
INTERNATIONAL STANDARD



296

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Machine tools — Self-holding tapers for tool shanks

Machines-outils — Cônes pour emmanchements d'outils à faible conicité

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Descriptors : tools, machine tools, shanks, morse taper shanks, taper, dimensions.

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 39 has reviewed ISO Recommendation R 296 and found it suitable for transformation. International Standard ISO 296 therefore replaces ISO Recommendation R 296-1963.

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ISO Recommendation R 296 was approved by the Member Bodies of the following countries :

Argentina	Hungary	Portugal
Belgium	India	Romania
Chile	Israel	Spain
Colombia	Italy	Sweden
Czechoslovakia	Japan	Switzerland
Denmark	Netherlands	United Kingdom
France	New Zealand	U.S.A.
Germany	Poland	U.S.S.R.

The Member Bodies of the following countries have subsequently approved this Recommendation :

Philippines
South Africa, Rep. of

The Member Body of the following country expressed disapproval of the Recommendation on technical grounds :

Australia

No Member Body disapproved the transformation of ISO/R 296.

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Machine tools — Self-holding tapers for tool shanks

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1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the dimensions of tapers for tool shanks with a small taper of about 4 to 5 %, classified, according to their use, into the three following categories :

- 1) tapers for general use,
- 2) smaller tapers,
- 3) larger tapers.

For the first category, tapers recommended by ISO are Nos. 1 to 6 Morse tapers. Their standard sizes in millimetres are given in table 2, and the corresponding sizes in inches are given in table 3.

For smaller and larger tapers, those recommended by ISO are, on the one hand, Nos. 4 and 6 metric 5 % tapers and No. 0 Morse taper, and on the other hand, Nos. 80 to 200 metric 5 % tapers. Their sizes, in millimetres only, are given in table 2. However, it was agreed to include in parallel, in the category of small tapers, Nos. 1 to 3 Brown & Sharpe tapers. Their sizes, in inches only, are given in table 3.

Consequently, as shown in table 1, self-holding tapers dealt with in this International Standard include :

- 1) for general use, only Nos. 1 to 6 Morse tapers;
- 2) for sizes below No. 1 Morse taper, two solutions : either Nos. 4 and 6 metric tapers and No. 0 Morse taper (without corresponding tapers in the inch table 3) or, alternatively, Nos. 1 to 3 Brown & Sharpe tapers (without corresponding tapers in the metric table 2);

ISO 296:1974 3) for sizes above No. 6 Morse taper, only Nos. 80 to 200 metric tapers (without corresponding tapers in the inch table 3).

TABLE 1

Designation	Sizes in millimetres	Sizes in inches
Small tapers	Nos. 4 and 6 metric and No. 0 Morse	Nos. 1 to 3 Brown & Sharpe
Tapers for general use	Nos. 1 to 6 Morse ¹⁾	
Large tapers	Nos. 80 to 200 metric	

1) Except for threads, Nos. 1 to 6 Morse tapers, manufactured either to metric values or to inch values, are strictly interchangeable, though not absolutely identical.

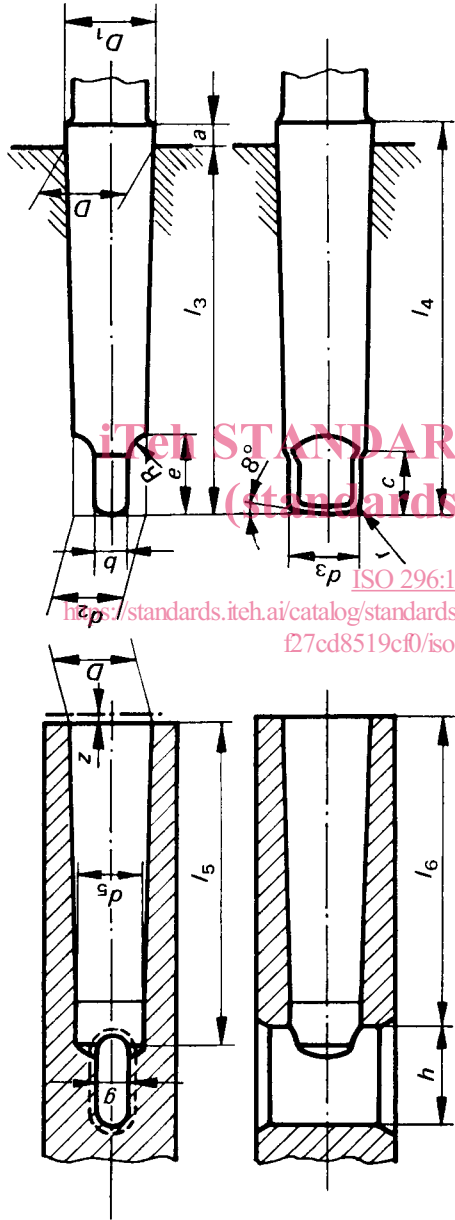
Lastly, this International Standard provides, for those elements which are threaded, two entirely distinct types of product according to the type of thread, **M** or **UNC**.

In order to distinguish between these two types, it is important that the element itself be marked with the corresponding thread symbol.

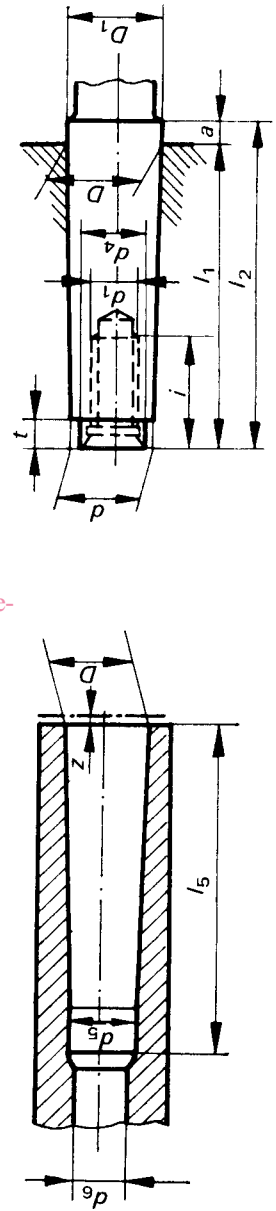
2 SIZES IN MILLIMETRES

(For sizes of Brown & Sharpe tapers, see table 3)

External taper with tenon



External taper with tapped hole



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TABLE 2 - Nos. 0 to 6 Morse tapers and 5 % metric tapers

Designation	Metric taper						Morse taper						Metric taper					
	4	6	0	1	2	3	4	5	6	80	100	120	160	200				
Basic size	1 : 20 = 0,05						0,624 6:12 = 1:20,047 = 0,049 88						1 : 20 = 0,05					
	Taper						0,602 35:12 = 1:19,922 = 0,050 20						0,631 51:12 = 1:19,002 = 0,052 63					
External taper	<i>D</i>	4	6	9,045	12,065	17,780	23,825	31,267	44,399	63,348	80	100	120	160	200			
	<i>a</i>	2	3	3,5	5	5	5	6,5	6,5	8	8	10	12	16	20			
	<i>D</i> ₁	4,1	6,2	12,2	18	24,1	31,6	44,7	63,8	80,4	100,5	120,6	160,8	201	201			
	<i>d</i>	2,9	4,4	6,4	9,4	14,6	19,8	25,9	37,6	53,9	70,2	106,6	143	179,4	179,4			
	<i>d</i> ₁	-	-	-	M6	M10	M12	M16	M20	M24	M30	M36	M36	M48	M48			
	<i>d</i> ₂	-	-	6,1	9	14	19,1	25,2	36,5	52,4	69	87	105	141	177			
	<i>d</i> ₃ max.	-	-	6	8,7	13,5	18,5	24,5	35,7	51	67	85	102	138	174			
	<i>d</i> ₄ max.	2,5	4	6	9	14	19	25	35,7	51	67	85	102	138	174			
	<i>l</i> ₁ max.	23	32	50	53,5	64	81	102,5	129,5	182	196	232	268	340	412			
	<i>l</i> ₂ max.	25	35	53	57	69	86	109	136	190	204	242	280	356	432			
	<i>l</i> ₃ max.	-	-	56,5	62	75	94	117,5	149,5	210	220	260	300	380	460			
	<i>l</i> ₄ max.	-	-	59,5	65,5	80	99	124	156	218	228	270	312	396	480			
	<i>b</i> h13	-	-	3,9	5,2	6,3	7,9	11,9	15,9	19	26	32	38	50	62			
	<i>c</i> 3)	-	-	6,5	8,5	10	13	16	19	27	24	28	32	40	48			
	<i>e</i> max.	-	-	10,5	13,5	16	20	24	29	40	48	58	68	88	108			
	<i>i</i> min.	-	-	16	16	24	28	32	40	50	65	80	80	100	100			
	<i>R</i> max.	-	-	4	5	6	7	8	10	13	24	30	36	48	60			
	<i>r</i>	-	-	1	1,2	1,6	2	2,5	3	4	5	5	6	8	10			
	<i>t</i> max.	2	3	4	5	5	7	9	10	16	24	30	36	48	60			
Internal taper	<i>d</i> ₅ H11	3	4,6	6,7	9,7	14,9	20,2	26,5	38,2	54,6	71,5	90	108,5	145,5	182,5			
	<i>d</i> ₆	-	-	-	7	11,5	14	18	23	27	33	39	39	52	52			
	<i>l</i> ₅ min.	25	34	52	56	67	84	107	135	188	202	240	276	350	424			
	<i>l</i> ₆	21	29	49	52	62	78	98	125	177	186	220	254	321	388			
	<i>g</i> A13	2,2	3,2	3,9	5,2	6,3	7,9	11,9	15,9	19	26	32	38	50	62			
	<i>h</i>	8	12	15	19	22	27	32	38	47	52	60	70	90	110			
	<i>z</i> 4)	0,5	0,5	1	1	1	1	1,5	1,5	2	2	2	2	3	3			
		0,5	0,5	1	1	1	1	1,5	1,5	2	2	2	2	3	3			

1) *D*₁ and *d* or *d*₂ - approximate values given for guidance.

(The actual values result from the actual values of *a* and *l*₁ or *l*₃ respectively, taking into account the taper and the basic size *D*).

2) *d*₁ = thread diameter; either a metric thread **M** with standard pitch or, if expressly stated, a **UNC** thread (see table 3 for inch sizes). In every case, the appropriate symbol **M** or **UNC** shall be marked on the component.

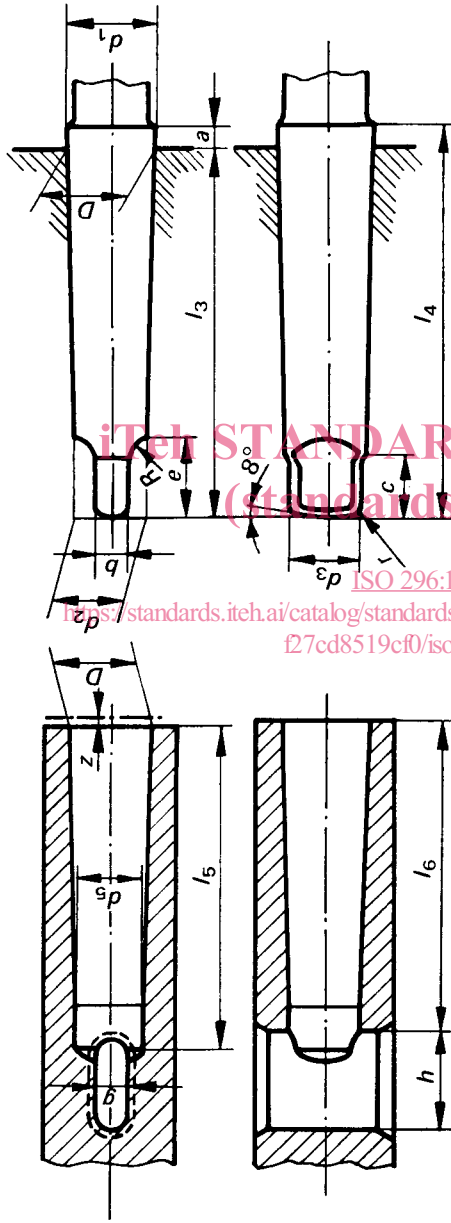
3) It is allowed to increase the length *c* over which the tenon is turned to diameter *d*₃, but without exceeding *e*.

4) *z* - maximum permissible deviation, outwards only, of the position of the gauge plane *D* from the nominal position of coincidence with the leading face.

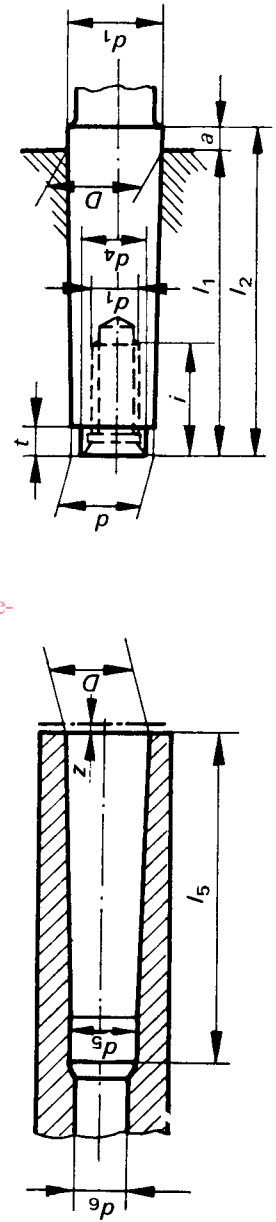
4 3 SIZES IN INCHES

(For sizes of No. 0 Morse taper and 5 % metric tapers, see table 2)

External taper with tenon



External taper with tapped hole



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TABLE 3 -- Nos. 1 to 6 Morse tapers and Brown & Sharpe tapers

Designation	Brown & Sharpe taper			Morse taper						
	1	2	3	1	2	3	4	5	6	
Basic size										
Taper	0.502 00:12 = 1:23.904 = 0.041 83	0.502 00:12 = 1:23.904 = 0.041 83	0.502 00:12 = 1:23.904 = 0.041 83	0.598 58:12 = 1:20.047 = 0.049 88	0.599 41:12 = 1:20.020 = 0.049 95	0.602 35:12 = 1:19.922 = 0.050 20	0.623 26:12 = 1:19.254 = 0.051 94	0.631 51:12 = 1:19.002 = 0.052 63	0.625 65:12 = 1:19.180 = 0.052 14	
<i>D</i>	0.239 22 3/32	0.299 68 3/32	0.375 25 3/32	0.475 1/8	0.700 3/16	0.938 3/16	1.231 1/4	1.748 1/4	2.494 5/16	
<i>a</i>	0.243 14	0.303 60	0.379 17	0.481 2	0.709 4	0.947 4	1.244 0	1.761 2	2.510 3	
<i>D</i> ₁	0.200 0	0.250 0	0.312 5	0.369 0	0.572 0	0.778 0	1.020 0	1.475 0	2.116 0	
<i>d</i>	—	—	—	UNC 7/4	UNC 3/8	UNC 1/2	UNC 5/8	UNC 5/8	UNC 1	
<i>d</i> ₁	0.189 54	0.236 93	0.296 81	0.353 4	0.553 3	0.752 9	0.990 8	1.438 8	2.063 9	
<i>d</i> ₂	11/64	7/32	9/32	11/32	17/32	23/32	31/32	1 13/32	2	
<i>d</i> ₃	max.	max.	max.	max.	max.	max.	max.	max.	max.	
<i>d</i> ₄	max.	max.	max.	max.	max.	max.	max.	max.	max.	
<i>l</i> ₁	max.	max.	max.	max.	max.	max.	max.	max.	max.	
<i>l</i> ₂	max.	max.	max.	max.	max.	max.	max.	max.	max.	
<i>l</i> ₃	max.	max.	max.	max.	max.	max.	max.	max.	max.	
<i>l</i> ₄	max.	max.	max.	max.	max.	max.	max.	max.	max.	
<i>b</i>	0.125 0	0.156 2	0.187 5	0.203 1	0.250 0	0.312 5	0.468 7	0.625 0	0.750 0	
<i>c</i>	1/4	5/16	3/8	11/32	13/32	17/32	5/8	3/4	1 1/16	
<i>e</i>	max.	max.	max.	max.	max.	max.	max.	max.	max.	
<i>i</i>	min.	min.	min.	min.	min.	min.	min.	min.	min.	
<i>R</i>	max.	max.	max.	max.	max.	max.	max.	max.	max.	
<i>r</i>	max.	max.	max.	max.	max.	max.	max.	max.	max.	
<i>t</i>	max.	max.	max.	max.	max.	max.	max.	max.	max.	
<i>d</i> ₅	0.203	0.255	0.319	0.378	0.588	0.797	1.044	1.502	2.150	
<i>d</i> ₆	—	—	—	9/32	7/16	9/16	11/16	11/16	1 1/8	
<i>l</i> ₅	min.	min.	min.	min.	min.	min.	min.	min.	min.	
<i>l</i> ₆	min.	min.	min.	min.	min.	min.	min.	min.	min.	
<i>g</i>	H12	H12	H12	H12	H12	H12	H12	H12	H12	
<i>h</i>	z	z	z	z	z	z	z	z	z	
<i>z</i>	0.040	0.040	0.040	0.040	0.040	0.040	0.060	0.060	0.080	

1) *D*₁ and *d* or *d*₂ — approximate values given for guidance.

(The actual values result from the actual values of *a* and *l* or *l*₃ respectively, taking into account the taper and the basic size *D*).

2) *d*₁ — thread diameter: either a UNC thread or, if expressly stated, a metric thread *M* with standard pitch (see table 2 for metric sizes). In every case, the appropriate symbol UNC or M shall be marked on the component.

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