
British Standard Specification for
**Safety of power-driven
industrial brushes**

Sécurité des brosses industrielles mécaniques — Spécifications

Sicherheit von motorbetriebenen Bürsten für gewerbliche Zwecke

Foreword

This British Standard has been prepared under the direction of the Furniture and Household Equipment Standards Committee at the request of manufacturers and users of industrial brushes.

The standard provides general requirements for the terminology, safety and marking of power-driven brushes.

The brushes concerned are used typically in industrial processes such as the surface preparation of metal or other material, and the functional movement of the brush is achieved by a power-driven action.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

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Specification

1 Scope

This British Standard gives terminology and specifies requirements for the safety of power-driven industrial brushes categorized by their shape, configuration, size, fill material and/or end-use. Table 1 lists the types of brush which are considered, and examples of these are described in the standard in clause 2 and appendix B, and shown in figures 2 to 24.

The standard does not apply to brushes for vehicle washing plant, vacuum cleaners or floor, gutter and street cleaning machines.

NOTE. The title of the publication referred to in this standard is listed on the inside back cover.

2 Terminology

2.1 power-driven brush. That part of a machine representing a brushing tool, always used as a part of a machine.

NOTE. Requirements for the machine itself are not covered by this standard.

2.2 brush body. That part of a brush which keeps the fill material together.

2.3 fill material. Material fixed into the brush body, by means of an anchor or other fastening, to form the brush area and hence the working part of a brushing tool.

NOTE. For the purposes of describing fill material, relevant data on its chemical and/or physical properties may be required.

The following materials are commonly used as fill material:

- (a) metal wire (carbon steel, stainless steel or non-ferrous metal);
- (b) plastics filaments or man-made fibre;
- (c) vegetable or plant fibre;
- (d) animal hair or bristle;
- (e) a mixture of the above materials (composite).

2.4 working surface. The surface which is formed by the tips of the fill material in contact with the work piece.

2.5 working width. The width of fill material within the brush body.

2.6 bundle. A group of single units of fill material, e.g. wires, filaments, fibres.

2.7 twisted tuft or knot. A bundle of fill material of uniform length which is passed through a hole or retaining rod to make a U-shape and then twisted together to form a knot.

2.8 bonded brush. A brush where the fill material is bonded together by an elastomeric material.

2.9 fill material density. The number of fill material tips in a given area of the brush working surface.

2.10 fill material length. The free length of free material from the brush body or the side plate diameter to the tip of the fill material.

2.11 straight fill materials. Wire, plastics or man-made fibre fill materials that have not been shaped before being incorporated into the brush or bundle.

2.12 crimped fill materials. Wire, plastics or man-made fibre passed through a gear crimping unit or other device in order to give it a shape similar to a sine wave or other regular pattern.

2.13 revolutions per minute (r/min). The number of complete revolutions made by a brush in one minute.

NOTE. Rotary brushes are categorized according to their speed of rotation in revolutions per minute.

2.14 maximum safe free speed (MSFS). The highest number of revolutions per minute at which a brush may safely be used.

2.15 surface metres per minute (SMPM). The circumferential speed, measured as the distance in metres that a given point on the periphery of a brush will travel in one minute, calculated from the expression:

$$\text{Diameter of brush (in m)} \times 3.1416 \times \text{r/min.}$$

2.16 spindle. The male extension of the driving means, usually of an end wheel or cup brush, of a size and shape capable of being gripped in a three jaw chuck or collet of a correct size.

2.17 bore adaptor. A part used to reduce the size of the standard bore in a brush.

NOTE. A bore adaptor often takes the form of a concentric ring, with or without a flange.

2.18 brush types

NOTE. Individual terms for brushes, defined by their shape and configuration, are given in table 1. The brushes are described in appendix B, and examples shown in figures 2 to 24.

2.18.1 radial brush. A brush having the shape of a wheel, the periphery of which is formed by the fill material, of width not more than 50 mm at the extreme periphery.

NOTE 1. See figures 2 to 4.

NOTE 2. When the width exceeds 50 mm the brush is termed a roller brush.

2.18.2 roller brush. A brush having the shape of a cylinder of width greater than 50 mm, the outside surface of which is formed by the fill material.

NOTE. See figures 5 to 10.

2.18.3 cup brush. A brush having the shape of an inverted cup, the sides of which are formed by the fill material. The fill material may be straight sided and parallel to the axis of the brush or flared at an angle dependent upon the application of the brush.

NOTE. See figures 11 to 14.

2.18.4 end brush. A brush having the general shape of a cylinder with the fill material protruding from one end. The fill material may have its length parallel with the axis of the brush or flared at an angle of up to 90° to this axis.

NOTE. See figures 15 to 20.

2.18.5 tube brush. A brush having a spiral shape with the fill material in a radial position and retained by twisted stem wires.

NOTE. See figures 21 to 24.

Table 1. Power-driven industrial brushes by category and type	
Category and sub-category	Type
1	Radial brushes
1.1	straight or crimped filled
1.2	twisted tuft or knot filled
1.3	straight or crimped filled with spindle
1.4	twisted tuft or knot filled with spindle
2	Roller brushes
2.1	sectional, straight filled
2.2	sectional, twisted tuft
2.3	straight strip
2.4	helical strip
2.5	coil-wound strip
2.6	unitized, straight
2.7	unitized, twisted
2.8	machine punched
3	Cup brushes
3.1	straight sided, crimped filled
3.2	straight sided, twisted tuft or knot filled
3.3	flared, crimped filled
3.4	flared, twisted tuft or knot filled
4	End brushes
4.1	solid
4.2	hollow centre
4.3	pilot
4.4	twisted tuft
4.5	flared
4.6	tubular
5	Tube brushes
5.1	single stem
5.2	double stem
5.3	three stem

Brushes shall have an even distribution of fill material throughout the brush in order to achieve good balance (see 3.2).

NOTE 1. The fill material should be free from any visible defects likely to impair the safe performance of the brush.

NOTE 2. Fill material and its performance requirements should be specified by agreement between purchaser and supplier for the identified end-use.

NOTE 3. Attention is drawn to the Health and Safety Executive Guidance Note EH23 'Anthrax: health hazards', in connection with fill materials of animal origin.

3.2 Balance

Brushes shall be in static balance when mounted.

3.3 Loose fill material

Brushes shall not suffer a loss in mass greater than 1 % when the brush is rotated at a speed of 15 m/s whilst a 13 mm diameter steel bar is applied to the face of the brush, with a penetration of 6 % of the fill material length, for a period of 1 min.

3.4 Operating speed

Rotary tool brushes shall be tested by the manufacturer at a test speed of 1.5 times the stated maximum safe free speed (MSFS), except in the case of wide faced roller brushes (shown in figures 5 to 10) which are mounted by the manufacturer, made for a declared purpose or application and designed solely for a particular use.

3.5 Brush bore

Brushes with a bore shall have a bore size to the following tolerances such that they can be fitted onto the appropriate shaft.

(a) For a bore size under 16 mm diameter: tolerance + 0.02 mm to 0.12 mm.

(b) For a bore size from 16 mm to 50 mm diameter: tolerance + 0.02 mm to 0.15 mm.

(c) For a bore size over 50 mm diameter and under 150 mm diameter: tolerance + 0.05 mm to 0.18 mm.

(d) For a bore size from 150 mm to 300 mm diameter: tolerance + 0.07 mm to 0.30 mm.

3 Safety requirements

3.1 General

All brush parts shall be made such that the driving torque is transmitted outwards from the shaft to the periphery of the brush.

4 Marking and safety instructions

4.1 Marking

A power-driven brush shall be marked legibly with the following.

- (a) The name, trademark or other means of identifying the manufacturer or supplier.
- (b) The maximum safe free speed (MSFS) of the brush, for brushes to which the requirement of 3.4 applies.
- (c) A written warning 'Eye protection must be worn' and/or the sign A.3.1 from BS 5378 : Part 1 : 1980 (see figure 1).

NOTE. Attention is drawn to the Protection of Eyes Regulations 1974, SI No. 1681.

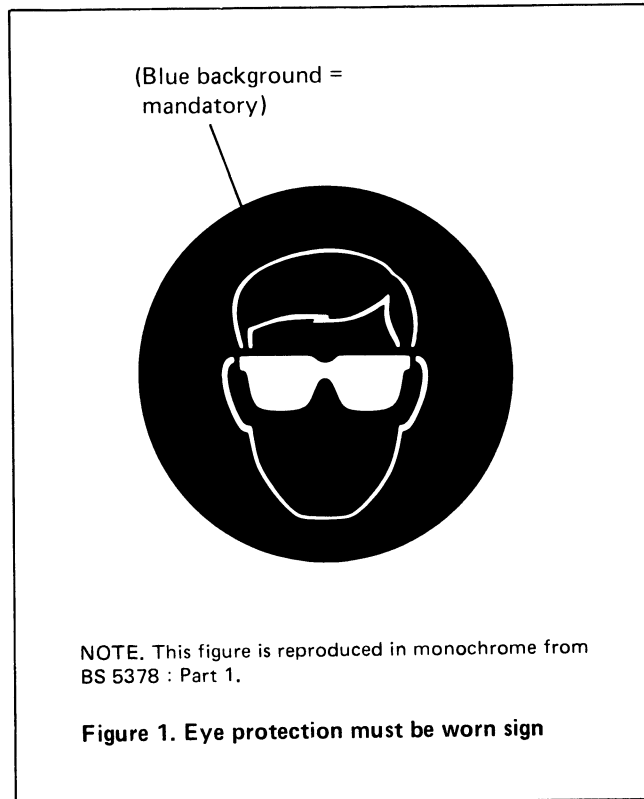
- (d) A warning against mounting on threaded tapered shafts.

- (e) The number and date of this British Standard, i.e. BS 6694 : 1986.*

Where, for reasons of size or material only, it is impracticable to mark the brush this information shall be given on its immediate packaging material.

4.2 Safety instructions

All power-driven industrial brushes shall be accompanied by safety instructions giving all appropriate information from appendix A.



* Marking BS 6694 : 1986 on or in relation to a product is a claim by the manufacturer that the product has been manufactured to the requirements of the standard. The accuracy of such a claim is therefore solely the manufacturer's responsibility. Enquiries as to the availability of third party certification should be addressed to the appropriate certification body.

Appendices

Appendix A. Safety instructions to accompany power-driven industrial brushes

A.1 Storage

Use suitable racks, bins, drawers or boxes to store the various types of brush used. The storage recommendations of the brush manufacturer should be followed. Do not store brushes where they might be subject to:

- (a) exposure to high humidity, heat, water or other liquids which might cause the filaments to deteriorate;
- (b) exposure to acids or fumes from acids which might induce deterioration;
- (c) any temperature low enough to cause condensation on the brushes when moving them from storage to an area of higher temperature;
- (d) bending or distortion of any of the brush components.

A.2 Selection

Do not use brushes of diameter exceeding 150 mm with portable machines having speeds in excess of 9000 r/min. Do not use brushes of diameter exceeding 76 mm with hand-held air powered machines having speeds in excess of 9000 r/min.

A.3 Shaft diameter

Table 2 gives minimum shaft diameters for mild (low carbon) steel shafts applying to fixed machine tools where the rotary brushes are mounted on shafts with an overhang, i.e. not supported on shafts in bearings at each end.

The use of shafts of diameters other than those indicated may be appropriate for shaft materials other than mild (low carbon) steel.

Table 2. Minimum shaft diameter for brushes of various sizes	
Brush diameter	Shaft diameter
mm	mm
50	4.6
75	6.5
75 heavy duty	10.0
100	10.0
150	13.0
200	16.0
250	20.0
300	25.4
350	32.0

A.4 Mounting

Before mounting a brush make the following checks.

- (a) Check that the machine speed does not exceed the MSFS recommended by the brush manufacturer for the brush, as a brush should not be mounted on a machine with an operating speed higher than the safety limit for the brush.
- (b) Check that no brushes that have been damaged in transport or storage are used.

It should be noted that rust discoloration or other indications of chemical or mechanical changes in the fill material can lead to premature failure of the brush.

A.5 Guarding

Only use power-driven brushes with machines that have safety guards to protect the user against flying particles from the workpiece and from physical contact with the brush so far as is reasonably practicable, consistent with normal use.

The following exceptions may be made:

- (a) brushes for use in recesses or for inside tube cleaning;
- (b) brushes for portable tools, which should be used in accordance with the tool manufacturer's recommendations for safety.

Always wear suitable eye protection (safety glasses and/or safety shield) when using power-driven brush tools.

Attention should be drawn to the requirements for safety signing at places of work, Council Directive 77/576/EEC (O.J. No. L229, 7.9.77, p. 12) and the Safety Signs Regulations 1980, SI No. 1471.

A.6 Extraction

When power-driven brushes are used, parts of the fill material and/or of the workpiece break off and are thrown out as the brush revolves, therefore efficient extraction plant should be used wherever possible, and is essential where the workpiece may discharge toxic material.

Appendix B. Brush types

NOTE. Typical brush types listed in table 1 are shown in figures 2 to 24. The numbers given in parentheses in each figure caption refer to the category and sub-category of the brush as given in table 1.

Key to indicated dimensions

- | | | | |
|---|-----------------------|---|----------------|
| A | Working width | H | Pitch |
| B | Fill material length | I | Cup diameter |
| C | Overall diameter | J | Cup length |
| D | Overall length/height | K | Pilot diameter |
| E | Bore/spindle diameter | L | Pilot length |
| F | Spindle length | M | Stem diameter |
| G | Core diameter | N | Stem length |

B.1 Radial brushes (category 1)

Radial brushes, shown in figures 2 to 4, are brushes which are circular in shape, with a wheel configuration. They are described in terms of overall diameter, fill material length, working width, bore dimensions and fill material.

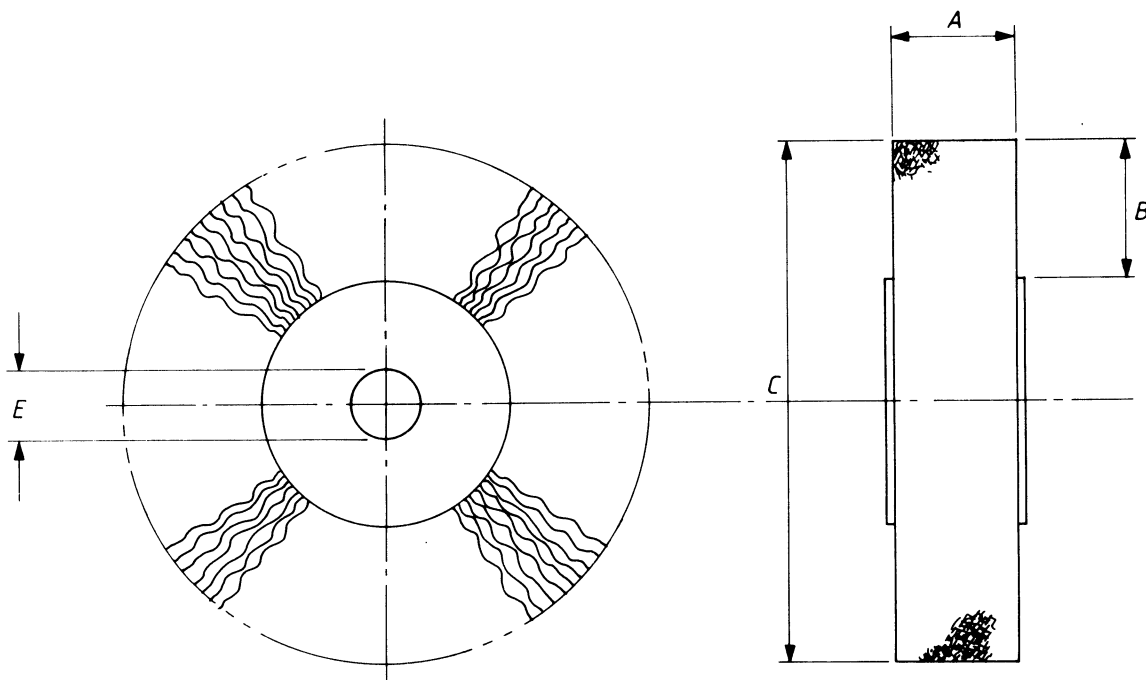


Figure 2. Radial brush: straight or crimped filled (1.1)