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**INTERNATIONAL STANDARD**



**2306**

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## **Drills for use prior to tapping screw threads**

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**Descriptors :** twist drills, tapping (threads), hole size, diameters.

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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.

International Standard ISO 2306 was drawn up by Technical Committee ISO/TC 29, *Small tools*.

It was approved in August 1971 by the Member Bodies of the following countries :

Austria	India	South Africa, Rep. of
Belgium	Ireland	Switzerland
Czechoslovakia	Israel	Thailand
Egypt, Arab Rep. of	Italy	Turkey
France	Japan	United Kingdom
Germany	Netherlands	U.S.A.
Greece	Poland	U.S.S.R.
Hungary	Romania	

The Member Body of the following country expressed disapproval of the document :

Australia

# Drills for use prior to tapping screw threads

## 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 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 minor diameter tolerance, the more economical tapping becomes and the risk of tap breakage is reduced.

With the foregoing points in mind, the tables have been prepared as a guide to drilling prior to conventional tapping. However, it is realised 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.

## 1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the sizes of drills to be used prior to tapping parallel screw threads of normal length of engagement, the drill diameter being approximately equal to the nominal diameter of the thread minus the pitch.

Drill sizes are given for the following threads:

- 1) ISO metric threads (coarse and fine pitch series):  
Tables 1 and 2.
- 2) ISO inch threads (UNC and UNF): Tables 3 and 4.
- 3) Pipe threads: Tables 5 and 6.

This International Standard specifies metric diameters of drills, which, except for the four sizes indicated by an asterisk, have been selected from ISO/R 235, and the dimensions shall be regarded as the only recommended dimensions to be used in the future for this purpose.

## 2 REFERENCES

ISO/R 7, *Pipe threads for gas list tubes and screwed fittings where pressure-tight joints are made on the threads (1/8 inch to 6 inches).*

ISO/R 228, *Pipe threads where pressure-tight joints are not made on the threads (1/8 inch to 6 inches).*

ISO/R 235, *Parallel shank twist drills jobber and stub series and Morse taper shank twist drills.*

ISO/R 261, *ISO general purpose metric screw threads – General plan.*

ISO/R 263, *ISO inch screw threads – General plan and selection for screws, bolts and nuts (diameter range 0.06 to 6 in).*

## 3 ISO METRIC THREADS

### 3.1 Coarse pitch series

TABLE 1

Dimensions in millimetres

Nominal diameter	Pitch	Thread				Drill diameter
		Minor diameter for class				
		5H max.	6H max.	7H max.	5H, 6H, 7H min.	
1	0.25	0.785			0.729	0.75
1.1	0.25	0.885			0.829	0.85
1.2	0.25	0.985			0.929	0.95
1.4	0.3	1.142	1.160		1.075	1.10
1.6	0.35	1.301	1.321		1.221	1.25
1.8	0.35	1.501	1.521		1.421	1.45
2	0.4	1.657	1.679		1.567	1.60
2.2	0.45	1.813	1.838		1.713	1.75
2.5	0.45	2.113	2.138		2.013	2.05
3	0.5	2.571	2.599	2.639	2.459	2.50
3.5	0.6	2.975	3.010	3.050	2.850	2.90
4	0.7	3.382	3.422	3.466	3.242	3.30
4.5	0.75	3.838	3.878	3.924	3.688	3.70
5	0.8	4.294	4.334	4.384	4.134	4.20
6	1	5.107	5.153	5.217	4.917	5.00
7	1	6.107	6.153	6.217	5.917	6.00
8	1.25	6.859	6.912	6.982	6.647	6.80
9	1.25	7.859	7.912	7.982	7.647	7.80
10	1.5	8.612	8.676	8.751	8.376	8.50
11	1.5	9.612	9.676	9.751	9.376	9.50
12	1.75	10.371	10.441	10.531	10.106	10.20
14	2	12.135	12.210	12.310	11.835	12.00
16	2	14.135	14.210	14.310	13.835	14.00
18	2.5	15.649	15.744	15.854	15.294	15.50
20	2.5	17.649	17.744	17.854	17.294	17.50
22	2.5	19.649	19.744	19.854	19.294	19.50
24	3	21.152	21.252	21.382	20.752	21.00
27	3	24.152	24.252	24.382	23.752	24.00
30	3.5	26.661	26.771	26.921	26.211	26.50
33	3.5	29.661	29.771	29.921	29.211	29.50
36	4	32.145	32.270	32.420	31.670	32.00
39	4	35.145	35.270	35.420	34.670	35.00
42	4.5	37.659	37.799	37.979	37.129	37.50
45	4.5	40.659	40.799	40.979	40.129	40.50
48	5	43.147	43.297	43.487	42.587	43.00
52	5	47.147	47.297	47.487	46.587	47.00
56	5.5	50.646	50.796	50.996	50.046	50.50

3.2 Fine pitch series

TABLE 2

Dimensions in millimetres

Nominal diameter	Pitch	Thread				Drill diameter
		Minor diameter for class				
		5H max.	6H max.	7H max.	5H,6H,7H min.	
2.5	0.35	2.201	2.221	X	2.121	2.15
3	0.35	2.701	2.721	X	2.621	2.65
3.5	0.35	3.201	3.221	X	3.121	3.15 <sup>1)</sup>
4	0.5	3.571	3.599	3.639	3.459	3.50
4.5	0.5	4.071	4.099	4.139	3.959	4.00
5	0.5	4.571	4.599	4.639	4.459	4.50
5.5	0.5	5.071	5.099	5.139	4.959	5.00
6	0.75	5.338	5.378	5.424	5.188	5.20
7	0.75	6.338	6.378	6.424	6.188	6.20
8	0.75	7.338	7.378	7.424	7.188	7.20
9	0.75	8.338	8.378	8.424	8.188	8.20
10	0.75	9.338	9.378	9.424	9.188	9.20
11	0.75	10.338	10.378	10.424	10.188	10.20
8	1	7.107	7.153	7.217	6.917	7.00
9	1	8.107	8.153	8.217	7.917	8.00
10	1	9.107	9.153	9.217	8.917	9.00
11	1	10.107	10.153	10.217	9.917	10.00
12	1	11.107	11.153	11.217	10.917	11.00
14	1	13.107	13.153	13.217	12.917	13.00
15	1	14.107	14.153	14.217	13.917	14.00
16	1	15.107	15.153	15.217	14.917	15.00
17	1	16.107	16.153	16.217	15.917	16.00
18	1	17.107	17.153	17.217	16.917	17.00
20	1	19.107	19.153	19.217	18.917	19.00
22	1	21.107	21.153	21.217	20.917	21.00
24	1	23.107	23.153	23.217	22.917	23.00
25	1	24.107	24.153	24.217	23.917	24.00
27	1	26.107	26.153	26.217	25.917	26.00
28	1	27.107	27.153	27.217	26.917	27.00
30	1	29.107	29.153	29.217	28.917	29.00

Dimensions in millimetres

Nominal diameter	Pitch	Thread				Drill diameter
		Minor diameter for class				
		5H max.	6H max.	7H max.	5H,6H,7H min.	
10	1.25	8.859	8.912	8.982	8.647	8.80
12	1.25	10.859	10.912	10.982	10.647	10.80
14	1.25	12.859	12.912	12.982	12.647	12.80
12	1.5	10.612	10.676	10.751	10.376	10.50
14	1.5	12.612	12.676	12.751	12.376	12.50
15	1.5	13.612	13.676	13.751	13.376	13.50
16	1.5	14.612	14.676	14.751	14.376	14.50
17	1.5	15.612	15.676	15.751	15.376	15.50
18	1.5	16.612	16.676	16.751	16.376	16.50
20	1.5	18.612	18.676	18.751	18.376	18.50
22	1.5	20.612	20.676	20.751	20.376	20.50
24	1.5	22.612	22.676	22.751	22.376	22.50
25	1.5	23.612	23.676	23.751	23.376	23.50
26	1.5	24.612	24.676	24.751	24.376	24.50
27	1.5	25.612	25.676	25.751	25.376	25.50
28	1.5	26.612	26.676	26.751	26.376	26.50
30	1.5	28.612	28.676	28.751	28.376	28.50
32	1.5	30.612	30.676	30.751	30.376	30.50
33	1.5	31.612	31.676	31.751	31.376	31.50
35	1.5	33.612	33.676	33.751	33.376	33.50
36	1.5	34.612	34.676	34.751	34.376	34.50
38	1.5	36.612	36.676	36.751	36.376	36.50
39	1.5	37.612	37.676	37.751	37.376	37.50
40	1.5	38.612	38.676	38.751	38.376	38.50
42	1.5	40.612	40.676	40.751	40.376	40.50
45	1.5	43.612	43.676	43.751	43.376	43.50
48	1.5	46.612	46.676	46.751	46.376	46.50
50	1.5	48.612	48.676	48.751	48.376	48.50
52	1.5	50.612	50.676	50.751	50.376	50.50

1) Not shown in ISO/R 235.

TABLE 2 (Concluded)

Dimensions in millimetres

Nominal diameter	Pitch	Thread				Drill diameter
		Minor diameter for class				
		5H max.	6H max.	7H max.	5H,6H,7H min.	
18	2	16.135	16.210	16.310	15.835	16.00
20	2	18.135	18.210	18.310	17.835	18.00
22	2	20.135	20.210	20.310	19.835	20.00
24	2	22.135	22.210	22.310	21.835	22.00
25	2	23.135	23.210	23.310	22.835	23.00
27	2	25.135	25.210	25.310	24.835	25.00
28	2	26.135	26.210	26.310	25.835	26.00
30	2	28.135	28.210	28.310	27.835	28.00
32	2	30.135	30.210	30.310	29.835	30.00
33	2	31.135	31.210	31.310	30.835	31.00
36	2	34.135	34.210	34.310	33.835	34.00
39	2	37.135	37.210	37.310	36.835	37.00
40	2	38.135	38.210	38.310	37.835	38.00
42	2	40.135	40.210	40.310	39.835	40.00
45	2	43.135	43.210	43.310	42.835	43.00
48	2	46.135	46.210	46.310	45.835	46.00
50	2	48.135	48.210	48.310	47.835	48.00
52	2	50.135	50.210	50.310	49.835	50.00
30	3	27.152	27.252	27.382	26.752	27.00
33	3	30.152	30.252	30.382	29.752	30.00
36	3	33.152	33.252	33.382	32.752	33.00
39	3	36.152	36.252	36.382	35.752	36.00
40	3	37.152	37.252	37.382	36.752	37.00
42	3	39.152	39.252	39.382	38.752	39.00
45	3	42.152	42.252	42.382	41.752	42.00
48	3	45.152	45.252	45.382	44.752	45.00
50	3	47.152	47.252	47.382	46.752	47.00
52	3	49.152	49.252	49.382	48.752	49.00
42	4	38.145	38.270	38.420	37.670	38.00
45	4	41.145	41.270	41.420	40.670	41.00
48	4	44.145	44.270	44.420	43.670	44.00
52	4	48.145	48.270	48.420	47.670	48.00

4 ISO INCH THREADS

4.1 Unified coarse (UNC)

TABLE 3

Dimensions in millimetres except where otherwise stated

Nominal diameter	Threads per inch	Pitch	Thread			Drill diameter
			Minor diameter for class			
			2B <sup>1)</sup> max.	3B max.	2B and 3B <sup>1)</sup> min.	
in						
No. 1	64	0.397	1.582	1.582	1.425	1.55
No. 2	56	0.454	1.872	1.872	1.694	1.85
No. 3	48	0.529	2.146	2.146	1.941	2.10
No. 4	40	0.635	2.385	2.385	2.156	2.35
No. 5	40	0.635	2.697	2.697	2.487	2.65
No. 6	32	0.794	2.896	2.896	2.642	2.85
No. 8	32	0.794	3.531	3.528	3.302	3.50
No. 10	24	1.058	3.962	3.950	3.683	3.90
No. 12	24	1.058	4.597	4.590	4.343	4.50
1/4	20	1.270	5.268	5.250	4.976	5.10
5/16	18	1.411	6.734	6.680	6.411	6.60
3/8	16	1.588	8.164	8.082	7.805	8.00
7/16	14	1.814	9.550	9.441	9.149	9.40
1/2	13	1.954	11.013	10.881	10.584	10.80
9/16	12	2.117	12.456	12.301	11.996	12.20
5/8	11	2.309	13.868	13.693	13.376	13.50
3/4	10	2.540	16.833	16.624	16.299	16.50
7/8	9	2.822	19.748	19.520	19.169	19.50
1	8	3.175	22.598	22.344	21.963	22.25
1 1/8	7	3.629	25.349	25.082	24.648	25.00
1 1/4	7	3.629	28.524	28.258	27.823	28.00
1 3/8	6	4.233	31.120	30.851	30.343	30.75
1 1/2	6	4.233	34.295	34.026	33.518	34.00
1 3/4	5	5.080	39.814	39.560	38.951	39.50
2	4 1/2	5.644	45.598	45.367	44.689	45.00

1) Includes Class 1 for fractional diameters.

4.2 Unified fine (UNF)

TABLE 4

Dimensions in millimetres except where otherwise stated

Nominal diameter in	Threads per inch	Pitch	Thread			Drill diameter
			Minor diameter for class			
			2B <sup>1)</sup> max.	3B max.	2B and 3B <sup>1)</sup> min.	
No. 0	80	0.318	1.306	1.306	1.181	1.25
No. 1	72	0.353	1.613	1.613	1.473	1.55
No. 2	64	0.397	1.913	1.913	1.755	1.90
No. 3	56	0.454	2.197	2.197	2.024	2.15
No. 4	48	0.529	2.459	2.459	2.271	2.40
No. 5	44	0.577	2.741	2.741	2.550	2.70
No. 6	40	0.635	3.023	3.012	2.819	2.95
No. 8	36	0.706	3.607	3.597	3.404	3.50
No. 10	32	0.794	4.166	4.168	3.962	4.10
No. 12	28	0.907	4.724	4.717	4.496	4.70
1/4	28	0.907	5.580	5.563	5.367	5.50
5/16	24	1.058	7.038	6.995	6.792	6.90
3/8	24	1.058	8.626	8.565	8.379	8.50
7/16	20	1.270	10.030	9.947	9.738	9.90
1/2	20	1.270	11.618	11.524	11.326	11.50
9/16	18	1.411	13.084	12.969	12.761	12.90
5/8	18	1.411	14.671	14.554	14.348	14.50
3/4	16	1.588	17.689	17.546	17.330	17.50
7/8	14	1.814	20.663	20.493	20.262	20.40 <sup>2)</sup>
1	12	2.117	23.569	23.363	23.109	23.25
1 1/8	12	2.117	26.744	26.538	26.284	26.50
1 1/4	12	2.117	29.919	29.713	29.459	29.50
1 3/8	12	2.117	33.094	32.888	32.634	32.75 <sup>2)</sup>
1 1/2	12	2.117	36.269	36.063	35.809	36.00

- 1) Includes Class 1 for fractional diameters.
- 2) Not shown in ISO/R 235.

5 PIPE THREADS

5.1 Where pressure-tight joints are not made on the threads (according to ISO/R 228)

TABLE 5

Dimensions in millimetres except where otherwise stated

Nominal diameter in	Threads per inch	Pitch	Thread		Drill diameter
			Minor diameter		
			max.	min.	
1/8	28	0.907	8.848	8.566	8.80
1/4	19	1.337	11.890	11.445	11.80
3/8	19	1.337	16.395	14.950	15.25
1/2	14	1.814	19.172	18.631	19.00
5/8	14	1.814	21.128	20.587	21.00
3/4	14	1.814	24.658	24.117	24.50
7/8	14	1.814	28.418	27.877	28.25
1	11	2.309	30.931	30.291	30.75
1 1/4	11	2.309	39.592	38.952	39.50
1 1/2	11	2.309	45.485	44.845	45.00
1 3/4	11	2.309	51.428	50.788	51.00
2	11	2.309	57.296	56.656	57.00

5.2 Where pressure-tight joints are made on the threads (according to ISO/R 7)

TABLE 6

Dimensions in millimetres except where otherwise stated

Nominal diameter in	Threads per inch	Pitch	Thread		Drill diameter
			Minor diameter		
			max.	min.	
1/8	28	0.907	8.637	8.495	8.60
1/4	19	1.337	11.549	11.341	11.50
3/8	19	1.337	15.054	14.846	15.00
1/2	14	1.814	18.773	18.489	18.50
3/4	14	1.814	24.259	23.975	24.00
1	11	2.309	30.471	30.111	30.25
1 1/4	11	2.309	39.132	38.772	39.00
1 1/2	11	2.309	45.025	44.665	45.00
2	11	2.309	56.836	56.476	56.50 <sup>1)</sup>

- 1) Not shown in ISO/R 235.

ANNEX

SUMMARY OF DRILL DIAMETERS FOR ISO METRIC THREADS

TABLE 7

Dimensions in millimetres

Nominal diameter	Drill diameter for a pitch of																						
	0.25	0.3	0.35	0.4	0.45	0.5	0.6	0.7	0.75	0.8	1	1.25	1.5	1.75	2	2.5	3	3.5	4	4.5	5	5.5	
1	0.75																						
1.1	0.85																						
1.2	0.95																						
1.4		1.10																					
1.6			1.25																				
1.8			1.45																				
2				1.60																			
2.2					1.75																		
2.5			2.15		2.05																		
3			2.65			2.50																	
3.5			3.15				2.90																
4						3.50		3.30															
4.5						4.00			3.70														
5						4.50				4.20													
5.5						5.00																	
6									5.20		5.00												
7									6.20		6.00												
8									7.20		7.00	6.80											
9									8.20		8.00	7.80											
10									9.20		9.00	8.80	8.50										
11									10.20		10.00		9.50										
12										11.00	10.80	10.50	10.20										
14										13.00	12.80	12.50	12.20	12.00	11.75								
15										14.00	13.80	13.50	13.20	13.00	12.75								
16										15.00	14.80	14.50	14.20	14.00	13.75								
17										16.00	15.80	15.50	15.20	15.00	14.75								
18										17.00	16.80	16.50	16.20	16.00	15.75	15.50							
20										19.00	18.80	18.50	18.20	18.00	17.75	17.50							
22										21.00	20.80	20.50	20.20	20.00	19.75	19.50							
24										23.00	22.80	22.50	22.20	22.00	21.75	21.50	21.00						
25										24.00	23.80	23.50	23.20	23.00	22.75								
26											24.50												
27										26.00	25.80	25.50	25.20	25.00	24.75	24.50							
28										27.00	26.80	26.50	26.20	26.00	25.75								
30										29.00	28.80	28.50	28.20	28.00	27.75	27.50	27.00	26.50					
32											30.50			30.00									
33												31.50		31.00		30.00	29.50						
35													33.50										
36														34.50	34.00	33.00	32.00						
38															36.50								
39															37.50	37.00	36.00	35.00					
40																38.00	37.00						
42																	40.00	39.00	38.00	37.50			
45																		42.00	41.00	40.50			
48																			44.00		43.00		
50																				47.00			
52																					48.00	47.00	
56																							50.50

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[ISO 2306:1972](#)

<https://standards.iteh.ai/catalog/standards/sist/1092f5e8-7fca-4178-a7a1-1dd7687265db/iso-2306-1972>