EUROPEAN STANDARD **EN 61029-2-4**

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English version

Safety of transportable motor-operated electric tools
Part 2-4: Particular requirements for bench grinders
(IEC 61029-2-4:1993, modified)

Sécurité des machines-outils électriques semi-fixes
Partie 2-4: Règles particulières pour les tourets à meuler
(CEI 61029-2-4:1993, modifiée)

Sicherheit transportabler motorbetriebener Elektrowerkzeuge
Teil 2-4: Besondere Anforderungen für Tischschleifmaschinen
(IEC 61029-2-4:1993, modifiziert)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat 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 Central Secretariat has the same status as the official versions.

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 61029-2-4:2003 E

Foreword

The text of the International Standard IEC 61029-2-4:1993, prepared by SC 61F, Safety of hand-held motor-operated electric tools, of IEC TC 61, Safety of household and similar electrical appliances, together with the common modifications prepared by the Technical Committee CENELEC TC 61F, Safety of hand-held and transportable electric motor-operated tools, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 61029-2-4 on 2002-03-05.

A draft for an amendment (prAA) was submitted to the formal vote and was approved by CENELEC for incorporation into EN 61029-2-4 on 2002-03-05.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2003-08-01

- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-03-01

In this document the common modifications to the International Standard are indicated by a vertical line in the left margin of the text.

This European Standard is divided into two parts:

Part 1 General requirements which are common to most transportable electric motor operated tools (for the purpose of this standard refer

red to simply as tools) which could come within the scope of this standard;

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

This European Standard has been prepared under a mandate given to CEN/CENELEC by the European Commission and the European Free Trade Association and supports the essential health and safety requirements of the Machinery Directive.

Compliance with the relevant clauses of part 1 together with this part 2 provides one means of conforming with the specified essential health and safety requirements of the Directive.

For noise and vibration this standard covers the requirements for their measurement, the provision of information arising from these measurements and the provision of information about the personal protective equipment required. Specific requirements for the reduction of the risk arising from noise and vibration through the design of the tool are not given as this reflects the current state of the art.

As with any standard, technical progress will be kept under review so that any developments can be taken into account.

Warning: Other requirements and other EC Directives can be applicable to the products falling within the scope of this standard.

Part 2-4 is to be used in conjunction with EN 61029-1:2000.
Part 2-4 supplements or modifies the corresponding clauses of EN 61029-1, so as to convert it into the European Standard: Safety requirements for transportable bench grinders.

Where a particular subclause of part 1 is not mentioned in this part 2-4, that subclause applies as far as is reasonable. Where this part 2-4 states "addition", "modification" or "replacement", the relevant text of part 1 is to be adapted accordingly.

Subclauses, tables and figures which are additional to those in part 1 are numbered starting from 101.
Subclauses, tables and figures which are additional to those in IEC 61029-2-4 are prefixed "Z".

NOTE In this European Standard the following print types are used:
- Requirements proper;
- *Test specifications;*
- Explanatory matter.

Contents

1 Scope

This clause of part 1 is applicable except as follows:

1.1 *Addition:*

This standard applies to transportable bench grinders with a wheel diameter not exceeding 250 mm, a thickness not exceeding 50 mm and a peripheral speed not exceeding 50 m/s, as defined in 2.101.

The requirements for bonded abrasive products (wheel) are given in EN 12413.

2 Definitions

This clause of part 1 is applicable except as follows:

2.21 *Replacement*:

2.21
normal load
the load to obtain rated input

2.101
bench grinder
tool designed to grind metal or similar materials by means of one or two rotating abrasive wheels fixed on the tool spindle, the work piece being held by hand (see Figure 101)

2.102
accessory
device or piece other than a grinding wheel intended to be mounted on the bench grinder spindle

2.103
tool spindle
motor spindle of the bench grinder which supports and transmits the rotation to the grinding wheel

2.104
nozzle for dust collection
device allowing the connection of the bench grinder to a dust collection system

2.105
guard for wheel
device which partially encloses the abrasive wheel in order to protect the user against accidental contact with the wheel in normal use and against ejection of fragments of the wheel in the protected area in case of breakage of the wheel

2.106
flange assembly
means provided to clamp an abrasive wheel to the tool spindle

2.107
work rest
surface or device intended to support or guide the piece to be worked

3 General requirement

This clause of part 1 is applicable.

4 General notes on tests

This clause of part 1 is applicable.

5 Rating

This clause of part 1 is applicable.

6 Classification

This clause of part 1 is applicable.

7 Marking

This clause of part 1 is applicable except as follows:

7.1 *Addition:*

– the rated no-load speed in rev/min;

- the maximum diameter D of the wheel to be used;

– indication of the direction of rotation of the grinding wheel.

7.6 *Addition:*

The direction of rotation of the wheel shall be indicated on the tool by an arrow raised or sunk or by any other means not less visible and indelible.

7.13 *Addition:*

The following instructions shall also be given:

– wear protective glasses;

– do not use damaged grinding wheels;

– use only grinding wheels recommended by the manufacturer which have a marked speed equal to or greater than the speed marked on the nameplate of the tool;

– adjust the spark arrestor frequently so as to compensate for wear of the wheel, keep the distance between the spark arrestor and the wheel as small as possible and in any case not greater than 2 mm;

– instruction for the safe use, handling and storage of abrasive wheels taking into account the requirements of the CEN standard for abrasive products for the type of tool covered by this standard. It is assumed that wheels will not be dressed. If wheel dressing is intended then suitable precautions should be taken;

– if the grinder is intended to be bolted down, an instruction requesting it to be secured to a suitable work surface.

The following information shall also be given:

– how to connect the dust collection device, if any;

– details of the grinding wheel(s) recommended, the maximum thickness of the wheel and the diameter of the hole in the wheel;

– the maximum wear of the wheel allowed before replacement;

– description of residual risks.

NOTE Sketches may be used to illustrate the modes of operation.

8 Protection against electric shock

This clause of part 1 is applicable.

9 Starting

This clause of part 1 is applicable.

10 Input and current

This clause of part 1 is applicable.

11 Heating

This clause of part 1 is applicable.

12 Leakage current

This clause of part 1 is applicable.

13 Environmental requirements

This clause of part 1 is applicable except as follows:

13.1 This subclause is not applicable.

13.2.1 *Addition:*

The most important sources of noise are:

- abrasive wheels,

- workpieces.

13.2.4 *Replacement of paragraphs 1, 2 and 3:*

Bench grinders are tested under load under the conditions shown in Table Z101.

Table Z101 – Noise test conditions for bench grinders

Wheels	New wheels as recommended by the manufacturer for grinding of firmer chisel
Work piece	Flat firmer chisel, 30 mm wide
Feed-speed	Sufficient to perform finish-grind
Test position	To be used on a test bench above reflecting plane as shown in Figure 12 of part 1.
Test cycle	To consider the influence of different wheels the measurements shall be performed as follows: - 3 measurements with grinding wheel; - 3 measurements with finishing wheel. Each measurement shall take at least 60 s.

The highest mean value of the three equivalent measurements has to be given in the manual.

13.3 This subclause is not applicable.

14 Protection against ingress of foreign bodies and moisture resistance

This clause of part 1 is applicable.

15 Insulation resistance and electric strength

This clause of part 1 is applicable.

16 Endurance

This clause of part 1 is applicable.

17 Abnormal operation

This clause of part 1 is applicable.

18 Stability and mechanical hazards

This clause of part 1 is applicable except as follows:

18.1 *Addition:*

Bench grinders shall be equipped with an adequate guarding system which cannot be removed without the aid of a tool.

The guarding system shall comply with the requirements of 18.1.101.

18.1.101 Wheel guards

Except for the openings in the guard as allowed in 18.1.101.2 the wheel shall be enclosed by a fixed guard.

On straight-sided wheels the side guard shall cover the flanges and the end of the tool spindle.

The guard shall be designed so that the tool cannot be fitted with a wheel greater than 1,07 times the maximum diameter marked on the tool.

18.1.101.1 Strength of guards

Guards for straight sided wheels shall either

a) have a thickness as given in Table Z102 or Table Z103, provided the guard is made of material in accordance with Table Z104, or,

b) meet the requirements of 18.1.101.1.1.

Guards for cup wheels shall either

a) have a thickness as given in Table Z102 or Table Z103, provided the guard is made of material in accordance with Table Z104, or,

b) if the bench grinder is also fitted with a straight sided wheel and that guard meets the requirements of 18.1.101.1.1, be of the same material and thickness as the guard for the straight sided wheel.

Table Z102 - Guard thickness for steel

Material (see Table Z104)	**Peripheral speed** m/s	**Wheel thickness** mm	**Wheel diameter in mm**					
			≤ 125		≤ 200		≤ 250	
			P	J	P	J	P	J
1, 2 & 3	32	50	1,5	1,5	2	1,5	3	2
1, 2 & 3	40	25	1,5	1,5	2	1,5	2,5	2
		50	1,5	1,5	2	1,5	3,5	2
1, 2 & 3	50	25	1,5	1,5	2	1,5	3	2
		50	2	1,5	3	2	4,5	3

Table Z103 - Guard thickness for aluminium

Material (See Table Z104)	Peripheral speed m/s	Wheel thickness mm	Wheel diameter in mm					
			≤ 125		≤ 200		≤ 250	
			P	J	P	J	P	J
7	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
	50	10	6	5	8,5	7	10,5	9
		20	7	6	10	8	13	11
6	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
	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

Table Z104 - Material specifications

Reference No.	Material	ISO or EN	Ultimate tensile strength N/mm^2	Elastic strength N/mm^2	Elongation %
1	Steel	ISO 3574 EN 10130	270	140	28
2	Steel	ISO 4997 ISO 6316	300	220	18
3	Steel	ISO 1052 EN 10025	340	215	17
4	Steel	ISO 3755	450	230	22
6	Aluminium	ISO 6361	310	260	10
7	Aluminium	ISO 3522	200	-	3

18.1.101.1.1 Strength test

The tool shall be assembled as for normal use, the guard shall be equipped with any attachments for which it is designed.

The tool shall be fitted with a grinding wheel of the same dimensions as recommended for normal use and shall be rotating at maximum speed. A projectile shall be made to impact the wheel as close as possible to the flange so as to cause a complete breakage of the wheel, care being taken that the projectile does not itself affect the outcome of the test (see Figure 102).

This test is dangerous and must only be carried out in a properly constructed and equipped test facility. The test must be carried out in a fully protected enclosure which can contain all the wheel fragments and other debris.

Compliance is checked by test and inspection. After the test the wheel guard shall remain attached to the tool, remain effective and shall show no visible crack when examined by a recognised method of crack detection. Minor deformations and superficial damage are acceptable. Any fixing devices such as guard clamps, bolts etc. shall remain effective.

18.1.101.2 Openings in the guard

18.1.101.2.1 For straight-sided wheels the opening angle in the guard shall not exceed 65° above the horizontal plane passing through the centre of the wheel.

Under this plane the opening height H shall be smaller than 0,2 D (see Figure 103) but in any case the total opening shall not exceed 90°.

18.1.101.2.2 For straight-sided cup wheels the height of the opening in the guard shall not be greater than 0,4 D above the horizontal plane passing through the axis of the wheel (see Figure 104a).

The opening in the guard H, below the horizontal plane passing through the axis of the wheel, shall not be greater than 0,2 D (see Figure 104b).

The width of the opening in the guard periphery shall not be more than is sufficient to allow the use of the wheel until it is worn out.

18.1.101.2.3 The side clearance between the wheel and the guard shall be as small as possible.

Compliance with 18.1.101.2 is checked by inspection and measurement.

18.1.101.3 Spark arrestor

Tools fitted with straight sided wheels shall have a spark arrestor to limit the ejection of sparks and pieces of the wheel out of the front of the wheel guard.

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 diameters of wheel from the maximum wheel diameter to the minimum recommended by the manufacturer.

Compliance is checked by inspection.

18.1.101.4 Work rest

The bench grinder shall be fitted with work rests.

The work rest shall be adjustable to within 2 mm of the surface of the wheel for all diameters of wheel from the maximum wheel diameter to the minimum recommended by the manufacturer.

The work rest shall be easy to adjust, shall cover at least the width of the wheel guard and the fixings shall ensure a firm position of the rest.

When the bench grinder is fitted with an inclinable work rest it shall be inclinable only in the downward direction (see Figure 105*).*

Compliance is checked by inspection.

18.1.102 Flange

Flanges shall either

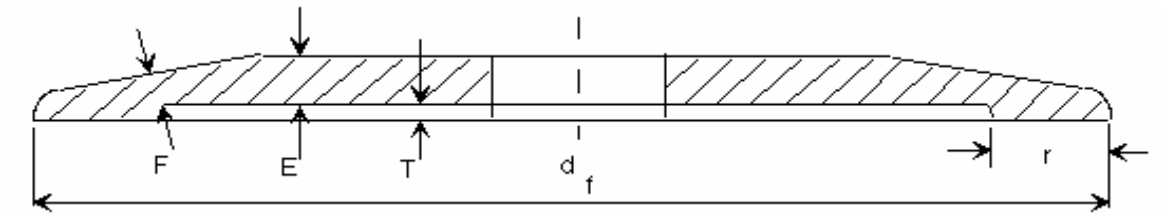
a) if made of steel in accordance with material reference number 4 of Table Z104, or of sintered powder metal with a minimum tensile strength of 500 N/mm^2 for wheels of a thickness not exceeding 0,15 times the diameter, comply with Table Z105, or

b) meet the requirements of the test shown in 18.1.102.1, and not be made of cast iron, or

c) for bench grinders with rated power of 560 watts or less, be of pressed steel according to material reference number 2 of Table Z104 and constructed in accordance with Table Z106.

Table Z105 - Flange dimensions

D	d_f	r	E	F	T
100	34	6	5	3,2	1,5
125	42	8	6	3,2	1,5
150	52	9	8	5	1,5
200	68	12	10	5	1,5
250	85	15	10	6	1,5



D = Maximum wheel diameter

d_f = Minimum external diameter of flange

r = Minimum width of contact surface

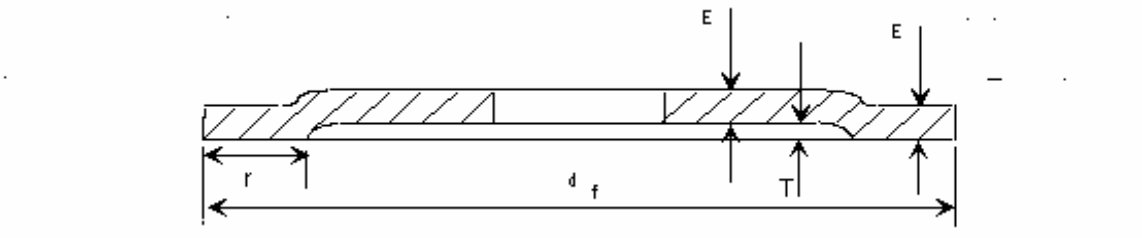
E = Minimum flange thickness on flat surface

F = Minimum flange thickness on inclined surface

T = Minimum depth of recess

Table Z106 - Dimensions of pressed steel flanges

D	d_f	R		E	T
	min.	min.	max.	min.	min.
100	34	3	5	2	0,75
125	42	5	7	2	0,75
150	52	7	13	3	0,75
180	61	7	13	3	2



D = Maximum wheel diameter

d_f = Minimum external diameter of flange

r = Minimum width of contact surface

E = Minimum flange thickness on flat surface

T = Minimum depth of recess

Compliance is checked by inspection and measurement.

18.1.102.1 Flanges in accordance with b) above shall be checked by the following test:

The abrasive wheel shall be replaced by a steel disc having the same dimensions.

The clamping nut shall be tightened with a first test torque according to Table Z107. A feeler gauge of thickness 0,05 mm shall be used to check whether the flanges are in contact with the disc all around the circumference. It shall not be possible to push the feeler gauge between the flange and the surface of the disc.

The clamping nut shall then be tightened to the second test torque according to Table Z107. It shall not be possible to push the feeler gauge between the flange and the surface of the disc by more than 1 mm at any point around the circumference of the flange.

Table Z107 - Test torque for flanges

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

18.1.103 Transparent screens

Bench grinders shall be fitted with transparent screens designed to prevent the ejection of particles towards the eyes and face of the operator.

The screen shall be adjustable and of such dimensions that in normal positions of grinding, including in a vertical plane above the wheel, the operator shall see the working part of the wheel only through the screen. The operation of adjusting the screen shall not modify the adjustment of other parts of the bench grinder.

The screen shall be made of material having an appropriate resistance against impact and abrasion. Laminated glass or polycarbonate are recommended, other plastics materials are acceptable.

Minimum dimensions of the transparent part of the screen shall be 60 mm high and 75 mm wide, or the width of the working part of the wheel whichever is the larger, and shall be located centrally about the median vertical plane of the working part of the wheel.

Compliance is checked by inspection and measurement.

18.2 *Replacement:*

Bench grinders not intended to be bolted down when in use shall be subjected to the following stability test.

The grinder is placed on a horizontal plane surface of beech wood, a horizontal force is applied to each grinding wheel, in turn, just above the work rest, and increased in magnitude until the bench grinder moves.

During the test the tool shall not tilt.

19 Mechanical strength

This clause of part 1 is applicable except as follows:

19.Z101 The wheel guards, including their fixing, shall have adequate mechanical strength to withstand the loading applied during handling.

Compliance is checked by the following test:

The grinder guards have to be supported in such a way that no other parts of the grinder are supported, neither by the supporting means nor by the bench, see Figure Z101.

A vertical downward force equal to the weight of the grinder is applied over the centre of the tool for 1 min.

There shall be no visible deformation of the guard during and after the test.

20 Construction

This clause of part 1 is applicable except as follows:

20.18 *Addition:*

The actuation of the mains switch or control device shall not be affected or restricted by adjustment of the work rest or by the work piece.

20.20 *Addition:*

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

21 Internal wiring

This clause of part 1 is applicable.

22 Components

This clause of part 1 is applicable.

23 Supply connection and external flexible cables and cords

This clause of part 1 is applicable

24 Terminals for external conductors

This clause of part 1 is applicable.

25 Provision for earthing

This clause of part 1 is applicable.

26 Screws and connections

This clause of part 1 is applicable.

27 Creepage distances, clearances and distance through insulation

This clause of part 1 is applicable.

28 Resistance to heat, fire and tracking

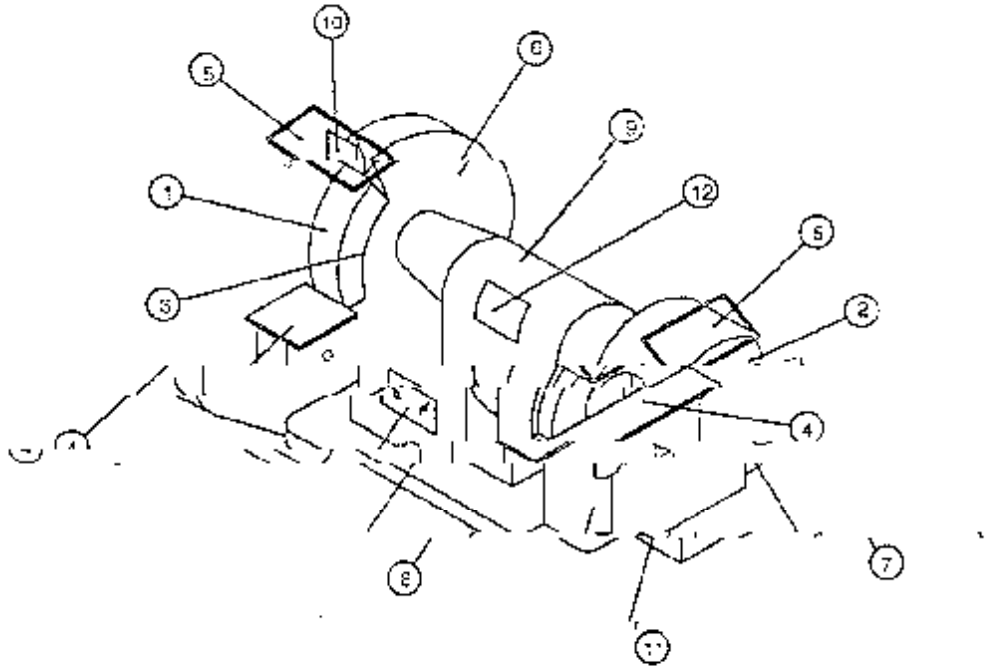
This clause of part 1 is applicable.

29 Resistance to rusting

This clause of part 1 is applicable.

30 Radiation

This clause of part 1 is not applicable.



1 = straight-sided grinding wheel
2 = straight-sided cup wheel
3 = flange
4 = work rest
5 = transparent screen
6 = guard for straight-sided wheel
7 = nozzle for dust
8 = on/off device
9 = motor housing
10 = spark arrestor
11 = cup wheel guard
12 = marking plate

Figure 101 – Bench grinder

This drawing is given as a guide only

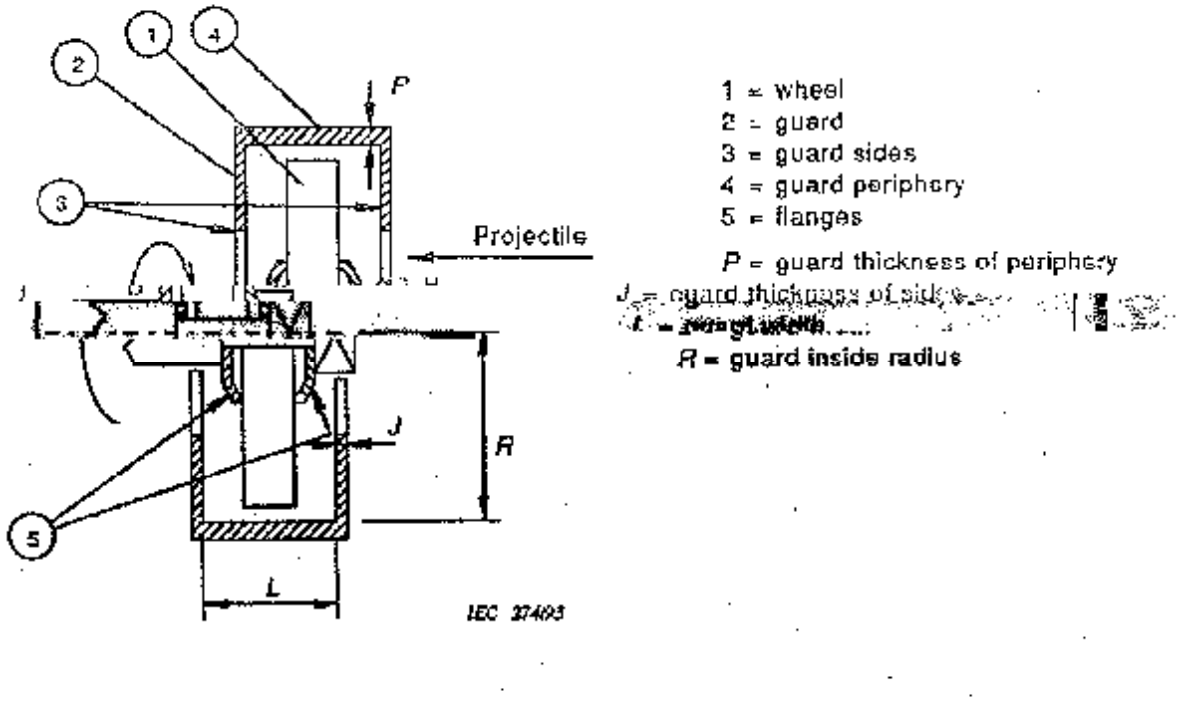


Figure 103 – Schema

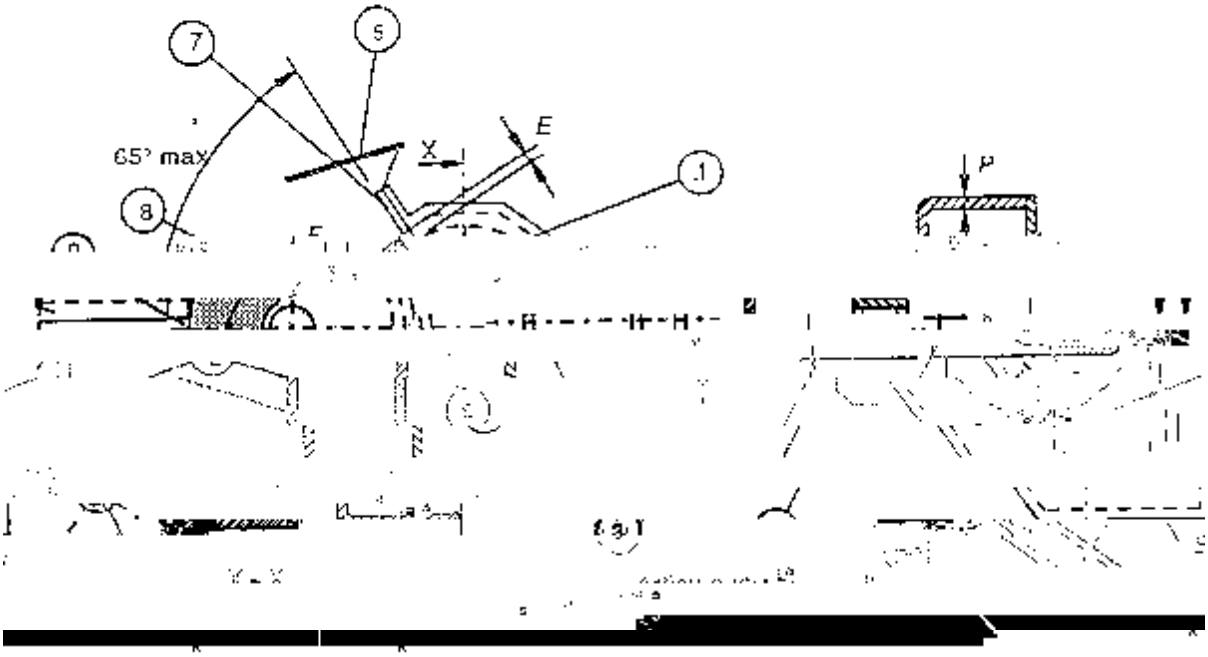


Figure 103 – Guard

Figure 104 – Bench grinder equipped with straight-sided cup wheels

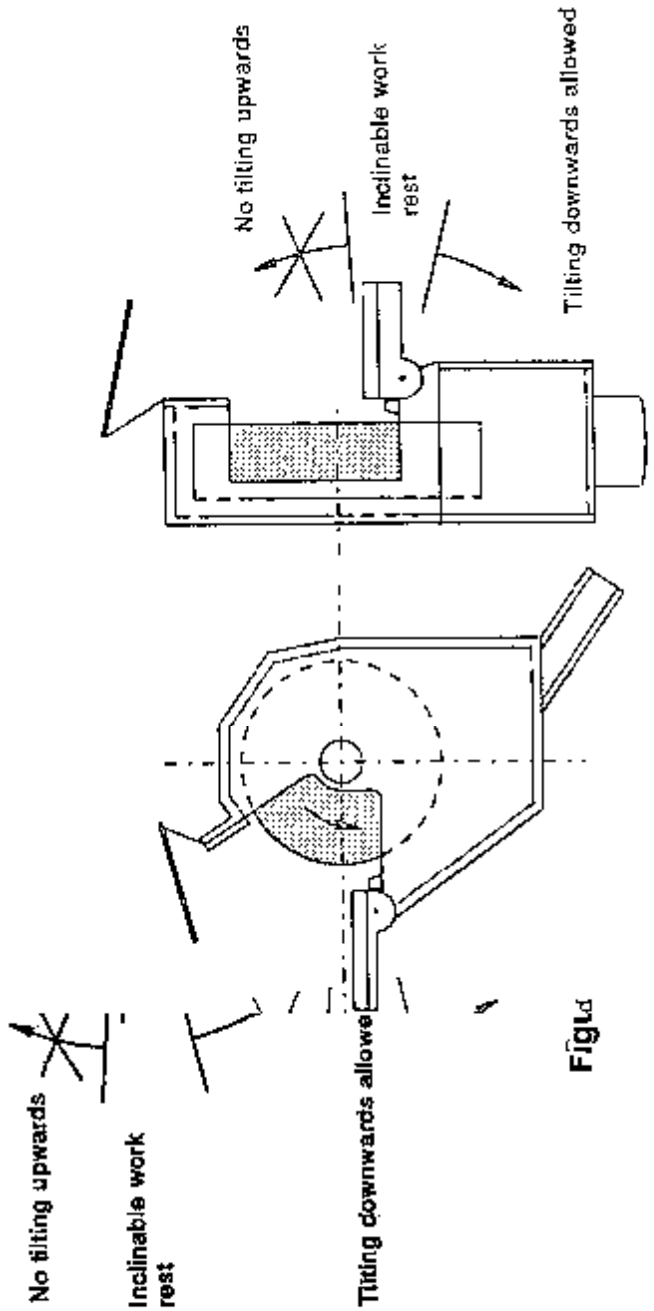
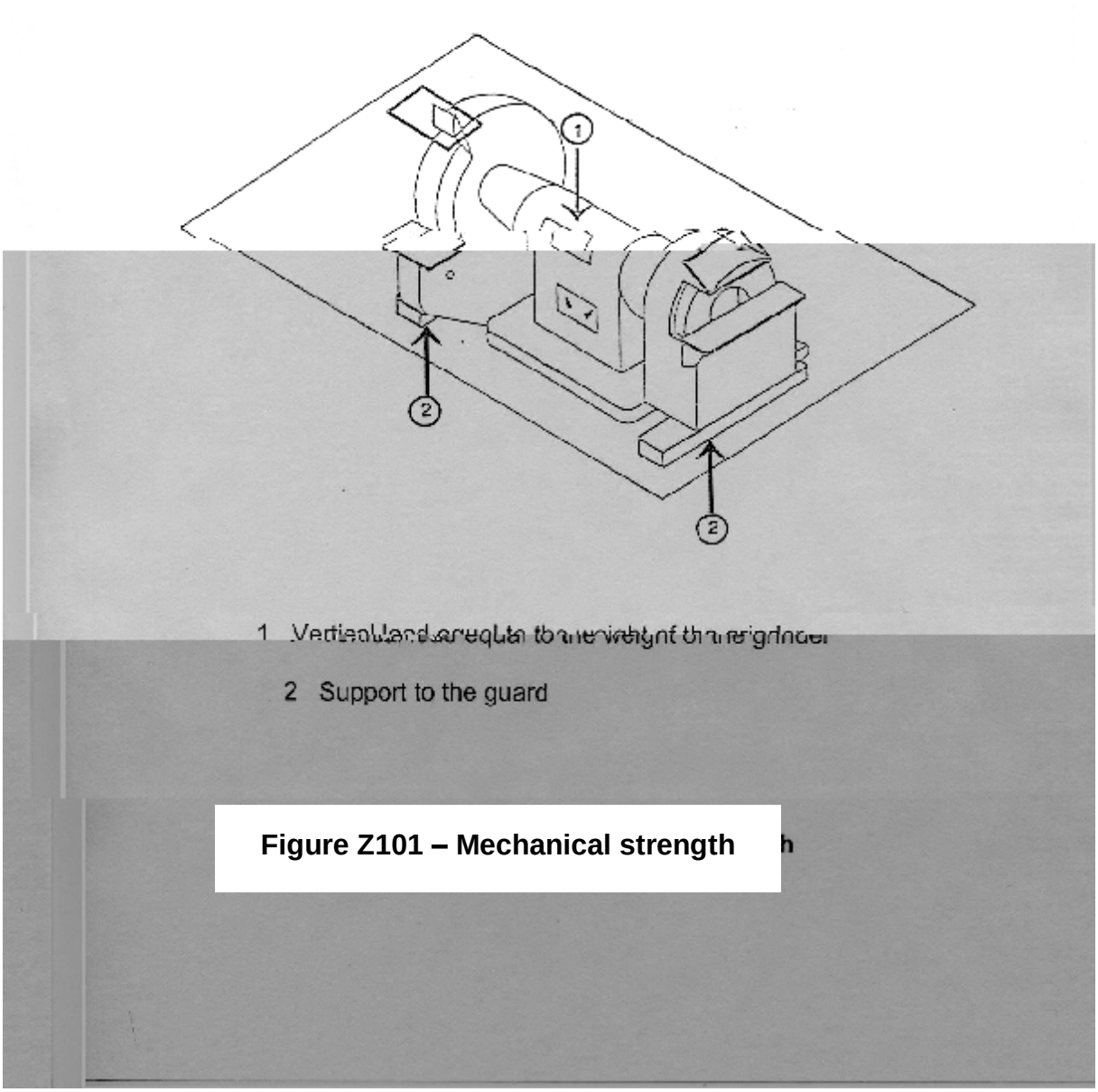


Figure 105 – Bench grinder with inclinable work rest



1 Vertical load equal to the weight of the grinder

2 Support to the guard

Figure Z101 – Mechanical strength

Annexes

The annexes of part 1 are applicable except as follows:

Annex A
(normative)

Normative references

Addition:

Publication	Date	Title
EN 10025	1990	Hot rolled products of non-alloy structural steels - Technical delivery conditons
EN 10130	1991	Cold rolled low carbon steel flat product for cold forming - Technical delivery conditions
EN 12413	1999	Safety requirements for bonded abrasive products
ISO 1052	1982	Steels for general engineering purposes
ISO 3522	1984	Cast aluminium alloys - Chemical composition and mechanical
ISO 3574	1999	Cold-reduced carbon steel sheet of commercial and drawing qualities
ISO 3755	1991	Cast carbon steels for general engineering purposes
ISO 4997	1999	Cold-reduced steel sheet of structural quality
ISO 6361	Series	Wrought aluminium and aluminium alloy sheets, strips and plates
ISO 6316	2000	Hot-rolled steel strip of structural quality