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BSI Standards Publication

Electric motor-operated hand-held tools, transportable tools and lawn and garden machinery — Safety

Part 3-4: Particular requirements for transportable bench grinders
(IEC 62841-3-4:2016)

bsi.

National foreword

This British Standard is the UK implementation of EN 62841-3-4:2016. It is derived from IEC 62841-3-4:2016, incorporating corrigendum December 2016. It supersedes BS EN 61029-2-4:2011 which is withdrawn.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by CENELEC corrigendum December 2016 is indicated in the text by [AC1⟩ ⟨AC1].

The CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags [C⟩ ⟨C].

The UK participation in its preparation was entrusted to Technical Committee CPL/116, Safety of motor-operated electric tools.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Outils électroportatifs à moteur, outils portables et machines pour jardins et pelouses - Sécurité - Partie 3-4: Exigences particulières pour les tourets à meuler transportables (IEC 62841-3-4:2016 , modifiée)

Elektrische motorbetriebene handgeführte Werkzeuge, transportable Werkzeuge und Rasen- und Gartenmaschinen - Sicherheit - Teil 3-4: Besondere Anforderungen für transportable Tischschleifmaschinen (IEC 62841-3-4:2016 , modifiziert)

This European Standard was approved by CENELEC on 2016-03-21. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

The text of document 116/258/FDIS, future edition 1 of IEC 62841-3-4, prepared by IEC/TC 116 "Safety of motor-operated electric tools" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62841-3-4:2016.

A draft amendment, which covers common modifications to IEC 62841-3-4:2016 (116/258/FDIS), was prepared by CLC/TC 116 "Safety of motor-operated electric tools" and approved by CENELEC.

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2016-12-24
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2020-06-24

This document supersedes EN 61029-2-4:2011.

This European Standard is divided into four parts:

Part 1: General requirements which are common to most hand-held electric motor operated tools (for the purpose of this standard referred to simply as tools) which could come within the scope of this standard;

Part 2, 3 or 4: Requirements for particular types of tools which either supplement or modify the requirements given in Part 1 to account for the particular hazards and characteristics of these specific tools.

This Part 3-4 is to be used in conjunction with EN 62841-1:2015.

This Part 3-4 supplements or modifies the corresponding clauses in EN 62841-1:2015, so as to convert it into the European Standard: Particular requirements for transportable bench grinders.

Where a particular subclause of Part 1 is not mentioned in this Part 3-4, that subclause applies as far as relevant. When 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.

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

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

Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 62841-3-4:2016 are prefixed “Z”.

This European Standard follows the overall requirements of EN ISO 12100.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s), see informative Annex ZZ, which is an integral part of this document.

Compliance with the clauses of Part 1 together with this Part 3-4 provides one means of conforming with the essential health and safety requirements of the Directive concerned.

Endorsement notice

The text of the International Standard IEC 62841-3-4:2016 was approved by CENELEC as a European Standard with agreed common modifications.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

This annex from EN 62841-1:2015 is applicable with the following addition:

Publication	Year	Title	EN/HD	Year
ISO 603-4	1999	Bonded abrasive products - Dimensions - Part 4: Grinding wheels for surface grinding/peripheral grinding	-	-

Annex ZZ
(informative)

Relationship between this European Standard and the essential requirements of Directive 2006/42/EC [2006 OJ L157] aimed to be covered

This European Standard has been prepared under a Commission's standardization request M/396 to provide one voluntary means of conforming to essential requirements of Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC [2006 OJ L157].

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZZ.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table ZZ.1 – Correspondence between this European Standard and Annex I of Directive 2006/42/EC

Essential Requirements of Directive 2006/42/EC	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
Annex I	All clauses	All corresponding requirements are covered by complying with all clauses.

WARNING 1: Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2: Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTRIC MOTOR-OPERATED HAND-HELD TOOLS, TRANSPORTABLE TOOLS AND LAWN AND GARDEN MACHINERY – SAFETY –

Part 3-4: Particular requirements for transportable bench grinders

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 62841-3-4 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
116/258/FDIS	116/275/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 3-4 is to be used in conjunction with the first edition of IEC 62841-1:2014.

This Part 3-4 supplements or modifies the corresponding clauses in IEC 62841-1, so as to convert it into the IEC Standard: Particular requirements for transportable bench grinders.

Where a particular subclause of Part 1 is not mentioned in this Part 3-4, that subclause applies as far as relevant. Where this standard states “addition”, “modification” or “replacement”, the relevant text in Part 1 is to be adapted accordingly.

The following print types are used:

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

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

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

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

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

NOTE The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 36 months from the date of publication.

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.

ELECTRIC MOTOR-OPERATED HAND-HELD TOOLS, TRANSPORTABLE TOOLS AND LAWN AND GARDEN MACHINERY – SAFETY –

Part 3-4: Particular requirements for transportable bench grinders

1 Scope

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

Addition:

This part of IEC 62841 applies to transportable **bench grinders** that can be equipped with one or two **accessories** as follows:

– type 1 grinding wheels in accordance with ISO 603-4:1999 with a diameter not exceeding 310 mm and a thickness not exceeding 55 mm;
– wire brushes with a diameter not exceeding 310 mm and a thickness not exceeding 55 mm;
– polishing wheels with a diameter not exceeding 310 mm;

and with a peripheral speed of any **accessory** between 10 m/s and 50 m/s.

NOTE Polishing wheels are also known as buffing wheels.

2 Normative references

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

Addition:

ISO 603-4:1999, *Bonded abrasive products – Dimensions – Part 4: Grinding wheels for surface grinding/peripheral grinding*

3 Terms and definitions

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

3.101
bench grinder
tool designed to grind, clean, polish or debur metal or similar materials by means of one or two rotating **accessories** fixed to one or two **tool spindles**, see Figure 101, where the workpiece is held by hand and possibly assisted by a **work rest**

3.102
tool spindle
drive spindle of a **bench grinder** which supports the **accessories** and provides the rotation

3.103
work rest
surface or device intended to support or to guide the workpiece

4 General requirements

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

4.101 *D* is understood to be the maximum diameter of the **accessory** to be used on each **tool spindle**. Unless otherwise specified, **tool spindle** specific requirements dependent on *D* shall be based on the value of *D* for the relevant **tool spindle**.

Throughout the remaining part of this document, unless otherwise explicitly stated, whenever a requirement or a reference is made to “force” as multiple of *D*, the force shall be expressed in newtons (N) and *D* shall be expressed in millimetres (mm).

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 **guards**, **work rests** and transparent screens. Any additional parts such as leg sets or carrying means that are required in accordance with the instructions for the safe use of the tool 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 be marked with:

– **rated no-load speed** of the **tool spindle**(s).

8.2 *Addition:*

Tools shall be marked with the following safety warnings:

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

– a warning near any polishing spindle (i.e. a spindle without a **guard**) never to use a grinding wheel or wire brush on the polishing side of the tool, if applicable.

8.3 *Addition:*

Bench grinders shall be marked with the minimum and maximum diameter of the **accessory** to be used on each **tool spindle**.

Bench grinders shall be marked with the direction of rotation of the **tool spindle**, indicated in a visible location on the tool in the vicinity of the **tool spindle**, by an arrow raised or recessed 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”.

8.14.1.101 Safety instructions for bench grinders

Bench grinder safety warnings

a) **Do not use a damaged accessory. Before each use, inspect the accessory such as abrasive wheels for chips and cracks and wire brushes for loose or cracked wires. 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.*

NOTE 1 For tools that are not intended for wire brushes, the phrase “and wire brushes for loose or cracked wires” is omitted.

b) **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.*

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

NOTE 2 The above safety warning applies only to tools intended to be used with wire brushes.

d) **Never grind on the sides of a grinding wheel.** *Grinding on the side can cause the wheel to break and fly apart.*

8.14.2 a) *Addition:*

101) Information about details and type of the **accessory**(ies) recommended for each **tool spindle**, e.g. the maximum thickness of the **accessory** and the diameter of the hole in the **accessory**;

102) Instruction to use only **accessories** with a diameter according to the relevant marking as required by 8.3;

103) Instruction to ensure that the **bench grinder** is always stable and secure (e.g. fixed to a bench) and instruction how to fix the tool to a workbench or the like;

104) Instructions on the correct mounting of wheels and ensuring that wheels are free of defects before use, including instructions for performing a ring test for cracks.

8.14.2 b) *Addition:*

101) Instruction to adjust the spark arrestor and the **work rest** frequently so as to compensate for wear of the wheel;

102) Instruction to keep the distance between the spark arrestor/**work rest** and the wheel as small as possible and in any case not greater than 2 mm;

103) Instruction to replace the worn wheel when these gaps are no longer able to be maintained;

104) For tools with two spindles: instruction to always use the tool with **accessories** on both spindles in order to limit the risk of contact with the rotating spindle;

105) Instruction to always use the **guard**, **work rest**, transparent screen and spark arrestor as required for the **accessory**(ies);

106) For tools with a vertically adjustable or inclinable **work rest**: instruction on how to properly adjust and secure the **work rest** angle in relation to the wheel;

107) Instructions on how to perform grinding functions safely;

108) Instruction to replace damaged or deeply grooved wheels;

109) Instruction where to lift and support the **bench grinder** during transportation;

110) Instruction to always adjust the **work rest** so that the angle between the **work rest** and the tangent of the **accessory** is always greater than 85°.

8.14.2 c) *Addition:*

101) Instructions for handling and storage of grinding wheels and wire brushes, if applicable.

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:

18.5 *Addition:*

For **bench grinders** operated by three phase motors, the tests of 18.5.1 and 18.5.2 may be replaced by the test of 18.5.3.

18.5.3 *Addition:*

If the test of 18.5.3 is applied, the tool shall be tested for a period of 5 min.

18.8 Electronic circuits providing safety critical functions

Replacement of Table 4 by the following:

Table 4 – Required performance levels

Type and purpose of SCF	Minimum Performance Level (PL)
For tools intended to be used with grinding wheels or wire brushes, **power switch** – prevent unwanted switch-on	a
For tools intended to be used with grinding wheels or wire brushes, **power switch** – provide desired switch-off	a
For tools not intended to be used with grinding wheels or wire brushes, **power switch** – prevent unwanted switch-on	Not an **SCF**
For tools not intended to be used with grinding wheels or wire brushes, **power switch** – provide desired switch-off	Not an **SCF**
Any electronic control to pass the test of 18.3	a
For tools intended to be used with grinding wheels, over-speed prevention to prevent output speed above 120 % of **rated no-load speed**	c
For tools not intended to be used with grinding wheels, over-speed prevention to prevent output speed above 130 % of **rated no-load speed**	a
Provide desired direction of rotation	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 *Replacement of the first paragraph:*

Moving and dangerous parts other than the **accessories** shall be so positioned or enclosed to provide adequate protection against personal injury. The guarding of **accessories** is covered in 19.1.101 through 19.1.103.

For grinding wheels and wire brushes, a **guard** in accordance with 19.1.101 and 19.1.102, a **work rest** in accordance with 19.102 and a transparent screen in accordance with 19.1.103 shall be provided.

For polishing wheels, a **guard**, a **work rest** and a transparent screen are not required.

Guards for **accessories** shall not be removable without the aid of a tool.

19.1.101 Guards

The **guard** shall cover the periphery and the sides of the **accessory**, flanges and the end of the **tool spindle**, except a portion of the **accessory** as allowed in 19.1.102 and indicated in Figure 102.

The **guard** shall be designed so that the **tool spindle** cannot be fitted with an **accessory** greater than 1,07 times the maximum diameter marked on the tool.

The **guard** shall be constructed so that removal of the peripheral protecting member is not necessary for replacement of the **accessory**.

Compliance is checked by inspection and by measurement.

19.1.102 Openings in the guard

For grinding wheels and for wire brushes, the opening angle in the **guard** shall not exceed 65° above the horizontal plane passing through the centre of the wheel. The total opening angle shall not exceed 90°. See Figure 102.

Compliance is checked by inspection and by measurement.

19.1.103 Transparent screens

Transparent screens shall be adjustable and have the minimum dimensions as specified in Figure 103.

The operation of adjusting the screen shall not modify the adjustment of other parts of the **bench grinder**.

The screen shall be made of transparent material having an appropriate resistance against shattering, such as polycarbonate or laminated glass which is held in place by an interlayer, between its two or more layers of glass.

For all **bench grinders**, the screens shall be mounted in such a way that the symmetrical axis of the screen coincides with the vertical median plane of the working part of the grinding wheel or the wire brush.

Compliance is checked by inspection.

19.6 *Replacement:*

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

*Compliance is checked by measuring the speed of the **tool spindle** after the tool has been operating for 5 min at no-load.*

19.7 *Addition:*

If a working stand is provided with a **bench grinder**, or is specifically identified in accordance with 8.14.2, the requirements of 19.7 are also applicable to the combination of the **bench grinder** and the working stand.

19.7.101 Bench grinders shall be provided with means to facilitate the fixing of the tool to a bench, e.g. by providing holes in the base of the tool.

Compliance is checked by inspection.

19.8 This subclause is applicable for **bench grinders**, if provided with:

– wheels; or

– a pedestal with wheels.

19.101 Spark arrestor

For grinding wheels, a spark arrestor to limit the ejection of sparks and pieces of wheel from the wheel **guard** shall be provided.

The spark arrestor shall be situated at the upper part of the wheel **guard** in line with the periphery of the wheel and cover all the width of the wheel **guard**.

The spark arrestor shall be adjustable to within 2 mm of the surface of the wheel for all wheel diameters between the maximum wheel diameter and 90 % of the smallest wheel diameter in accordance with 8.3, see dimension *E* in Figure 102.

Compliance is checked by inspection and by measurement.

19.102 Work rest

The **work rest** shall not extend around the side of the wheel and cover at least the width of the wheel **guard**. The **work rest** shall only be radially adjustable to within 2 mm of the peripheral surface of the wheel for all wheel diameters between the maximum wheel diameter and 90 % of the smallest wheel diameter in accordance with 8.3, see dimension *F* in Figure 102.

The plane of the **work rest** surface shall either be fixed or be capable of adjustment only so as to form an angle of not less than 85° to the tangent of the wheel with the smallest diameter wheel in accordance with 8.3. See Figure 104.

If the **work rest** is adjustable in height, it shall be possible to achieve this angle at any height setting.

Any required adjustment of the **work rest** shall be capable of being performed without the aid of a tool.

Compliance is checked by inspection, by measurement and by manual test in accordance with 8.14.2 b).

19.103 Flanges

Bench grinders shall be provided with flanges for mounting grinding wheels to the **tool spindle**. Flanges shall comply with the minimum dimensions in relation to the maximum diameter *D* of the wheel, as specified in Table 101.

Table 101 – Minimum flange dimensions (see Figure 105)

Maximum wheel diameter	d_f mm	r mm	T mm
$D \leq 100$ mm	34	6	1,5
100 mm $< D \leq$ 125 mm	42	8	1,5
125 mm $< D \leq$ 150 mm	52	9	1,5
150 mm $< D \leq$ 200 mm	68	12	1,5
200 mm $< D \leq$ 250 mm	85	15	1,5
250 mm $< D \leq$ 310 mm	100	17	1,5

Compliance is checked by measurement.

19.104 Torque test for flanges

The flanges required by 19.103 shall be designed so that they are of adequate strength.

Compliance is checked by the following test.

The abrasive wheel is replaced by a flat steel plate of sufficient thickness to be clamped between the flanges, having the same bore diameter of the wheel and which extends beyond the flanges.

The clamping nut shall be tightened with a first test torque according to Table 102. A feeler gauge of thickness 0,05 mm shall be used to check whether the flanges are in contact with the plate all around the circumference. It shall not be possible to push the feeler gauge between the flange and the surface of the plate by more than 1 mm at any point around the circumference of the flange, excluding any chamfer.

The test is then repeated using the second test torque according to Table 102.

Table 102 − Test torque for flanges

Thread		First test torque	Second test torque
Metric	UNC	Nm	Nm
8		2	8
10	3/8	4	15
12	½	7,5	30
14		11	45
16	5/8	17,5	70
20	¾	35	140
> 20	> ¾	75	300

19.105 Direction of accessory rotation

The periphery of all **accessories** shall move in a downward direction with respect to the operator's position.

Compliance is checked by inspection.

19.106 Eccentricity of the tool spindle and flange

The eccentricity of the **tool 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 **tool 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 0,3 mm.

Compliance is checked by measurement.

The eccentricity of the flange in the worst off-centre position allowed by the mounting procedure is measured.

19.107 Out of balance

A **bench grinder** intended for use with grinding wheels of 100 mm or more in diameter shall have adequate strength when out of balance.

Compliance is checked by the following test.

*A simulated grinding wheel having a diameter equal to the maximum diameter marked on the **tool spindle** in accordance with 8.3 is mounted on the **tool spindle**. The **bench grinder** is then to be operated at no-load for 250 000 revolutions. The simulated wheel may consist of a circular steel plate. The simulated wheel is to be out of balance, by the addition or removal of material:*

– *for wheels less than 150 mm in diameter, by d^2/1 607 Nmm, where d is the diameter of the wheel in mm;*
– *for wheels of 150 mm or more in diameter, by 14 Nmm.*

*After the test, the tool shall withstand the electric strength test of Annex D between **live parts** and **accessible parts** and **live parts** shall not have become accessible as specified in Clause 9. In addition, all **guards** shall remain intact.*

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 guards

Guards for grinding wheels and wire brushes shall be made of a material with a minimum peripheral thickness *P* and a minimum side thickness *J* as specified in Table 103 or Table 104 and illustrated in Figure 102.

Table 103 − Guard thickness for steel

Minimum ultimate tensile strength	**Peripheral speed**	**Maximum wheel thickness**	**Maximum wheel diameter**							
			$D \leq 125$ mm		125 mm < D ≤ 200 mm		200 mm < D ≤ 250 mm		250 mm < D ≤ 310 mm	
N/mm^2	m/s	mm	***P*** mm	***J*** mm	***P*** mm	***J*** mm	***P*** mm	***J*** mm	***P*** mm	***J*** mm
300	≥ 10 and ≤ 32	25	1,5	1,5	2	1,5	2,0	2	2,5	2,5
		55	1,5	1,5	2	1,5	3	2	3,5	2,5
	> 32 and ≤ 40	25	1,5	1,5	2	1,5	2,5	2	3,0	2,5
		55	1,5	1,5	2	1,5	3,5	2	4,0	2,5
	> 40 and ≤ 50	25	1,5	1,5	2	1,5	3	2	3,5	2,5
		55	2	1,5	3	2	4,5	3	5,0	3,5

Table 104 − Guard thickness for aluminium

Minimum ultimate tensile strength	**Peripheral speed**	**Maximum wheel thickness**	**Maximum wheel diameter**					
			$D \leq 125$ mm		125 mm < D ≤ 200 mm		200 mm < D ≤ 250 mm	
N/mm^2	m/s	mm	***P*** mm	***J*** mm	***P*** mm	***J*** mm	***P*** mm	***J*** mm
200	≥ 10 and ≤ 32	10	5,5	5	6,5	5	8	6
		20	6	5	8	6	10	8
		32	6,5	5	9	7	12	10
	> 32 and ≤ 50	10	6	5	8,5	7	10,5	9
		20	7	6	10	8	13	11
310	≥ 10 and ≤ 40	10	2,5	2,5	3,5	3,5	4	4
		20	3	3	4	4	5	5
		32	3,5	3,5	4,5	4,5	6	5
	> 40 and ≤ 50	10	3	3	4	4	5	5
		20	3,5	3,5	4,5	4,5	6	5
		32	4	4	5	5	7	6

Compliance is checked by inspection, by measurement and by either receipt of confirmation of the ultimate tensile strength of the material from the material manufacturer or through measurement of samples of the material.

20.102 Tool spindle

Tool spindles shall be made of steel and have sufficient size to support **accessories** with a maximum diameter in accordance with 8.3. The diameter of the **tool spindle** shall comply with the minimum values specified in Table 105.

Table 105 – Minimum tool spindle diameter

Maximum accessory diameter	Minimum tool spindle diameter mm
$D \leq 80$ mm	8
80 mm $< D \leq$ 155 mm	12
155 mm $< D \leq$ 206 mm	15
206 mm $< D \leq$ 256 mm	18
256 mm $< D \leq$ 310 mm	24

Compliance is checked by measurement.

20.103 Means for transportation

Means for transportation of **bench grinders** as required by 19.4 and as described in the instructions in accordance with 8.14.2 b) 109) shall be of adequate strength to safely transport the tool.

Compliance is checked by inspection and the following test.

Carrying means other than grasping surfaces on motor housings are subjected to a force corresponding to three times the weight of the equipment but not more than 600 N per carrying means. The force is applied in the direction of lifting uniformly over a 70 mm width at the centre of the carrying means. The force is steadily increased so that the test value is attained within 10 s and maintained for a period of 1 min.

If more than one carrying means is provided, the force is distributed between the carrying means in the same proportion as in the normal transportation position. If the equipment is provided with more than one carrying means, but so designed that it may readily be carried by only one carrying means, each carrying means shall be capable of sustaining the total force.

The carrying means shall not break loose from the equipment and there shall not be any permanent distortion, cracking or other evidence of failure.

20.104 Working stand

A working stand for a **bench grinder**, if provided with the tool or if specifically identified in accordance with 8.14.2, shall have adequate strength.

Compliance is checked by the following test.

*The **bench grinder** is mounted to the working stand and an additional vertical force of 3 times the largest D is gradually applied for 1 min, distributed equally on the housing of the **bench grinder**. During the test the working stand shall not collapse, and after removing the force it shall not show any permanent deformation.*

NOTE One example of achieving equal distribution of the additional force is using bags of sand or other similar means.

21 Construction

This clause of Part 1 is applicable except as follows:

21.15 This subclause of Part 1 is not applicable.

21.18.2.1 *Addition:*

Bench grinders are not considered to give rise to danger on restoration of the voltage supply.

21.30 This subclause of Part 1 is not applicable.

21.35 This subclause of Part 1 is not applicable.

21.101 Dust outlet

Connection ports for external dust collection equipment, if any, shall be directed away from the operator.

Compliance is checked by inspection.

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:*

For **bench grinders**, protection devices (e.g. overload or over-temperature protection devices) or circuits that switch off the tool shall be of the non-self-resetting type.

24 Supply connection and external flexible cables and cords

This clause of Part 1 is applicable.

25 Terminals for external conductors

This clause of Part 1 is applicable.

26 Provision for earthing

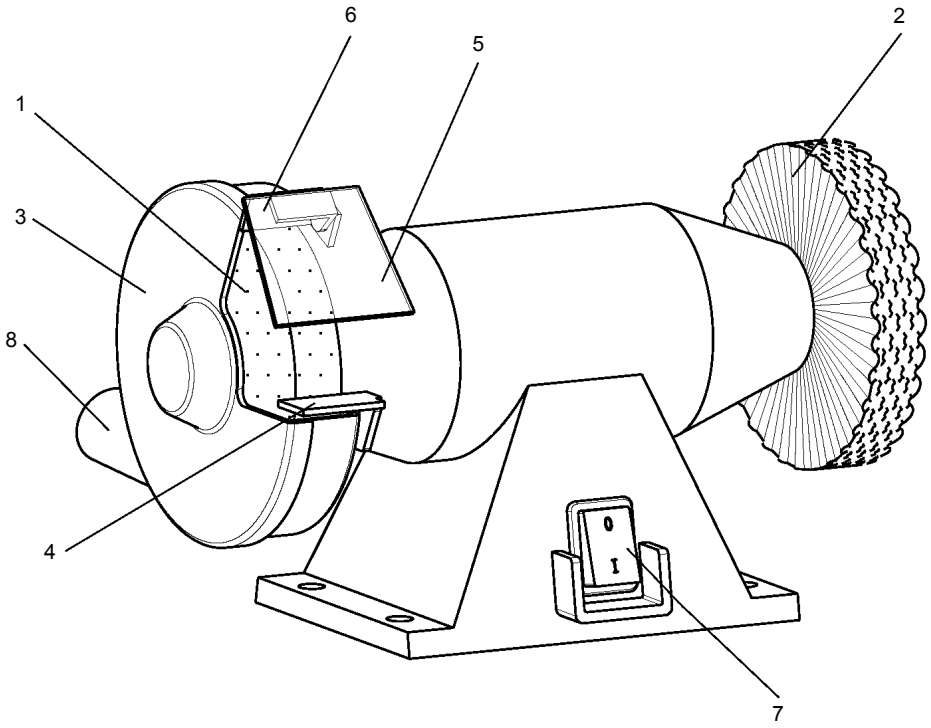
This clause of Part 1 is applicable.

27 Screws and connections

This clause of Part 1 is applicable.

28 Creepage distances, clearances and distances through insulation

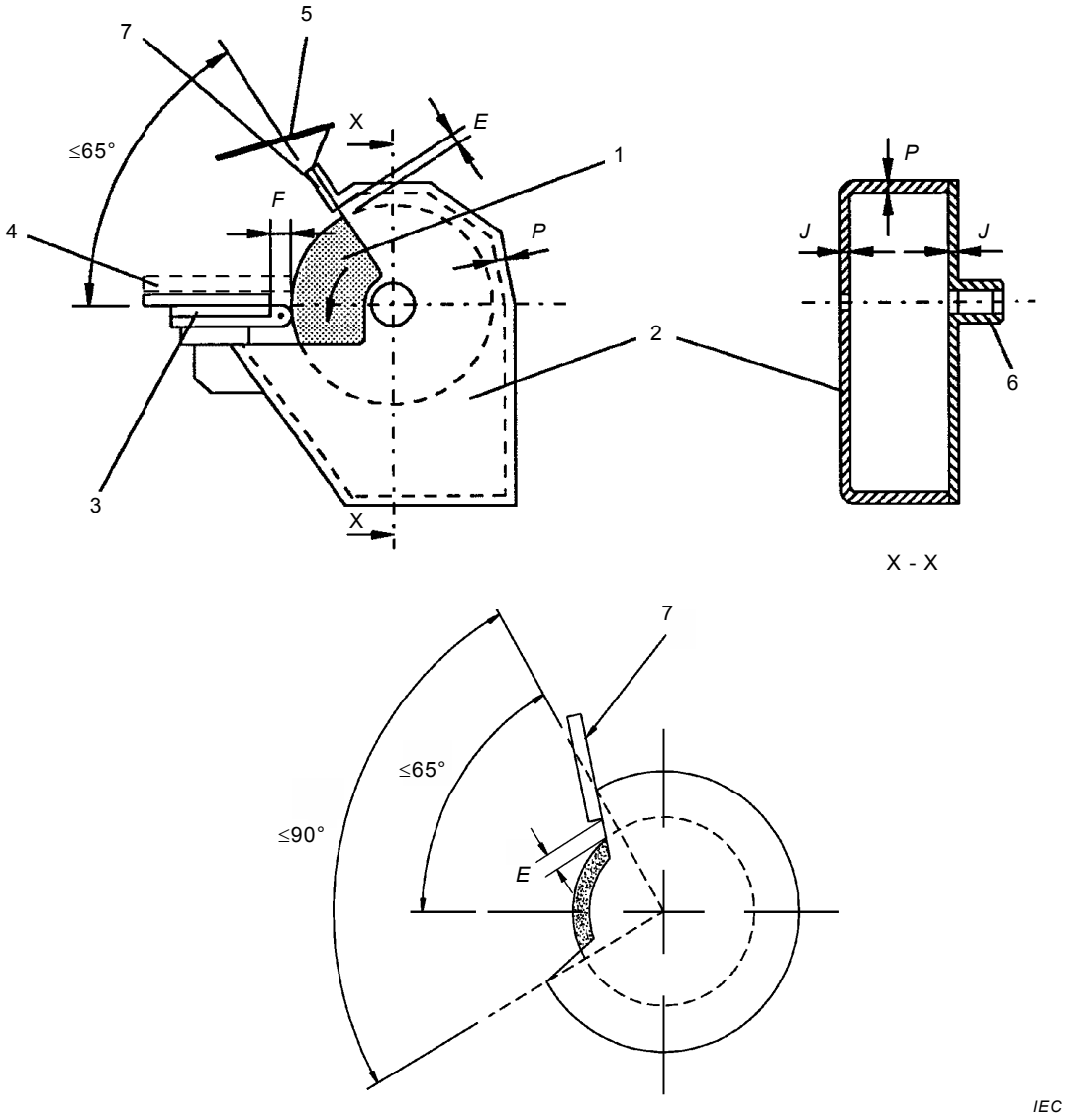
This clause of Part 1 is applicable.



Key

1	grinding wheel	5	transparent screen
2	polishing wheel	6	spark arrestor
3	**guard** for grinding wheel or wire brush	7	**power switch**
4	**work rest**	8	dust outlet, if any

Figure 101 – Bench grinder



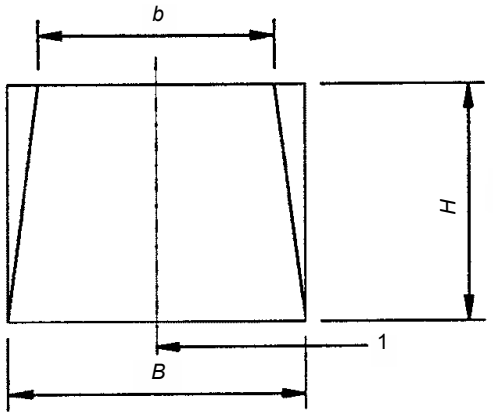
NOTE The lower part of Figure 102 is based on Figure 38.1 in the Standard for Stationary and Fixed Electric Tools, UL 987, Edition 8.

Key

1	grinding wheel	*P*	thickness of the periphery of the **guard**
2	**guard** for grinding wheel or wire brush	*J*	thickness of the sides of the **guard**
3	**work rest**	*E*	clearance between spark arrestor and wheel
4	workpiece	*F*	clearance between **work rest** and wheel
5	transparent screen		
6	**guard** for the **tool spindle**		
7	spark arrestor		

NOTE For articulation of the **work rest**, see Figure 104.

Figure 102 – Opening angles and dimensions for a guard



Key

$H \geq 60$ mm

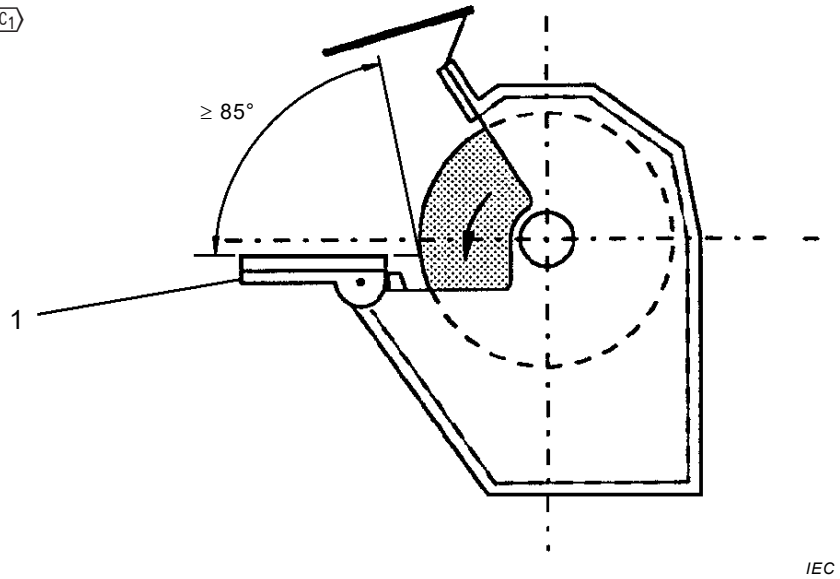
$b \geq 75$ mm

$B \geq 75$ mm

1 median vertical plane of the working part of the wheel

Figure 103 – Transparent screen

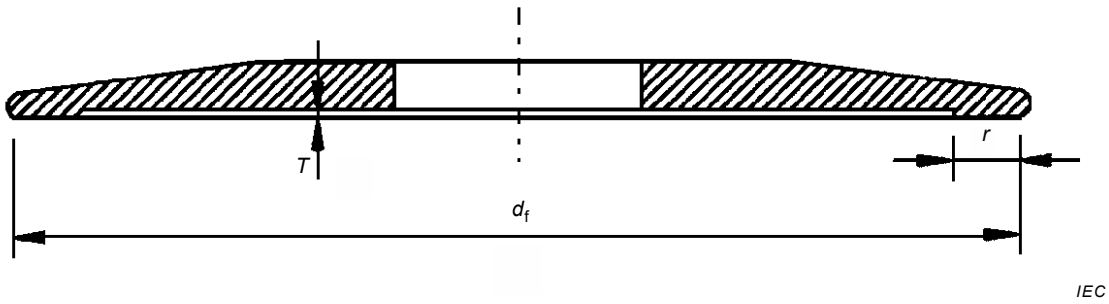
AC1



Key

1 adjustable **work rest**

Figure 104 – Bench grinder with inclinable work rest AC1



Key

d_f external diameter of flange

r width of contact surface

T depth of recess

Figure 105 – Flange dimensions

Annexes

The annexes of Part 1 are applicable except as follows.

〈C〉 Annex I
(normative)

Measurement of noise and vibration emissions 〈C〉

NOTE In Europe (EN 62841-3-4), Annex I is normative.

I.2 Noise test code (grade 2)

This clause of Part 1 is applicable except as follows:

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

Addition:

Bench grinders supplied with a working stand are placed on this working stand standing on a reflecting plane.

Other **bench grinders** are placed on a test bench as shown in Figure I.1 standing on a reflecting plane.

I.2.5 Operating conditions

Addition:

Bench grinders are tested at under load observing the conditions shown in Table I.101.

Table I.101 – Operating conditions for bench grinders

Workpiece and orientation	Grinding a horizontal plate of mild steel with a length of approximately 150 mm, a width equal to the thickness of the grinding wheel minus 5 mm and a thickness of (5 ± 0,5) mm. The **work rest** is adjusted so that the workpiece is horizontal. The workpiece is oriented so that the face of the workpiece made up from width and thickness is ground.
Feed force	The workpiece is pressed against the **work rest** and the wheel so as to minimize any noise emission by the workpiece itself. The feed forces shall be determined by means of a scale and shall be recorded. NOTE Typical forces to achieve the above are 10 N against the wheel and 30 N against the **work rest**.
Tool bit	New grinding wheel as supplied with the tool. If no grinding wheel is supplied with the tool, a grinding wheel with a grain size of 60 and suitable for grinding steel is used.

I.3 Vibration

This clause of Part 1 is not applicable.

Bibliography

〚C〛 The Bibliography of EN 62841-1:2015 is applicable. 〚C〛

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