

Recommendations for

Tapping drill sizes for use with fluted taps

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Electronic Engineering Association	Socket Screw Manufacturers' Association
Fasteners Turned Parts Institute	Twist Drill Association
Gauge Toolmakers' Association	

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Foreword

These recommendations, prepared under the authority of the Mechanical Engineering Industry Standards Committee, give recommended metric sizes of tapping drills which are regularly stocked for the standard sizes and types of screw threads in common use. The application of this publication does not absolve a manufacturer of the responsibility for producing a screw thread in accordance with the relevant screw thread standard.

BS 1157 was first published in 1953 and revised in 1965. This latest edition has been published in order that it is in agreement with International Standard ISO 2306 *“Drills for use prior to tapping screw threads”*.

This has enabled the provisions of BS 1157, Supplement No. 1:1967 “Table 10 to Table 16. Tapping drill sizes for ISO metric screw threads in accordance with BS 3643”, to be incorporated in the body of these recommendations.

It should be noted that all the drill diameters are shown in BS 328 *“Twist drills and combined drills and countersinks”*, Part 1 *“Twist drills”*, either as standard sizes or as specials for use when tapping holes.

Appendix A shows alternative metric sizes of drills where such sizes are available as standard.

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 and ii, pages 1 to 22, an inside back cover 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.

0 Introduction

The diameter of a hole produced by a drill depends to some extent upon the degree of accuracy to which the drill point is ground, the material being drilled, the lubricant used, and the alignment, feed and speed of the operation.

When tapping relatively soft material, there is a tendency for the material to be squeezed down towards the root of the tap threads and in such cases the minor diameter of the tapped hole may become smaller than the diameter of the drill used. The tendency is very much less with harder materials, and in some cases is entirely absent.

The larger the drilled hole, within the relevant nut minor diameter tolerance, the more economical tapping becomes, and the risk of tap breakage is reduced. With the foregoing points in mind, Table 1 to Table 14 have been prepared as a guide to drilling prior to conventional tapping. However, it is realized that users may find it beneficial to choose their own drill diameters for certain applications. Even in these instances, stocked diameter drills should be used whenever possible. See Appendix A.

It should be noted that a fluteless tap will require, for the same screw thread, a different size of twist drill from that given in this document and that this type of tap is not therefore covered by these recommendations.

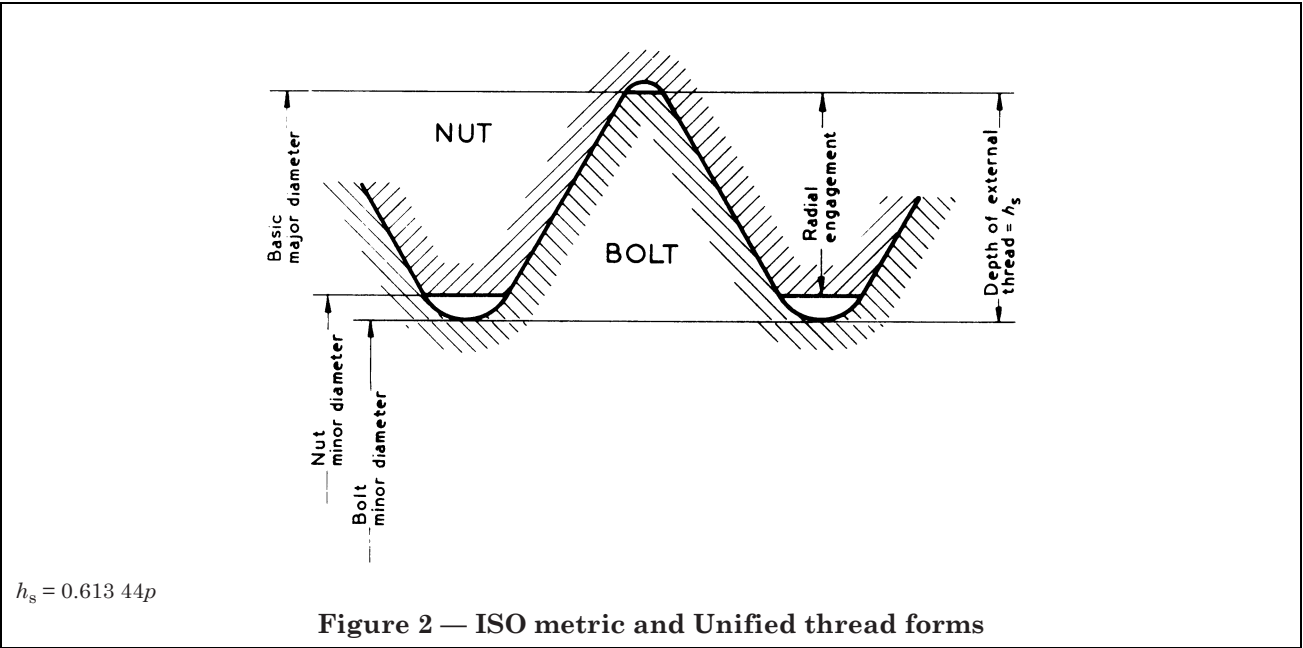
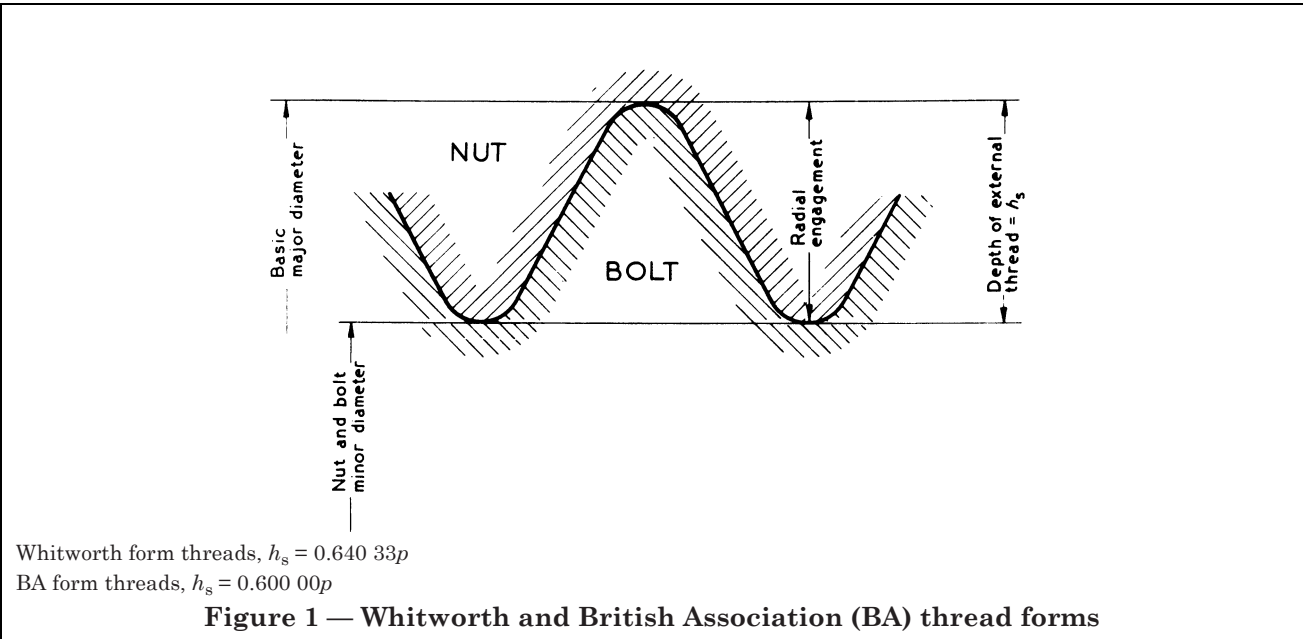
For the convenience of the users who wish to choose their own drill sizes for special purposes, the limits of size of the nut minor diameters are given for each size and type of thread.

For general guidance the majority of tables give comparable figures of the theoretical extent of engagement of the nut and bolt threads resulting from the use of the stipulated drill size. For purposes of calculation it has been assumed that the major diameter of the bolt is basic size and that the minor diameter of the nut is equal to the nominal diameter of the drill concerned. Owing to the basic difference in thread form, however, between Whitworth and BA threads (see Figure 1) as compared with ISO metric and Unified threads (see Figure 2), the maximum possible depth of engagement (100 %) has a different interpretation; the latter thread profiles having a truncated nut as the design form and the former threads having engagement of the complete profile.

$$\text{Percentage depth of engagement} = \frac{(\text{nom. (basic major) dia. of thread} - \text{drill dia.})}{2 (\text{depth of external thread})} \times 100$$

It is, therefore, based on the depth of the external thread in the maximum metal condition, it being considered that the figure required by the user of these recommendations is that of engagement compared with the full form of the external thread rather than comparison with a maximum possible engagement already substantially reduced because of the truncated nut of a particular thread design. It is felt that a common basis of the depth of the external thread affords the only possible means of providing truly comparable figures, but it is not intended to give a comparison of efficiency between one thread form and another.

In the selection of drill sizes the aim has been to specify drills which will afford at least 70 % engagement between the bolt and nut. The relationship, however, between the maximum minor diameter of the nut and the basic major diameter of the bolt, in the cases of most Unified threads below $\frac{1}{4}$ in diameter, affords an engagement of less than the 70 % approved minimum. Due, therefore, to the relatively high maximum minor diameters, the drill sizes afford a fairly low engagement in these ranges.



1 Scope

These recommendations give drill sizes, covered by BS 328-1, for use prior to tapping the threads indicated. Table 1 to Table 14 cover preferred thread forms and Table 15 to Table 17 cover non-preferred forms. Appendix A covers alternative tapping drill sizes.

2 References

The titles of the British Standards referred to in these recommendations are listed on the inside back cover.

Table 1 — ISO metric thread (coarse pitch series)^a

Dimensions in millimetres except where otherwise stated.

Nominal diameter of thread	Pitch (p)	Minor diameter of nut				Depth of external thread (0.613 44p)	Drill diameter	Theoretical radial engagement with external thread
		Maximum class 5H	Maximum class 6H	Maximum class 7H	Minimum classes 5H, 6H, 7H			
M 1.0	0.25	0.785			0.729	0.1534	0.75	81.5
M 1.1	0.25	0.885			0.829	0.1534	0.85	81.5
M 1.2	0.25	0.985			0.929	0.1534	0.95	81.5
M 1.4	0.30	1.142	1.160		1.075	0.1840	1.10	81.5
M 1.6	0.35	1.301	1.321		1.221	0.2147	1.25	81.5
M 1.8	0.35	1.501	1.521		1.421	0.2147	1.45	81.5
M 2.0	0.40	1.657	1.679		1.567	0.2454	1.60	81.5
M 2.2	0.45	1.813	1.838		1.713	0.2760	1.75	81.5
M 2.5	0.45	2.113	2.138		2.013	0.2760	2.05	81.5
M 3.0	0.50	2.571	2.599	2.639	2.459	0.3067	2.50	81.5
M 3.5	0.60	2.975	3.010	3.050	2.850	0.3681	2.90	81.5
M 4.0	0.70	3.382	3.422	3.466	3.242	0.4294	3.30	81.5
M 4.5	0.75	3.838	3.878	3.924	3.688	0.4601	3.70	86.8
M 5.0	0.80	4.294	4.334	4.384	4.134	0.4908	4.20	81.5
M 6.0	1.00	5.107	5.153	5.217	4.917	0.6134	5.00	81.5
M 7.0	1.00	6.107	6.153	6.217	5.917	0.6134	6.00	81.5
M 8.0	1.25	6.859	6.912	6.982	6.647	0.7668	6.80	78.5
M 9.0	1.25	7.859	7.912	7.982	7.647	0.7668	7.80	78.5
M 10	1.50	8.612	8.676	8.751	8.376	0.9202	8.50	81.5
M 11	1.50	9.612	9.676	9.751	9.376	0.9202	9.50	81.5
M 12	1.75	10.371	10.441	10.531	10.106	1.0735	10.20	83.7
M 14	2.00	12.135	12.210	12.310	11.835	1.2269	12.00	81.5
M 16	2.00	14.135	14.210	14.310	13.835	1.2269	14.00	81.5
M 18	2.50	15.649	15.744	15.854	15.294	1.5336	15.50	81.5
M 20	2.50	17.649	17.744	17.854	17.294	1.5336	17.50	81.5
M 22	2.50	19.649	19.744	19.854	19.294	1.5336	19.50	81.5
M 24	3.00	21.152	21.252	21.382	20.752	1.8403	21.00	81.5
M 27	3.00	24.152	24.252	24.382	23.752	1.8403	24.00	81.5
M 30	3.50	26.661	26.771	26.921	26.211	2.1470	26.50	81.5
M 33	3.50	29.661	29.771	29.921	29.211	2.1470	29.50	81.5
M 36	4.00	32.145	32.270	32.420	31.670	2.4538	32.00	81.5
M 39	4.00	35.145	35.270	35.420	34.670	2.4538	35.00	81.5
M 42	4.50	37.659	37.799	37.979	37.129	2.7605	37.50	81.5
M 45	4.50	40.659	40.799	40.979	40.129	2.7605	40.50	81.5
M 48	5.00	43.147	43.297	43.487	42.587	3.0672	43.00	81.5
M 52	5.00	47.147	47.297	47.487	46.587	3.0672	47.00	81.5
M 56	5.50	50.646	50.796	50.996	50.046	3.3739	50.50	81.5

^a This thread form is covered by BS 3643-2.

Table 2 — ISO metric thread (fine pitch series)^a: 0.25 mm, 0.35 mm, 0.50 mm and 0.75 mm)

Dimensions in millimetres except where otherwise stated.

Nominal diameter of thread	Pitch (<i>p</i>)	Minor diameter of nut				Depth of external thread (0.613 44 <i>p</i>)	Drill diameter	Theoretical radial engagement with external thread
		Maximum class 5H	Maximum class 6H	Maximum class 7H	Minimum classes 5H, 6H, 7H			
M 2.0	0.25	1.785			1.729	0.1534	1.75	81.5
M 2.2	0.25	1.985			1.929	0.1534	1.95	81.5
M 2.5	0.35	2.201	2.221		2.121	0.2147	2.15	81.5
M 3.0	0.35	2.701	2.721		2.621	0.2147	2.65	81.5
M 3.5	0.35	3.201	3.221		3.121	0.2147	3.15	81.5
M 4.0	0.50	3.571	3.599	3.639	3.459	0.3067	3.50	81.5
M 4.5	0.50	4.071	4.099	4.139	3.959	0.3067	4.00	81.5
M 5.0	0.50	4.571	4.599	4.639	4.459	0.3067	4.50	81.5
M 5.5	0.50	5.071	5.099	5.139	4.959	0.3067	5.00	81.5
M 6.0	0.75	5.338	5.378	5.424	5.188	0.4601	5.20	87.0
M 7.0	0.75	6.338	6.378	6.424	6.188	0.4601	6.20	87.0
M 8.0	0.75	7.338	7.378	7.424	7.188	0.4601	7.20	87.0
M 9.0	0.75	8.338	8.378	8.424	8.188	0.4601	8.20	87.0
M 10.0	0.75	9.338	9.378	9.424	9.188	0.4601	9.20	87.0
M 11.0	0.75	10.338	10.378	10.424	10.188	0.4601	10.20	87.0

^a This thread form is covered by BS 3643-3.

Table 3 — ISO metric thread (fine pitch series^a: 1.00 mm and 1.25 mm)

Dimensions in millimetres except where otherwise stated.

Nominal diameter of thread	Pitch (p)	Minor diameter of nut				Depth of external thread (0.613 44p)	Drill diameter	Theoretical radial engagement with external thread
		Maximum class 5H	Maximum class 6H	Maximum class 7H	Minimum classes 5H, 6H, 7H			
								%
M 8	1.00	7.107	7.153	7.217	6.917	0.6134	7.0	81.5
M 9	1.00	8.107	8.153	8.217	7.917	0.6134	8.0	81.5
M 10	1.00	9.107	9.153	9.217	8.917	0.6134	9.0	81.5
M 11	1.00	10.107	10.153	10.217	9.917	0.6134	10.0	81.5
M 12	1.00	11.107	11.153	11.217	10.917	0.6134	11.0	81.5
M 14	1.00	13.107	13.153	13.217	12.917	0.6134	13.0	81.5
M 15	1.00	14.107	14.153	14.217	13.917	0.6134	14.0	81.5
M 16	1.00	15.107	15.153	15.217	14.917	0.6134	15.0	81.5
M 17	1.00	16.107	16.153	16.217	15.917	0.6134	16.0	81.5
M 18	1.00	17.107	17.153	17.217	16.917	0.6134	17.0	81.5
M 20	1.00	19.107	19.153	19.217	18.917	0.6134	19.0	81.5
M 22	1.00	21.107	21.153	21.217	20.917	0.6134	21.0	81.5
M 24	1.00	23.107	23.153	23.217	22.917	0.6134	23.0	81.5
M 25	1.00	24.107	24.153	24.217	23.917	0.6134	24.0	81.5
M 27	1.00	26.107	26.153	26.217	25.917	0.6134	26.0	81.5
M 28	1.00	27.107	27.153	27.217	26.917	0.6134	27.0	81.5
M 30	1.00	29.107	29.153	29.217	28.917	0.6134	29.0	81.5
M 10	1.25	8.859	8.912	8.982	8.647	0.7668	8.8	78.2
M 12	1.25	10.859	10.912	10.982	10.647	0.7668	10.8	78.2
M 14	1.25	12.859	12.912	12.982	12.647	0.7668	12.8	78.2

^a This thread form is covered by BS 3643-3.