
INTERNATIONAL STANDARD



529

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Short machine taps and hand taps

Tarauds courts à machine et à main

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up has the right to be represented on that Committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, Technical Committee ISO/TC 29 has reviewed ISO Recommendation R 529 and found it technically suitable for transformation. International Standard ISO 529 therefore replaces ISO Recommendation R 529-1966 together with its Amendment 1-1971 and Addendum 1-1972 to which it is technically identical.

ISO Recommendation R 529 was approved by the Member Bodies of the following countries :

Argentina	Denmark	Portugal
Austria	France	Spain
Belgium	Germany	Switzerland
Brazil	Hungary	Turkey
Canada	Italy	United Kingdom
Chile	Netherlands	Yugoslavia
Colombia	New Zealand	
Czechoslovakia	Poland	

The Member Bodies of the following countries expressed disapproval of the Recommendation on technical grounds :

Sweden
U.S.A.
U.S.S.R.

The Member Body of the following country disapproved the transformation of ISO/R 529 into an International Standard :

Austria

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Short machine taps and hand taps

1 SCOPE AND FIELD OF APPLICATION

This International Standard lays down the following general dimensions of short machine taps and hand taps, as a function of the thread diameter and pitch :

- length of thread;
- overall length;
- shank diameter and dimensions of driving square;
- dimensions of the connecting portion between the shank and threaded part.

It contains two sections :

- Section one : Dimensions in millimetres;
- Section two : Dimensions in inches.

NOTE – The dimensions in inches given in tables 20 to 36 of section two are exact conversions of the dimensions in millimetres given in tables 1 to 17 of section one.

Tables 20 to 36 should facilitate the adoption of metric values by countries using inches. The elimination of section two is expected after five years.

Each section contains six groups of tables (tables 1 to 17 for dimensions in millimetres and tables 20 to 36 for dimensions in inches), corresponding respectively to the following threads :

Metric threads :

- coarse pitch
- fine pitch

Inch threads :

- Unified Coarse threads (UNC)
- Unified Fine threads (UNF)

- British Standard Whitworth (BSW) and British Standard Fine (BSF) – non-recommended
- British Association (BA) – non-recommended.

Taps are standardized only for threads, in millimetres or in inches, having a pitch greater than that of the Unified Extra Fine thread (UNEF).

However, in the annexes are given :

- in tables 18 and 37 : the minimum permissible values l_0 of length of thread, as determined by tests carried out in different countries;
- in tables 19 and 38 : the values of overall length and shank diameter which may be used for the manufacture of taps outside this standard.

The standardized lengths of thread l , always at least equal to l_0 , have been chosen in such a way as to permit the use of the same blank for several consecutive pitches.

Tables 1 to 17 and 20 to 36 are followed by a note giving details of tolerances and marking applying to all the standard taps covered by these tables.

2 REFERENCES

ISO 237, *Rotating tools with parallel shanks – Diameters of shanks and sizes of driving squares.*

ISO/R 286, *ISO System of limits and fits – Part 1: General, tolerances and deviations.*

ISO 2857, *Ground thread taps for ISO metric threads of tolerance 4H to 8H and 4G to 6G coarse and fine pitches – Manufacturing tolerances on the threaded portion.*

SECTION ONE – DIMENSIONS IN MILLIMETRES

3 COARSE PITCH METRIC THREADS

3.1 Full-diameter shank taps with plain connecting portion

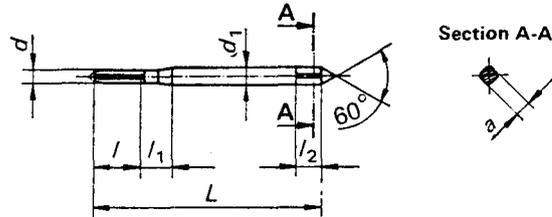


TABLE 1

Designation	d nominal	Pitch	d ₁ h9	l	L	l ₁	Square	
							a h11	l ₂
M 1	1,0	0,25	2,50	5,5	38,5	4,5	2,00	4
M 1,1	1,1							
M 1,2	1,2							
M 1,4	1,4	0,30	2,50	7,0	40,0	5,0	2,00	4
M 1,6	1,6	0,35		8,0	41,0			
M 1,8	1,8							
M 2	2,0	0,40	2,80	9,5	44,5	5,5	2,24	5
M 2,2	2,2	0,45						
M 2,5	2,5							

3.2 Full-diameter shank taps with recess

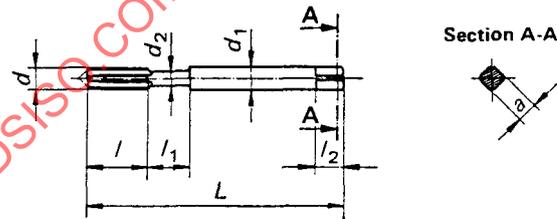
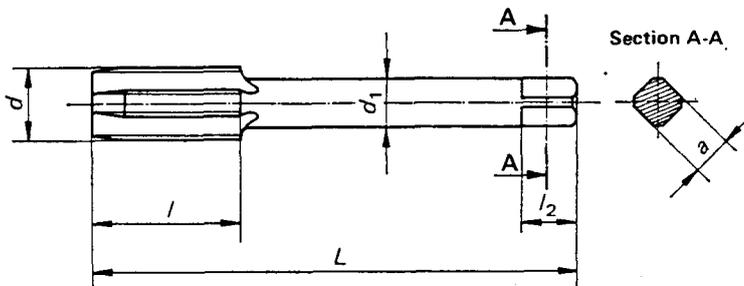


TABLE 2

Designation	d nominal	Pitch	d ₁ h9	l	L	d ₂ min.	l ₁	Square	
								a h11	l ₂
M 3	3,0	0,50	3,15	11,0	48,0	2,12	7,0	2,50	5
M 3,5	3,5	0,60	3,55	13,0	50,0	2,50		2,80	
M 4	4,0	0,70	4,00	13,0	53,0	2,80	8,0	3,15	6
M 4,5	4,5	0,75	4,50			3,15			
M 5	5,0	0,80	5,00	16,0	58,0	3,55	9,0	4,00	7
M 6	6,0	1,00	6,30	19,0	66,0	4,50	11,0	5,00	8
M 7	7,0		7,10			5,30			
M 8	8,0	1,25	8,00	22,0	72,0	6,00	13,0	6,30	9
M 9	9,0		9,00			7,10	14,0	7,10	10
M 10	10,0	1,50	10,00	24,0	80,0	7,50	15,0	8,00	11

3.3 Relieved-shank taps



NOTES

1 Tolerances

a) Thread and overall length

Values in millimetres

Nominal diameter of tap	Maximum deviation	
	over	including
—	5,5	on l and L
5,5	12,0	0 -2,5
12,0	39,0	0 -3,2
39,0	—	0 -5,0
		0 -6,3

b) Shank diameters and driving squares

Tolerances in accordance with ISO 237.

— on diameter d_1 :

h9* for precision shanks,

h11* for non-precision shanks;

— on the across flats dimension a :

h11*.

h12* (including errors of form of the square and of its position in relation to the shank).

TABLE 3

Designation	d nominal	Pitch	d ₁ h9	l	L	Square	
						a h11	l/2
M 3	3	0,5	2,24	11	48	1,80	4
M 3,5	3,5	0,6	2,50	13	50	2,00	
M 4	4	0,7	3,15		53	53	2,50
M 4,5	4,5	0,75	3,55	53		2,80	
M 5	5	0,8	4,00	16	58	3,15	6
M 6	6	1	4,50	19	66	3,55	
M 7	7		5,60		66	4,50	7
M 8	8	1,25	6,30	22	72	5,00	
M 9	9		7,10		72	5,60	
M 10	10	1,50	8,00	24	80	6,30	9
M 11	11,0		8,00		25,0	85	
M 12	12,0	1,75	9,00	29,0	89	7,10	12
M 14	14,0	2,00	11,20	30,0	95	9,00	
M 16	16,0		12,50		32,0	102	10,00
M 18	18,0	2,50	14,00	37,0	112	11,20	14
M 20	20,0		14,00		37,0	112	
M 22	22,0	3,00	16,00	38,0	118	12,50	16
M 24	24,0		16,00		38,0	118	
M 27	27,0	3,50	18,00	45,0	130	14,00	18
M 30	30,0		18,00		45,0	130	
M 33	33,0	4,00	20,00	45,0	135	16,00	20
M 36	36,0		20,00		45,0	135	
M 39	39,0	4,50	22,40	51,0	151	18,00	22
M 42	42,0		22,40		51,0	151	
M 45	45,0	5,00	25,00	57,0	162	20,00	24
M 48	48,0		25,00		57,0	162	
M 52	52,0	5,50	28,00	60,0	170	22,40	26
M 56	56,0		28,00		60,0	170	
M 60	60,0	6,00	31,50	67,0	187	25,00	28
M 64	64,0		31,50		67,0	187	
M 68	68,0	6,00	35,50	70,0	200	28,00	31
			35,50		70,0	200	
		6,00	40,00	76,0	221	31,50	34
			40,00		76,0		
		6,00	45,00	79,0	224	35,50	38
			45,00		79,0		

2 Marking

The tap shall be marked, on the shank, by any means not impairing the metal surface.

Marking shall consist of the following :

Thread

In accordance with the standard designation (see tables 1 to 17, first column) completed by

— an indication of the class of tap thread (ISO 1, ISO 2 or ISO 3, in accordance with ISO 2857);

— a clear mark (the letter L for example) for left-hand threads.

Serial taps

A mark indicating the order in which the taps should be used, except for the finishing tap.

Material :

— High speed steel taps : High speed steel taps shall be marked HSS.

— Taps made from other steels than high speed steel : The marking of taps made from steels other than high speed steel is left to the discretion of the manufacturer or should be specified in the national standards.

* See ISO/R 286.

4 FINE PITCH METRIC THREADS

4.1 Full-diameter shank taps with plain connecting portion

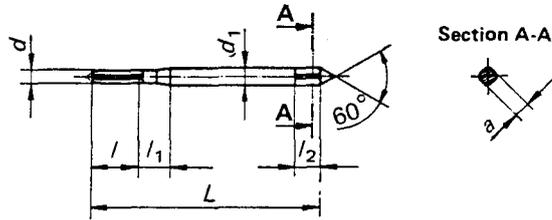


TABLE 4

Designation	d nominal	Pitch	d ₁ h9	l	L	l ₁	Square	
							a h11	l ₂
M 1 × 0,2	1,0	0,2	2,50	5,5	38,5	4,5	2,00	4
M 1,1 × 0,2	1,1							
M 1,2 × 0,2	1,2							
M 1,4 × 0,2	1,4							
M 1,6 × 0,2	1,6							
M 1,8 × 0,2	1,8	0,25	2,80	9,5	44,5	6,0	2,24	5
M 2 × 0,25	2,0							
M 2,2 × 0,25	2,2							
M 2,5 × 0,35	2,5	0,35						

4.2 Full-diameter shank taps with recess

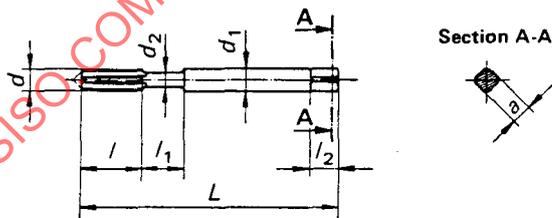


TABLE 5

Designation	d nominal	Pitch	d ₁ h9	l	L	d ₂ min.	l ₁	Square	
								a h11	l ₂
M 3 × 0,35	3,0	0,35	3,15	11,0	48,0	2,12	7,0	2,50	5
M 3,5 × 0,35	3,5		3,55	13,0	50,0	2,50		2,80	
M 4 × 0,5	4,0	0,5	4,00	13,0	53,0	2,80	8,0	3,15	6
M 4,5 × 0,5	4,5		4,50			3,15		3,55	
M 5 × 0,5	5,0		5,00			3,55		4,00	
M 5,5 × 0,5	5,5	0,75	5,60	17,0	62,0	4,00	9,0	4,50	7
M 6 × 0,75	6,0		6,30	19,0	66,0	4,50		5,00	
M 7 × 0,75	7,0	7,10	5,30			5,60			
M 8 × 1	8,0	1	8,00	19,0	69,0	6,00	13,0	6,30	9
M 9 × 1	9,0		9,00			7,10		7,10	
M 10 × 1	10,0		10,00			20,0		76,0	
M 10 × 1,25		1,25							

4.3 Relieved-shank taps

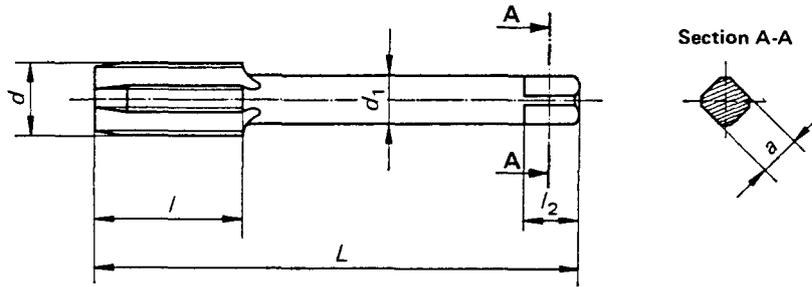


TABLE 6

Designation	d nominal	Pitch	d ₁ h9	l	L	Square						
						a h11	l ₂					
M 3 × 0,35	3	0,35	2,24	11	48	1,80	4					
M 3,5 × 0,35	3,5		2,50	13	50	2,00						
M 4 × 0,5	4		3,15		53	2,50						
M 4,5 × 0,5	4,5	0,5	3,55	16	58	2,80	5					
M 5 × 0,5	5		4,00					17	62	3,15		
M 5,5 × 0,5	5,5		0,75					4,50	19	66	3,55	6
M 6 × 0,75	6	5,60		4,50	7							
M 7 × 0,75	7	6,30		5,00	8							
M 8 × 1	8	1	7,10	20	76	5,60	9					
M 9 × 1	9		8,00			6,30		10				
M 10 × 1	10		1,25			9,0		24,0	84,0	7,1	10	
M 12 × 1,25	12,0	29,0		89,0								
M 12 × 1,5	12,0	1,5		25,0	90,0		9,0	12				
M 14 × 1,25	14,0	1,5	11,2	30,0	95,0							
M 14 × 1,5	14,0			12,5	32,0	102,0			10,0	13		
M 15 × 1,5	15,0						14,0	29,0*			104,0*	11,2
M 16 × 1,5	16,0	37,0*	112,0*									
M 17 × 1,5	17,0	29,0*	104,0*	12,5	16							
M 18 × 1,5	18,0	2	37,0*			112,0*						
M 18 × 2	18,0	1,5	33,0*			113,0*						
M 20 × 1,5	20,0	2	38,0*	118,0*								
M 20 × 2	20,0	1,5	18,0	35,0	120,0	14,0	18					
M 22 × 1,5	22,0	2						20,0	37,0	127,0	16,0	20
M 22 × 2	22,0	1,5										
M 24 × 1,5	24,0	2	32,0	2	37,0	137,0	22					
M 24 × 2	24,0	1,5						32,0	2	37,0	137,0	22
M 25 × 1,5	25,0	2										
M 25 × 2	25,0	1,5	32,0	2	37,0	137,0	22					
M 27 × 1,5	27,0	2						32,0	2	37,0	137,0	22
M 27 × 2	27,0	1,5										
M 28 × 1,5	28,0	2	32,0	2	37,0	137,0	22					
M 28 × 2	28,0	1,5						32,0	2	37,0	137,0	22
M 30 × 1,5	30,0	2										
M 30 × 2	30,0	1,5	32,0	2	37,0	137,0	22					
M 30 × 3	30,0	2						32,0	2	37,0	137,0	22
M 32 × 1,5	32,0	3										
M 32 × 2	32,0	1,5	32,0	2	37,0	137,0	22					
M 32 × 3	32,0	2						32,0	2	37,0	137,0	22
M 33 × 1,5	33,0	2										
M 33 × 2	33,0	1,5	32,0	2	37,0	137,0	22					
M 33 × 3	33,0	2						32,0	2	37,0	137,0	22

TABLE 6 (concluded)

Designation	d nominal	Pitch	d ₁ h9	l	L	Square																	
						a h11	l ₂																
M 35 × 1,5	35,0	1,5	25,0	39,0	144,0	20,0	24																
M 36 × 1,5	36,0							3	57,0	162,0													
M 36 × 2	36,0										1,5	39,0	149,0										
M 36 × 3	36,0	2	60,0	170,0																			
M 39 × 1,5	39,0				3	39,0	149,0																
M 39 × 2	39,0							1,5	39,0	149,0													
M 39 × 3	39,0	2	39,0	149,0																			
M 40 × 1,5	40,0				3	60,0	170,0																
M 40 × 2	40,0							1,5	60,0	170,0													
M 40 × 3	40,0	2	60,0	170,0																			
M 42 × 1,5	42,0				4	39,0	149,0																
M 42 × 2	42,0							1,5	39,0	149,0													
M 42 × 3	42,0	2	60,0	170,0																			
M 42 × 4	42,0				3	60,0	170,0																
M 45 × 1,5	45,0							4	45,0	165,0													
M 45 × 2	45,0	1,5	45,0	165,0																			
M 45 × 3	45,0				2	67,0	187,0																
M 45 × 4	45,0							3	67,0	187,0													
M 48 × 1,5	48,0	4	45,0	165,0																			
M 48 × 2	48,0				1,5	45,0	165,0																
M 48 × 3	48,0							2	67,0	187,0													
M 48 × 4	48,0	3	67,0	187,0																			
M 50 × 1,5	50,0				4	45,0	165,0																
M 50 × 2	50,0							1,5	45,0	165,0													
M 50 × 3	50,0	2	67,0	187,0																			
M 52 × 1,5	52,0				4	45,0	175,0																
M 52 × 2	52,0							1,5	45,0	175,0													
M 52 × 3	52,0	2	70,0	200,0																			
M 52 × 4	52,0				3	70,0	200,0																
M 55 × 1,5	55,0							4	45,0	175,0													
M 55 × 2	55,0	1,5	45,0	175,0																			
M 55 × 3	55,0				2	70,0	200,0																
M 55 × 4	55,0							3	70,0	200,0													
M 56 × 1,5	56,0	4	45,0	175,0																			
M 56 × 2	56,0				1,5	45,0	175,0																
M 56 × 3	56,0							2	70,0	200,0													
M 56 × 4	56,0	3	70,0	200,0																			
M 70 × 6	70,0				6	45,0	79,0				234,0	35,5	38										
M 72 × 6	72,0							50,0	83,0	258,0													
M 75 × 6	75,0	86,0	261,0																				
M 76 × 6	76,0			90,0										261,0									
M 80 × 6	80,0														95,0	261,0							
M 85 × 6	85,0																56,0	89,0	279,0	45,0	46		
M 90 × 6	90,0				56,0	89,0	279,0				45,0	46											
M 95 × 6	95,0							56,0	89,0	279,0			45,0									46	
M 100 × 6	100,0	56,0	89,0																				279,0

* As an exception to this rule, the following values, which give to this table a continuously rising gradation, can also be included if the manufacturer wishes :

for the taps

M18 × 1,5	} / = 33,0	L = 108,0
M18 × 2		
M20 × 1,5		
M20 × 2		

for the taps

M22 × 1,5	} / = 35,0	L = 115,0
M22 × 2		

NOTE - Tolerances and marking, see notes on page 3

5 UNIFIED COARSE (UNC) THREADS

5.1 Full-diameter shank taps with plain connecting portion

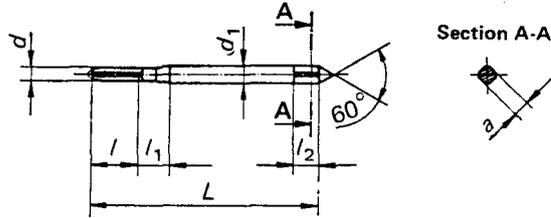


TABLE 7

Designation	d nominal	Approximate pitch	d ₁ h9	l	L	l ₁	Square	
							a h11	l ₂
No. 1 - 64-UNC	1,854	0,397	2,50	8,0	41,0	5,5	2,00	4
No. 2 - 56-UNC	2,184	0,454	2,80	9,5	44,5	6,0	2,24	5
No. 3 - 48-UNC	2,515	0,529						

5.2 Full-diameter shank taps with recess

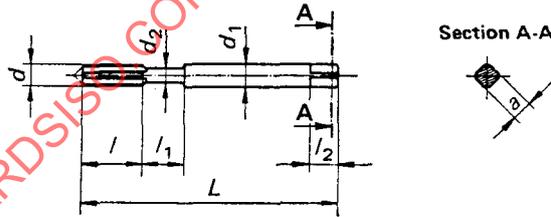


TABLE 8

Designation	d nominal	Approximate pitch	d ₁ h9	l	L	d ₂ min.	l ₁	Square	
								a h11	l ₂
No. 4 - 40-UNC	2,845	0,635	3,15	11,0	48,0	2,12	7,0	2,50	5
No. 5 - 40-UNC	3,175					2,36			
No. 6 - 32-UNC	3,505	0,794	3,55	13,0	50,0	2,50	8,0	3,55	6
No. 8 - 32-UNC	4,166		4,50						
No. 10 - 24-UNC	4,826	1,058	5,00	16,0	58,0	3,55	9,0	4,00	7
No. 12 - 24-UNC	5,486		5,60			4,25		4,50	
1/4 - 20-UNC	6,350	1,270	6,30	19,0	66,0	4,50	11,0	5,00	8
5/16 - 18-UNC	7,938	1,411	8,00	22,0	72,0	6,00	13,0	6,30	9
3/8 - 16-UNC	9,525	1,588	10,00	24,0	80,0	7,50	15,0	8,00	11

5.3 Relieved-shank taps

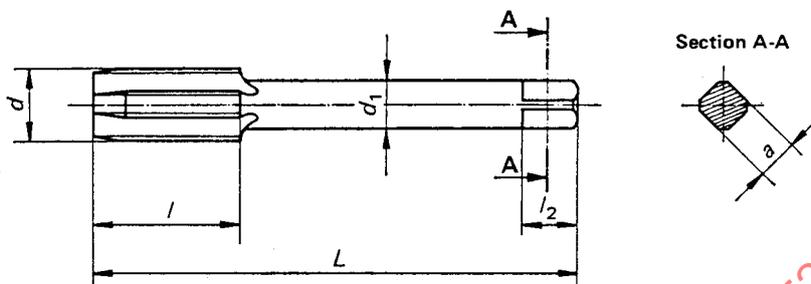


TABLE 9

Designation	d nominal	Approximate pitch	d ₁ h9	l	L	Square	
						a h11	l/2
No. 5 - 40-UNC	3,175	0,635	2,24	11	48	1,80	4
No. 6 - 32-UNC	3,505	0,794	2,50	13	50	2,00	
No. 8 - 32-UNC	4,166		1,058	3,15	16	53	2,50
No. 10 - 24-UNC	4,826	4,00		17		62	3,15
No. 12 - 24-UNC	5,486	1,270	4,50	19	66	3,55	6
1/4 - 20-UNC	6,350	1,411	6,30	22	72	5,00	8
5/16 - 18-UNC	7,938	1,588	7,10	24	80	5,60	
3/8 - 16-UNC	9,525	1,814	8,0	25,0	85,0	6,3	9
7/16 - 14-UNC	11,112	1,594	9,0	29,0	89,0	7,1	10
1/2 - 13-UNC	12,700	2,117	11,2	30,0	95,0	9,0	12
9/16 - 12-UNC	14,288	2,309	12,5	32,0	102,0	10,0	13
5/8 - 11-UNC	15,875	2,540	14,0	37,0	112,0	11,2	14
3/4 - 10-UNC	19,050	2,822	16,0	38,0	118,0	12,5	16
7/8 - 9-UNC	22,225	3,175	18,0	45,0	130,0	14,0	18
1 - 8-UNC	25,400	3,629	20,0	48,0	138,0	16,0	20
1 1/8 - 7-UNC	28,575		22,4	51,0	151,0	18,0	22
1 1/4 - 7-UNC	31,750	4,233	25,0	57,0	162,0	20,0	24
1 3/8 - 6-UNC	34,925		28,0	60,0	170,0	22,4	26
1 1/2 - 6-UNC	38,100	5,080	31,5	67,0	187,0	25,0	28
1 3/4 - 5-UNC	44,450	5,644	35,5	70,0	200,0	28,0	31
2 - 4 1/2-UNC	50,800		40,0	76,0	221,0	31,5	34
2 1/4 - 4 1/2-UNC	57,150	6,350	50,0	79,0	224,0		
2 1/2 - 4-UNC	63,500			45,0	79,0	234,0	35,5
2 3/4 - 4-UNC	69,850	83,0	83,0	83,0	258,0	40,0	42
3 - 4-UNC	76,200			86,0	261,0		
3 1/4 - 4-UNC	82,550	56,0	89,0	89,0	279,0	45,0	46
3 1/2 - 4-UNC	88,900						
3 3/4 - 4-UNC	95,250						
4 - 4-UNC	101,600						

NOTE — Tolerances and marking, see notes on page 3

6 UNIFIED FINE (UNF) THREADS

6.1 Full-diameter shank taps with plain connecting portion

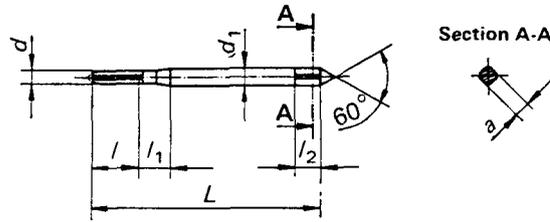


TABLE 10

Designation	d nominal	Approximate pitch	d ₁ h9	l	L	l ₁	Square	
							a h11	l ₂
No. 0 - 80-UNF	1,524	0,318	2,50	8,0	41,0	5,0	2,00	4
No. 1 - 72-UNF	1,854	0,353						
No. 2 - 64-UNF	2,184	0,397	2,80	9,5	44,5	6,0	2,24	5
No. 3 - 56-UNF	2,515	0,454						

6.2 Full-diameter shank taps with recess

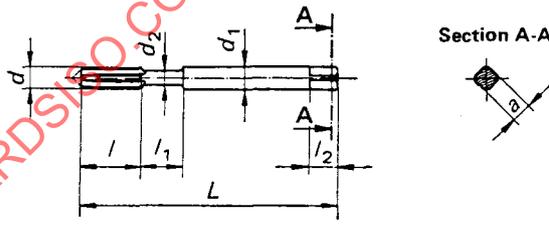


TABLE 11

Designation	d nominal	Approximate pitch	d ₁ h9	l	L	d ₂ min.	l ₁	Square	
								a h11	l ₂
No. 4 - 48-UNF	2,845	0,529	3,15	11,0	48,0	2,12	7,0	2,50	5
No. 5 - 44-UNF	3,175	0,577							
No. 6 - 40-UNF	3,505	0,635	3,55	13,0	50,0	2,50	8,0	3,55	6
No. 8 - 36-UNF	4,166	0,706	4,50		53,0	3,15			
No. 10 - 32-UNF	4,826	0,794	5,00	16,0	58,0	3,55	9,0	4,00	7
No. 12 - 28-UNF	5,486	0,907	5,60	17,0	62,0	4,25		4,50	
1/4 - 28-UNF	6,350		6,30	19,0	66,0	4,50	11,0	5,00	8
5/16 - 24-UNF	7,938	8,00	69,0		6,00	13,0	6,30	9	
3/8 - 24-UNF	9,525	1,058	10,00	20,0	76,0	7,50	15,0	8,00	11

6.3 Relieved-shank taps

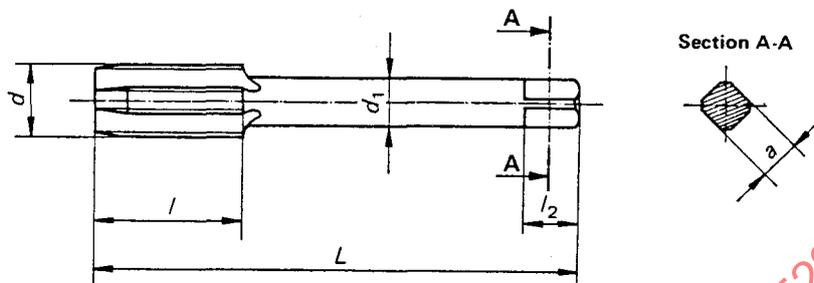


TABLE 12

Designation	d nominal	Approximate pitch	d ₁ h9	L	Square		
					a h11	l ₂	
No. 5 - 44-UNF	3,175	0,577	2,24	11	48	1,80	4
No. 6 - 40-UNF	3,505	0,635	2,50	13	50	2,00	
No. 8 - 36-UNF	4,166	0,706	3,15	16	53	2,50	5
No. 10 - 32-UNF	4,826	0,794	3,55	17	58	2,80	
No. 12 - 28-UNF	5,486	0,907	4,00	19	62	3,15	6
1/4 - 28-UNF	6,350		4,50	19	66	3,55	
5/16 - 24-UNF	7,938	1,058	6,30	20	69	5,00	8
3/8 - 24-UNF	9,525		7,10	20	76	5,60	
7/16 - 20-UNF	11,112	1,270	8,00	22,0	82,0	6,30	9
1/2 - 20-UNF	12,700		9,00	24,0	84,0	7,10	
9/16 - 18-UNF	14,288	1,411	11,20	25,0	90,0	9,00	12
5/8 - 18-UNF	15,875		12,50	25,0	95,0	10,00	
3/4 - 16-UNF	19,050	1,588	14,00	29,0	104,0	11,20	14
7/8 - 14-UNF	22,225	1,814	16,00	33,0	113,0	12,50	16
1 - 12-UNF	25,400	2,117	18,00	35,0	120,0	14,00	18
1 1/8 - 12-UNF	28,575		20,00	37,0	127,0	16,00	20
1 1/4 - 12-UNF	31,750		22,40	37,0	137,0	18,00	22
1 3/8 - 12-UNF	34,925		25,00	39,0	144,0	20,00	24
1 1/2 - 12-UNF	38,100		28,00	39,0	149,0	22,40	26

NOTE - Tolerances and marking, see notes on page 3

7 BRITISH STANDARD WHITWORTH (BSW) AND BRITISH STANDARD FINE (BSF) THREADS – NON-RECOMMENDED

7.1 Full-diameter shank taps with recess

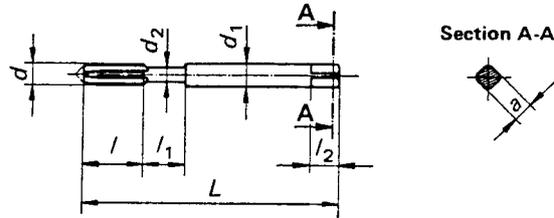


TABLE 13

Designation		d nominal	Approximate pitch		d ₁ h9	l	L	d ₂ min.	l ₁	Square	
			BSW	BSF						a h11	l ₂
1/8 - 40-BSW	—	3,175	0,635	—	3,15	11	48	2,36	7	2,5	5
3/16 - 24-BSW	3/16 - 32-BSF	4,762	1,058	0,794	5,00	16	58	3,55	9	4,0	7
—	7/32 - 28-BSF	5,556	—	0,907	5,60	17	62	4,25		4,5	
1/4 - 20-BSW	1/4 - 26-BSF	6,350	1,270	0,977	6,30	19	66	4,50	11	5,0	8
—	9/32 - 26-BSF	7,144	—		7,10			5,60		5,6	
5/16 - 18-BSW	5/16 - 22-BSF	7,938	1,411	1,154	8,00	22	72	6,00	13	6,3	9
3/8 - 16-BSW	3/8 - 20-BSF	9,525	1,588	1,270	10,00	24	80	7,50	15	8,0	11

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7.2 Relieved-shank taps

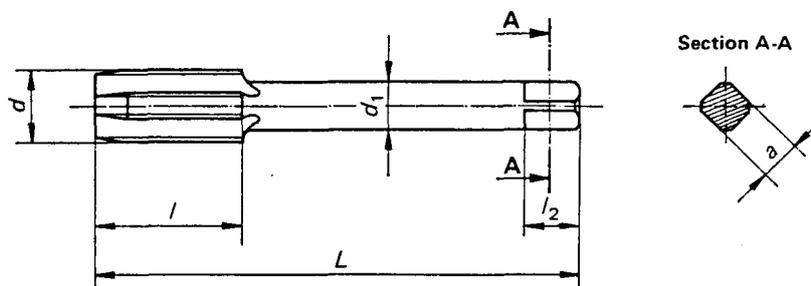


TABLE 14

Designation		d nominal	Approximate pitch		d ₁ h9	L	Square		
BSW	BSF		BSW	BSF			a h11	l ₂	
1/8 - 40-BSW	—	3,175	0,635	—	2,24	11	48	1,80	4
3/16 - 24-BSW	3/16 - 32-BSF	4,762	1,058	0,794	3,55	16	58	2,80	5
—	7/32 - 28-BSF	5,556	—	0,907	4,00	17	62	3,15	6
1/4 - 20-BSW	1/4 - 26-BSF	6,350	1,270	0,977	4,50	19	66	3,55	
—	9/32 - 26-BSF	7,144	—	—	5,60			4,50	7
5/16 - 18-BSW	5/16 - 22-BSF	7,938	1,411	1,154	6,30	22	72	5,00	8
3/8 - 16-BSW	3/8 - 20-BSF	9,525	1,588	1,270	7,10	24	80	5,60	
7/16 - 14-BSW	7/16 - 18-BSF	11,112	1,814	1,411	8,00	25	85	6,3	9
1/2 - 12-BSW	1/2 - 16-BSF	12,700	2,117	1,588	9,00	29	89	7,1	10
9/16 - 12-BSW	9/16 - 16-BSF	14,288			11,20	30	95	9,0	12
5/8 - 11-BSW	5/8 - 14-BSF	15,875	2,309	1,814	12,50	32	102	10,0	13
11/16 - 11-BSW	11/16 - 14-BSF	17,462			14,00	37	112	11,2	14
3/4 - 10-BSW	3/4 - 12-BSF	19,050	2,540	2,117	16,00	38	118	12,5	16
7/8 - 9-BSW	7/8 - 11-BSF	22,225	2,822	2,309	18,00	45	130	14,0	18
1 - 8-BSW	1 - 10-BSF	25,400	3,175	2,540	20,00	48	138	16,0	20
1 1/8 - 7-BSW	1 1/8 - 9-BSF	28,575	3,629	2,822	22,40	51	151	18,0	22
1 1/4 - 7-BSW	1 1/4 - 9-BSF	31,750			25,00	57	162	20,0	24
—	1 3/8 - 8-BSF	34,925	—	—	28,00	60	170	22,4	26
1 1/2 - 6-BSW	1 1/2 - 8-BSF	38,100	4,233	3,175					
—	1 5/8 - 8-BSF	41,275	—	—	31,50	67	187	25,0	28
1 3/4 - 5-BSW	1 3/4 - 7-BSF	44,450	5,080	3,629					
2 - 4 1/2-BSW	2 - 7-BSF	50,800	5,644	—	35,50	70	200	28,0	31
2 1/4 - 4-BSW	2 1/4 - 6-BSF	57,150	6,350	4,233	40,00	76	221	31,5	34
2 1/2 - 4-BSW	2 1/2 - 6-BSF	63,500				79	224		
2 3/4 - 3 1/2-BSW	2 3/4 - 6-BSF	69,850	7,257	—	45,00	83	234	35,5	38
3 - 3 1/2-BSW	3 - 5-BSF	76,200					258		
3 1/4 - 3 1/4-BSW	3 1/4 - 5-BSF	82,550	7,815	—	50,00	86	261	40,0	42
3 1/2 - 3 1/4-BSW	3 1/2 - 4 1/2-BSF	88,900					279		
3 3/4 - 3-BSW	3 3/4 - 4 1/2-BSF	95,250	8,467	—	56,00	89	279	45,0	46
4 - 3-BSW	4 - 4 1/2-BSF	101,600							

NOTE — Tolerances and marking, see notes on page 3

8 BRITISH ASSOCIATION (BA) THREADS – NON-RECOMMENDED

8.1 Full-diameter shank taps with plain connecting portion

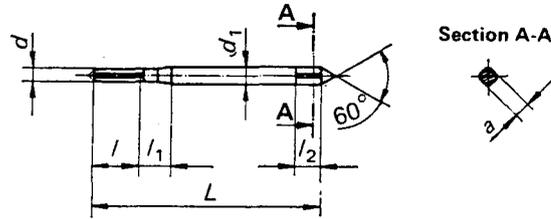


TABLE 15

Designation	d nominal	Pitch	d ₁ h9	l	L	l ₁	Square	
							a h11	l ₂
BA No. 14	1,0	0,23	2,50	5,5	38,5	4,5	2,00	4
BA No. 13	1,2	0,25		7,0	40,0	5,0		
BA No. 12	1,3	0,28		8,0	41,0			
BA No. 11	1,5	0,31						
BA No. 10	1,7	0,35						
BA No. 9	1,9	0,39						
BA No. 8	2,2	0,43	2,80	9,5	44,5	6,0	2,24	5
BA No. 7	2,5	0,48						
BA No. 6	2,8	0,53						

8.2 Full-diameter shank taps with recess

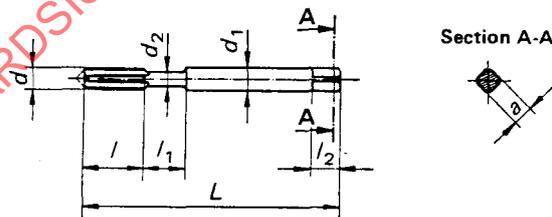


TABLE 16

Designation	d nominal	Pitch	d ₁ h9	l	L	d ₂ min.	l ₁	Square		
								a h11	l ₂	
BA No. 5	3,2	0,59	3,15	11	48	2,12	7,0	2,50	5	
BA No. 4	3,6	0,66	3,55	13	50	2,50		2,80		
BA No. 3	4,1	0,73	4,50		16	53	3,15	8,0	3,55	6
BA No. 2	4,7	0,81	5,00	17		58	3,55	9,0	4,00	7
BA No. 1	5,3	0,90	5,60			62	4,25		4,50	
BA No. 0	6,0	1,00	6,30	19	66	4,50	11,0	5,00	8	

8.3 Relieved-shank taps

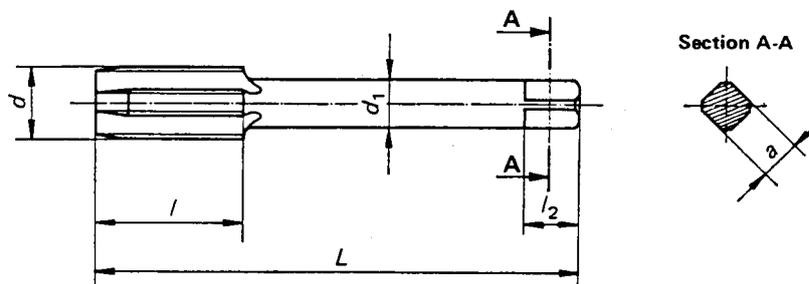


TABLE 17

Designation	d nominal	Pitch	d ₁ h9	l	L	Square	
						a h11	l ₂
BA No. 5	3,2	0,59	2,24	11	48	1,80	4
BA No. 4	3,6	0,66	2,50	13	50	2,00	
BA No. 3	4,1	0,73	3,15		16	53	2,50
BA No. 2	4,7	0,81	3,55	17	58	2,80	
BA No. 1	5,3	0,90	4,00	19	62	3,15	6
BA No. 0	6,0	1,00	4,50	19	66	3,55	

NOTE – Tolerances and marking, see notes on page 3

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ANNEX A

SUMMARY OF THE BASES ON WHICH THIS INTERNATIONAL STANDARD IS ESTABLISHED

A.1 THEORETICAL FORMULAE

The following empirical formulae, in millimetres, which take into account the results of tapping tests undertaken in different countries to determine the thread length of taps and which are expressed as a function of the thread diameter d and pitch p , have been used as a starting point for drawing up this International Standard.

- a) For the permissible nominal value l_0 of the length of thread :

$$7p + 4,8 d^{0,4} p^{0,2}$$

The first term of this formula corresponds to the maximum length for the thread lead.

- b) For the shank length, including the driving square :

$$(20 d^{0,27} + 3) + (2,05 d^{0,7} p^{0,4} + 3)$$

The first term of this formula corresponds to the length absorbed in the tapping attachment.

A.2 LENGTH OF THREAD : PERMISSIBLE MINIMUM VALUES l_0

Table 18 gives, for each range of diameters and pitches, the permissible minimum values l_0 of the length of thread calculated in accordance with formula a) above with some rounding.

A.3 LENGTH OF THREAD AND OVERALL LENGTH : STANDARD VALUES

The standard length of thread l for each range of diameters, which is always at least equal to the minimum value l_0 , has been determined in such a way as to enable the same blank to be used for several consecutive pitches.

The overall lengths L have been determined as a function of the shank length resulting from formula b) above, using conveniently rounded values.

The standard values of l and L are given in table 19.

A.4 SHANK DIAMETERS AND DRIVING SQUARES

Shank diameters and driving squares are in accordance with the specifications of ISO 237.

The shank diameter for each range of tap diameters is given in table 19.

A.5 FORM OF TAPS

- a) For diameters up to and including 2,8 mm :

Taps with full diameter shank and plain connecting portion between thread and shank.

- b) For diameters over 2,8 mm up to and including 10 mm :

Taps with full diameter shank and recess between thread and shank.

- c) For diameters from 3 mm :

Taps with reduced shanks.

A.6 LENGTH OF THREAD : PERMISSIBLE MINIMUM VALUES

T

Metric pitches in millimetres	0,20	0,23 0,25	0,28 0,35	0,39 0,40	0,43 0,45	0,48 0,53	0,59 0,66	0,70 0,81	0,90 1,00
Number of threads per inch	—	—	80 72	64	56	48	44 40	36 32	28 24
Inch pitches converted to millimetres (approximately)	—	—	0,318 0,353	0,397	0,454	0,529	0,577 0,635	0,706 0,794	0,907 1,058
Diameter ranges <i>d</i>	<i>l</i> ₀ = min								
(over)	(including)								
0,90	1,25	5,5	5,5						
1,25	1,40	5,5	6	7					
1,40	1,80		6						
1,80	2,00	5,5	7	7	8				
2,00	2,80		7	8	8	9	9,5		
2,80	3,20		7	8	9	9	10	11	11
3,20	3,60								
3,60	4,00			9	10	11	11	12	13
4,00	4,50								
4,50	5,00							14	16
5,00	5,60								
5,60	6,35			10	11	12	12	13	15
6,35	7,20								
7,20	8,00				11				
8,00	9,00					13	13	14	16
9,00	10,00								
10,00	10,60					14	14	15	
10,60	11,80							16	17
11,80	13,20								20
13,20	15,00								
15,00	17,00							17	19
17,00	19,00								22
19,00	21,20							17	20
21,20	23,60								22
23,60	26,50								24
26,50	28,00								
28,00	30,00							22	25
30,00	33,50								
33,50	37,50							24	
37,50	42,50								27
42,50	45,00								
45,00	50,00								29
50,00	56,00								30
56,00	63,00								
63,00	67,00								32
67,00	75,00								
75,00	80,00								
80,00	90,00								
90,00	101,60								

TABLE 18

0,90 1,00	1,25	1,50	1,75	2,00	2,50	3,00	3,50	4,00 4,50	5,00	5,50	6,00
28 24	22 18	16	14	13 12	11 10	9 8	7	6	5	4 1/2	4 3
0,907 1,058	1,154 1,411	1,588	1,814	1,954 2,117	2,309 2,540	2,822 3,175	3,629	4,233	5,080	5,644	6,350 8,467

= minimum permissible values of length of thread

16											
17	19										
19	22										
20	22	24									
		25	25								
22	25	24	25	27	29						
		27	29	30							
22	27	29	30	30	32						
24	29	30	33	35	37	38					
		33	35	37	41	45	48				
25	30	32	33	37	41	45	48				
		33	35	39	43	48	51	57			
27	32	33	35	39	43	48	51	57			
		35	37	41	45	51	54	60			
29	33	37	39	41	45	51	54	60	67		
30	35	37	39	43	45	54	57	60	67	70	
	35	39	41	43	48	54	57	64	70	76	76
32	37	41	43	45	48	57	60	64	73	76	79
		43	45	48	51	60	64	67	76	79	83
	39	43	45	48	51	60	64	70	76	79	86
		45	48	49	54	60	64	70	83	89	

A.7 SHANK DIAMETER, LENGTH OF THREAD AND OVERALL LENGTH : STANDARD VALUES

TA

Diameter ranges <i>d</i>		Metric pitches in millimetres		0,20	0,23 0,25	0,28 0,35	0,39 0,40	0,43 0,45	0,48 0,53	0,59 0,66	0,70 0,81	0,90 1,00	
		Number of threads per inch		—	—	80 72	64	56	48	44 40	36 32	28 24	
		Inch pitches converted to millimetres (approximately)		—	—	0,318 0,353	0,397	0,454	0,529	0,577 0,635	0,706 0,794	0,907 1,058	
		Shank diameter <i>d</i> ₁		Full-diameter shank tap with plain connecting portion	Full-diameter shank tap with recess	Relieved-shank tap	<i>l</i> = Standard length of thread						
(over)	(including)												
0,90	1,25	2,50	X	X	<i>l</i> = 5,5	<i>L</i> = 38,5							
1,25	1,40				<i>l</i> = 7	<i>L</i> = 40							
1,40	1,80				<i>l</i> = 8	<i>L</i> = 41							
1,80	2,00												
2,00	2,80	2,80			<i>l</i> = 9,5	<i>L</i> = 44,5							
2,80	3,20	3,15	2,24		<i>l</i> = 11		<i>L</i> = 48						
3,20	3,60			3,55	2,50		<i>l</i> = 13		<i>L</i> = 50				
3,60	4,00			4,00	3,15		<i>L</i> = 53		<i>l</i> = 13	<i>L</i> = 53			
4,00	4,50			4,50	3,55								
4,50	5,00			5,00	4,00		<i>L</i> = 58		<i>l</i> = 16	<i>L</i> = 58			
5,00	5,60			5,60	4,00		<i>L</i> = 62		<i>l</i> = 17	<i>L</i> = 62			
5,60	6,35			6,30	4,50								
6,35	7,20			7,10	5,60			<i>L</i> = 66			<i>l</i> = 19		
7,20	8,00			8,00	6,30				<i>L</i> = 66		<i>l</i> = 19		
8,00	9,00			9,00	7,10						<i>L</i> = 69		
9,00	10,00	10,00	8,00				<i>L</i> = 73		<i>l</i> = 20				
10,00	10,60	8,00	8,00										
10,60	11,80								<i>L</i> = 80				
11,80	13,20			9,00									
13,20	15,00			11,20							<i>L</i> = 87		
15,00	17,00			12,50							<i>L</i> = 92		
17,00	19,00										<i>L</i> = 97		
19,00	21,20			14,00								<i>L</i> = 102	
21,20	23,60			16,00								<i>L</i> = 106	
23,60	26,50			18,00								<i>L</i> = 110	
26,50	28,00			20,00									
28,00	30,00	22,40											
30,00	33,50			25,00									
33,50	37,50			28,00									
37,50	42,50												
42,50	45,00			31,50									
45,00	50,00												
50,00	56,00			35,50									
56,00	63,00			40,00									
63,00	67,00												
67,00	75,00			45,00									
75,00	80,00	50,00											
80,00	90,00												
90,00	101,60			56,00									

NOTE – Values shown within the dotted lines may be used for the manufacture of taps outside the standard.

LENGTH OF THREAD AND OVERALL LENGTH : STANDARD VALUES

TABLE 19

Threads inches metres	0,20	0,23 0,25	0,28 0,35	0,39 0,40	0,43 0,45	0,48 0,53	0,59 0,66	0,70 0,81	0,90 1,00	1,25	-	-
Threads per inch	-	-	80 72	64	56	48	44 40	36 32	28 24	22	20 19	18
Converted metres (natively)	-	-	0,318 0,353	0,397	0,454	0,529	0,577 0,635	0,706 0,794	0,907 1,058	1,154	1,270 1,337	1,411
meter d_1												
	l = Standard length of thread											
	l = 5,5 L = 38,5											
	l = 7 L = 40											
	l = 8 L = 41											
	l = 9,5 L = 44,5											
5	2,24	l = 11 L = 48										
5	2,50	l = 13 L = 50										
10	3,15	L = 53										
10	3,55	l = 13 L = 53										
10	4,00	L = 58										
10	4,00	l = 16 L = 58										
10	4,50	L = 62										
10	4,50	l = 17 L = 62										
10	5,60	L = 66										
10	5,60	l = 19 L = 66										
10	6,30	L = 66										
10	6,30	l = 19 L = 69										
10	7,10	l = 22 L = 72										
10	8,00	L = 73										
10	8,00	l = 20 L = 76										
10	8,00	l = 24 L = 80										
10	8,00	l = 22 L = 82										
10	9,00	l = 24 L = 84										
10	11,20	L = 87										
10	11,20	l = 25 L = 90										
10	12,50	L = 92										
10	12,50	l = 25 L = 95										
10	14,00	L = 97										
10	14,00	l = 29 L = 102										
10	16,00	L = 109										
10	16,00	l = 29 L = 114										
10	18,00	L = 120										
10	20,00	L = 130										
10	22,40	L = 137										
10	25,00	L = 142										
10	28,00	L = 153										
10	31,50	L = 165										
10	35,50	L = 180										
10	40,00	L = 182										
10	45,00	L = 192										
10	50,00	L = 214										
10	56,00	L = 229										

the dotted lines may be used for the manufacture of taps outside the standard.

TABLE 19

1,25	-	-	1,50	1,75	2,00	2,50	3,00	3,50	4,00 4,50	5,00	5,50	6,00
22	20 19	18	16	14	13 12	11 10	9 8	7	6	5	4 1/2	4 3
1,154	1,270 1,337	1,411	1,588	1,814	1,954 2,117	2,309 2,540	2,822 3,175	3,629	4,233	5,080	5,644	6,350 8,467

L = Standard overall length

L = 66													
l = 22		L = 72											
L = 76	l = 24		L = 80										
l = 22		L = 82		l = 24		L = 84							
				l = 25		L = 85							
l = 24		L = 84		l = 29		L = 89							
l = 25		L = 90		l = 30		L = 95							
l = 25		L = 95		l = 32		L = 102							
l = 29		L = 104		l = 37		L = 112							
		l = 29		L = 104									
109		l = 33		L = 113		l = 38		L = 118					
114		l = 35		L = 120		l = 45		L = 130					
L = 120		l = 37		L = 127		l = 45		L = 135					
L = 130		l = 37		L = 137		l = 48		L = 138					
L = 137		l = 39		L = 144		l = 51		L = 151					
L = 142		l = 39		L = 149		l = 57		L = 162					
		l = 39		L = 149		l = 60		L = 170					
L = 153		l = 45		L = 165		l = 67		L = 187					
L = 165		l = 45		L = 175		l = 70		L = 200					
L = 180				L = 193		L = 209		l = 76		L = 221			
L = 182				L = 203		L = 219		l = 79		L = 224			
L = 192				L = 203		L = 219		l = 79		L = 234			
L = 214				L = 226		L = 242		l = 83		L = 258			
L = 229				L = 244		L = 260		l = 86		L = 261			
				L = 244		L = 260		l = 89		L = 279			

SECTION TWO – DIMENSIONS IN INCHES

9 COARSE PITCH METRIC THREADS

9.1 Full-diameter shank taps with plain connecting portion

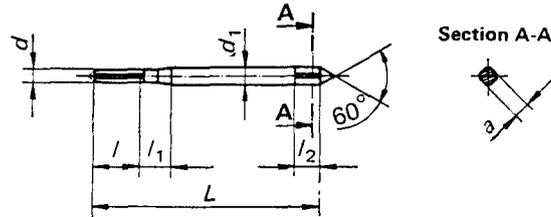


TABLE 20

Designation	d nominal	Pitch	d ₁ h9	l	L	l ₁	Square	
							a h11	l ₂
M 1	0.039 4	0.009 84	0.098 4	0.216 5	1.515 8	0.177 2	0.079	0.157 5
M 1.1	0.043 3							
M 1.2	0.047 2							
M 1.4	0.055 1	0.011 81		0.275 6	1.574 8	0.196 8		
M 1.6	0.063 0	0.013 78		0.315 0	1.614 2			
M 1.8	0.070 9							
M 2	0.078 7	0.015 75	0.110 2	0.374 0	1.752 0	0.236 2	0.088	0.196 8
M 2.2	0.086 6							
M 2.5	0.098 4							

9.2 Full-diameter shank taps with recess

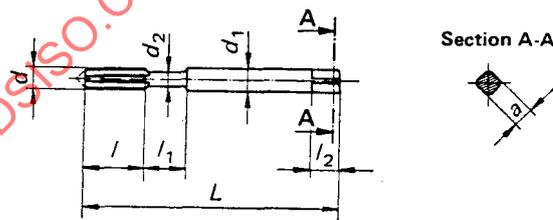
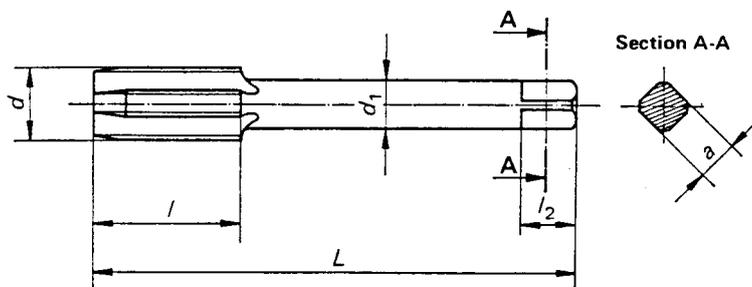


TABLE 21

Designation	d nominal	Pitch	d ₁ h9	l	L	d ₂ min.	l ₁	Square			
								a h11	l ₂		
M 3	0.118 1	0.019 69	0.124 0	0.433 1	1.889 8	0.083	0.275 6	0.098	0.196 8		
M 3.5	0.137 8	0.023 62	0.139 8	0.511 8	1.968 5	0.098		0.110			
M 4	0.157 5	0.027 56	0.157 5		2.086 6	0.110	0.315 0	0.124	0.236 2		
M 4.5	0.177 2	0.029 53	0.177 2			0.124					
M 5	0.196 9	0.031 50	0.196 9	0.629 9	2.283 5	0.140	0.354 3	0.157	0.275 6		
M 6	0.236 2	0.039 37	0.248 0	0.748 0	2.598 4	0.177	0.433 1	0.197	0.315 0		
M 7	0.275 6		0.279 5			0.209		0.220			
M 8	0.315 0	0.049 21	0.315 0	0.866 1	2.834 6	0.236	0.511 8	0.248	0.354 3		
M 9	0.354 3		0.354 3			0.280		0.551 2		0.280	0.393 7
M 10	0.393 7		0.393 7			0.295		0.590 6		0.315	0.433 1

9.3 Relieved-shank taps



NOTES

1 Tolerances

a) Thread and overall length

Values in inches

Nominal diameter of tap		Maximum deviation on l and L
over	including	
—	0.216 5	0 - 0.098 4
0.216 5	0.472 4	0 - 0.126 0
0.472 4	1.535 4	0 - 0.196 8
1.535 4	—	0 - 0.248 0

b) Shank diameters and driving squares

Tolerances in accordance with ISO 237 Direct conversion of the metric values of the following tolerances :

- on diameter d_1 :
h9* for precision shanks,
h11* for non-precision shanks;
- on the across flats dimension a :
h11*
h12* (including errors of form of the square and of its position in relation to the shank).

TABLE 22

Designation	d nominal	Pitch	d_1 h9	l	L	Square	
						a h11	$l/2$
M 3	0.118 1	0.019 69	0.088 2	0.433 1	1.889 8	0.071	0.157 5
M 3.5	0.137 8	0.023 62	0.098 4	0.511 8	1.968 5	0.079	
M 4	0.157 5	0.027 56	0.124 0		0.511 8	2.086 6	0.098
M 4.5	0.177 2	0.029 53	0.139 8	0.511 8		2.086 6	0.110
M 5	0.196 9	0.031 50	0.157 5		0.629 9		2.283 5
M 6	0.236 2	0.039 37	0.177 2	0.748 0	2.598 4	0.140	0.236 2
M 7	0.275 6		0.220 5			0.220 5	
M 8	0.315 0	0.049 21	0.248 0	0.866 1	2.834 6	0.197	0.315 0
M 9	0.354 3		0.279 5			0.279 5	
M 10	0.393 7	0.059 06	0.315 0	0.944 9	3.149 6	0.248	0.354 3
M 11	0.433 1			0.984 2	0.984 2		
M 12	0.472 4	0.068 90	0.354 3	1.141 7	3.503 9	0.280	0.393 7
M 14	0.551 2	0.078 74	0.440 9	1.181 1	3.740 2	0.354	0.472 4
M 16	0.629 9		0.492 1	0.492 1	1.259 8	4.015 8	0.394
M 18	0.708 7	0.098 42	0.551 2	1.456 7	4.409 4	0.441	0.551 2
M 20	0.787 4						
M 22	0.866 1	0.118 11	0.708 7	1.771 6	5.118 1	0.551	0.708 7
M 24	0.944 9		0.708 7				
M 27	1.063 0	0.137 80	0.787 4	1.889 8	5.433 1	0.630	0.787 4
M 30	1.181 1		0.787 4				
M 33	1.299 2	0.157 48	0.881 9	2.244 1	6.378 0	0.787	0.944 9
M 36	1.417 3		0.881 9				
M 39	1.535 4	0.177 17	1.102 4	2.362 2	6.692 9	0.882	1.023 6
M 42	1.653 5		1.102 4				
M 45	1.771 7	0.196 85	1.240 2	2.637 8	7.362 2	0.984	1.102 4
M 48	1.889 8		1.240 2				
M 52	2.047 2	0.216 54	1.397 6	2.755 9	7.874 0	1.102	1.220 5
M 56	2.204 7		1.397 6				
M 60	2.362 2	0.236 22	1.574 8	3.110 2	8.700 8	1.240	1.338 6
M 64	2.519 7		1.574 8				
M 68	2.677 2	1.771 7	1.771 7	3.110 2	9.212 6	1.398	1.496 1

2 Marking

The tap shall be marked, on the shank, by any means not impairing the metal surface.

Marking shall consist of the following :

Thread

In accordance with the standard designation (see tables 20 to 36, first column) completed by

- an indication of the class of tap thread (ISO 1, ISO 2 or ISO 3, in accordance with ISO 2857);

- a clear mark (the letter L for example) for left-hand threads.

Serial taps

A mark indicating the order in which the taps should be used, except for the finishing tap.

Material :

- High speed steel taps : High speed steel taps shall be marked HSS.

- Taps made from other steels than high speed steel : The marking of taps made from steels other than high speed steel is left to the discretion of the manufacturer or should be specified in the national standards.

• See ISO/R 286.

10 FINE PITCH METRIC THREADS

10.1 Full-diameter shank taps with plain connecting portion

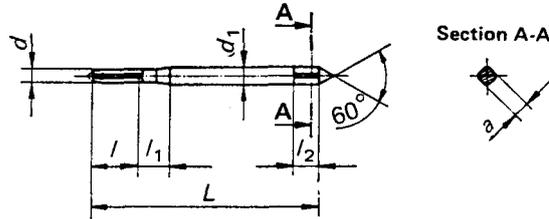


TABLE 23

Designation	d nominal	Pitch	d ₁ h9	l	L	l ₁	Square	
							a h11	l ₂
M 1 × 0.2	0.039 4	0.007 87	0.098 4	0.216 5	1.515 8	0.177 2	0.079	0.157 5
M 1.1 × 0.2	0.043 3							
M 1.2 × 0.2	0.047 2							
M 1.4 × 0.2	0.055 1							
M 1.6 × 0.2	0.063 0							
M 1.8 × 0.2	0.070 9	0.009 84	0.110 2	0.374 0	1.752 0	0.236 2	0.088	0.196 8
M 2 × 0.25	0.078 7							
M 2.2 × 0.25	0.086 6							
M 2.5 × 0.35	0.098 4	0.013 78						

10.2 Full-diameter shank taps with recess

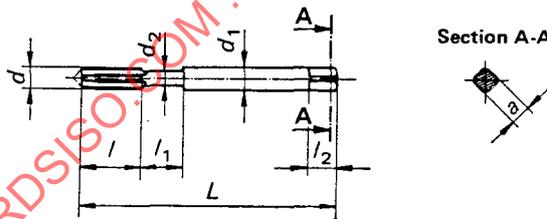


TABLE 24

Designation	d nominal	Pitch	d ₁ h9	l	L	d ₂ min.	l ₁	Square		
								a h11	l ₂	
M 3 × 0.35	0.118 1	0.013 78	0.124 0	0.433 1	1.889 8	0.083	0.275 6	0.098	0.196 8	
M 3.5 × 0.35	0.137 8		0.139 8		1.968 5	0.098		0.110		
M 4 × 0.5	0.157 5	0.019 69	0.157 5	0.511 8	2.086 6	0.110	0.315 0	0.124	0.236 2	
M 4.5 × 0.5	0.177 2		0.177 2			0.124				
M 5 × 0.5	0.196 9		0.196 9		0.629 9	2.283 5	0.140	0.354 3	0.157	0.275 6
M 5.5 × 0.5	0.216 5		0.220 5		0.669 3	2.440 9	0.157		0.177	
M 6 × 0.75	0.236 2		0.029 53		0.248 0	0.748 0	2.598 4	0.177	0.433 1	0.197
M 7 × 0.75	0.275 6	0.279 5		0.209	0.220					
M 8 × 1	0.315 0	0.039 37	0.315 0	0.748 0	2.716 5	0.236	0.511 8	0.248	0.354 3	
M 9 × 1	0.354 3		0.354 3			0.280		0.280		0.393 7
M 10 × 1	0.393 7	0.049 21	0.393 7	0.787 4	2.992 1	0.295	0.590 6	0.315	0.433 1	
M 10 × 1.25										

10.3 Relieved-shank taps

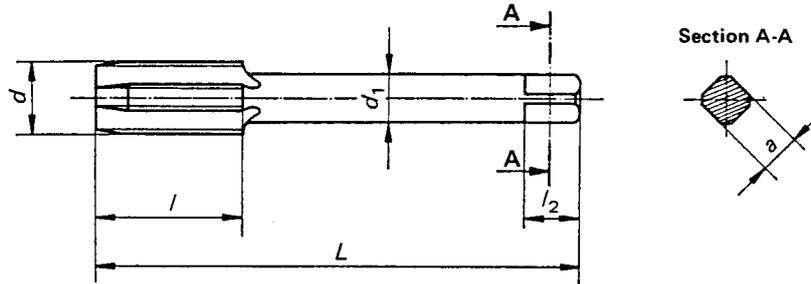


TABLE 25

Designation	d nominal	Pitch	d ₁ h9	l	L	Square	
						a h11	l/2
M 3 × 0.35	0.118 1	0.013 78	0.088 2	0.433 1	1.889 8	0.071	0.157 5
M 3.5 × 0.35	0.137 8		0.098 4	1.968 5	0.079		
M 4 × 0.5	0.157 5	0.019 69	0.124 0	0.511 8	2.086 6	0.098	0.196 8
M 4.5 × 0.5	0.177 2		0.139 8	2.283 5	0.110		
M 5 × 0.5	0.196 9	0.029 53	0.157 5	0.629 9	2.440 9	0.124	0.236 2
M 5.5 × 0.5	0.216 5		0.177 2	2.598 4	0.140		
M 6 × 0.75	0.236 2	0.039 37	0.220 5	0.748 0	2.716 5	0.177	0.275 6
M 7 × 0.75	0.275 6		0.248 0	2.716 5	0.197		
M 8 × 1	0.315 0	0.049 21	0.279 5	0.881 9	2.992 1	0.220	0.315 0
M 9 × 1	0.354 3		0.315 0	2.992 1	0.248	0.354 3	
M 10 × 1	0.393 7	0.049 21	0.315 0	0.787 4	2.992 1	0.248	0.354 3
M 10 × 1.25							
M 12 × 1.25	0.472 4	0.059 06	0.354 3	0.944 9	3.307 1	0.280	0.393 7
M 12 × 1.5	0.472 4						
M 14 × 1.25	0.551 2	0.049 21	0.440 9	0.984 2	3.543 3	0.354	0.472 4
M 14 × 1.5	0.551 2						
M 15 × 1.5	0.590 6	0.059 06	0.492 1	1.181 1	3.740 2	0.394	0.511 8
M 16 × 1.5	0.629 9						
M 17 × 1.5	0.669 3	0.078 74	0.551 2	1.141 7*	4.094 5*	0.44	0.551 2
M 18 × 1.5	0.708 7						
M 18 × 2	0.787 4	0.059 06	0.708 7	1.141 7*	4.094 5*	0.44	0.551 2
M 20 × 1.5	0.787 4						
M 20 × 2	0.787 4	0.059 06	0.629 9	1.299 2*	4.448 8*	0.492	0.629 9
M 22 × 1.5	0.866 1						
M 22 × 2	0.866 1	0.078 74	0.708 7	1.496 1*	4.645 7*	0.492	0.629 9
M 24 × 1.5	0.944 9						
M 24 × 2	0.944 9	0.059 06	0.708 7	1.378 0	4.724 4	0.551	0.708 7
M 25 × 1.5	0.984 3						
M 25 × 2	0.984 3	0.059 06	0.708 7	1.456 7	5.000	0.630	0.787 4
M 27 × 1.5	1.063 0						
M 27 × 2	1.063 0	0.059 06	0.708 7	1.456 7	5.000	0.630	0.787 4
M 28 × 1.5	1.102 4						
M 28 × 2	1.102 4	0.059 06	0.708 7	1.456 7	5.000	0.630	0.787 4
M 30 × 1.5	1.181 1						
M 30 × 2	1.181 1	0.078 74	0.881 9	1.456 7	5.393 7	0.709	0.866 1
M 30 × 3	1.181 1						
M 32 × 1.5	1.259 8	0.059 06	0.881 9	1.456 7	5.393 7	0.709	0.866 1
M 32 × 2	1.259 8						
M 33 × 1.5	1.299 2	0.059 06	0.881 9	1.456 7	5.393 7	0.709	0.866 1
M 33 × 2							
M 33 × 3	1.299 2	0.118 11	2.007 9	5.944 9			

TABLE 25 (concluded)

Designation	d nominal	Pitch	d ₁ h9	l	L	Square	
						a h11	l/2
M 35 × 1.5	1.378 0	0.059 06	0.984 2	1.535 4	5.669 3	0.787	0.944 9
M 36 × 1.5	1.378 0						
M 36 × 2	1.417 3	0.078 74	0.984 2	1.535 4	5.669 3	0.787	0.944 9
M 36 × 3		0.118 11					
M 39 × 1.5	1.535 4	0.059 06	1.102 4	1.535 4	5.866 1	0.882	1.023 6
M 39 × 2		0.078 74					
M 39 × 3	1.535 4	0.118 11	1.102 4	1.535 4	5.866 1	0.882	1.023 6
M 40 × 1.5		0.059 06					
M 40 × 2	1.574 8	0.078 74	1.102 4	1.535 4	5.866 1	0.882	1.023 6
M 40 × 3		0.118 11					
M 42 × 1.5	1.653 5	0.059 06	1.102 4	1.535 4	5.866 1	0.882	1.023 6
M 42 × 2		0.078 74					
M 42 × 3	1.653 5	0.118 11	1.102 4	1.535 4	5.866 1	0.882	1.023 6
M 42 × 4		0.157 48					
M 45 × 1.5	1.771 7	0.059 06	1.240 2	1.771 6	6.496 1	0.984	1.102 4
M 45 × 2		0.078 74					
M 45 × 3	1.771 7	0.118 11	1.240 2	1.771 6	6.496 1	0.984	1.102 4
M 45 × 4		0.157 48					
M 48 × 1.5	1.889 8	0.059 06	1.240 2	1.771 6	6.496 1	0.984	1.102 4
M 48 × 2		0.078 74					
M 48 × 3	1.889 8	0.118 11	1.240 2	1.771 6	6.496 1	0.984	1.102 4
M 48 × 4		0.157 48					
M 50 × 1.5	1.968 5	0.059 06	1.397 6	1.771 6	6.889 8	1.102	1.220 5
M 50 × 2		0.078 74					
M 50 × 3	1.968 5	0.118 11	1.397 6	1.771 6	6.889 8	1.102	1.220 5
M 52 × 1.5		0.059 06					
M 52 × 2	2.047 2	0.078 74	1.397 6	1.771 6	6.889 8	1.102	1.220 5
M 52 × 3		0.118 11					
M 52 × 4	2.047 2	0.157 48	1.397 6	1.771 6	6.889 8	1.102	1.220 5
M 55 × 1.5		0.059 06					
M 55 × 2	2.165 4	0.078 74	1.397 6	1.771 6	6.889 8	1.102	1.220 5
M 55 × 3		0.118 11					
M 55 × 4	2.165 4	0.157 48	1.397 6	1.771 6	6.889 8	1.102	1.220 5
M 56 × 1.5		0.059 06					
M 56 × 2	2.204 7	0.078 74	1.397 6	1.771 6	6.889 8	1.102	1.220 5
M 56 × 3		0.118 11					
M 56 × 4	2.204 7	0.157 48	1.397 6	1.771 6	6.889 8	1.102	1.220 5
M 70 × 6		2.755 9					
M 72 × 6	2.834 6	0.236 22	1.968 5	1.771 7	3.110 2	1.398	1.496 1
M 75 × 6	2.952 8						
M 80 × 6	3.149 6	0.236 22	1.968 5	1.771 7	3.110 2	1.398	1.496 1
M 85 × 6	3.346 5						
M 90 × 6	3.543 3	0.236 22	1.968 5	1.771 7	3.110 2	1.398	1.496 1
M 95 × 6	3.740 2						
M 100 × 6	3.937 0	2.204 7	3.503 9	10.984 3	1.772	1.811 0	

* As an exception to this rule, the following values, which give to this table a continuously rising gradation, can also be included if the manufacturer wishes :

for the taps

M18 × 1,5	} l = 1,299 2	} L = 4,252 0
M18 × 2		
M20 × 1,5		
M20 × 2		

for the taps

M22 × 1,5	} l = 1,378 0	} L = 4,527 6
M22 × 2		

NOTE – Tolerances and marking, see notes on page 19

11 UNIFIED COARSE (UNC) THREADS

11.1 Full-diameter shank taps with plain connecting portion

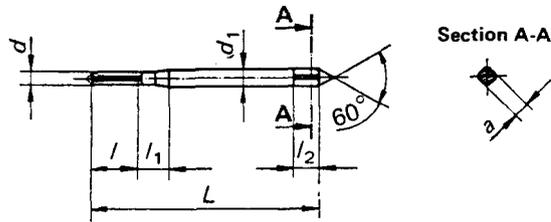


TABLE 26

Designation	d nominal	Number of threads per inch	d ₁ h9	l	L	l ₁	Square	
							a h11	l ₂
No. 1 - 64-UNC	0.073	64	0.098 4	0.315 0	1.614 2	0.216 5	0.079	0.157 5
No. 2 - 56-UNC	0.086	56	0.110 2	0.374 0	1.752 0	0.236 2	0.088	0.196 8
No. 3 - 48-UNC	0.099	48						

11.2 Full-diameter shank taps with recess

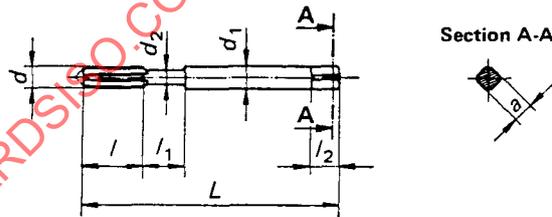


TABLE 27

Designation	d nominal	Number of threads per inch	d ₁ h9	l	L	d ₂ min.	l ₁	Square	
								a h11	l ₂
No. 4 - 40-UNC	0.112	40	0.124 0	0.433 1	1.889 8	0.083	0.275 6	0.098	0.196 8
No. 5 - 40-UNC	0.125		0.093						
No. 6 - 32-UNC	0.138	32	0.139 8	0.511 8	1.968 5	0.098	0.315 0	0.110	0.236 2
No. 8 - 32-UNC	0.164		0.177 2						
No. 10 - 24-UNC	0.190	24	0.196 9	0.629 9	2.283 5	0.140	0.354 3	0.157	0.275 6
No. 12 - 24-UNC	0.216		0.220 5						
1/4 - 20-UNC	0.250	20	0.248 0	0.748 0	2.598 4	0.177	0.433 1	0.197	0.315 0
5/16 - 18-UNC	0.312	18	0.315 0	0.866 1	2.834 6	0.236	0.511 8	0.248	0.354 3
3/8 - 16-UNC	0.375	16	0.393 7	0.944 9	3.149 6	0.295	0.590 6	0.315	0.433 1

11.3 Relieved-shank taps

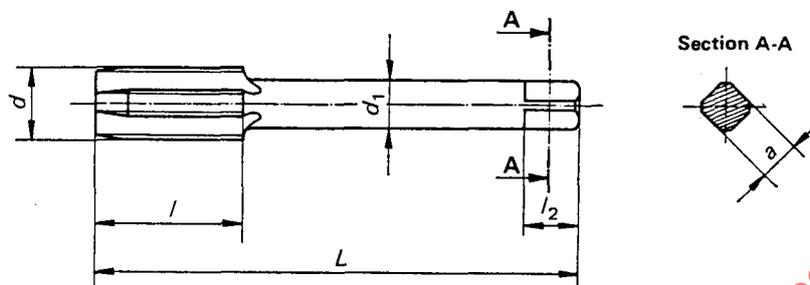


TABLE 28

Designation	d nominal	Number of threads per inch	d ₁ h9	l	Square				
					a h11	l ₂			
No. 5 - 40-UNC	0.125	40	0.088 2	0.433 1	1.889 8	0.071	0.157 5		
No. 6 - 32-UNC	0.138	32	0.098 4	0.511 8	1.968 5	0.079			
No. 8 - 32-UNC	0.164		0.124 0		2.086 6	0.098	0.196 8		
No. 10 - 24-UNC	0.190	24	0.139 8	0.629 9	2.283 5	0.110			
No. 12 - 24-UNC	0.216		0.157 5	0.669 3	2.440 9	0.124	0.236 2		
1/4 - 20-UNC	0.250	20	0.177 2	0.748 0	2.598 4	0.140			
5/16 - 18-UNC	0.312	18	0.248 0	0.866 1	2.834 6	0.197	0.315 0		
3/8 - 16-UNC	0.375	16	0.279 5	0.944 9	3.149 6	0.220			
7/16 - 14-UNC	0.438	14	0.315 0	0.984 2	3.346 5	0.248	0.354 3		
1/2 - 13-UNC	0.500	13	0.354 3	1.141 7	3.503 9	0.280	0.393 7		
9/16 - 12-UNC	0.562	12	0.440 9	1.181 1	3.740 2	0.354	0.472 4		
5/8 - 11-UNC	0.625	11	0.492 1	1.259 8	4.015 8	0.394	0.511 8		
3/4 - 10-UNC	0.750	10	0.551 2	1.456 7	4.409 4	0.441	0.551 2		
7/8 - 9-UNC	0.875	9	0.629 9	1.496 1	4.645 7	0.492	0.629 9		
1 - 8-UNC	1.000	8	0.708 7	1.771 6	5.118 1	0.551	0.708 7		
1 1/8 - 7-UNC	1.125	7	0.787 4	1.889 8	5.433 1	0.630	0.787 4		
1 1/4 - 7-UNC	1.250		0.881 9	2.007 9	5.944 9	0.709	0.866 1		
1 3/8 - 6-UNC	1.375	6	0.984 2	2.244 1	6.378 0	0.787	0.944 9		
1 1/2 - 6-UNC	1.500		1.102 4	2.362 2	6.692 9	0.882	1.023 6		
1 3/4 - 5-UNC	1.750	5	1.240 2	2.637 8	7.362 2	0.984	1.102 4		
2 - 4 1/2-UNC	2.000	4 1/2	1.397 6	2.755 9	7.874 0	1.102	1.220 5		
2 1/4 - 4 1/2-UNC	2.250		1.574 8	2.992 1	8.700 8	1.240	1.338 6		
2 1/2 - 4-UNC	2.500	4	1.771 7	3.110 2	8.818 9				
2 3/4 - 4-UNC	2.750				9.212 6	1.398	1.496 1		
3 - 4-UNC	3.000	4	1.968 5	3.267 7	10.157 5	1.575	1.653 5		
3 1/4 - 4-UNC	3.250				3.385 8			10.275 6	
3 1/2 - 4-UNC	3.500				2.204 7	3.503 9	10.984 3	1.772	1.811 0
3 3/4 - 4-UNC	3.750								
4 - 4-UNC	4.000								

NOTE - Tolerances and marking, see notes on page 19

12 UNIFIED FINE (UNF) THREADS

12.1 Full-diameter shank taps with plain connecting portion

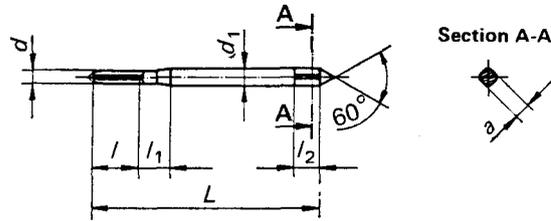


TABLE 29

Designation	d nominal	Number of threads per inch	d ₁ h9	l	L	l ₁	Square	
							a h11	l ₂
No. 0 - 80-UNF	0.060	80	0.098 4	0.315 0	1.614 2	0.196 8	0.079	0.157 5
No. 1 - 72-UNF	0.073	72				0.216 5		
No. 2 - 64-UNF	0.086	64	0.110 2	0.374 0	1.752 0	0.236 2	0.088	0.196 8
No. 3 - 56-UNF	0.099	56						

12.2 Full-diameter shank taps with recess

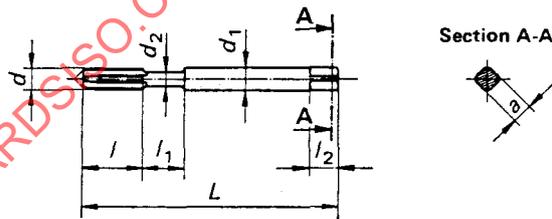


TABLE 30

Designation	d nominal	Number of threads per inch	d ₁ h9	l	L	d ₂ min.	l ₁	Square	
								a h11	l ₂
No. 4 - 48-UNF	0.112	48	0.124 0	0.433 1	1.889 8	0.083	0.275 6	0.098	0.196 8
No. 5 - 44-UNF	0.125	44				0.093			
No. 6 - 40-UNF	0.138	40	0.139 8	0.511 8	1.968 5	0.098	0.315 0	0.140	0.236 2
No. 8 - 36-UNF	0.164	36	0.177 2		2.086 6	0.124			
No. 10 - 32-UNF	0.190	32	0.196 9	0.629 9	2.283 5	0.140	0.354 3	0.157	0.275 6
No. 12 - 28-UNF	0.216	28	0.220 5	0.748 0	2.440 9	0.167		0.177	
1/4 - 28-UNF	0.250		0.248 0		2.598 4	0.177	0.433 1	0.197	0.315 0
5/16 - 24-UNF	0.312	24	0.315 0	0.787 4	2.716 5	0.236	0.511 8	0.248	0.354 3
3/8 - 24-UNF	0.375		0.393 7		2.992 1	0.295	0.590 6	0.315	0.433 1

12.3 Relieved-shank taps

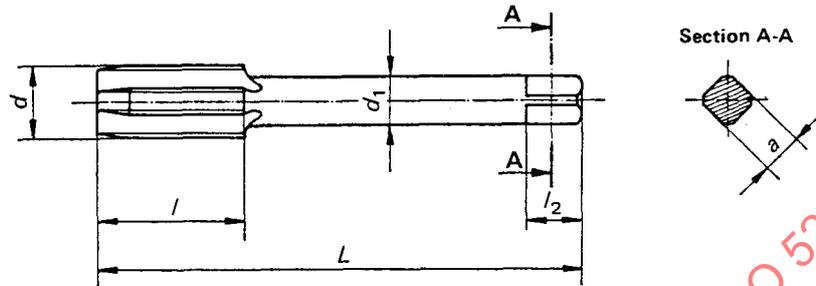


TABLE 31

Designation	d nominal	Number of threads per inch	d ₁ h9	L	Square		
					a h11	l ₂	
No. 5 - 44-UNF	0.125	44	0.088 2	0.433 1	1.889 8	0.071	0.157 5
No. 6 - 40-UNF	0.138	40	0.098 4	0.511 8	1.968 5	0.079	
No. 8 - 36-UNF	0.164	36	0.124 0	0.629 9	2.086 6	0.098	0.196 8
No. 10 - 32-UNF	0.190	32	0.139 8	0.748 0	2.283 5	0.110	
No. 12 - 28-UNF	0.216	28	0.157 5	0.669 3	2.440 9	0.124	0.236 2
1/4 - 28-UNF	0.250		0.177 2	0.748 0	2.598 4	0.140	
5/16 - 24-UNF	0.312	24	0.248 0	0.787 4	2.716 5	0.197	0.315 0
3/8 - 24-UNF	0.375		0.279 5	0.787 4	2.992 1	0.220	
7/16 - 20-UNF	0.438	20	0.315 0	0.866 1	3.228 4	0.248	0.354 3
1/2 - 20-UNF	0.500		0.354 3	0.944 9	3.307 1	0.280	
9/16 - 18-UNF	0.562	18	0.440 9	0.984 2	3.543 3	0.354	0.472 4
5/8 - 18-UNF	0.625		0.492 1	0.984 2	3.740 2	0.394	
3/4 - 16-UNF	0.750	16	0.551 2	1.141 7	4.094 5	0.441	0.551 2
7/8 - 14-UNF	0.875	14	0.629 9	1.299 2	4.448 8	0.492	0.629 9
1 - 12-UNF	1.000	12	0.708 7	1.378 0	4.724 4	0.551	0.708 7
1 1/8 - 12-UNF	1.125		0.787 4	1.456 7	5.000 0	0.630	0.787 4
1 1/4 - 12-UNF	1.250		0.881 9	1.535 4	5.393 7	0.709	0.866 1
1 3/8 - 12-UNF	1.375		0.984 2	1.535 4	5.669 3	0.787	0.944 9
1 1/2 - 12-UNF	1.500		1.102 4	1.535 4	5.866 1	0.882	1.023 6

NOTE - Tolerances and marking, see. notes on page 19

13 BRITISH STANDARD WHITWORTH (BSW) AND BRITISH STANDARD FINE (BSF) THREADS — NON-RECOMMENDED

13.1 Full-diameter shank taps with recess

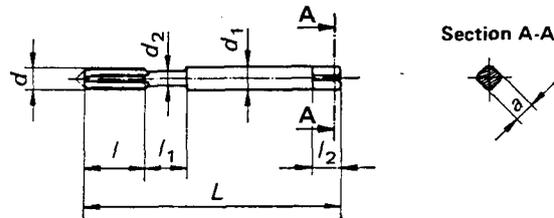


TABLE 32

Designation		d nominal	Number of threads per inch		d ₁ h9	l	L	d ₂ min.	l ₁	Square	
BSW	BSF		BSW	BSF						a h11	l ₂
1/8 - 40-BSW	—	0.125 0	40	—	0.124 0	0.433 1	1.889 8	0.093	0.275 6	0.098	0.196 8
3/16 - 24-BSW	3/16 - 32-BSF	0.187 5	24	32	0.196 9	0.629 9	2.283 5	0.140	0.354 3	0.157	0.275 6
—	7/32 - 28-BSF	0.218 8	—	28	0.220 5	0.669 3	2.440 9	0.167		0.177	
1/4 - 20-BSW	1/4 - 26-BSF	0.250 0	20	26	0.248 0	0.748 0	2.598 4	0.177	0.433 1	0.197	0.315 0
—	9/32 - 26-BSF	0.281 2	—		0.279 5			0.220		0.220	
5/16 - 18-BSW	5/16 - 22-BSF	0.312 5	18	22	0.315 0	0.866 1	2.834 6	0.236	0.511 8	0.248	0.354 3
3/8 - 16-BSW	3/8 - 20-BSF	0.375 0	16	20	0.393 7	0.944 9	3.149 6	0.295	0.590 6	0.315	0.433 1

13.2 Relieved-shank taps

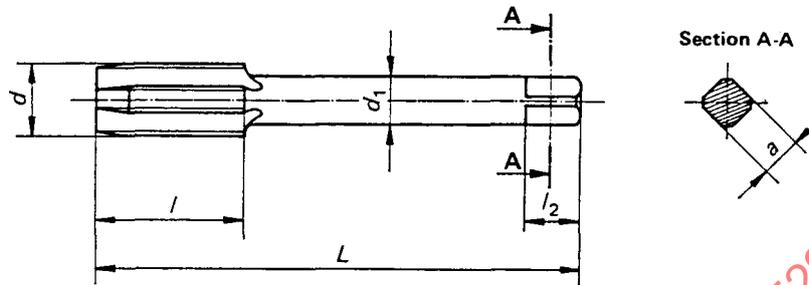


TABLE 33

Designation		d nominal	Number of threads per inch		d_1 h9	l	L	Square	
BSW	BSF		BSW	BSF				a h11	l_2
1/8 - 40-BSW	—	0.125 0	40	—	0.088 2	0.433 1	1.889 8	0.071	0.157 5
3/16 - 24-BSW	3/16 - 32-BSF	0.187 5	24	32	0.139 8	0.629 9	2.283 5	0.110	0.196 8
—	7/32 - 28-BSF	0.218 8	—	28	0.157 5	0.669 3	2.440 9	0.124	0.236 2
1/4 - 20-BSW	1/4 - 26-BSF	0.250 0	20	26	0.177 2	0.748 0	2.598 4	0.140	
—	9/32 - 26-BSF	0.281 2	—		0.220 5			0.177	0.275 6
5/16 - 18-BSW	5/16 - 22-BSF	0.312 5	18	22	0.248 0	0.866 1	2.834 6	0.197	0.315 0
3/8 - 16-BSW	3/8 - 20-BSF	0.375 0	16	20	0.279 5	0.944 9	3.149 6	0.220	
7/16 - 14-BSW	7/16 - 18-BSF	0.437 5	14	18	0.315 0	0.984 2	3.346 5	0.248	0.354 3
1/2 - 12-BSW	1/2 - 16-BSF	0.500 0	12	16	0.354 3	1.141 7	3.503 9	0.280	0.393 7
9/16 - 12-BSW	9/16 - 16-BSF	0.562 5			0.440 9	1.181 1	3.740 2	0.354	0.472 4
5/8 - 11-BSW	5/8 - 14-BSF	0.625 0	11	14	0.492 1	1.259 8	4.015 8	0.394	0.511 8
11/16 - 11-BSW	11/16 - 14-BSF	0.687 5			0.551 2	1.456 7	4.409 4	0.441	0.550 2
3/4 - 10-BSW	3/4 - 12-BSF	0.750 0	10	12	0.629 9	1.496 1	4.645 7	0.492	0.629 9
7/8 - 9-BSW	7/8 - 11-BSF	0.875 0	9	11	0.708 7	1.771 6	5.118 1	0.551	0.708 7
1 - 8-BSW	1 - 10-BSF	1.000 0	7	9	0.787 4	1.889 8	5.433 1	0.630	0.787 4
1 1/8 - 7-BSW	1 1/8 - 9-BSF	1.125 0			0.881 9	2.007 9	5.944 9	0.709	0.866 1
1 1/4 - 7-BSW	1 1/4 - 9-BSF	1.250 0	—	8	0.984 2	2.244 1	6.378 0	0.787	0.944 9
—	1 3/8 - 8-BSF	1.375 0			1.102 4	2.362 2	6.692 9	0.882	1.023 6
1 1/2 - 6-BSW	1 1/2 - 8-BSF	1.500 0	—	7	1.240 2	2.637 8	7.362 2	0.984	1.102 4
—	1 5/8 - 8-BSF	1.625 0	1.397 6		2.755 9	7.874 0	1.102	1.220 5	
1 3/4 - 5-BSW	1 3/4 - 7-BSF	1.750 0	4 1/2	4	1.574 8	2.992 1	8.700 8	1.240	1.338 6
2 - 4 1/2-BSW	2 - 7-BSF	2.000 0	4		1.771 7	3.110 2	8.818 9		
2 1/4 - 4-BSW	2 1/4 - 6-BSF	2.250 0	3 1/2	6	1.968 5	3.267 7	10.157 5	1.575	1.653 5
2 1/2 - 4-BSW	2 1/2 - 6-BSF	2.500 0				3.385 8	10.275 6		
2 3/4 - 3 1/2-BSW	2 3/4 - 6-BSF	2.750 0	3	4 1/2	2.204 7	3.503 9	10.984 3	1.772	1.811 0
3 - 3 1/2-BSW	3 - 5-BSF	3.000 0				3.503 9	10.984 3	1.772	1.811 0
3 1/4 - 3 1/4-BSW	3 1/4 - 5-BSF	3.250 0	3	4 1/2	2.204 7	3.503 9	10.984 3	1.772	1.811 0
3 1/2 - 3 1/4-BSW	3 1/2 - 4 1/2-BSF	3.500 0							
3 3/4 - 3-BSW	3 3/4 - 4 1/2-BSF	3.750 0	3	4 1/2	2.204 7	3.503 9	10.984 3	1.772	1.811 0
4 - 3-BSW	4 - 4 1/2-BSF	4.000 0	3	4 1/2	2.204 7	3.503 9	10.984 3	1.772	1.811 0

NOTE — Tolerances and marking, see notes on page 19