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ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 296

SELF-HOLDING TAPERS FOR TOOL SHANKS

1st EDITION
March 1963

For each individual country the only valid standard is the national standard of that country.

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BRIEF HISTORY

The ISO Recommendation R 296, *Self-holding Tapers for Tool Shanks*, was drawn up by Technical Committee ISO/TC 39, *Machine Tools*, the Secretariat of which is held by the Association Française de Normalisation (AFNOR).

Work on this question by the Technical Committee began in 1950, taking into account the studies which had been made by the former International Federation of the National Standardizing Associations (ISA), and led, in 1955, to the adoption of a Draft ISO Recommendation.

In July 1960, this Draft ISO Recommendation (No. 388) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies:

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.

One Member Body opposed the approval of the Draft:

Australia.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in March 1963, to accept it as an ISO RECOMMENDATION.

ISO Recommendation R 296 March 1963

SELF-HOLDING TAPERS FOR TOOL SHANKS

1. INTRODUCTION

Tapers for tool shanks with a small taper of about 4 to 5 per cent may be classified into three categories according to their use:

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

For the first category, tapers recommended by ISO are No. 1 to 6 Morse tapers. Their standard sizes in millimetres are given in Table 1, pages 5–6, and the corresponding sizes in inches are given in Table 2, pages 7–8.

For smaller and larger tapers, those recommended by ISO are, on the one hand, No. 4 and 6 metric 5 per cent tapers and No. 0 Morse taper, on the other hand, No. 80 to 200 metric 5 per cent tapers. Their sizes, in millimetres only, are given for the Morse taper in Table 1, pages 5–6, and for the metric tapers, in Table 2, pages 7–8.

However, it was agreed to include, in the category of small tapers No. 1 to 3 Brown & Sharpe tapers in parallel. Their sizes, in inches only, are given in Table 2, pages 7–8.

Consequently, as shown in the table below, self-holding tapers dealt with in this ISO Recommendation include:

(1) for general use, only No. 1 to 6 Morse tapers;

(2) for sizes above No. 6 Morse taper, only No. 80 to 200 metric tapers (without corresponding tapers in the inch tables);

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

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

Lastly, this ISO Recommendation provides, for those elements which are threaded, two entirely distinct types of products, 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, each national standards body being free to adopt, in its national standard, either of the two threads.

2. INTERCHANGEABILITY

2.1 Due to the fact that each national standards body is left free to adopt in its national standard, for small tapers below No. 1 Morse taper, either the solution "Metric tapers and No. 0 Morse taper" or the alternative "Brown & Sharpe", in this limited field of small tapers interchangeability will be possible only between countries that have adopted the same one of those two solutions.

2.2 Due to the fact that each national standards body is also left free to adopt in its national standard, for external tapers with tapped holes, either the **M** thread or the **UNC** thread, interchangeability will be possible, with this type of external taper, only between countries that have adopted the same one of those two types of thread.

2.3 On the other hand, for all sizes other than for threads, the No. 1 to 6 Morse tapers, manufactured either to metric values or to inch values, are strictly interchangeable, though not absolutely identical. Acceptance conditions, if provided for in national standards, should therefore be such that they should allow the acceptance of either the tapers specified in metric units or the tapers specified in inch units.

4. SIZES IN INCHES*

* For sizes of No. 0 Morse taper and 5 per cent metric tapers, see Table 1.

	5	6
:12 254 94	0.631 51 : 12 = 1 : 19.002 = 0.052 63	0.625 65 : 12 = 1 : 19.180 = 0.052 14
	1.748	2.494
	1/4	5/16
0	1.761 2	2.510 3
0	1.475 0	2.116 0
/8	UNC 5/8	UNC 1
8	1.438 8	2.063 9
2	1 13/32	2
2	1 13/32	2
6	5 3/16	7 1/4
6	5 7/16	7 9/16
	5 7/8	8 1/4
	6 1/8	8 9/16
7	0.625 0	0.750 0
	3/4	1 1/16
	1.15	1.58
	1 1/4	2
6	3/8	1/2
2	1/8	5/32
	5/16	3/8
	1.502	2.150
6	11/16	1 1/8
2	5 5/16	7 3/8
	4 15/16	7
	0.650	0.780
	1 1/2	1 7/8
	0.060	0.080

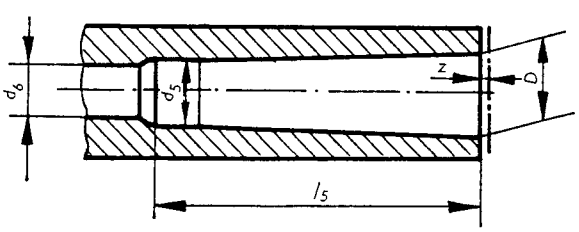
(1) D_1 and d or d_2 — approximate values given for guidance.
(The actual values result from the actual values of a and l or l_3 respectively, taking into account the taper and the basic size D).

(2) d_1 = thread diameter: either a **UNC** thread or, if expressly stated, a metric thread **M** with standard pitch (see Table 1 for metric sizes). In every case, the appropriate symbol **UNC** or **M** should 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.

External taper with tapped hole



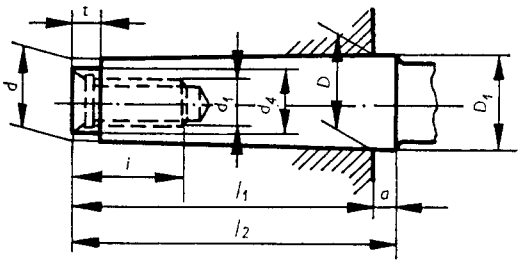
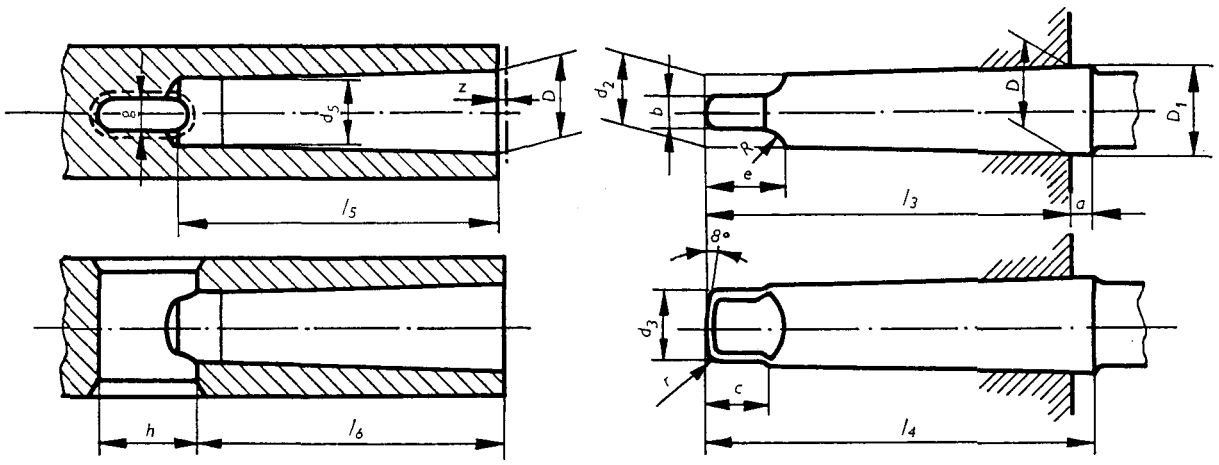


TABLE 2. — **No. 1 to 6 Morse tapers and Brown & Sharpe tapers**

Designation		Brown & Sharpe taper			Morse taper				
		1	2	3	1	2	3	4	5
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
External taper	D	0.239 22	0.299 68	0.375 25	0.475	0.700	0.938	1.231	1.748
	a	$^3/_{32}$	$^3/_{32}$	$^3/_{32}$	$^1/_8$	$^3/_{16}$	$^3/_{16}$	$^1/_4$	$^1/_4$
	D_1 (1)	0.243 14	0.303 60	0.379 17	0.481 2	0.709 4	0.947 4	1.244 0	1.761 2
	d (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
	d_1 (2)	—	—	—	UNC $^1/_4$	UNC $^3/_8$	UNC $^1/_2$	UNC $^5/_8$	UNC $^5/_8$
	d_2 (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
	d_3 max.	$^{11}/_{64}$	$^7/_{32}$	$^9/_{32}$	$^{11}/_{32}$	$^{17}/_{32}$	$^{23}/_{32}$	$^{31}/_{32}$	$1\ ^{13}/_{32}$
	d_4 max.	$^{11}/_{64}$	$^7/_{32}$	$^9/_{32}$	$^{11}/_{32}$	$^{17}/_{32}$	$^{23}/_{32}$	$^{31}/_{32}$	$1\ ^{13}/_{32}$
	l_1 max.	$^{15}/_{16}$	$1\ ^3/_{16}$	$1\ ^1/_2$	$2\ ^1/_8$	$2\ ^9/_{16}$	$3\ ^3/_{16}$	$4\ ^1/_{16}$	$5\ ^3/_{16}$
	l_2 max.	$1\ ^1/_{32}$	$1\ ^9/_{32}$	$1\ ^{19}/_{32}$	$2\ ^1/_4$	$2\ ^3/_4$	$3\ ^3/_8$	$4\ ^5/_{16}$	$5\ ^7/_{16}$
	l_3 max.	$1\ ^3/_{16}$	$1\ ^1/_2$	$1\ ^7/_8$	$2\ ^7/_{16}$	$2\ ^{15}/_{16}$	$3\ ^{11}/_{16}$	$4\ ^5/_8$	$5\ ^7/_8$
	l_4 max.	$1\ ^9/_{32}$	$1\ ^{19}/_{32}$	$1\ ^{31}/_{32}$	$2\ ^9/_{16}$	$3\ ^1/_8$	$3\ ^7/_8$	$4\ ^7/_8$	$6\ ^1/_8$
	b h12	0.125 0	0.156 2	0.187 5	0.203 1	0.250 0	0.312 5	0.468 7	0.625 0
	c (3)	$^1/_4$	$^5/_{16}$	$^3/_8$	$^{11}/_{32}$	$^{13}/_{32}$	$^{17}/_{32}$	$^5/_8$	$^3/_4$
	e max.	0.381	0.455	0.532	0.52	0.66	0.83	0.96	1.15
	i min.	—	—	—	$^1/_2$	$^3/_4$	1	$1\ ^1/_4$	$1\ ^1/_4$
	R max.	$^3/_{16}$	$^3/_{16}$	$^3/_{16}$	$^3/_{16}$	$^1/_4$	$^9/_{32}$	$^5/_{16}$	$^3/_8$
	r	$^1/_{32}$	$^1/_{32}$	$^3/_{64}$	$^3/_{64}$	$^1/_{16}$	$^5/_{64}$	$^3/_{32}$	$^1/_8$
	t max.	$^1/_8$	$^1/_8$	$^1/_8$	$^3/_{16}$	$^3/_{16}$	$^1/_4$	$^1/_4$	$^5/_{16}$
Internal taper	d_5 H11	0.203	0.255	0.319	0.378	0.588	0.797	1.044	1.502
	d_6	—	—	—	$^9/_{32}$	$^7/_{16}$	$^9/_{16}$	$^{11}/_{16}$	$^{11}/_{16}$
	l_5 min.	1	$1\ ^1/_4$	$1\ ^9/_{16}$	$2\ ^3/_{16}$	$2\ ^{21}/_{32}$	$3\ ^9/_{32}$	$4\ ^5/_{32}$	$5\ ^5/_{16}$
	l_6	$^{29}/_{32}$	$1\ ^1/_8$	$1\ ^{13}/_{32}$	$2\ ^1/_{16}$	$2\ ^1/_2$	$3\ ^1/_{16}$	$3\ ^7/_8$	$4\ ^{15}/_{16}$
	g H12	0.141	0.172	0.203	0.223	0.270	0.333	0.493	0.650
	h	$^{13}/_{32}$	$^9/_{16}$	$^{23}/_{32}$	$^3/_4$	$^7/_8$	$1\ ^1/_8$	$1\ ^1/_4$	$1\ ^1/_2$
	z (4)	0.040	0.040	0.040	0.040	0.040	0.040	0.060	0.060

External taper with tenon



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;	Metric taper				
	80	100	120	160	200
65 : 12 .9.180 52 14	1 : 20 = 0.05				
.348	80	100	120	160	200
	8	10	12	16	20
.8	80.4	100.5	120.6	160.8	201
.9	70.2	88.4	106.6	143	179.4
24	M 30	M 36	M 36	M 48	M 48
.4	69	87	105	141	177
	67	85	102	138	174
	67	85	102	138	174
	196	232	268	340	412
	204	242	280	356	432
	220	260	300	380	460
	228	270	312	396	480
	26	32	38	50	62
	24	28	32	40	48
	48	58	68	88	108
	65	80	80	100	100
	24	30	36	48	60
	5	5	6	8	10
	24	30	36	48	60
.6	71.5	90	108.5	145.5	182.5
	33	39	39	52	52
	202	240	276	350	424
	186	220	254	321	388
	26	32	38	50	62
	52	60	70	90	110
	2	2	2	3	3

3. SIZES IN MILLIMETRES*

* For sizes of Brown & Sharpe tapers, see Table 2.

(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 2 for inch sizes). In every case, the appropriate symbol **M** or **UNC** should be marked on the component.

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External taper with tapped hole