that they provide for or aid in securing and driving the abrasive products 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 or wheel with threaded hole tends to tighten during working.

Compliance is checked by inspection.

In order to limit the unbalance of any rotating accessory, the eccentricity of the spindle shall be less than 0,1 mm.

For tools that provide for mounting of the accessory through the flange or similar clamping and locating device, the total eccentricity of the combination of the spindle, the diameter of the flange bore and the diameter of the part of the flange which locates and guides the accessory shall be less than:

- 0,30 mm for rated speeds less than 15 000 min^{-1};
- 0,15 mm for rated speeds from 15 000 min^{-1} to less than 25 000 min^{-1};
- 0,10 mm for rated speeds 25 000 min^{-1} and higher.

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.

For tools with collets and chucks, a true concentric steel pin is mounted and its eccentricity is measured at 10 mm and at 20 mm from the mounting location.

19.104 Flanges required by 19.102 shall be designed so that they secure and locate the abrasive products to the grinder. At least one of the flanges shall be keyed, screwed, shrunk-on or otherwise secured to prevent rotation relative to the tool spindle.

The flanges shall be flat and have no sharp edges.

The flanges shall have the dimensions specified in 19.104.1 and 19.104.2 and illustrated in Figure 104, where D is the outside diameter of the abrasive wheel, G and W are the dimensions of the recess and D_f is the outside diameter of the flange clamping surface.

Flanges for wheels under 55 mm diameter may be unrecessed.

For wheels of any diameter with threaded inserts or projecting studs, the flanges shall be unrecessed, i.e. $G = 0$.

The backing and the locking flange shall have the same diameter D_f or the overlap of the backing and locking flange bearing surfaces shall be at least equal to dimension C.

In order to prevent interference, the locking flange and/or nut shall not extend beyond the plane defined by the lip of the guard when mounted with the thickest recommended Type 27, 28 or 29 wheel.

19.104.1 The flange dimensions for wheel Type 1 shall be:

$D_f \geq 0{,}33\ D$

The flange diameter for wheel Types 6, 11, 27, 28, 29, 41 and 42 shall be:

$D_f = (20 \pm 1)$ mm	for 55 mm $\leq D <$ 80 mm
$D_f = (20 \pm 1)$ mm	for 80 mm $\leq D <$ 105 mm for wheels with a bore diameter of 10 mm (3/8'' in UNC)
$D_f = (29 \pm 1)$ mm	for 80 mm $\leq D <$ 105 mm for wheels with a bore diameter of 16 mm (5/8'' in UNC)
$D_f = (41 \pm 1)$ mm	for 105 mm $\leq D \leq$ 230 mm

For wheel Type 41, the D_f dimension may exceed the above values.

19.104.2 The dimensions *C*, *G and W* in Figure 104 shall be:

$C \geq 3$ mm

$W \geq G \geq 1$ mm for $D_f < 50$ mm

$W \geq G \geq 1{,}5$ mm for $D_f \geq 50$ mm

Compliance of the requirements in 19.104, 19.104.1 and 19.104.2 is checked by measurement.

In 19.105, change the font of the 3rd to 5th paragraph to italic.

Replace the existing Subclause 19.106 by the following:

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.

Delete the existing Subclause 19.107.

20 Mechanical strength

Add the following new subclause:

20.5 This subclause is not applicable for polishers and disk-type sanders, provided these tools are not intended to be used as a grinder as specified in the instructions in accordance with 8.12.2.

Replace the existing Subclause 20.101.1 by the following:

20.101.1 *The guard shall be mounted and securely fixed to the grinder in accordance with the instructions of 8.12.2 b) 105). If the guard is adjustable, it shall be positioned as close as possible to 30° (in a range of ± 10°) from the neutral or the symmetrical wheel covering position against the direction of the wheel's rotation or to its maximum setting if the adjustable range is less than 30°. See Figures 106a and 106b.*

The maximum thickness grinding wheel recommended by the manufacturer with a diameter equal to the rated capacity of the grinder shall be mounted to the spindle in accordance with the instructions.

The grinder shall be operated at rated voltage and no-load for a minimum of 5 min. The speed of the wheel is measured and recorded.

Replace the existing Subclause 20.101.3 by the following:

20.101.3 *For grinders with side handles, at the midpoint of the side handle on each side of the grinder a mass of 0,5 kg and at the midpoint of switch handle a mass of 1 kg shall be attached (see Figure 107). Using a flexible nylon braided rope, the grinder is suspended at the midpoint of the gripping zone on each side handle and at the midpoint of the switch handle.*

NOTE 1 The above test requires a second side handle or adaptor.

For grinders without side handles, at the midpoint of switch handle a mass of 1 kg shall be attached. An adaptor with means of suspension and weight attachment of 0,5 kg at each side shall be provided. The adaptor for the simulated side handles shall have a mass as small as possible and be located at the midpoint of the front gripping zone for straight and vertical grinders (see Figure 109) and less than half the rated capacity distance behind the output spindle for angle grinders. The suspension point and weight attachment on the left and right side of the tool shall be located at a distance from the centre of the spindle which is equivalent to rated capacity and at 90° to the centre line through the length of the tool.

The three suspension ropes are anchored to a single point and the tool is positioned inside a test box (see Figures 110a and 110b).

The test box, preferably a hexagonal, octagonal or round, approximately 1 m in interior diameter and approximately 1 m deep, shall have an outer shell capable of restraining the disintegrating wheel segments and the interior walls, lined with 25 mm to 35 mm of modelling clay, backed by an additional 25 mm to 35 mm thick layer of cork (see Figures 110a and 110b). The function of the modelling clay and cork is to absorb and retain the wheel segments or the impression of the impacting segments. The modelling clay and cork may be replaced by other materials performing the same function. Prior to the test, the clay walls shall be free of any wheel segment impressions.

An angle grinder with the mounted guard and the notched wheel facing down in the horizontal plane is positioned with the wheel approximately in the centre and 300 mm from the bottom of the box (see Figure 110a). To align the grinder inside the box and to prevent the grinder from twisting during the wheel's acceleration, the two side handles are secured to the box with a force less than 5 N.

For straight and vertical grinders, the test box is turned on its side, thus the axis of the box is horizontal. The grinder is positioned with the wheel approximately in the centre of the box, with the plane of the wheel perpendicular to the clay walls of the box (see Figure 110b). To restrain the grinder from excessive movement during the wheel's acceleration, the switch handle is secured with a force less than 5 N to the box. After securing, the movement of the midpoint of the switch handle shall not exceed 30 mm from side to side.

NOTE 2 One possible method to achieve the force necessary is the use of permanent magnets.

As an alternative method, the use of a high-speed camera is allowed to fix the position of the tool just prior to the wheel burst.

21 Construction

Add the following new subclause:

21.32 This subclause is not applicable for polishers and disk-type sanders, provided these tools are not intended to be used as a grinder as specified in the instructions in accordance with 8.12.2.

Replace the existing Figure 102 by the following:

Dimensions in millimetres

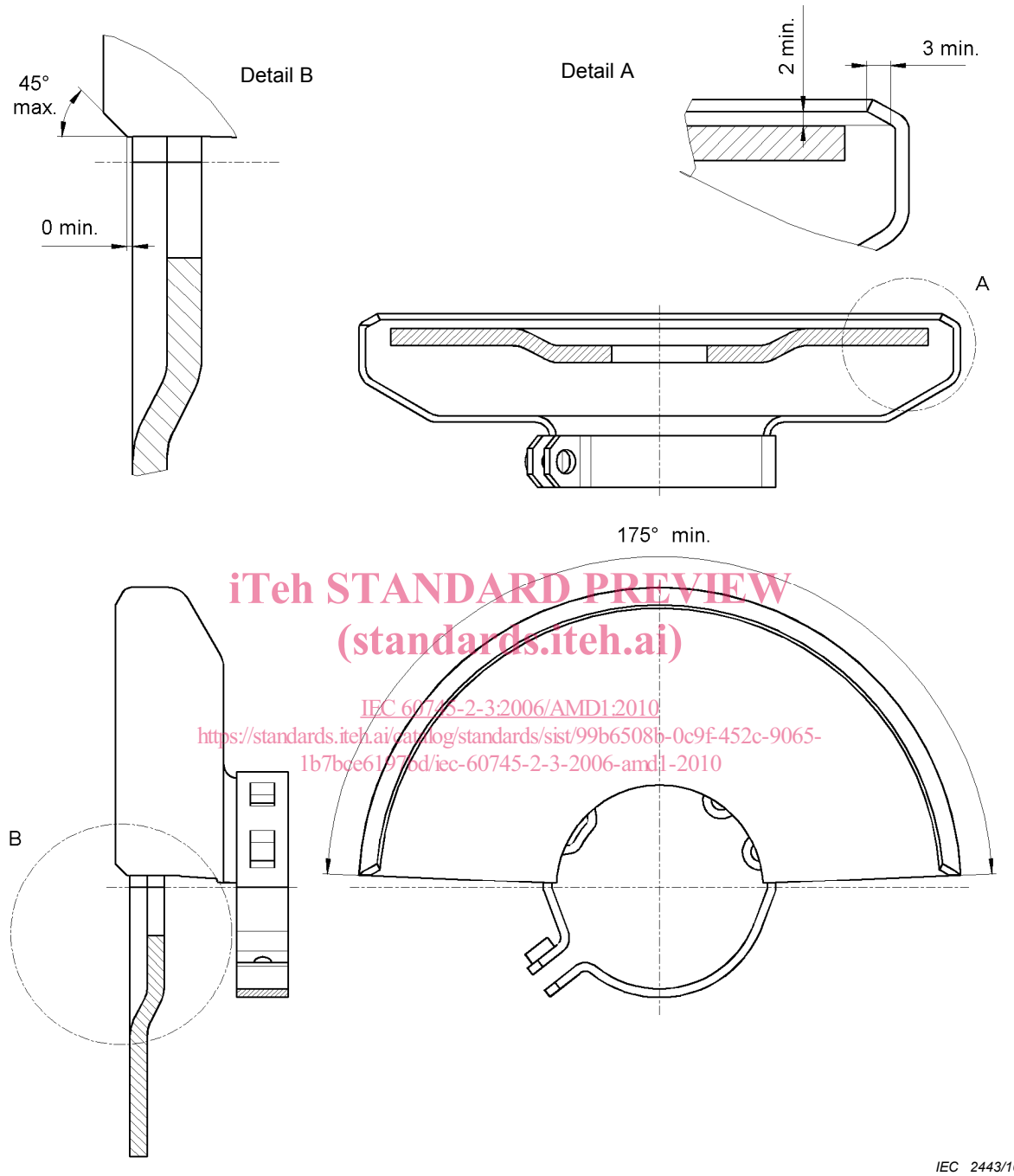

Figure 102 – Typical guard design with front lip for wheel Types 27, 28 and 29