

Specification for

Fine pitch gears —

Part 5: Hobs and Cutters

Co-operating organizations

The Mechanical Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

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Association of Consulting Engineers*	Institution of Heating and Ventilating Engineers
Association of Mining Electrical and Mechanical Engineers*	Institution of Mechanical Engineers
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British Electrical and Allied Manufacturers' Association*	London Transport Board
British Gear Manufacturers' Association*	Machine Tool Trades Association*
British Internal Combustion Engine Manufacturers' Association	Ministry of Defence, Army Department*
British Iron and Steel Federation	Ministry of Defence, Navy Department*
British Mechanical Engineering Federation*	Ministry of Labour (H.M. Factory Inspectorate)
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Gas Council	National Coal Board
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Institution of Civil Engineers	Radio Industry Council
	Royal Institute of British Architects

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

British Horological Institute	Society of Motor Manufacturers and Traders Ltd.
Electronic Engineering Association	University of Sheffield
Institution of Engineering Inspection	Manufacturers of fine pitch gears
Milling Cutter and Reamer Association	
Ministry of Aviation	
North-East Coast Institution of Engineers and Shipbuilders	

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Foreword

This standard makes reference to the following British Standards:

BS 978, *Fine pitch gears*.

BS 978-1, *Involute spur and helical gears*.

BS 978-2, *Cycloidal type gears*.

PD 3376, BS 978-2:Addendum No. 1, *Double circular arc type gears*.

BS 978-3, *Bevel gears*.

BS 2062, *Gear hobs, Part 1: Hobs for general purposes. 1 d.p. to 20 d.p. inclusive*.

BS 2518, *Rotary form-relieved gear cutters*.

BS 2887, *Pinion type cutters for spur gears 4 D.P. to 20 D.P.*

This British Standard has been prepared under the authority of the Mechanical Engineering Industry Standards Committee and is one of a series for fine pitch gears and cutters.

Other standards in this series are:

BS 978-1, *Involute spur and helical gears*.

BS 978-2, *Cycloidal type gears*.

BS 978-2:Addendum No. 1, *Double circular arc type gears*.

BS 978-3, *Bevel gears*.

BS 978-4, *Worm gears (in course of preparation)*.

The grades of cutters specified are related to similar grades in other British Standards as follows:

Grade A corresponds to Grade AA in BS 2062-1¹⁾ and in BS 2887²⁾.

Grade B corresponds to Grade A in BS 2062-1¹⁾ and in BS 2887²⁾.

Grade C corresponds to Grade B in BS 2062-1¹⁾.

This standard is divided into three sections viz.:

- *Section 1: Gear hobs for fine pitch gears;*
- *Section 2: Rotary form-relieved gear cutters for fine pitch gears;*
- *Section 3: Pinion type cutters for fine pitch gears.*

The general terms used, common to gears and cutters are taken from BS 2519³⁾.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 23 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ BS 2062, "Gear hobs", Part 1, "Hobs for general purposes 1 d.p. to 20 d.p. inclusive".

²⁾ BS 2887, "Pinion type cutters for spur gears 4 D.P. to 20 D.P.".

³⁾ BS 2519, "Glossary of terms and notation for toothed gearing".

Section 1. Hobs for fine pitch gears

1.1 Scope

This section of the standard relates to single-start, topping and non-topping, right- and left-hand hobs for the production of spur and helical gears in the pitch ranges 24 D.P. to 200 D.P. and 1 mm to 0.127 mm module inclusive.

Three grades of hobs are given, viz. Grade A for the production of precision gears, Grade B for gears for high class work and Grade C for general engineering.

1.2 Terminology

The terminology of Figure 1 shall be used in all statements relating to gear hobs.

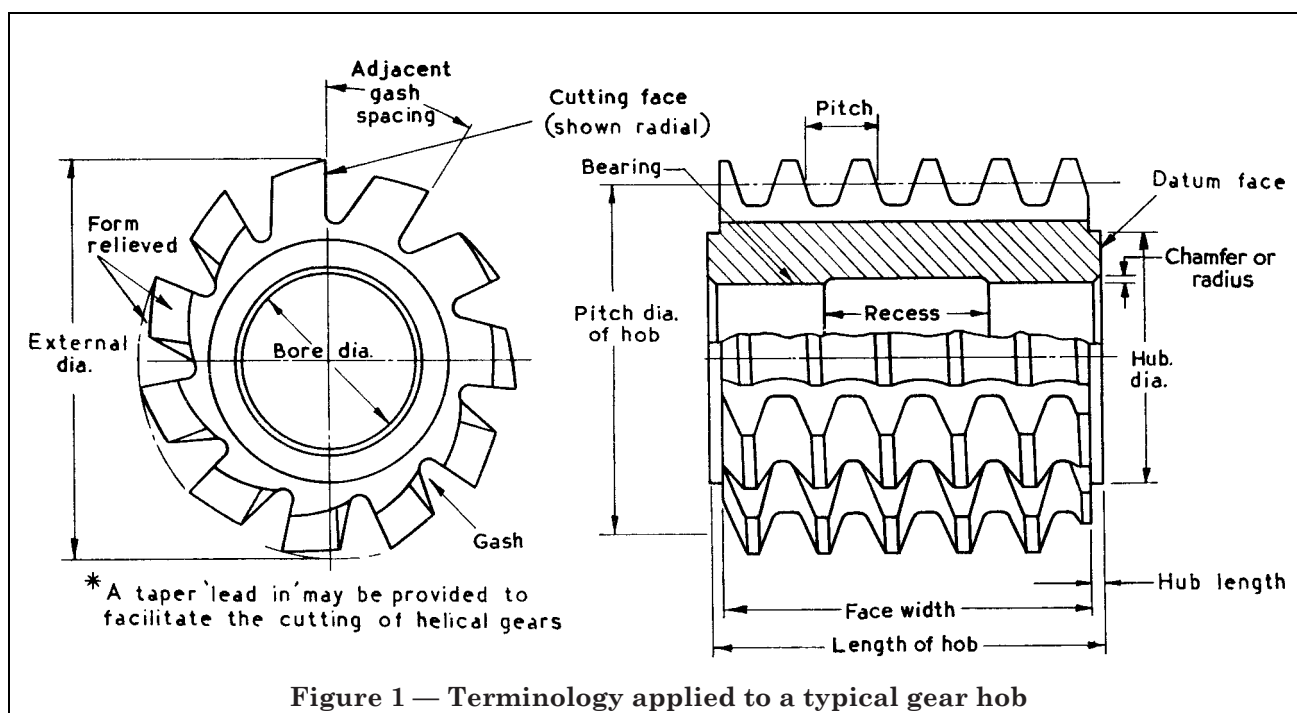


Figure 1 — Terminology applied to a typical gear hob

1.3 Tooth form

The hob teeth shall be such as will generate gear teeth corresponding to the following basic rack tooth shapes:

- a) Involute
 - i) as Figure 1 of BS 978-1⁴⁾ (see Appendix B)
 - ii) as Figure 2 of BS 978-1⁴⁾ (see Appendix B)
- b) Cycloidal as specified in BS 978-2⁵⁾.
- c) Double circular arc as in the addendum to Part 2 of BS 978⁶⁾ (see Appendix C).

NOTE One hob will cut gears with any number of teeth of the forms given in a) and c) above.

1.4 Gashes

The hobs shall be gashed parallel to the axis.

1.5 Bores

The bores shall be parallel and may be recessed in the centre portion.

⁴⁾ BS 978, "Fine pitch gears", Part 1, "Involute spur and helical gears".

⁵⁾ BS 978-2, "Cycloidal type gears".

⁶⁾ PD 3376, BS 978-2: Addendum No. 1, "Double circular arc type gears".

1.6 Dimensions

The dimensions of the hobs shall be as in Table 1.

Table 1 — General dimensions of hobs

1	2	3	4	5	6	7	8	9	10	11	12
Pitch		Outside diameter		Bore		Minimum overall length		Hub (see Notes 1 to 4)			
D.P. series	Module series							Diameter (approx.)		Length	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm
24	1.0583	$\frac{17}{8}$ $\frac{15}{8}$	32	$\frac{3}{4}$ $\frac{1}{2}$	10	$\frac{11}{4}$ $\frac{11}{4}$	20	$\frac{11}{4}$ $\frac{13}{16}$	22	$\frac{3}{32}$ $\frac{3}{32}$	1.5
28	0.9071	$\frac{17}{8}$ $\frac{15}{8}$	32	$\frac{3}{4}$ $\frac{1}{2}$	10	$\frac{11}{4}$ $\frac{11}{4}$	20	$\frac{11}{4}$ $\frac{13}{16}$	22	$\frac{3}{32}$ $\frac{3}{32}$	1.5
32	0.7938	$\frac{17}{8}$ $\frac{15}{8}$	32 24	$\frac{3}{4}$ $\frac{1}{2}$	10 8	$\frac{11}{4}$ $\frac{11}{4}$	20 11	$\frac{11}{4}$ $\frac{13}{16}$	22 17.5	$\frac{3}{32}$ $\frac{3}{32}$	1.5 1.5
36	0.7056	$\frac{17}{8}$ $\frac{11}{8}$	32 24	$\frac{3}{4}$ $\frac{1}{2}$	10 8	$\frac{11}{4}$ $\frac{11}{8}$	15 11	$\frac{11}{4}$ $\frac{13}{16}$	22 17.5	$\frac{3}{32}$ $\frac{3}{32}$	1.5 1.5
40	0.635	$\frac{17}{8}$ $\frac{11}{8}$	32 24	$\frac{3}{4}$ $\frac{1}{2}$	10 8	$\frac{11}{4}$ $\frac{11}{8}$	15 11	$\frac{11}{4}$ $\frac{13}{16}$	22 17.5	$\frac{3}{32}$ $\frac{3}{32}$	1.5 1.5
48	0.5292	$\frac{17}{8}$ $\frac{11}{8}$	32 24	$\frac{3}{4}$ $\frac{1}{2}$	10 8	$\frac{11}{4}$ 1	15 11	$\frac{11}{4}$ $\frac{13}{16}$	22 17.5	$\frac{3}{32}$ $\frac{3}{32}$	1.5 1.5
64	0.3969	$\frac{15}{8}$ $\frac{11}{8}$	32 24	$\frac{3}{4}$ $\frac{1}{2}$	10 8	$\frac{11}{4}$ $\frac{7}{8}$	15 11	$\frac{11}{4}$ $\frac{13}{16}$	22 17.5	$\frac{3}{32}$ $\frac{3}{32}$	1.5 1.5
80	0.3175	$\frac{15}{8}$ $\frac{11}{8}$	32 24	$\frac{3}{4}$ $\frac{1}{2}$	10 8	$\frac{11}{4}$ $\frac{3}{4}$	15 11	$\frac{11}{4}$ $\frac{13}{16}$	22 17.5	$\frac{3}{32}$ $\frac{3}{32}$	1.5 1.5
100	0.254	$\frac{15}{8}$ $\frac{11}{8}$	32 24	$\frac{3}{4}$ $\frac{1}{2}$	10 8	1 $\frac{3}{4}$	15 11	$\frac{11}{4}$ $\frac{13}{16}$	22 17.5	$\frac{3}{32}$ $\frac{3}{32}$	1.5 1.5
120	0.2177	$\frac{15}{8}$ $\frac{11}{8}$	32 24 18	$\frac{3}{4}$ $\frac{1}{2}$	10 8 8	1 $\frac{5}{8}$	15 11 11	1 $\frac{13}{16}$	22 17.5 13	$\frac{3}{32}$ $\frac{1}{16}$	1.5 1.5 1.5
140	0.1814	$\frac{15}{8}$ $\frac{11}{8}$	32 18	$\frac{3}{4}$ $\frac{1}{2}$	10 8	1 $\frac{1}{2}$	15 11	1 $\frac{13}{16}$	22 13	$\frac{3}{32}$ $\frac{1}{16}$	1.5 1.5
160	0.1588	$\frac{15}{8}$ $\frac{11}{8}$	32 18	$\frac{3}{4}$ $\frac{1}{2}$	10 8	1 $\frac{1}{2}$	15 11	1 $\frac{13}{16}$	22 13	$\frac{3}{32}$ $\frac{1}{16}$	1.5 1.5
180	0.1411	$\frac{15}{8}$ $\frac{11}{8}$	32 18	$\frac{3}{4}$ $\frac{1}{2}$	10 8	1 $\frac{1}{2}$	15 11	1 $\frac{13}{16}$	22 13	$\frac{3}{32}$ $\frac{1}{16}$	1.5 1.5
200	0.127	$\frac{15}{8}$ $\frac{11}{8}$ $\frac{11}{8}$	32 18 18	$\frac{3}{4}$ $\frac{1}{2}$ $\frac{1}{2}$	10 8 8	1 $\frac{1}{2}$ 1 ^a	15 11 11	1 $\frac{13}{16}$ $\frac{13}{16}$	22 13 13	$\frac{3}{32}$ $\frac{1}{16}$ $\frac{1}{16}$	1.5 1.5 1.5

NOTE 1 Although dimensions for the hub diameter are given this feature should be as large as possible.

NOTE 2 The hub periphery is the datum surface for reference.

NOTE 3 Hubs need not be provided on Grades B and C hobs and in such cases the length of the hob may be reduced by twice the hub length.

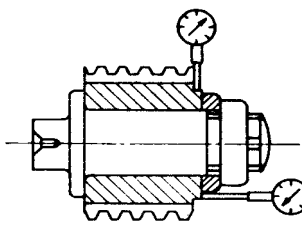
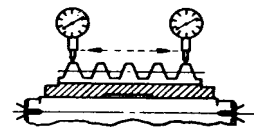
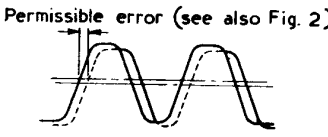
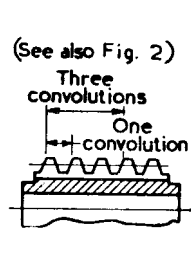
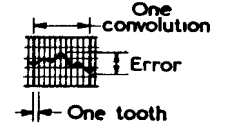
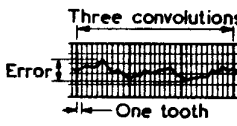
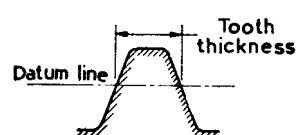
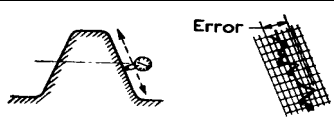
NOTE 4 For Grade A hobs, single or double hubs may be provided depending upon the purchaser's requirements.

^a Non-preferred length

1.7 Tolerances

The tolerances to be applied to each grade of hob shall be as given in Table 2.

Table 2 — Tolerances (In 0.0001 inch units)

1	2	3	4	5	6	7	
Item	Typical illustration	Test	Diametral pitch				
			Grade	24 to 48 inc.	Over 48 to 100 inc.	Over 100 to 200 inc.	
Hub reference datum surfaces and periphery		^a Axial run-out of datum face	A B C	1 2 3	1 2 3	1 2 —	
		Radial run-out of datum cylinder	A B C	1 2 3	1 2 3	1 2 —	
Periphery		^b Radial run-out	A B C	3 6 10	3 5 10	3 3 —	
Tooth lead variation			A B C	1½ 2 3	1 2 2½	1 2 —	
			Variation along tooth helix in one convolution (cyclic pitch error)	A B C	2 3 5	1½ 3 4	1½ 2½ —
			Variation along tooth helix in any three consecutive convolutions (cumulative pitch error)	A B C	2½ 5 7	2 4 6	2 3 —
Tooth		Tooth thickness a) Minus only for non-topping hobs. For non-topping hobs the distance from the datum line to the top of the hob tooth is assumed to be the nominal value. b) Plus only for topping hobs. For topping hobs the distance from the datum line to the root of the hob tooth is assumed to be the nominal value.	A	Non-topping	5	4	3
				Topping	2	1½	1
			B	Non-topping	8	5	3
				Topping	4	3	2
			C	Non-topping	13	10	—
				Topping	6	5	—
Tooth flank		Profile Involute tooth form hobs only, plus only at tip and cutting depth	A B C	1½ 2 3	1 1½ 2	1 1½ —	

^a Where an accessible datum face is provided.
^b For the finer pitches this test is usually performed on an optical projector.

^a Where an accessible datum face is provided.

^b For the finer pitches this test is usually performed on an optical projector.