



BS 949 : Part 1 : 1976

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Specification for

Screwing taps



Part 1. Specification for taps for ISO metric threads

Tarauds de filetage

Partie 1. Spécification des tarauds pour filetages métriques ISO

Innengewinde

Teil 1. Spezifikation für Innengewinde des ISO metrischen Gewinde

BS 949 : Part 1 : 1976

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If it had been prepared, that international standard would have used the ISO class designations for taps for Unified threads. Without it, the zone designations (as in the 1969 edition of this standard) could have been retained for taps for Unified threads, in the same way that it was intended that they should be retained for taps for BSW, BSF and BA threads. However, it would be confusing to have class designations for taps for ISO metric threads and zone designations for taps for other thread forms. The class designations are therefore now used for all taps specified in BS 949 (see Part 2 for further details).

There being no longer any requirement to retain a separate Part of this standard for taps for BSW, BSF and BA threads, their specification has been included in an appendix in Part 2.

With effect from the publication of Part 3, the arrangement of BS 949 is therefore the following:

- (a) This Part, Part 1, specifying taps for ISO metric threads;
- (b) Part 2, specifying taps for Unified threads (and for the obsolescent threads of Whitworth and BA forms);
- (c) Part 3, specifying taps for pipe threads.

So far as the manufacturing tolerances of ground-thread taps are concerned, this Part of BS 949 is in conformity with ISO 287. The tolerances on taps other than those with ground threads are shown in appendix E; the tolerances on the general dimensions are in accordance with ISO 529 and ISO 2283 and those on the threaded portion are unchanged from those specified in the 1969 edition of this British Standard (i.e. Zone 5).

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Foreword

This Part of this British Standard has been prepared under the authority of the Mechanical Engineering Standards Committee.

A specification for screwing taps for ISO metric threads was included in the 1969 edition of BS 949, which also contained specifications for taps for Unified threads, for pipe threads and for British Standard Whitworth threads (BSW), British Standard Fine threads (BSF) and British Association threads (BA). The general dimensions of the taps for ISO metric threads were based on ISO/R 529.

So far as the general dimensions of short machine or hand taps are concerned, this Part of this British Standard is again in conformity with International Standard ISO 529 (which has superseded ISO/R 529), except that the taps with reduced diameter shanks and nominal diameters from 3 mm to 10 mm that were specified in Addendum No. 1 to ISO/R 529 (and are included in ISO 529) are not recommended for use in the United Kingdom (it is not thought necessary to have alternative patterns of short machine or hand taps in any part of the size range). However, these alternative taps may be mentioned in international discussions and in order that their dimensions may be known they are given in appendix C

The 'nut taps' that were specified in previous editions of this British Standard are not now included since the machines for the mass production of nuts are so specialized that there is no longer any need for a standard range of nut taps. With the nut taps deleted there is considered to be no sufficient reason for preferring a national version of a long reach tap to one that is internationally standardized.

So far as the general dimensions of long shank machine taps are concerned this Part of this British Standard is therefore in conformity with ISO 2283.

With the publication of ISO 2857, the International Organization for Standardization (ISO) has progressed to the specification of manufacturing tolerances for the threaded portion of ground-thread taps. A primary purpose

of this revision of BS 949 is the introduction of the ISO class designations for tolerances in the place of the zone designations that were previously specified (the zone designations were not used in any other country). The tolerances on the flank angles of the taps specified in table 14 are not in accordance with ISO 2857 (see the note at the end of B.4).

When this Part of this British Standard was published in 1976, its foreword announced the following interim arrangement of BS 949, pending publication of new Parts 2 and 3:

- (a) This Part, Part 1 : 1976, specifying taps for ISO metric threads;
- (b) Part 4 : 1969 specifying taps for Unified threads, for pipe threads and for the obsolescent threads of Whitworth and BA forms, being BS 949 : 1969 amended by the alteration of its number and title and by the deletion of all its contents relating to taps for ISO metric threads (and also of certain other details).

At the same time it was envisaged that, after completion Parts 2 and 3, the arrangement of BS 949 would be the following:

- (a) This Part, Part 1 : 1976, as above;
- (b) Part 2, specifying taps for Unified threads and based on a proposal which was being developed in ISO;
- (c) Part 3, specifying taps for pipe threads;
- (d) Part 4, specifying taps for the obsolescent threads of Whitworth and BA forms.

In the event, ISO has not proceeded with the proposal to develop an international standard specifying manufacturing tolerances for the threaded portion of Unified threads. Part 2, now published, therefore specifies the same tolerances for taps for Unified threads as did the 1969 edition of this standard.

British Standard

Screwing taps

Part 1. Specification for taps for ISO metric threads

Section one. General

1. Scope

1.1 This Part of this British Standard specifies dimensions and tolerances for screwing taps for the following threads.

- (a) ISO metric coarse pitch series threads in accordance with BS 3643 : Part 2;
- (b) ISO metric fine pitch series threads in accordance with BS 3643 : Part 3.

1.2 The sizes of taps specified include those suitable for the tapped holes for sparking plugs specified in BS 45 and those suitable for the tapped holes for fittings for steel conduit specified in BS 4568 : Part 1.

1.3 This Part of BS 949 specifies taps for right-hand threads unless otherwise stated (see 20.4). Any reference to taps in connection with this Part of this British Standard is assumed to relate to taps for right-hand threads unless taps for left-hand threads are specified.

2. References

The titles of the standards publications referred to in this Part of this British Standard are listed on the inside back cover.

Section two. Nomenclature

3. General dimension terminology

3.1 The general dimension terminology of taps is illustrated in figure 1.

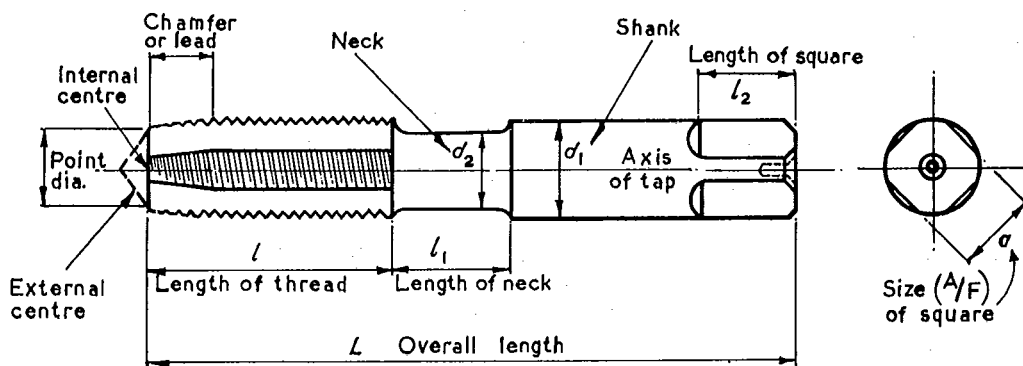


Figure 1. General dimension terminology of taps (the tap illustrated is the pattern shown in figure 7).

3.2 The nominal diameter of a tap is the nominal major diameter of the tapped hole that it is to cut.

3.3 For the purposes of this Part of this British Standard taps are designated 'taper taps', 'second taps' and 'bottoming taps'. These terms and other terminology associated with taps for different purposes are illustrated in figure 2.

NOTE 1. For the differences between taper, second and bottoming taps, see 10.3.

NOTE 2. The term 'plug tap' has been used in the United Kingdom with the meaning 'bottoming tap', but it has been used in the USA with the meaning 'second tap'. In order to avoid confusion, agreement has been reached in the ISO subcommittee concerned with taps and dies that the term 'plug tap' should be strongly deprecated in both countries.

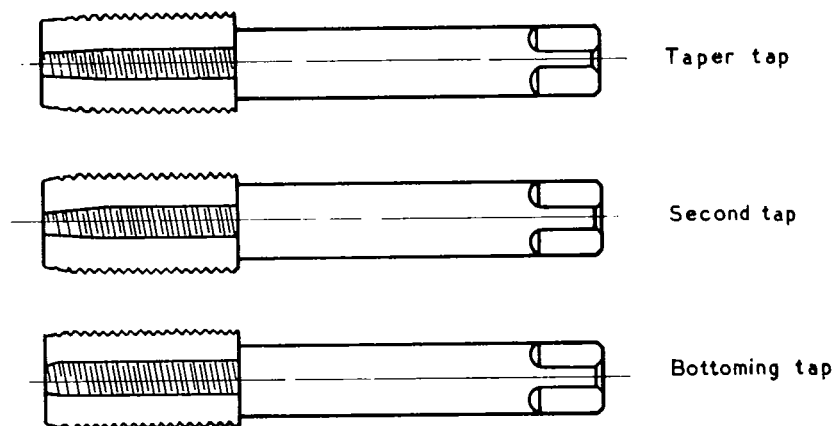
4. Terminology of thread profiles

4.1 The internal threads produced with the taps specified in this Part of this British Standard are conventionally designated by the simplified denomination 'nut'. The thread profile of a nut and the method of its dimensioning and tolerancing are shown in figure 3.

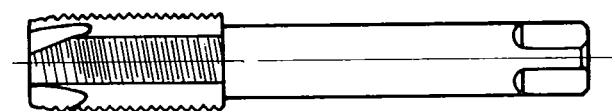
4.2 The method of dimensioning and tolerancing the thread profile of a tap is illustrated in figure 4.

5. Cutting feature terminology

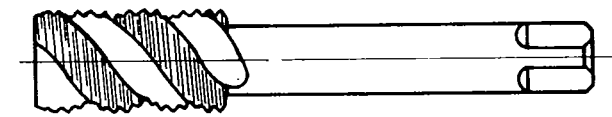
The terminology associated with the cutting features of a tap is illustrated in figure 5.



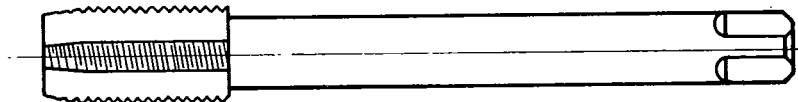
(a) Set of three short machine or hand taps (see 10.3)



(b) Short machine tap with straight flutes and spiral point, primarily for directing swarf forward of tap, illustrated with internal centres



(c) Short machine tap with right-hand spiral flutes, primarily for directing swarf towards the rear of the tap



(d) Long shank machine tap (for long reach purposes) shown with second lead

NOTE. Each illustration shows a 20 mm tap to the same scale.

Figure 2. Taps for different purposes

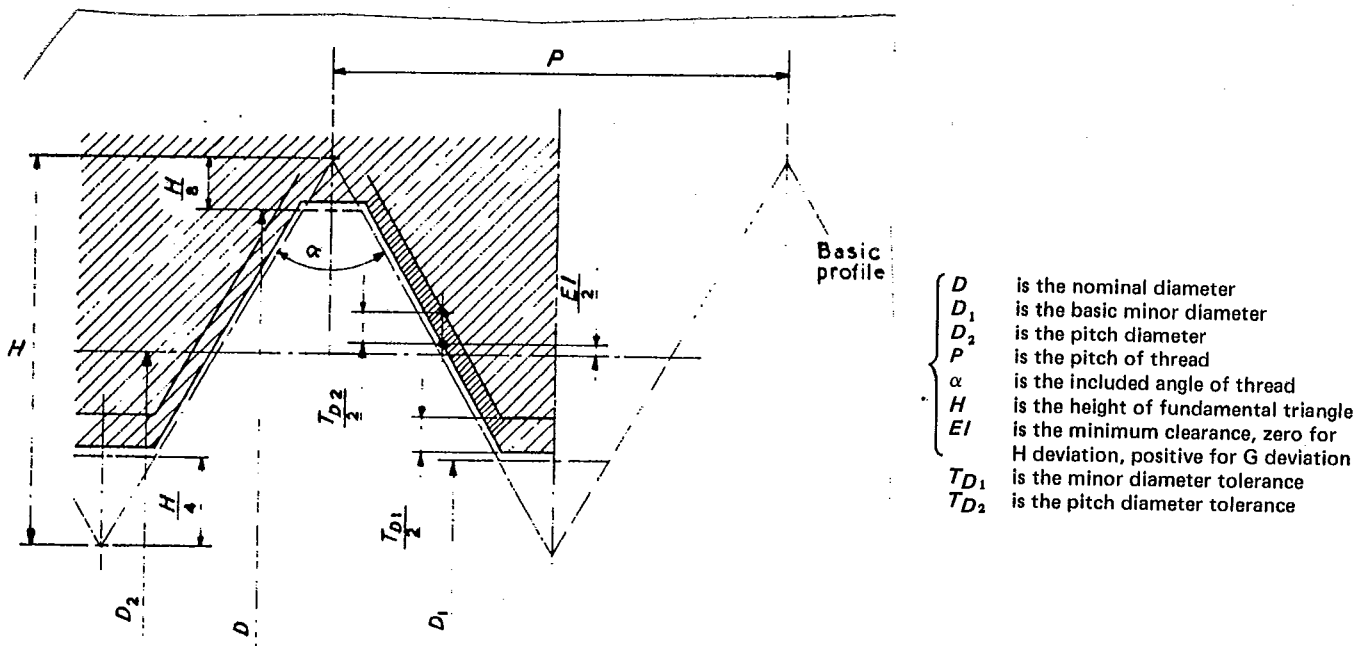


Figure 3. Thread profile of a nut

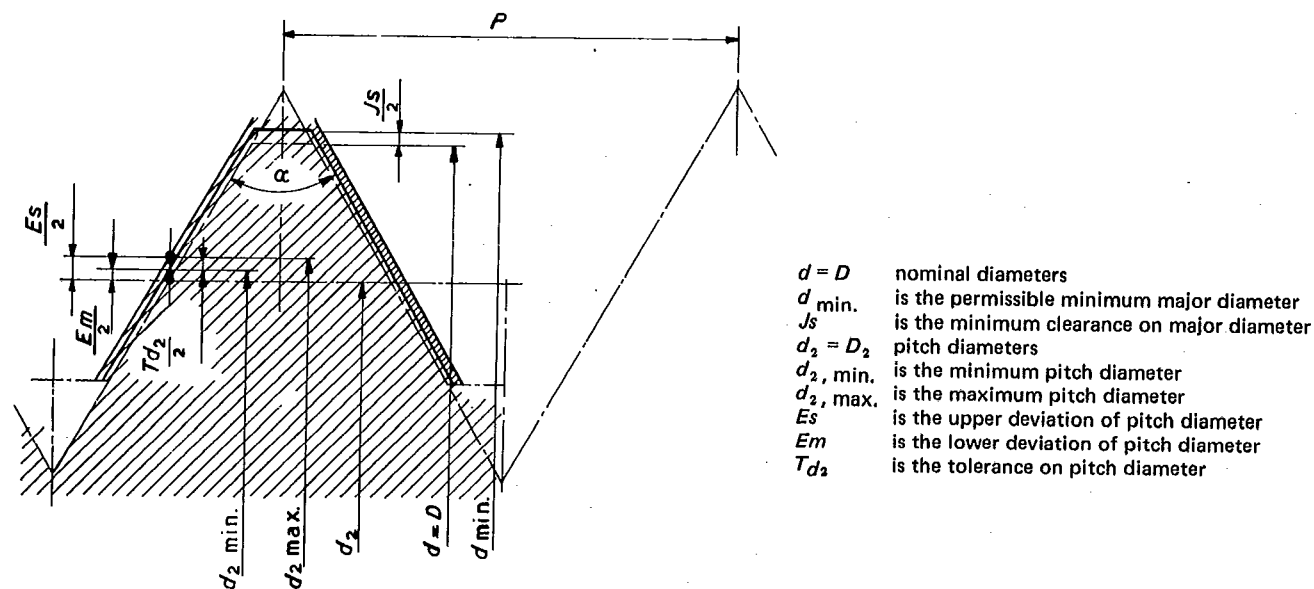
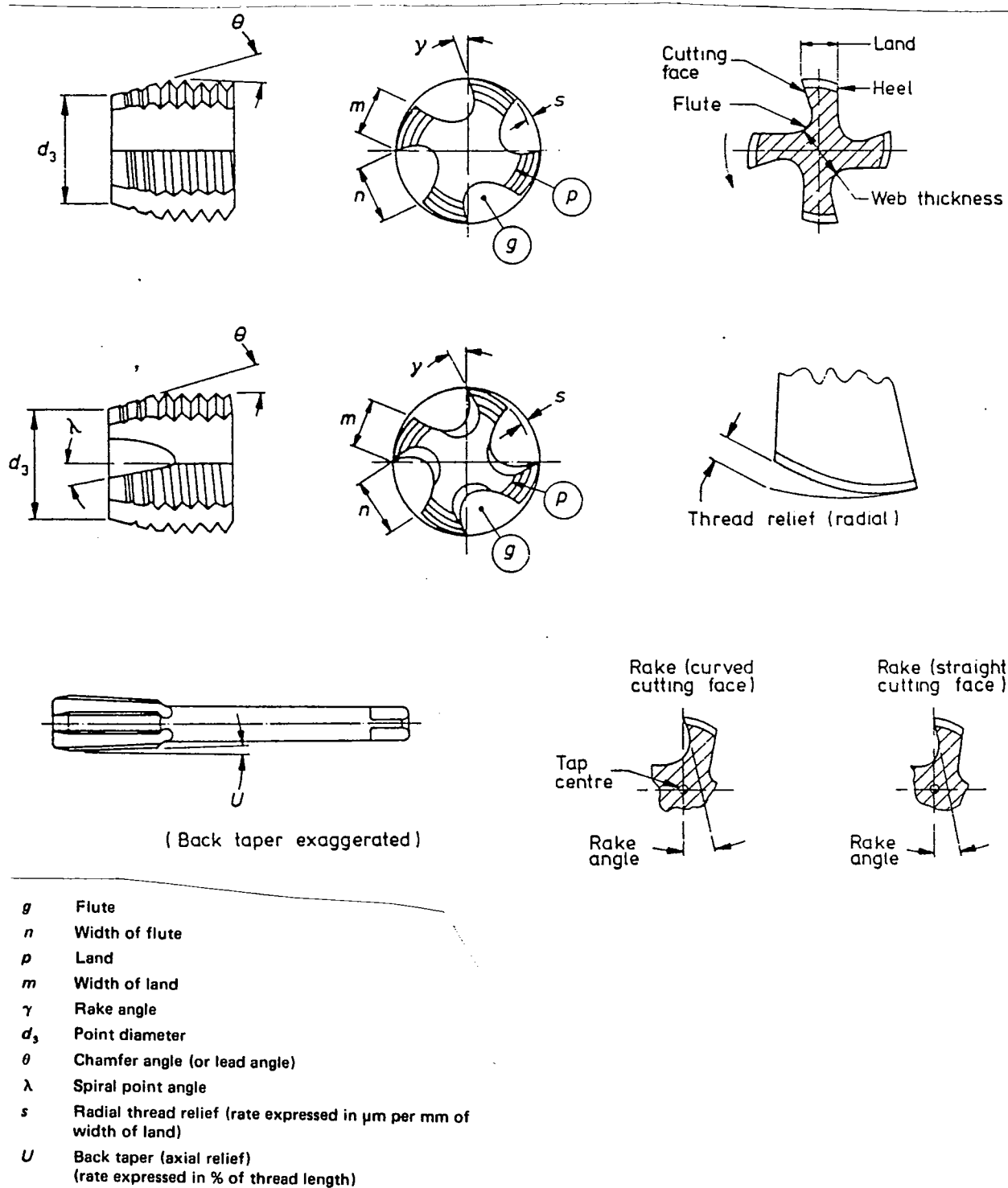


Figure 4. Thread profile of a tap



Section three. Types, patterns and size ranges of taps

6. Types of tap

Two types of tap are specified in this Part of BS 949, namely short machine or hand taps and long shank machine taps (these latter are in lieu of nut taps; see the foreword).

7. Patterns of tap and size ranges

7.1 The short machine or hand taps are specified in three patterns which differ in the shank of the tap, not in the threaded portion. The three patterns are:

- (a) taps in the size range over 0.9 mm and up to 2.8 mm which have a full diameter shank and a tapered connecting portion between the threaded portion and the shank (see figure 6);
- (b) taps in the size range over 2.8 mm and up to 10.0 mm which have a full diameter shank and a neck between the threaded portion and the shank (see figure 7);

(c) taps in the size range over 10.0 mm and up to 101.6 mm which have a reduced diameter shank (see figure 8).

7.2 The long shank machine tap (size range over 2.8 mm and up to 26.5 mm) is also a tap with a reduced diameter shank (see figure 9), but for a given size of tap the shank length is greater than that of the short tap (see 9.2).

7.3 The sizes of each type and pattern of tap that are directly specified in tables 2, 3, 4 and 6 are shown in table 1.

NOTE 1. The sizes of taps shown in table 1 are not necessarily all first preference sizes; For the selection of preferred thread sizes, see BS 3643 : Part 1.

NOTE 2. For taps with reduced diameter shanks in the size range for which taps with full diameter shanks and neck are specified, see the foreword and appendix C.

Table 1. Summary of the sizes of each type and pattern of tap that are specified in tables 2, 3, 4 and 6

1	2	3	4
Short machine or hand taps		Long shank machine taps	
Coarse pitch series	Fine pitch series	Coarse pitch series	Fine pitch series
M1 M1.1 M1.2 M1.4 M1.6 M1.8 M2 M2.2 M2.5	M1 X 0.2 M1.1 X 0.2 M1.2 X 0.2 M1.4 X 0.2 M1.6 X 0.2 M1.8 X 0.2 M2 X 0.25 M2.2 X 0.25 M2.5 X 0.35		
M3 M3.5 M4 M4.5 M5 M6 M7 M8 M9 M10	M3 X 0.35 M3.5 X 0.35 M4 X 0.5 M5 X 0.5 M6 X 0.75 M8 X 1 M10 X 1 M10 X 1.25	M3 M3.5 M4 M4.5 M5 M6 M7 M8 M9 M10	M3 X 0.35 M3.5 X 0.35 M4 X 0.5 M5 X 0.5 M6 X 0.75 M8 X 1 M10 X 1 M10 X 1.25
M11 M12 M14 M16 M18 M20 M22 M24 M27 M30 M33 M36 M39 M42 M45 M48 M52 M56 M60 M64 M68	M12 X 1.25 M14 X 1.25 M14 X 1.5 M16 X 1.5 M18 X 1.5 M20 X 1.5 M25 X 1.5 M32 X 1.5 M40 X 1.5 M50 X 1.5 M63 X 1.5	M11 M12 M14 M16 M18 M20 M22 M24	M12 X 1.25 M14 X 1.25 M14 X 1.5 M16 X 1.5 M18 X 1.5 M20 X 1.5

Section four. General dimensions

8. General dimensions of short machine or hand taps

8.1 The general dimensions of the sizes of short machine or hand taps shown in table 1 shall be as shown in tables 2, 3 and 4*, and the tolerances on those dimensions shall be as shown in tables 7 and 8.

8.2 The general dimensions of other sizes of short machine or hand taps shall be as shown in table 5, and the tolerances on those dimensions shall be as shown in tables 7 and 8.

NOTE. For taps with reduced diameter shanks in the size range for which taps with full diameter shank and neck are specified, see appendix C.

9. General dimensions of long shank machine taps

9.1 The general dimensions of the sizes of long shank machine taps shown in table 1 shall be as shown in table 6, and the tolerances on those dimensions shall be as shown in tables 7 and 8.

*The dimensions specified in tables 2, 3 and 4 are repeated in table 5.

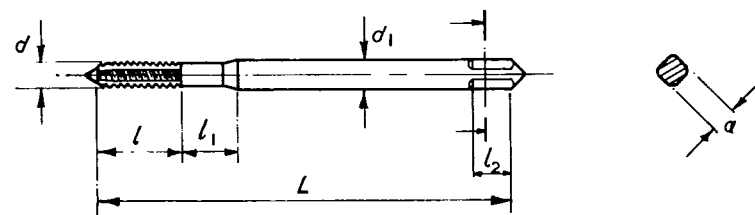


Figure 6. Short machine or hand tap in the size range over 0.9 mm and up to 2.8 mm (with full diameter shank and a tapered connecting portion between threaded portion and shank)

9.2 The general dimensions of other sizes of long shank machine taps shall be as shown in table 19 in appendix F, and the tolerances on those dimensions shall be as shown in tables 7 and 8.

NOTE 1. For a given nominal diameter, the long shank machine taps for a coarse pitch series thread and for a fine pitch series thread have different thread lengths l , but in other respects their general dimensions are the same.

NOTE 2. Except for the thread length l of a tap for a fine pitch series thread, the general dimensions of long shank machine taps are derived from the general dimensions of the short machine or hand tap for a coarse pitch series thread of the same nominal diameter. The general dimensions of long shank machine taps are derived as follows.

(a) The shank diameter is equal to that of the same nominal size of short machine or hand tap with reduced diameter shank (compare tables 6 and 19 with tables 4, 5(c) and 15).

(b) The overall length is given by the expression $1.5 \times (L - l) + l$ where l and L are taken from columns 4 and 6 of table 5; if the value of $(L - l)$ is an odd number, the result is rounded down to the nearest millimetre.

(c) The thread length l is the same as the thread length of the short machine or hand tap for the same thread, i.e. as shown in column 4 or column 5 of table 5(b) and (c).

Table 2. General dimensions of certain sizes of short machine or hand taps with nominal diameters over 0.9 mm and up to and including 2.8 mm (see figure 6)

Dimensions in millimetres

1	2	3	4	5	6	7	8	9	10	11	12
Coarse pitch series taps			Fine pitch series taps			Shank diameter	Length of thread	Overall length	Length of tapered connecting portion l_1	Driving square	
Thread designation	Nominal (basic major) diameter d	Pitch p	Thread designation	Nominal (basic major) diameter d	Pitch p					A/F a	Length l_2
M1	1.0	0.25	M1 × 0.2	1.0	0.20	2.50	5.5	38.5	4.5	2.00	4
M1.1	1.1		M1.1 × 0.2	1.1							
M1.2	1.2		M1.2 × 0.2	1.2							
M1.4	1.4	0.30	M1.4 × 0.2	1.4		2.50	7.0	40.0	5.0	2.00	4
M1.6	1.6	0.35	M1.6 × 0.2	1.6		2.50	8.0	41.0	5.0	2.00	4
M1.8	1.8		M1.8 × 0.2	1.8							
M2	2.0	0.40	M2 × 0.25	2.0	0.25	2.50	8.0	41.0	5.5	2.00	4
M2.2	2.2	0.45	M2.2 × 0.25	2.2		2.80	9.5	44.5	6.0	2.24	5
M2.5	2.5		M2.5 × 0.35	2.5	0.35						

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10. General dimensions common to all types of tap

10.1 For all the taps specified in this Part of this British Standard, the size and length of the driving square shall be related to the shank diameter as shown in table 5 (the relationship is in accordance with ISO 237).

10.2 The point diameter of a tap shall be approximately equal to the basic minor diameter of the thread to be cut.

10.3 The amount of the chamfer (or lead) of a tap shall be as follows:

Taper tap approximately 4° per side.
Second tap approximately 8° per side.
Bottoming tap approximately 23° per side.

10.4 The larger sizes of taps are customarily manufactured with internal centres. The smaller sizes of taps are manufactured with internal centres or external centres at the manufacturer's discretion.

10.5 Ground-thread taps may, but need not, have radial thread relief.

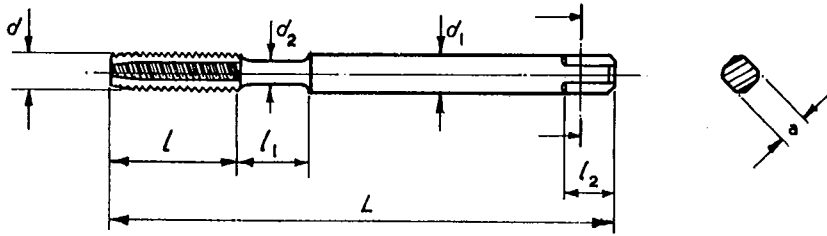


Figure 7. Short machine or hand tap in the size range over 2.8 mm and up to 10.0 mm (with full diameter shank and a neck between threaded portion and shank)

Table 3. General dimensions of certain sizes of short machine or hand taps with nominal diameters over 2.8 mm and up to and including 10.0 mm (see figure 7)

Dimensions in millimetres

1	2	3	4	5	6	7	8	9	10
Thread designation	Nominal (basic major) diameter d	Pitch p	Shank diameter d_1	Length of thread l	Overall length L	Neck		Driving square	
						Minimum diameter d_2	Length l_1	A/F a	Length l_2

(a) Coarse pitch series threads

M3	3.0	0.50	3.15	11	48	2.12	7	2.50	5
M3.5	3.5	0.60	3.55	13	50	2.50	7	2.80	5
M4	4.0	0.70	4.00	13	53	2.80	8	3.15	6
M4.5	4.5	0.75	4.50	13	53	3.15	8	3.55	6
M5	5.0	0.80	5.00	16	58	3.55	9	4.00	7
M6	6.0	1.00	6.30	19	66	4.50	11	5.00	8
M7	7.0		7.10	19	66	5.30	11	5.60	8
M8	8.0	1.25	8.00	22	72	6.00	13	6.30	9
M9	9.0		9.00	22	72	7.10	14	7.10	10
M10	10.0	1.50	10.00	24	80	7.50	15	8.00	11

(b) Fine pitch series threads

M3	X	0.35	3.0	0.35	3.15	11	48	2.12	7	2.50	5
M3.5	X	0.35	3.5		3.55	13	50	2.50	7	2.80	5
M4	X	0.5	4.0	0.50	4.00	13	53	2.80	8	3.15	6
M5	X	0.5	5.0		5.00	16	58	3.55	9	4.00	7
M6	X	0.75	6.0	0.75	6.30	19	66	4.50	11	5.00	8
M8	X	1	8.0	1.00	8.00	19	69	6.00	13	6.30	9
M10	X	1	10.0		10.00	20	76	7.50	15	8.00	11
M10	X	1.25		1.25							

NOTE The fine pitch series taps with nominal diameters 3.0, 3.5, 4.0, 5.0 and 6.0 mm each have the same general dimensions as the coarse pitch series tap with the same nominal diameter; see table 3(a).

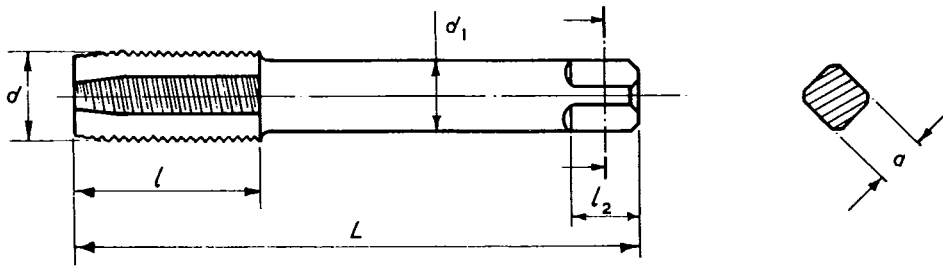


Figure 8. Short machine or hand tap in the size range over 10.0 mm and up to 101.6 mm (with reduced diameter shank).

Table 4. General dimensions of certain sizes of short machine or hand taps with nominal diameters over 10.0 mm (see figure 8)

Dimensions in millimetres

1 Thread designation	2 Nominal (basic major) diameter <i>d</i>	3 Pitch <i>p</i>	4 Shank diameter <i>d</i> ₁	5 Length of thread <i>l</i>	6 Overall length <i>L</i>	7 Driving square		8 Length <i>l</i> ₂
						A/F <i>a</i>	Length	

(a) Coarse pitch series threads

M11	11	1.50	8.0	25	85	6.3	9
M12	12	1.75	9.0	29	89	7.1	10
M14	14	2.00	11.2	30	95	9.0	12
M16	16		12.5	32	102	10.0	13
M18	18	2.50	14.0	37	112	11.2	14
M20	20		16.0	38	118	12.5	16
M22	22						
M24	24	3.00	18.0	45	130	14.0	18
M27	27		20.0	45	135	16.0	20
M30	30	3.50	20.0	48	138	16.0	20
M33	33		22.4	51	151	18.0	22
M36	36	4.00	25.0	57	162	20.0	24
M39	39		28.0	60	170	22.4	26
M42	42	4.50					
M45	45	31.5	67	187	25.0	28	
M48	48						5.00
M52	52	35.5	70	200	28.0	31	
M56	56						5.50
M60	60	6.00	40.0	76	221	31.5	34
M64	64		40.0	79	224	31.5	34
M68	68		45.0	79	234	35.5	38

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Table 4 (concluded)

Dimensions in millimetres

1	2	3	4	5	6	7	8
Thread designation	Nominal (basic major) diameter d	Pitch p	Shank diameter d_1	Length of thread l	Overall length L	Driving square	
						A/F a	Length l_2

(b) Fine pitch series threads

M12	X	1.25	12	1.25	9.0	24	84	7.1	10
M14	X	1.25	14		11.2	25	90	9.0	12
M14	X	1.5		1.50	11.2	30	95	9.0	12
M16	X	1.5	12.5		32	102	10.0	13	
M18	X	1.5	14.0		29*	104*	11.2	14	
M20	X	1.5							
M25	X	1.5	18.0		35	120	14.0	18	
M32	X	1.5	22.4		37	137	18.0	22	
M40	X	1.5	28.0		39	149	22.4	26	
M50	X	1.5	31.5		45	165	25.0	28	
M63	X	1.5	40.0		47	193	31.5	34	

* The standard values of the length of thread (l) and of the overall length (L) for the short machine or hand taps for M18 X 1.5 and M20 X 1.5 threads are $l = 29$ mm and $L = 104$ mm, as shown in table 4(b). If, at the discretion of the manufacturer, it is desired to provide taps with a continuously rising gradation in these dimensions, taps with the values $l = 33$ mm and $L = 108$ mm may be provided in addition to those shown in the table.

Table 5. Summary of general dimensions of short machine or hand taps

Dimensions in millimetres

1	2	3	4	5	6	7	8	9	10	11	12
Nominal diameter		Shank diameter	Thread length*		Overall length*		Minimum neck diameter	Connecting length or neck length	Driving square		Fine pitch blank used for threads finer than (pitch <i>p</i>)
Over	Up to and including		Coarse pitch series	Fine pitch series	Coarse pitch series	Fine pitch series			A/F	Length	
			<i>l</i>	<i>l</i>	<i>L</i>	<i>L</i>			<i>a</i>	<i>l</i> ₂	
		<i>d</i> ₁					<i>d</i> ₂	<i>l</i> ₁			

(a) See table 2 and figure 6

0.90	1.25	2.50	5.5		38.5			4.5	2.00	4	
1.25	1.40	2.50	7.0		40.0			5.0	2.00	4	
1.40	1.80	2.50	8.0		41.0			5.0	2.00	4	
1.80	2.00	2.50	8.0		41.0			5.5	2.00	4	
2.00	2.80	2.80	9.5		44.5			6.0	2.24	5	

(b) See table 3 and figure 7

2.80	3.20	3.15	11		48		2.12	7.0	2.50	5	
3.20	3.60	3.55	13		50		2.50	7.0	2.80	5	
3.60	4.00	4.00	13		53		2.80	8.0	3.15	6	
4.00	4.50	4.50	13		53		3.15	8.0	3.55	6	
4.50	5.00	5.00	16		58		3.55	9.0	4.00	7	
5.00	5.60	5.60	17		62		4.25	9.0	4.50	7	
5.60	6.35	6.30	19		66		4.50	11.0	5.00	8	
6.35	7.20	7.10	19		66		5.30	11.0	5.60	8	
7.20	8.00	8.00	22	19	72	69	6.00	13.0	6.30	9	1.25
8.00	9.00	9.00	22	19	72	69	7.10	14.0	7.10	10	1.25
9.00	10.00	10.00	24	20	80	76	7.50	15.0	8.00	11	1.50

(c) See table 4 and figure 8

10.00	10.60	7.10	24	22	84	82			5.60	8	1.50
10.60	11.80	8.00	25	22	85	82			6.30	9	1.50
11.80	13.20	9.00	29	24	89	84			7.10	10	1.50
13.20	15.00	11.20	30	25	95	90			9.00	12	1.50
15.00	17.00	12.50	32	25	102	95			10.00	13	1.50
17.00	21.20	14.00	37	29†	112	104†			11.20	14	1.75
21.20	23.60	16.00	38	33†	118	113†			12.50	16	2.00
23.60	26.50	18.00	45	35	130	120			14.00	18	2.50
26.50	28.00	20.00	45	37	135	127			16.00	20	2.50
28.00	30.00	20.00	48	37	138	127			16.00	20	2.50
30.00	33.50	22.40	51	37	151	137			18.00	22	2.50
33.50	37.50	25.00	57	39	162	144			20.00	24	2.50
37.50	42.50	28.00	60	39	170	149			22.40	26	2.50
42.50	50.00	31.50	67	45	187	165			25.00	28	3.00
50.00	56.00	35.50	70	45	200	175			28.00	31	3.00
56.00	63.00	40.00	76	47	221				31.50	34	
63.00	67.00	40.00	79		224				31.50	34	
67.00	75.00	45.00	79		234				35.50	38	
75.00	80.00	50.00	83		258				40.00	42	
80.00	90.00	50.00	86		261				40.00	42	
90.00	101.60	56.00	89		279				45.00	46	

* For taps of nominal diameter up to and including 7.20 mm, the same blank is used for the coarse pitch tap and for the fine pitch series tap of a given nominal diameter. For taps of nominal diameter over 7.20 mm and up to and including 56.00 mm, the thread lengths *l* shown in column 5 and the overall lengths *L* shown in column 7 are used for fine pitch series taps, i.e. for pitches finer than the value shown in column 12.

The standard values of the length of thread *l* and of the overall length *L* are shown in the table. If taps for fine pitch series threads are required with a continuously rising gradation in these dimensions, taps with the following values of *l* and *L* may be provided, at the discretion of the manufacturer, in addition to those shown in the table:

(a) nominal diameter over 17.00 mm and up to and including 21.20 mm, *l* = 33 mm, *L* = 108 mm;
(b) nominal diameter over 21.20 mm and up to and including 23.60 mm, *l* = 35 mm, *L* = 115 mm.