ASME B5.10-1994

(REVISION OF ANSI B5.10-1981)

Machine Taper

(SELF HOLDING AND
STEEP TAPER SERIES)

AN AMERICAN NATIONAL STANDARD

The American Society of
Mechanical Engineers

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(REVISION OF ANSI B5.10–1981)

The American Society of Mechanical Engineers

345 East 47th Street, New York, N.Y. 10017

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FOREWORD

(This Foreword is not part of ASME B5.10-1994.)

The American Standard for Machine Tapers was formulated by the Sectional Committee on the Standardization of Small Tools and Machine Tool Elements organized in September 1922, under the procedure of the American Standards Association. This project is now sponsored by the NMTBA, SAE, ASTE, and the ASME. The importance of unifying American practice in the use of machine tapers had been recognized for some time and it was known that certain European countries had adopted as their national standards certain selections and slight modifications of the three American tapers then in use, the Brown & Sharpe (1860), Morse (1862), and Jarno (1889).

Technical Committee No. 3 on the Standardization of Machine Tapers was appointed in August 1926, and held its organization meeting in September 1926, in New Haven, Connecticut.

The first of a series of six tentative drafts of this standard bears the date of May 1927, and the last, November 1933. During this period of six years numerous committee meetings were held and several questionnaires were distributed to industry on this subject. In the early stages of the work on this standard the opinion of the members of the committee was divided between the belief that an entirely new system of tapers should be adopted to be put into effect gradually and the belief that no changes should be made in the three existing taper series. Finally, however, the members of the technical committee agreed on a compromise standard series which now contains twenty two (22) sizes in a composite list of self-holding tapers having slopes selected from the three present series and the series adopted by William Sellers & Co. in 1862. This proposed composite series, therefore, constitutes an appreciable reduction from the number of sizes now in use.

The formal approval by the sectional committee and the sponsor organizations of the first proposal covering the self-holding series followed next and the American Standards Association gave its approval and designation as American Standard in March 1937.

The subgroup charged with the task of developing a standard for self-releasing (steep) taper series was appointed in April 1932. Its members made an experimental study of the subject, then canvassed industry by means of a questionnaire, and finally decided to recommend the use of the slope which the NMTBA committee had adopted if there were no insurmountable patent difficulties. At the December 1939 meeting of Sectional Committee B5, Technical Committee No. 3 reported that a series of six preferred and six intermediate steep tapers had been developed and were presented to the sectional committee at that time.

Another subgroup was appointed in December 1938 to revise the part of the standard dealing with the self-holding taper series. It completed its work in the spring of 1941 and its results were reviewed in detail at a meeting of the sectional committee in December 1941.

This revised proposal was approved by letter ballot vote of the sectional committee and following the approval of the sponsor bodies, it was presented to the American Standards Association with recommendation as an American Standard. This designation was given in October 1943.

The standard was reviewed by the sectional committee in 1949 and reaffirmed as American Standard in June of that year. Another review of the standard was instigated by the sectional committee in 1952 and some minor changes were made. The revision was approved by the sectional committee by letter ballot vote and endorsed by the sponsors for transmittal to American Standards Association for designation as American Standard. This designation was given on March 30, 1953.

As this standard was again taken up for revision, it was suggested that tolerances for rates of tapers be established. This was done and the proposal in draft dated October 1956 was circulated to Sectional Committee for letter ballot. As this balloting was about completed one of our Sponsors suggested in the spring of 1957 that this standard be enlarged to include all Brown & Sharpe, Morse, and Morse Stub Tapers and that a review be made of the tables to determine their acceptance by industry.

The Technical Committee upon completion of this work proposed the publication of this standard with an Appendix, and a new edition of this standard was approved by the American Standards Association on February 25, 1960 and published as ASA B5.10–1960.

Since the 1960 edition has been in use, suggestions for minor revisions and editorial changes have been made and B5/TC 29 has recently prepared a proposal on Spindle Noses and Tool Shanks for Horizontal Boring Machines which affects B5.10 so that in order to have the two publications in general agreement the current revision was undertaken.

The Technical Committee reached agreement on the present standard at a meeting held February 16, 1962, following which it was approved by Sectional Committee B5 and its sponsors.

The American Standards Association approval was given on May 16, 1963, with the designation Machine Tapers ASA B5.10–1963.

The revision to the 1963 edition includes the addition of the R.W.M.A. No. 6 Taper. This revision after approval of the committee and Secretariat was approved by ANSI on May 22, 1981 and designated B5.10-1981.

Following a recent review by Technical Committee 45 of ASME B5, it was agreed to remove a tolerance note from the B5.10 standard that has proven to be impractical for the manufacturing of self-holding taper shank tooling.

This revised Standard was approved by ANSI on April 5, 1994 and designated ASME B5.10-1994.

ASME COMMITTEE B5
Machine Tools — Components, Elements, Performance, and Equipment

(The following is a roster of the Committee at the time of approval of this Standard.)

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MACHINE TAPERS
(Self-Holding and Steep Taper Series)

1. INTRODUCTORY NOTES

1.1 Object and Scope

This Standard establishes (1) American standard practice for the slope of self-holding and steep machine tapers, (2) the detailed dimensions for this type of taper tool shank, (3) the corresponding dimensions for the taper socket in the spindle of the machine, including the dimensions of keyways. This, it is hoped, will serve as a guide for future designing of machines and related equipment utilizing tapers that come within the ranges specified in the various tables.

1.1.1 The purpose of a machine taper is to provide a connection between the tool, arbor, or center and its mating part which will insure and maintain accurate alignment between the parts and yet permit the parts to be readily separated for reconditioning or for the substitution of other parts.

1.1.2 This Standard as published includes the tapers which are presented as the recommended standard for application where either self-holding or steep tapers are desired. An appendix to meet the demands for an authoritative source for data on such tapers as are sometimes used by industry and lie outside the standard has been added.

1.2 Definition

The term self-holding has been given to some tapers because, when seated firmly in the socket, they tend to stay in place due to the small taper angle. In the smaller sizes no other means of holding is, as a rule, required. With the larger sizes, while the self-holding feature is still present, the external forces tending to remove the shank from the socket during operations often make necessary a more positive means of locking the shank in place. Drive keyways and draw bolts are used for this purpose. Removal of the shank from the socket is accomplished by starting it with a drift key or some other positive means. The self-holding feature of this series of tapers distinguishes it from the self-releasing or steep type where the taper angle is sufficiently large to make the retention of the shank dependent upon a positive locking device, in which case the taper fit between shank and socket serves only to maintain alignment. When unlocked, these tapers will release themselves.

1.2.1 The Self-Holding Taper series consists of twenty-two sizes, three small sizes taken from the Brown & Sharpe series having a nominal taper of $^1/_2$ in. per foot, eight sizes taken from the Morse series having a nominal taper of approximately $^5/_8$ in. per foot, and eleven sizes having a taper of $^3/_4$ in. per foot. The basic dimensions of the tapers comprising this composite series are given in Table 1.

1.2.2 In the case of taper shanked rotating tools or arbors, the machine tool spindle imparts motion to these tools and some means must be provided, either friction or a positive drive, to transmit the rotary motion of the spindle to the tool.

1.2.3 The tool shank, to maintain proper alignment, must be seated firmly in its socket, and under certain conditions, particularly with the larger sizes, it must be securely locked, so that it will not loosen during the operation of the machine. This may be accomplished by friction or, if a more positive means is required, a hold-back key or draw bolt may be provided depending upon the requirements of the particular application.

1.2.4 Tables 2 to 9, inclusive, give the detail dimensions and tolerances for self-holding taper shanks and sockets classified as to (1) the means of transmitting the torque from the spindle to the shank of tool, and (2) the means of retaining the shank in the socket.

1.2.5 Table 12 covers the dimensions for steep tapers.

1.3 Gaging

The reference gage for American Standard Self-Holding Tapers and Steep Tapers is a tapered plug gage. Tables 10, 11, 13, and 14 give the dimensions and tolerances for plug and ring gages applying to the above mentioned tapers.

1.4 Appendix

Table A is a tabulation of Brown & Sharpe tapers not included in Tables 1 to 14 inclusive. Table B lists additional Morse tapers, not included in Tables 1 to 14 inclusive. Table C presents Morse Stub Tapers and Table D Jarno Taper data.

2. NOMENCLATURE

Basic Size. The nominal size from which the limits of size for a dimension are derived by the application of the allowance and tolerance.

Brown & Sharpe Taper. A system of tapers originated by the Brown & Sharpe Mfg. Co. with a nominal taper per foot of $^1/_2$ in.

Drift or Drift Key. A flat tapered bar for forcing the taper shank out of its socket.

Drift Slot. A slot through the socket at the small end of the tapered hole to receive a drift for forcing taper shanks out of the socket.

Exposed Length. The distance the large end of the taper shank projects from the drive socket or large end of the taper ring gage.

Gage Line. The axial position on a taper where the diameter is equal to the basic large end diameter of the specified taper.

Jarno Taper. A system of tapers originated by Oscar J. Beale of the Brown & Sharpe Mfg. Co. with a taper of 0.6 in. per foot.

Keeper Key. A method of retaining a shank in the socket by means of a tapered retaining key placed through the shank and spindle.

Keeper Slot. A cross slot in a tool shank or adapter to receive a tapered retaining key.

Key Drive. A method of driving the tool by an external rectangular key.

Morse Taper. A system of tapers originated by the Morse Twist Drill and Machine Company with a nominal taper per foot of $^5/_8$ in., on which American Standard Tapers Numbers, 1, 2, 3, 4, $4^1/_2$, 5, 6, and 7 are based.

Over-All Length of Shank. Total length from large end of taper to end of tang.

Self-Holding Taper. A taper with an angle small enough to hold a shank in place ordinarily by friction without other holding means (sometimes referred to as slow taper), and one which insures the rotation of the tool with the socket.

Socket. The part of a machine tool spindle or adapter which is designed to receive and locate the tapered shank of a tool, or arbor.

Steep Taper. A taper having an angle sufficiently large to insure the easy or self-releasing feature.

Stub Taper. A taper based on the Morse system of tapers but with reduced overall length.

Tang. The flattened end of a taper shank.

Tang Relief. Reduction in diameter of the small end of shank.

Taper per Foot. The difference in diameter between two points 12 in. apart measured along the axis.

Taper Shank. The tapered part of a tool which serves to center the tool in a socket.

Tolerance. The total amount of variation permitted in the size of a part.

Tongue. See preferred term *tang*.

Table 1 Taper Series—Basic Dimensions, Self Holding Tapers

No. of Taper	Taper per Foot (Basic)	Taper per Inch[2]	Diameter at Gage Line [1] A	Means of Driving and Holding				Origin of Series
0.239	0.50200	0.041833	0.23922	Taper Drive with Tang *(See Tables 2 and 3)*	Taper Drive with Keeper Key *(See Tables 4 and 5)*	Nose Key Drive with Keeper Key *(See Tables 6 and 7)*	Nose Key Drive with Draw-bolt *(See Tables 8 and 9)*	Brown and Sharpe Taper Series
0.299	0.50200	0.041833	0.29968					
0.375	0.50200	0.041833	0.37525					
1	0.59858	0.049882	0.47500					Morse Taper Series
2	0.59941	0.049951	0.70000					
3	0.60235	0.050196	0.93800					
4	0.62326	0.051938	1.23100					
$4\frac{1}{2}$	0.62400	0.052000	1.50000					
5	0.63151	0.052626	1.74800					
6	0.62565	0.052138	2.49400					
7	0.62400	0.052000	3.27000					
200	0.750	0.062500	2.000					$\frac{3}{4}$ Inch per Foot Taper Series
250	0.750	0.062500	2.500					
300	0.750	0.062500	3.000					
350	0.750	0.062500	3.500					
400	0.750	0.062500	4.000					
450	0.750	0.062500	4.500					
500	0.750	0.062500	5.000					
600	0.750	0.062500	6.000					
800	0.750	0.062500	8.000					
1000	0.750	0.062500	10.000					
1200	0.750	0.062500	12.000					

All dimensions given in inches.
[1]See illustrations above Tables 2–14 inclusive.
[2]Calculated from Taper per foot which is basic.

Portions of some of the Tables in this standard are reproduced in and are part of ANSI B5.40-1977 Spindle Noses and Tool Shanks for Horizontal Boring Machines.

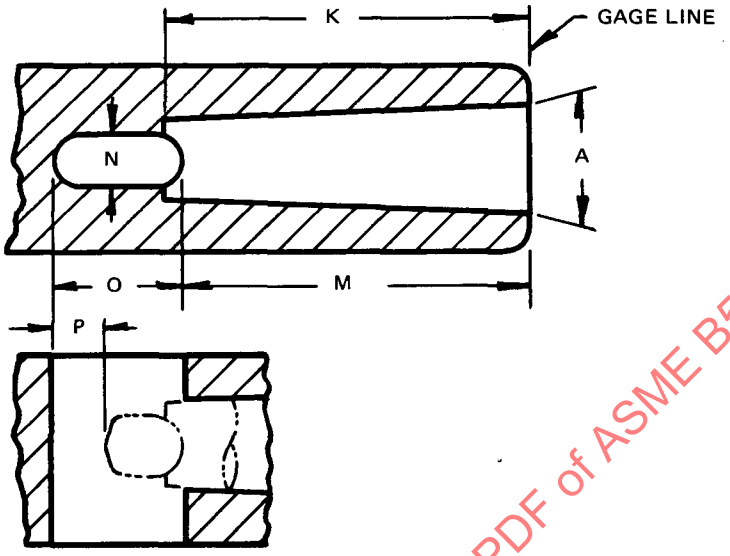


Table 2 Taper Drive Socket for Tang, Self Holding Tapers

SOCKETS							
No. of Taper	Diameter at Gage Line[1] A	Minimum Depth of Tapered Hole K		Gage Line to Tang Slot M	Tang Slot		
		Drilled	Reamed		Width N	Length O	Shank End to Back of Tang Slot P
0.239	0.23922	1.06	1.00	0.94	0.141	0.38	0.13
0.299	0.29968	1.31	1.25	1.17	0.172	0.50	0.17
0.375	0.37525	1.63	1.56	1.47	0.203	0.63	0.22
1	0.47500	2.19	2.16	2.06	0.218	0.75	0.38
2	0.70000	2.66	2.61	2.50	0.266	0.88	0.44
3	0.93800	3.31	3.25	3.06	0.328	1.19	0.56
4	1.23100	4.19	4.13	3.88	0.484	1.25	0.50
4 1/2	1.50000	4.62	4.56	4.31	0.578	1.38	0.56
5	1.74800	5.31	5.25	4.94	0.656	1.50	0.56
6	2.49400	7.41	7.33	7.00	0.781	1.75	0.50

All dimensions given in inches.
[1] See Table 10 for Plug Gage dimensions.

TOLERANCES

Diameter of Hole at Gage Line (A)
All sizes, +0.000, −0.002
Width of Tang Slot (N)
Up to and including No. 5 +0.006, −0.000
Larger than No. 5 +0.008, −0.000
Centrality of Tang Slot (N) with Centerline of Taper 0.0025 (0.005 Total Indicator Variation)

On Rate of Taper, all sizes 0.002 per foot. This tolerance may be applied on Sockets only in the direction which decreases the Rate of Taper.

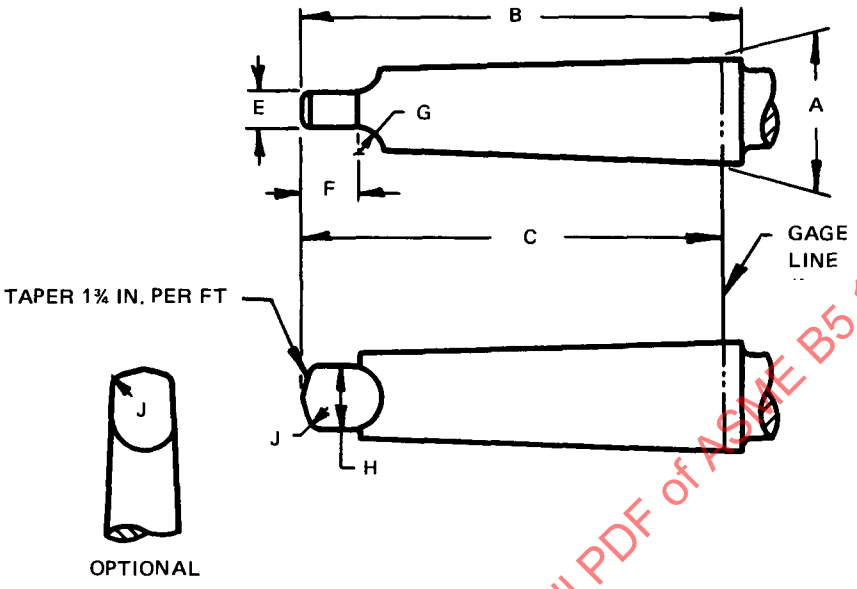


Table 3 Taper Drive Shank with Tang, Self Holding Tapers

SHANKS								
				Tang				
No. of Taper	Diameter at Gage Line[1] A	Total Length of Shank B	Gage Line to End of Shank C	Thickness E	Length F	Radius of Mill G	Diameter H	Radius J
0.239	0.23922	1.28	1.19	0.125	0.19	0.19	0.18	0.03
0.299	0.29968	1.59	1.50	0.156	0.25	0.19	0.22	0.03
0.375	0.37525	1.97	1.88	0.188	0.31	0.19	0.28	0.05
1	0.47500	2.56	2.44	0.203	0.38	0.19	0.34	0.05
2	0.70000	3.13	2.94	0.250	0.44	0.25	0.53	0.06
3	0.93800	3.88	3.69	0.312	0.56	0.22	0.72	0.08
4	1.23100	4.88	4.63	0.469	0.63	0.31	0.97	0.09
4 1/2	1.50000	5.38	5.13	0.562	0.69	0.38	1.20	0.13
5	1.74800	6.12	5.88	0.625	0.75	0.38	1.41	0.13
6	2.49400	8.25	8.25	0.750	1.13	0.50	2.00	0.16

All dimensions given in inches.
[1]See Table 11 for Ring Gage dimensions.

TOLERANCES

Diameter of Shank at Gage Line (A)
All sizes +0.002, −0.000
Thickness of Tang (E)
Up to and including No. 5, +0.000, −0.006
Larger than No. 5, +0.000, −0.008
Centrality of Tang (E) with Centerline of Taper
0.0025 (0.005 Total Indicator Variation)

On Rate of Taper, all sizes 0.002 per foot. This tolerance may be applied on Shanks only in the direction which increases the Rate of Taper.

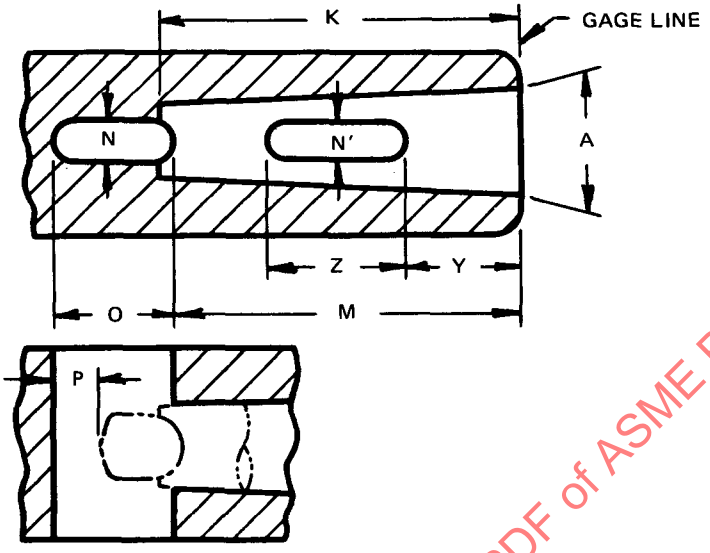


Table 4 Taper Drive Socket With Keeper Key Slot, Self Holding Tapers

SOCKETS

No. of Taper	Diameter at Gage Line[1] A	Minimum Depth of Tapered Hole K		Gage Line to Tang Slot M	Tang Slot[2]			Keeper Slot[2]		
		Drilled	Reamed		Width N	Length O	Shank End to Back of Tang Slot P	Gage Line to Front of Slot Y	Length Z	Width N′
3	0.938	3.31	3.25	3.06	0.328	1.19	0.56	1.13	1.19	0.266
4	1.231	4.19	4.13	3.88	0.484	1.25	0.50	1.50	1.25	0.391
4 1/2	1.500	4.63	4.56	4.32	0.578	1.38	0.56	1.81	1.38	0.453
5	1.748	5.31	5.25	4.94	0.656	1.50	0.56	2.13	1.50	0.516
6	2.494	7.41	7.33	7.00	0.781	1.75	0.50	2.25	1.75	0.641
7	3.270	10.16	10.08	9.50	1.156	2.63	0.88	2.63	1.81	0.766

All dimensions given in inches.
[1]See Table 10 for Plug Gage dimensions.
[2]Edges at entrance side of Slots N and N′ shall be chamfered at 45 deg as follows:
No. 3, 3/64 inch, all other sizes 1/16 inch deep.
For Tapers Nos. 4–7 inclusive using Key Drive
See also ANSI B5.40-1977 Tables 4 and 5 on Spindle Noses and Tool Shanks for Horizontal Boring Machines.

TOLERANCES

Diameter of hole at Gage Line (A)
All sizes, +0.000, −0.002
Width of Slots (N) and (N′)
Up to and including No. 5, +0.006, −0.000
Larger than No. 5, +0.008, −0.000
Centrality of Slots (N) and (N′) with Centerline of Taper 0.0025 (0.005 Total Indicator Variation)

On Rate of Taper, all sizes 0.002 per foot. This tolerance may be applied on Sockets only in the direction which decreases the Rate of Taper.

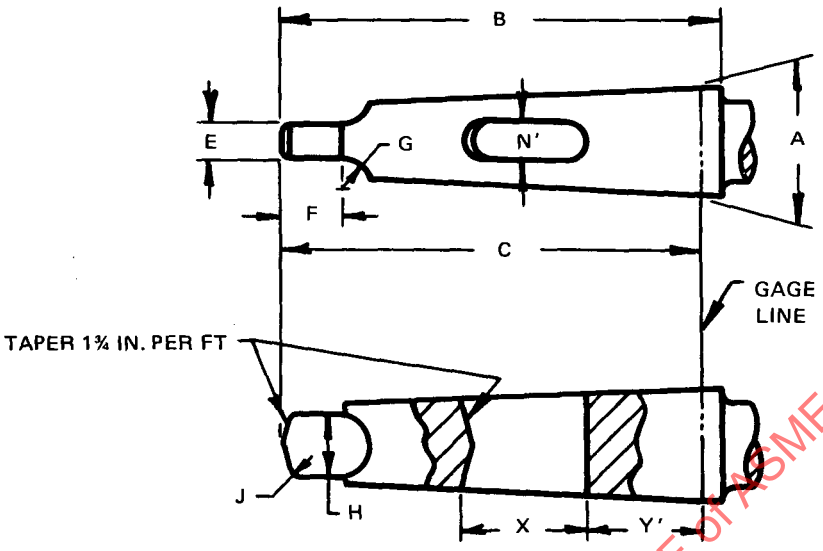


Table 5 Taper Drive Shank With Keeper Key Slot, Self Holding Tapers

SHANKS												
				Tang					Keeper Slot[2]		
No. of Taper	Diameter at Gage Line[1] A	Total Length of Shank B	Gage Line to End of Shank C	Thickness E	Length F	Radius of Mill G	Diameter H	Radius J	Gage Line to Bottom of Slot Y′	Length X	Width N′
3	0.938	3.88	3.69	0.312	0.56	0.28	0.78	0.08	1.03	1.13	0.266
4	1.231	4.88	4.63	0.469	0.63	0.31	0.97	0.09	1.41	1.19	0.391
4 1/2	1.500	5.38	5.13	0.562	0.69	0.38	1.20	0.13	1.72	1.25	0.453
5	1.748	6.13	5.88	0.625	0.75	0.38	1.41	0.13	2.00	1.38	0.516
6	2.494	8.56	8.25	0.750	1.13	0.50	2.00	0.16	2.13	1.63	0.641
7	3.270	11.63	11.25	1.125	1.38	0.75	2.63	0.19	2.50	1.69	0.766

All dimensions given in inches.

[1]See Table 11 for Ring Gage dimensions.

[2]Edges at entrance side of Slots N′ shall be chamfered at 45 deg as follows:

No. 3, 3/64 inch, all other sizes 1/16 inch deep.

For Tapers Nos. 4–7 inclusive using Key Drive see also ANSI B5.40-1977 Tables 4 and 5 on Spindle Noses and Tool Shanks for Horizontal Boring Machines.

TOLERANCES

Diameter of shank at Gage Line (A)
All sizes, +0.002, −0.000

Thickness of Tang (E)
Up to and including No. 5, +0.000, −0.006
Larger than No. 5, +0.000, −0.008

Width of Slots (N′)
Up to and including No. 5, +0.006, −0.000
Larger than No. 5, +0.008, −0.000

Centrality of Tang (E) with Centerline of Taper
0.0025 (0.005 Total Indicator Variation)

Centrality of Slots (N′) with Centerline of Taper
0.0025 (0.005 Total indicator Variation)

On Rate of Taper, all sizes 0.002 per foot.
This tolerance may be applied on shanks only in the direction which increases the Rate of Taper.

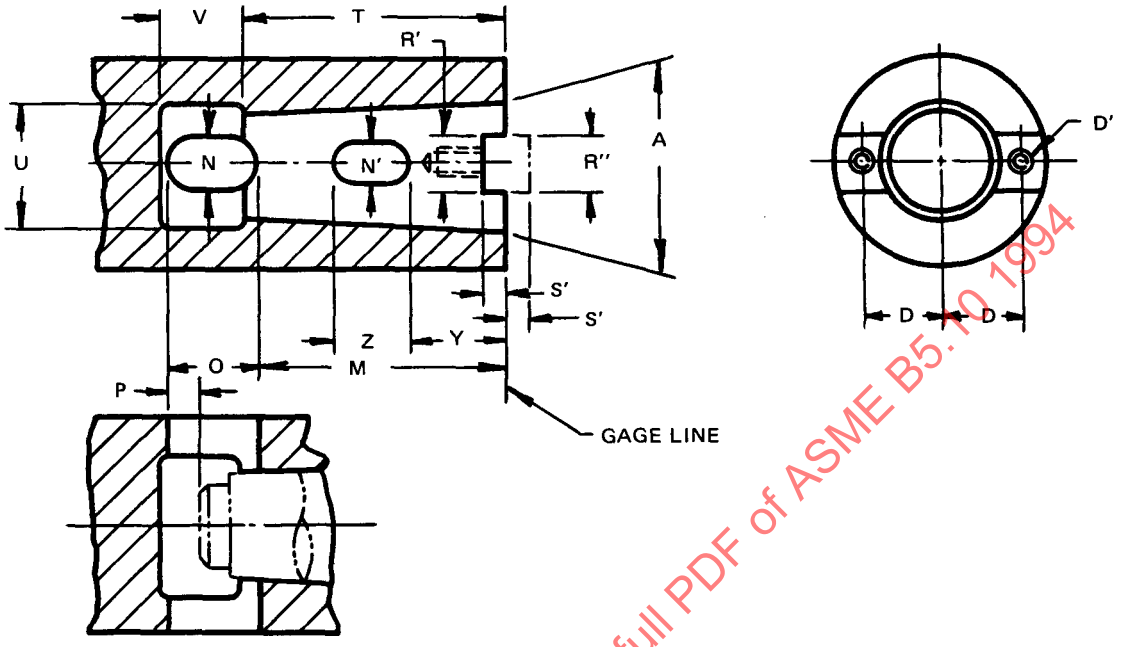


Table 6 Nose Key Drive Socket With Keeper Key Slot, Self Holding Tapers

SOCKETS

No. of Taper	Diameter at Gage Line[1] A	Drive Key: Screw Holes: Center Line to Center of Screw D	Drive Key: Screw Holes: UNF-2B Hole UNF-2A Screw D′	Drive Key: Width R″	Drive Keyway: Width R′	Drive Keyway: Depth S′	Gage Line to Front of Relief T	Diameter of Relief U	Depth of Relief V	Gage Line to Keyway M	Tang Slot[2]: Width N	Tang Slot[2]: Length O	Tang Slot[2]: Shank End to Back of Tang Slot P	Keeper Slot[2]: Gage Line to Front of Slot Y	Keeper Slot[2]: Length Z	Keeper Slot[2]: Width N′
200	2.000	1.41	0.375	0.999	1.000	0.50	4.75	1.81	1.00	4.50	0.656	1.56	0.94	2.00	1.69	0.656
250	2.500	1.66	0.375	0.999	1.000	0.50	5.50	2.25	1.00	5.19	0.781	1.94	1.25	2.25	1.69	0.781
300	3.000	2.25	0.375	1.999	2.000	0.50	6.25	2.75	1.00	5.94	1.031	2.19	1.50	2.63	1.69	1.031
350	3.500	2.50	0.375	1.999	2.000	0.50	6.94	3.19	1.25	6.75	1.031	2.19	1.50	3.00	2.13	1.031
400	4.000	2.75	0.375	1.999	2.000	0.50	7.69	3.63	1.25	7.50	1.031	2.19	1.50	3.25	2.38	1.031
450	4.500	3.00	0.500	2.999	3.000	0.75	8.38	4.19	1.50	8.00	1.031	2.75	1.75	3.63	2.56	1.031
500	5.000	3.25	0.500	2.999	3.000	0.75	9.13	4.63	1.50	8.75	1.031	2.75	1.75	4.00	2.75	1.031
600	6.000	3.75	0.500	2.999	3.000	0.75	10.56	5.50	1.75	10.13	1.281	3.25	2.06	4.63	3.25	1.281
800	8.000	4.75	0.500	3.999	4.000	1.00	13.50	7.38	2.00	12.88	1.781	4.25	2.75	5.75	4.25	1.781
1000	10.000	...	...	3.999	4.000	1.00	16.31	9.19	2.50	15.75	2.031	5.00	3.31	7.00	5.00	2.031
1200	12.000	...	...	3.999	4.000	1.00	19.00	11.00	3.00	18.50	2.531	6.00	4.00	8.25	6.00	2.531

All dimensions given in inches.

[1] See Table 10 for Plug Gage Dimensions.

[2] Edges at entrance side of Slots N and N′ shall be chamfered at 45 deg. as follows: Nos. 200 to 350 inclusive, $^3/_{16}$ inch deep; Nos. 400 to 600 inclusive, $^3/_{32}$ inch deep; Nos. 800 to 1200 inclusive, $^1/_8$ inch deep.

For additional Key size data see ANSI B5.40-1977 Table 6 on Spindle Noses and Tool Shanks for Horizontal Boring Machines.

TOLERANCES

Diameter of Hole at Gage Line (A)
All sizes. +0.000, −0.002
Width of Slots (N) and (N′) +0.008, −0.000
Width of Drive Keyway (R′) +0.000, −0.001
Centrality of Slots (N) and (N′) with Centerline of Spindle, 0.007
Centrality of Drive Keyway (R′) with Centerline of Spindle; 0.002 Total Indicator Variation
Width of Key (R″) +0.000, −0.001
On Rate of Taper, all sizes 0.002 per foot. This tolerance may be applied on sockets only in the direction which decreases the Rate of Taper.

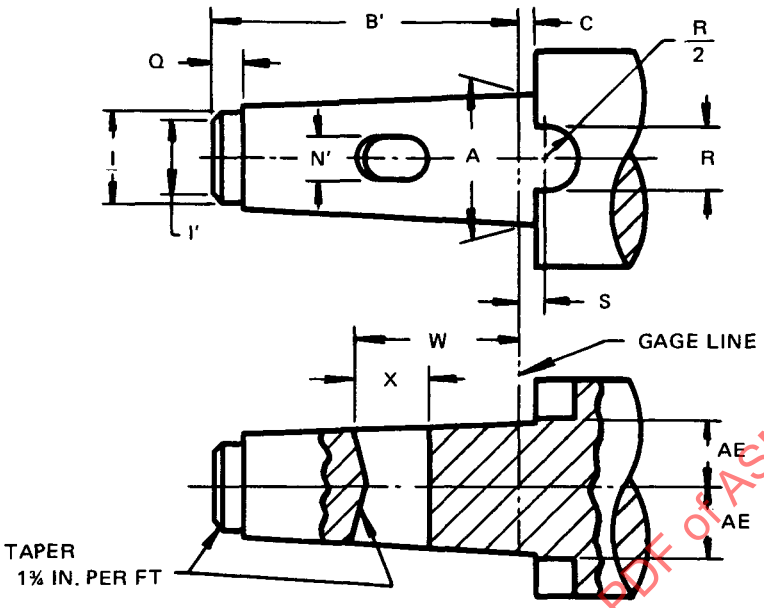


Table 7 Nose Key Drive Shank for Keeper Key Drive, Self Holding Tapers

SHANKS												
							Drive Keyway			Keeper Slot[2]		
No. of Taper	Diameter at Gage Line[1] A	Length From Gage Line B'	Exposed Length C	Length of Relief Q	Diameter of Flat I'	Diameter of Relief I	Width R	Depth S	Center Line to Bottom of Keyway AE	Gage Line to Back of Slot W	Length X	Width N'
200	2.000	5.13	Min 0.003 Max 0.035 for all sizes	0.25	1.38	1.63	1.010	.562	1.005	3.44	1.56	0.656
250	2.500	5.88		0.25	1.38	1.06	1.010	.562	1.255	3.69	1.56	0.781
300	3.000	6.63		0.25	1.63	2.50	2.010	.562	1.505	4.06	1.56	1.031
350	3.500	7.44		0.31	2.00	2.94	2.010	.562	1.755	4.88	2.00	1.031
400	4.000	8.19		0.31	2.13	3.31	2.010	.562	2.005	5.31	2.25	1.031
450	4.500	9.00		0.38	2.38	3.81	3.010	.812	2.255	5.88	2.44	1.031
500	5.000	9.75		0.38	2.50	4.25	3.010	.812	2.505	6.44	2.63	1.031
600	6.000	11.31		0.44	3.00	5.19	3.010	.812	3.005	7.44	3.00	1.281
800	8.000	14.38		0.50	3.50	7.00	4.010	1.062	4.005	9.56	4.00	1.781
1000	10.000	17.44		0.63	4.50	8.75	4.010	1.062	5.005	11.50	4.75	2.031
1200	12.000	20.50		0.75	5.38	10.50	4.010	1.062	6.005	13.75	5.75	2.031

All dimensions given in inches.

[1] See Table 11 for Ring Gage dimensions.

[2] Edges at entrance side of Slots N' shall be chamfered at 45 deg as follows: Nos. 200 to 350 inclusive, $^1/_{16}$ inch deep; Nos. 400 to 600 inclusive, $^3/_{32}$ inch deep; Nos. 800 to 1200 inclusive, $^1/_8$ inch deep.

For additional Key size data see ANSI B5.40-1977 Table 6 on Spindle Noses and Tool Shanks for Horizontal Boring Machines.

TOLERANCES

Diameter of Shank at Gage Line (A)
All sizes, +0.002, −0.000
Width of Slot (N') +0.008, −0.000
Width of Drive Keyway (R)
+0.010, −0.000
Centrality of Slot (N') with Centerline of Spindle, 0.007
Centrality of Drive Keyway (R) with Centerline of Spindle, 0.004 Total Indicator Variation.

Distance (AE) bottom of Keyway to Centerline of Taper +0.010, −0.000
On rate of Taper, all sizes 0.002 per foot. This tolerance may be applied on Shanks only in the direction which increases the Rate of Taper.

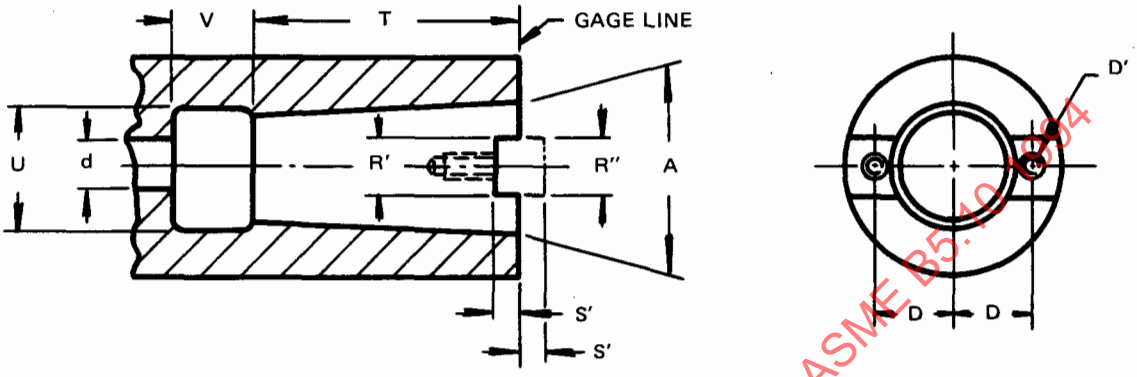


Table 8 Nose Key Drive Socket For Use With Drawbolt, Self Holding Tapers

SOCKETS										
		Drive Key			Drive Keyway					
		Screw Holes								
No. of Taper	Diameter at Gage Line[1] A	Center Line to Center of Screw D	UNF 2B Hole UNF 2A Screw D′	Width R″	Width R′	Depth S′	Gage Line to Front of Relief T	Diameter of Relief U	Depth of Relief V	Diameter of Draw Bolt Hole d
200	2.000	1.41	0.38	0.999	1.000	0.50	4.75	1.81	1.00	1.00
250	2.500	1.66	0.38	0.999	1.000	0.50	5.50	2.25	1.00	1.00
300	3.000	2.25	0.38	1.999	2.000	0.50	6.25	2.75	1.00	1.13
350	3.500	2.50	0.38	1.999	2.000	0.50	6.94	3.19	1.25	1.13
400	4.000	2.75	0.38	1.999	2.000	0.50	7.69	3.63	1.25	1.63
450	4.500	3.00	0.50	2.999	3.000	0.75	8.38	4.19	1.50	1.63
500	5.000	3.25	0.50	2.999	3.000	0.75	9.13	4.63	1.50	1.63
600	6.000	3.75	0.50	2.999	3.000	0.75	10.56	5.50	1.75	2.25
800	8.000	4.75	0.50	3.999	4.000	1.00	13.50	7.38	2.00	2.25
1000	10.000	...	...	3.999	4.000	1.00	16.31	9.19	2.50	2.25
1200	12.000	...	...	3.999	4.000	1.00	19.00	11.00	3.00	2.25

All dimensions given in inches.
[1]See Table 10 for Plug Gage dimensions.
For additional Key size data see ANSI B5.40-1977 Table 8 on Spindle Noses and Tool Shanks for Horizontal Boring Machines.

TOLERANCES

Diameter of Hole at Gage Line (A)
All sizes, +0.000, −0.002
Width of Drive Keyway (R′) +0.000, −0.001
Centrality of Drive Keyway (R′) with Centerline of Spindle, 0.002 Total Indicator Variation.

On Rate of Taper, all sizes 0.002 per foot.
This tolerance may be applied on Sockets only in the direction which decreases the Rate of Taper.

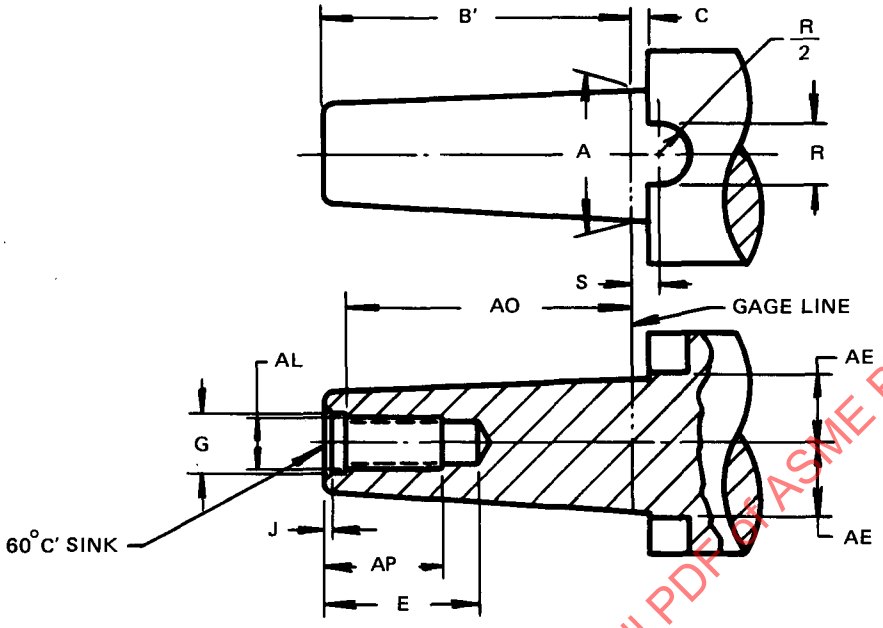


Table 9 Nose Key Drive Shank For Use With Drawbolt, Self Holding Tapers

SHANKS													
				Drawbar Hole						Drive Keyway		
No. of Taper	Diameter at Gage Line[1] A	Length From Gage Line B′	Exposed Length C	Diameter UNC-2B AL	Depth of Drilled Hole E	Depth of Thread AP	Diameter of Counter Bore G	Gage Line to First Thread AO	Depth of 60° Chamfer J	Width R	Depth S	Center Line to Bottom of Keyway AE
200	2.000	5.13	Min	7/8-9	2.44	1.75	0.91	4.78	0.13	1.010	0.562	1.005
250	2.500	5.88	0.003	7/8-9	2.44	1.75	0.91	5.53	0.13	1.010	0.562	1.255
300	3.000	6.63	Max	1 -8	2.75	2.00	1.03	6.19	0.19	2.010	0.562	1.505
350	3.500	7.44	0.035	1 -8	2.75	2.00	1.03	7.00	0.19	2.010	0.562	1.755
400	4.000	8.19	For	1 1/2-6	4.00	3.00	1.53	7.50	0.31	2.010	0.562	2.005
450	4.500	9.00	all	1 1/2-6	4.00	3.00	1.53	8.31	0.31	3.010	0.812	2.255
500	5.000	9.75	sizes	1 1/2-6	4.00	3.00	1.53	9.06	0.31	3.010	0.812	2.505
600	6.000	11.31		2 -4 1/2	5.31	4.00	2.03	10.38	0.50	3.010	0.812	3.005
800	8.000	14.38		2 -4 1/2	5.31	4.00	2.03	13.44	0.50	4.010	1.062	4.005
1000	10.000	17.44		2 -4 1/2	5.31	4.00	2.03	16.50	0.50	4.010	1.062	5.005
1200	12.000	20.50		2 -4 1/2	5.31	4.00	2.03	19.56	0.50	4.010	1.062	6.005

All dimensions given in inches.
[1]See Table 11 for Ring Gage dimensions.
For additional Key size data see ANSI B5.40-1977 Table 8 on Spindle Noses and Tool Shanks for Horizontal Boring Machines.

TOLERANCES

Diameter of Shank at Gage Line (A)
All sizes +0.002, −0.000
Width of Drive Keyway (R) +0.010, −0.000
Centrality of Drive Keyway (R) with Centerline of Shank 0.004 Total Indicator Variation
Distance (AE) Bottom of Keyway to Centerline of Taper +0.010, −0.000

On Rate of Taper, all sizes 0.002 per foot.
This tolerance may be applied on Shanks only in the direction which increases the Rate of Taper

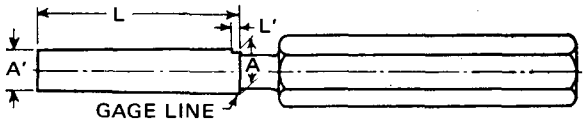


Table 10 Plug Gages, Self Holding Taperss

No. of Taper	Taper per Foot[1] (Basic)	Taper per Inch[2]	Diameter at Gage Line[1] A	Tolerances for Diameter A			Diameter at Small End[3] A'	Length Gage Line to Small End L	Depth of Gaging Notch (Optional) L'	E Taper Deviation[4]		
				Class X Gage	Class Y Gage	Class Z Gage				Class X Gage	Class Y Gage	Class Z Gage
0.239	0.50200	0.041833	0.23922	+0.00004	+0.00007	+0.00010	0.20000	0.94	0.048	0.00004	0.00007	0.00010
0.299	0.50200	0.041833	0.29968	+0.00004	+0.00007	+0.00010	0.25000	1.19	0.048	0.00004	0.00007	0.00010
0.375	0.50200	0.041833	0.37525	+0.00004	+0.00007	+0.00010	0.31250	1.50	0.048	0.00004	0.00007	0.00010
1	0.59858	0.049882	0.47500	+0.00004	+0.00007	+0.00010	0.36900	2.13	0.040	0.00004	0.00007	0.00010
2	0.59941	0.049951	0.70000	+0.00004	+0.00007	+0.00010	0.57200	2.56	0.040	0.00004	0.00007	0.00010
3	0.60235	0.050196	0.93800	+0.00006	+0.00009	+0.00012	0.77800	3.19	0.040	0.00006	0.00009	0.00012
4	0.62326	0.051938	1.23100	+0.00006	+0.00009	+0.00012	1.02000	4.06	0.038	0.00006	0.00009	0.00012
4 1/2	0.62400	0.052000	1.50000	+0.00006	+0.00009	+0.00012	1.26600	4.50	0.038	0.00006	0.00009	0.00012
5	0.63151	0.052626	1.74800	+0.00008	+0.00012	+0.00016	1.47500	5.19	0.038	0.00008	0.00012	0.00016
6	0.62565	0.052138	2.49400	+0.00008	+0.00012	+0.00016	2.11600	7.25	0.038	0.00008	0.00012	0.00016
7	0.62400	0.052000	3.27000	+0.00010	+0.00015	+0.00020	2.75000	10.00	0.038	0.00010	0.00015	0.00020
200	0.750	0.062500	2.000	+0.00008	+0.00012	+0.00016	1.703	4.75	0.032	0.00008	0.00012	0.00016
250	0.750	0.062500	2.500	+0.00008	+0.00012	+0.00016	2.156	5.50	0.032	0.00008	0.00012	0.00016
300	0.750	0.062500	3.000	+0.00010	+0.00015	+0.00020	2.609	6.25	0.032	0.00010	0.00015	0.00020
350	0.750	0.062500	3.500	+0.00010	+0.00015	+0.00020	3.063	7.00	0.032	0.00010	0.00015	0.00020
400	0.750	0.062500	4.000	+0.00010	+0.00015	+0.00020	3.516	7.75	0.032	0.00010	0.00015	0.00020
450	0.750	0.062500	4.500	+0.00010	+0.00015	+0.00020	3.969	8.50	0.032	0.00010	0.00015	0.00020
500	0.750	0.062500	5.000	+0.00013	+0.00019	+0.00025	4.422	9.25	0.032	0.00013	0.00019	0.00025
600	0.750	0.062500	6.000	+0.00013	+0.00019	+0.00025	5.328	10.75	0.032	0.00013	0.00019	0.00025
800	0.750	0.062500	8.000	+0.00016	+0.00024	+0.00032	7.141	13.75	0.032	0.00016	0.00024	0.00032
1000	0.750	0.062500	10.000	+0.00020	+0.00030	+0.00040	8.953	16.75	0.032	0.00020	0.00030	0.00040
1200	0.750	0.062500	12.000	+0.00020	+0.00030	+0.00040	10.766	19.75	0.032	0.00020	0.00030	0.00040

All dimensions given in inches.

[1]Taper per Foot and Diameter at "Gage Line" (Col. A) Basic Dimensions.

[2]Calculated from Taper per Foot which is Basic.

[3]Dimensions in Column (A') Calculated for reference only.

[4]Taper deviation is the permissible allowance from true taper at any point of diameter in the length of the gage. On taper *plug* gages, this deviation may be applied only in the direction which *decreases* the rate of taper.

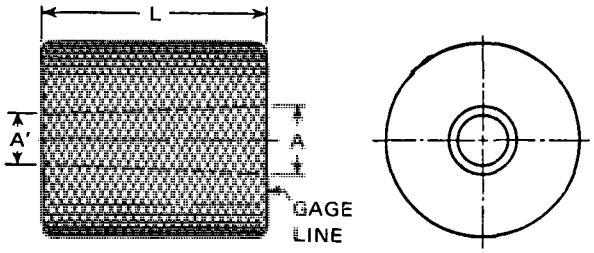


Table 11 Ring Gages, Self Holding Tapers

No. of Taper	Taper per Foot[1] (Basic)	Taper per Inch[2]	Diameter at Gage Line[1] A	Tolerances for Diameter A			REF Diameter at Small End[3] A'	Length L	D Taper Deviation[4]		
				Class X Gage	Class Y Gage	Class Z Gage			Class X Gage	Class Y Gage	Class Z Gage
0.239	0.50200	0.041833	0.23922	−0.00004	−0.00007	−0.00010	0.20000	0.94	0.00004	0.00007	0.00010
0.299	0.50200	0.041833	0.29968	−0.00004	−0.00007	−0.00010	0.25000	1.19	0.00004	0.00007	0.00010
0.375	0.50200	0.041833	0.37525	−0.00004	−0.00007	−0.00010	0.31250	1.50	0.00004	0.00007	0.00010
1	0.59858	0.049882	0.47500	−0.00004	−0.00007	−0.00010	0.36900	2.13	0.00004	0.00007	0.00010
2	0.59941	0.049951	0.70000	−0.00004	−0.00007	−0.00010	0.57200	2.56	0.00004	0.00007	0.00010
3	0.60235	0.050196	0.93800	−0.00006	−0.00009	−0.00012	0.77800	3.19	0.00006	0.00009	0.00012
4	0.62326	0.051938	1.23100	−0.00006	−0.00009	−0.00012	1.02000	4.06	0.00006	0.00009	0.00012
4 1/2	0.62400	0.052000	1.50000	−0.00006	−0.00009	−0.00012	1.26600	4.50	0.00006	0.00009	0.00012
5	0.63151	0.052626	1.74800	−0.00008	−0.00012	−0.00016	1.47500	5.19	0.00008	0.00012	0.00016
6	0.62565	0.052138	2.49400	−0.00008	−0.00012	−0.00016	2.11600	7.25	0.00008	0.00012	0.00016
7	0.62400	0.052000	3.27000	−0.00010	−0.00015	−0.00020	2.75000	10.00	0.00010	0.00015	0.00020
200	0.750	0.062500	2.0000	−0.00008	−0.00012	−0.00016	1.703	4.75	0.00008	0.00012	0.00016
250	0.750	0.062500	2.5000	−0.00008	−0.00012	−0.00016	2.156	5.50	0.00008	0.00012	0.00016
300	0.750	0.062500	3.0000	−0.00010	−0.00015	−0.00020	2.609	6.25	0.00010	0.00015	0.00020
350	0.750	0.062500	3.5000	−0.00010	−0.00015	−0.00020	3.063	7.00	0.00010	0.00015	0.00020
400	0.750	0.062500	4.0000	−0.00010	−0.00015	−0.00020	3.516	7.75	0.00010	0.00015	0.00020
450	0.750	0.062500	4.5000	−0.00010	−0.00015	−0.00020	3.969	8.50	0.00010	0.00015	0.00020
500	0.750	0.062500	5.0000	−0.00013	−0.00019	−0.00025	4.422	9.25	0.00013	0.00019	0.00025
600	0.750	0.062500	6.0000	−0.00013	−0.00019	−0.00025	5.328	10.75	0.00013	0.00019	0.00025
800	0.750	0.062500	8.0000	−0.00016	−0.00024	−0.00032	7.141	13.75	0.00016	0.00024	0.00032
1000	0.750	0.062500	10.0000	−0.00020	−0.00030	−0.00040	8.953	16.75	0.00020	0.00030	0.00040
1200	0.750	0.062500	12.0000	−0.00020	−0.00030	−0.00040	10.766	19.75	0.00020	0.00030	0.00040

All dimensions given in inches.

[1]Taper per Foot and Diameter at "Gage Line" (Col. A) Basic Dimensions.

[2]Calculated from Taper per Foot which is Basic.

[3]Dimensions in Column (A') Calculated for reference only.

[4]Taper deviation is the permissible allowance from true taper at any point of diameter in the length of the gage. On taper *ring* gages, this deviation may be applied only in the direction which *increases* the rate of taper.

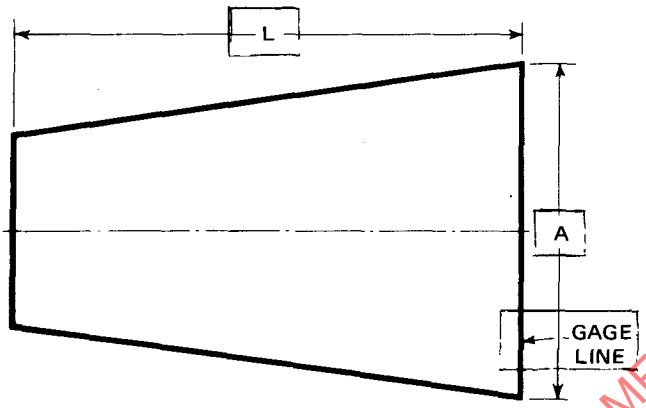


Table 12 Dimensions of Steep Machine Tapers

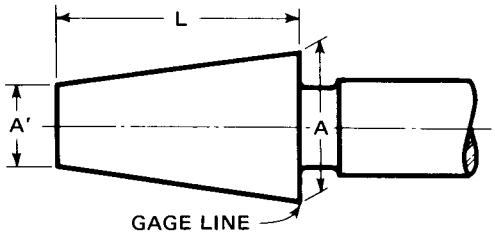
No. of Taper[1]	Taper per Foot [2]	Diameter at Gage Line A		Length Along Axis L	
5	3.500	1/2	0.500	11/16	0.6875
10	3.500	5/8	0.625	7/8	0.8750
15	3.500	3/4	0.750	1 1/16	1.0625
20	3.500	7/8	0.875	1 5/16	1.3125
25	3.500	1	1.000	1 9/16	1.5625
30	3.500	1 1/4	1.250	1 7/8	1.8750
35	3.500	1 1/2	1.500	2 1/4	2.2500
40	3.500	1 3/4	1.750	2 9/16	2.5625
45	3.500	2 1/4	2.250	3 5/16	3.3125
50	3.500	2 3/4	2.750	4	4.0000
55	3.500	3 1/2	3.500	5 3/16	5.1875
60	3.500	4 1/4	4.250	6 3/8	6.3750

All dimensions given in inches.

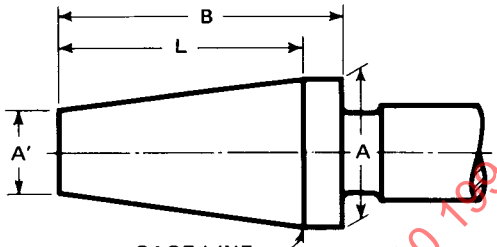
[1] The tapers numbered **10, 20, 30, 40, 50,** and **60** that are printed in bold type are designated as the "Preferred Series." The tapers numbered 5, 15, 25, 35, 45, and 55 that are printed in medium type are designated as the "Intermediate Series."

[2] This taper corresponds to an included angle of 16°, 35', 39.4".

For additional data see ANSI B5.18-1972 on Spindle Noses and Tool Shanks for Milling Machines.



CLASS X TYPE GAGE



CLASS Y & Z TYPE GAGE

Table 13 Plug Gages, Steep Machine Tapers

No. of Taper	Taper per Foot[1] (Basic)	Taper per Inch[2]	Diameter at Gage Line[1] A	Tolerances for Diameter A			Diameter at Small End[3] A'	Length Gage Line to Small End L	Overall Length of Gage Body B	E Taper Deviation[4]		
				Class X Gage	Class Y Gage	Class Z Gage				Class X Gage	Class Y Gage	Class Z Gage
5	3.500	0.29166	1/2 0.500	+0.00004	+0.00007	+0.00010	0.2995	11/16 0.6875	0.81	0.00004	0.00007	0.00010
10	3.500	0.29166	5/8 0.625	+0.00004	+0.00007	+0.00010	0.3698	7/8 0.8750	1.00	0.00004	0.00007	0.00010
15	3.500	0.29166	3/4 0.750	+0.00004	+0.00007	+0.00010	0.4401	1 1/16 1.0625	1.25	0.00004	0.00007	0.00010
20	3.500	0.29166	7/8 0.875	+0.00006	+0.00009	+0.00012	0.4922	1 5/16 1.3125	1.50	0.00006	0.00009	0.00012
25	3.500	0.29166	1 1.000	+0.00006	+0.00009	+0.00012	0.5443	1 9/16 1.5625	1.75	0.00006	0.00009	0.00012
30	3.500	0.29166	1 1/4 1.250	+0.00006	+0.00009	+0.00012	0.7031	1 7/8 1.8750	2.06	0.00006	0.00009	0.00012
35	3.500	0.29166	1 1/2 1.500	+0.00006	+0.00009	+0.00012	0.8438	2 1/4 2.2500	2.44	0.00006	0.00009	0.00012
40	3.500	0.29166	1 3/4 1.750	+0.00008	+0.00012	+0.00016	1.0026	2 9/16 2.5625	2.75	0.00008	0.00012	0.00016
45	3.500	0.29166	2 1/4 2.250	+0.00008	+0.00012	+0.00016	1.2839	3 5/16 3.3125	3.50	0.00008	0.00012	0.00016
50	3.500	0.29166	2 3/4 2.750	+0.00010	+0.00015	+0.00020	1.5833	4 4.0000	4.25	0.00010	0.00015	0.00020
55	3.500	0.29166	3 1/2 3.500	+0.00010	+0.00015	+0.00020	1.9870	5 3/16 5.1875	5.50	0.00010	0.00015	0.00020
60	3.500	0.29166	4 1/4 4.250	+0.00010	+0.00015	+0.00020	2.3906	6 3/8 6.3750	6.75	0.00010	0.00015	0.00020

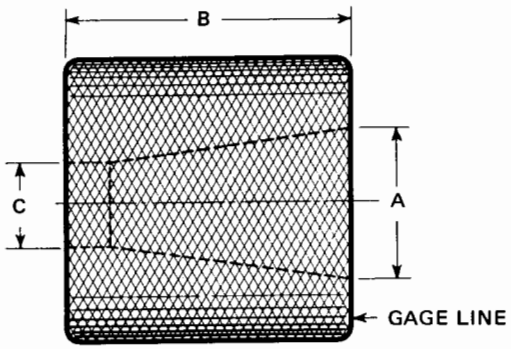
All dimensions given in inches.

[1]Taper per foot and Diameter at "Gage Line" (Col. A) Basic Dimensions.

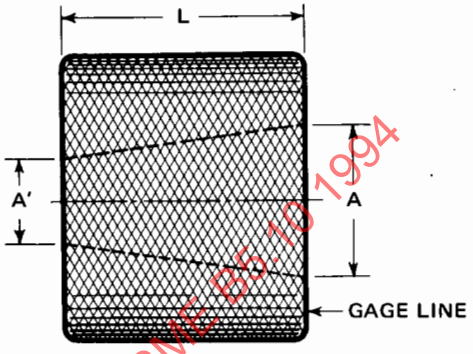
[2]Calculated from Taper per Foot which is Basic.

[3]Dimensions in Column (A') Calculated for reference only.

[4]Taper deviation is the permissible allowance from true taper at any point of diameter in the length of the gage. On taper *plug* gages, this deviation may be applied only in the direction which *decreases* the rate of taper.



CLASS Y & Z TYPE GAGE



CLASS X TYPE GAGE

Table 14 Ring Gages, Steep Machine Tapers

No. of Taper	Taper per Foot[1] (Basic)	Taper per Inch[2]	Diameter at Gage Line[1] A	Tolerance for Diameter A			Diameter at Small End[3] A′
				Class X Gage	Class Y Gage	Class Z Gage	
5	3.500	0.29166	1/2 0.500	−0.00004	−0.00007	−0.00010	0.2995
10	3.500	0.29166	5/8 0.625	−0.00004	−0.00007	−0.00010	0.3698
15	3.500	0.29166	3/4 0.750	−0.00004	−0.00007	−0.00010	0.4401
20	3.500	0.29166	7/8 0.875	−0.00006	−0.00009	−0.00012	0.4922
25	3.500	0.29166	1 1.000	−0.00006	−0.00009	−0.00012	0.5443
30	3.500	0.29166	1 1/4 1.250	−0.00006	−0.00009	−0.00012	0.7031
35	3.500	0.29166	1 1/2 1.500	−0.00006	−0.00009	−0.00012	0.8438
40	3.500	0.29166	1 3/4 1.750	−0.00008	−0.00012	−0.00016	1.0026
45	3.500	0.29166	2 1/4 2.250	−0.00008	−0.00012	−0.00016	1.2839
50	3.500	0.29166	2 3/4 2.750	−0.00010	−0.00015	−0.00020	1.5833
55	3.500	0.29166	3 1/2 3.500	−0.00010	−0.00015	−0.00020	1.9870
60	3.500	0.29166	4 1/4 4.250	−0.00010	−0.00015	−0.00020	2.3906

Table 14 Ring Gages, Steep Machine Tapers (Continued)

No. of Taper	Length L		Overall Length of Gage Body B	Diameter of Opening C	E Taper Deviation[4]		
					Class X Gage	Class Y Gage	Class Z Gage
5	$11/16$	0.6875	0.81	0.30	0.00004	0.00007	0.00010
10	$7/8$	0.875	1.00	0.36	0.00004	0.00007	0.00010
15	$1\,1/16$	1.0625	1.25	0.44	0.00004	0.00007	0.00010
20	$1\,5/16$	1.3125	1.50	0.48	0.00006	0.00009	0.00012
25	$1\,9/16$	1.5625	1.75	0.53	0.00006	0.00009	0.00012
30	$1\,7/8$	1.8750	2.19	0.70	0.00006	0.00009	0.00012
35	$2\,1/4$	2.250	2.44	0.84	0.00006	0.00009	0.00012
40	$2\,9/16$	2.5625	2.75	1.00	0.00008	0.00012	0.00016
45	$3\,5/16$	3.3125	3.50	1.00	0.00008	0.00012	0.00016
50	4	4.000	4.25	1.00	0.00010	0.00015	0.00020
55	$5\,3/16$	5.1875	5.50	1.00	0.00010	0.00015	0.00020
60	$6\,3/8$	6.375	6.75	2.00	0.00010	0.00015	0.00020

All dimensions given in inches.
[1]Taper per Foot and Diameter at "Gage Line" (Col. A) Basic Dimensions.
[2]Calculated from Taper per Foot which is basic.
[3]Dimensions in Column (A') Calculated for reference only.
[4]Taper deviation is the permissible allowance from true taper at any point of diameter in the length of the gage. On taper *ring* gages, this deviation may be applied only in the direction which *increases* the rate of taper.

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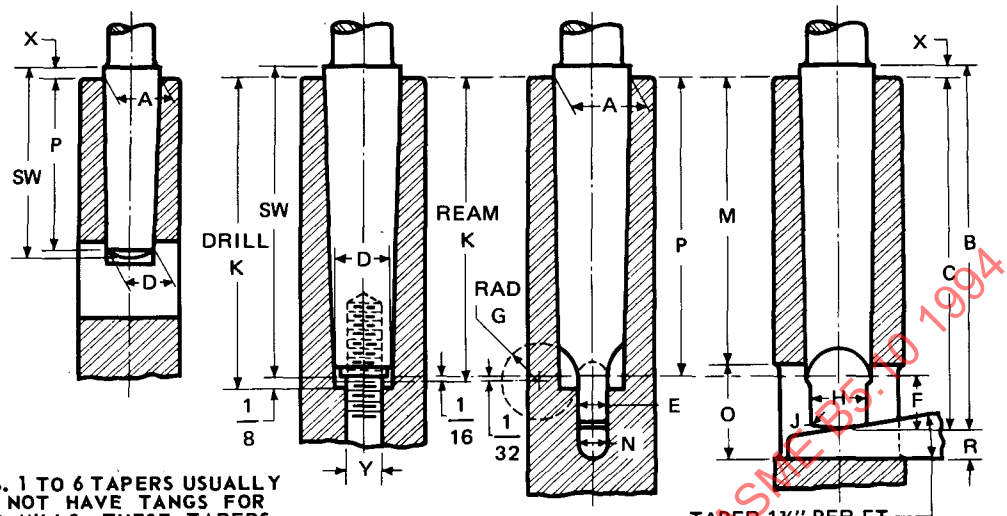
APPENDIX

This appendix includes data on tapers that are sometimes used by industry. The data given herein are presented for the sole purpose of giving information relative to such tapers.



NOS. 1 TO 6 TAPERS USUALLY DO NOT HAVE TANGS FOR END MILLS: THESE TAPERS DO HAVE TANGS FOR DRILLS

Y – DIAMETER, NUMBER AND HAND OF THREAD SHOULD BE SPECIFIED, TO MATCH DRAW-IN BOLT. (WHERE POSSIBLE, HAND OF THREAD SHOULD MATCH HAND OF CUTTER)

Table A Brown & Sharpe Tapers

No. of Taper	Taper per Foot[1]	Taper per Inch[2]	Diameter of Plug at Small End[1] D	Plug Depth #B&S Taper P	Plug Depth Diameter at Large End[2] A	Plug Depth B&S Mill. Mach. Taper P	Plug Depth Diameter at Large End[2] A	Shank Total Length of Shank with Tang B	Shank Length without Tang SW	Shank Depth C	Shank Projects from End of Socket X
1			(0.239)								
2	See Tapers Nos. (0.299) in Tables 1, 2 and 3.										
3			(0.375)								
4	0.50240	0.014867	0.3500	1.69	0.4206			2.19		2.09	
4	0.50240	0.041867	0.3500			1.25	0.4023	1.75	1.39	1.66	0.096
5	0.50160	0.041800	0.4500	2.13	0.5388			2.66		2.56	
5	0.50160	0.041800	0.4500			1.75	0.5232	2.28	1.91	2.19	0.094
6	0.50329	0.041941	0.5000	2.38	0.5996			2.97	2.53	2.88	0.094
7	0.50147	0.041789	0.6000	2.88	0.7201			3.50		3.41	
7	0.50147	0.041789	0.6000			3.00	0.7254	3.63	3.09	3.53	0.094
8	0.50100	0.041750	0.7500	3.56	0.8987			4.25	3.69	4.13	0.125
9	0.50085	0.041738	0.9001	4.25	1.0775			5.00		4.88	
9	0.50085	0.041738	0.9001			4.00	1.0671	4.75	4.13	4.63	0.125
10	0.51612	0.043010	1.04465	5.00	1.2597			5.84		5.72	
10	0.51612	0.043010	1.04465			5.6875	1.2893	6.53	5.81	6.41	0.125
11	0.50100	0.041750	1.24995	5.94	1.4978			6.78		6.66	
11	0.50100	0.041750	1.24995			6.750	1.5318	7.59	6.88	7.47	0.125
12	0.49973	0.041644	1.5001	7.13	1.7968	7.968	1.7968	8.06	7.25	7.94	0.125
13	0.50020	0.041683	1.75005	7.13	2.0731			8.69	7.88	8.56	0.125
14	0.50000	0.041666	2.0000	8.25	2.3438	8.250	2.3438	9.28	8.38	9.16	0.125
15	0.50000	0.041666	2.2500	8.75	2.6146			9.73	8.88	9.65	0.125
16	0.50000	0.041666	2.5000	9.25	2.8854			10.38	9.38	10.25	0.125
17	0.50000	0.041666	2.7500	9.75	3.1563				9.88		0.125
18	0.50000	0.041666	3.0000	10.25	3.4271				10.38		0.125

Table A Brown & Sharpe Tapers (*Continued*)

No. of Taper	Tang					Socket			Tang Slot		
	Thick-ness E	Length F	Radius of Mill G	Diameter H	Radius J	Min. Depth of Tapered Hole K: Drilled	Min. Depth of Tapered Hole K: Reamed	End of Socket to Tang Slot M	Width N	Length O	Shank End to Back of Tang Slot R
1			(0.239)								
2	See Tapers Nos.		(0.299)	in Tables 1, 2 and 3.							
3			(0.375)								
4	0.219	0.34	0.31	0.320	0.050	1.81	1.75	1.64	0.228	0.69	0.23
4	0.219	0.34	0.31	0.320	0.050	1.38	1.31	1.20	0.228	0.69	0.23
5	0.250	0.38	0.31	0.420	0.060	2.25	2.19	2.06	0.260	0.75	0.25
5	0.250	0.38	0.31	0.420	0.060	1.88	1.81	1.69	0.260	0.75	0.25
6	0.281	0.44	0.31	0.460	0.060	2.50	2.44	2.30	0.291	0.88	0.30
7	0.313	0.47	0.38	0.560	0.070	3.00	2.94	2.78	0.322	0.94	0.31
7	0.313	0.47	0.38	0.560	0.070	3.13	3.06	2.91	0.322	0.94	0.31
8	0.344	0.50	0.38	0.710	0.080	3.69	3.63	3.45	0.353	1.00	0.33
9	0.375	0.56	0.44	0.860	0.100	4.38	4.31	4.13	0.385	1.13	0.38
9	0.375	0.56	0.44	0.860	0.100	4.13	4.06	3.88	0.385	1.13	0.38
10	0.438	0.66	0.44	1.010	0.110	5.13	5.06	4.84	0.447	1.31	0.44
10	0.438	0.66	0.44	1.010	0.110	5.81	5.75	5.53	0.447	1.31	0.44
11	0.438	0.66	0.50	1.210	0.130	6.06	6.00	5.78	0.447	1.31	0.44
11	0.438	0.66	0.50	1.210	0.130	6.88	6.81	6.59	0.447	1.31	0.44
12	0.500	0.75	0.50	1.460	0.150	7.25	7.19	6.94	0.510	1.50	0.50
13	0.500	0.75	0.63	1.710	0.170	7.88	7.81	7.57	0.510	1.50	0.50
14	0.563	0.84	0.75	1.960	0.190	8.38	8.31	8.03	0.572	1.69	0.56
15	0.563	0.84	0.88	2.210	0.210	8.88	8.81	8.53	0.572	1.69	0.56
16	0.625	0.94	1.00	2.450	0.230	9.38	9.31	9.00	0.635	1.88	0.63
17						9.88	9.81				
18						10.38	10.31				

All dimensions in inches.
#These Depths are not used in all cases.
*These Lengths are standard for shank cutters.
[1]Taper per foot and diameter of plug at small end are basic.
[2]Taper per inch and diameter at large end (Col.'s A) calculated for reference only.

TOLERANCES

Diameter of shank at large end of socket (A)
All sizes +0.002, -0.000.
Diameter of hole at large end of socket (A)
All sizes, +0.000, -0.002.
Thickness of tang (E)
All sizes, +0.000, -0.006.
Width of tang slot (N)
All sizes, +0.006, -0.000.

Centrality of tang (E) with centerline of taper
.0025 (.005 Total Indicator Variation)
Centrality of tang slot (N) with centerline of taper
.0025 (.005 Total Indicator Variation)
On rate of taper, all sizes 0.002 per foot.
This tolerance may be applied on *shanks* only in the direction which *increases* the rate of taper and on *sockets* only in the direction which *decreases* the rate of taper.

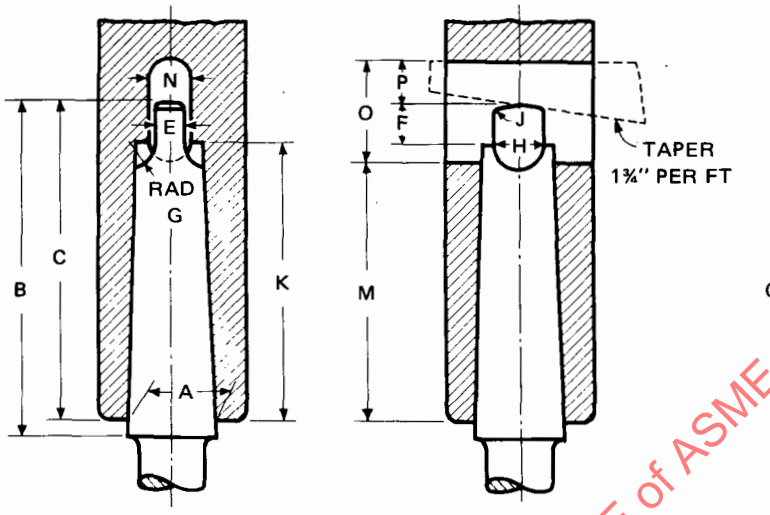


Table B Morse Tapers

No. of Taper	Taper per Foot[1]	Taper per Inch[1]	Diameter at End of Socket[1] A	Shank		Tang					Socket			Tang Slot		
				Total Length of Shank B	Depth C	Thickness E	Length F	Radius of Mill G	Diameter H	Radius J	Min. Depth of Tapered Hole K Drilled	Min. Depth of Tapered Hole K Reamed	End of Socket to Tang Slot M	Width N	Length O	Shank End to Back of Tang Slot P
0	0.62460	0.052050	0.3561	2.34	2.22	0.156	0.25	0.16	0.24	0.05	2.06	2.03	1.94	0.17	0.56	0.28
1																
2																
3																
4	For Tapers Nos. 1–6 Inclusive See Tables 1, 2 and 3.															
4½																
5																
6																
7	0.62400	0.052000	3.27000	11.625	11.25	1.125	1.38	0.75	2.63	0.19	10.16	10.08	9.50	1.156	2.63	0.875

All dimensions given in inches.

[1]Taper per foot, and diameter at end of socket (A) are basic dimensions.
Taper per inch, calculated for reference only.

TOLERANCES

Diameter of shank at end of socket (A)
All sizes, +0.002, -0.000.
Diameter of hole at end of socket (A)
All sizes, +0.000, -0.002.
Thickness of tang (E) Up to and including No. 5, +0.000, -0.006. Larger than No. 5, +0.000. -0.008
Width of tang slot (N) Up to and including No. 5, +0.006, -0.000. Larger than No. 5, +0.008, -0.000.
Centrality of tang (E) with centerline of taper 0.0025 (0.005 Total Indicator Variation)
Centrality of tang slot (N) with centerline of taper 0.0025 (0.005 Total Indicator Variation)
On rate of taper, all sizes 0.002 per foot.
This tolerance may applied on *shanks* only in the direction which *increases* the rate of taper and on *sockets* only in the direction which *decreases* the rate of taper.

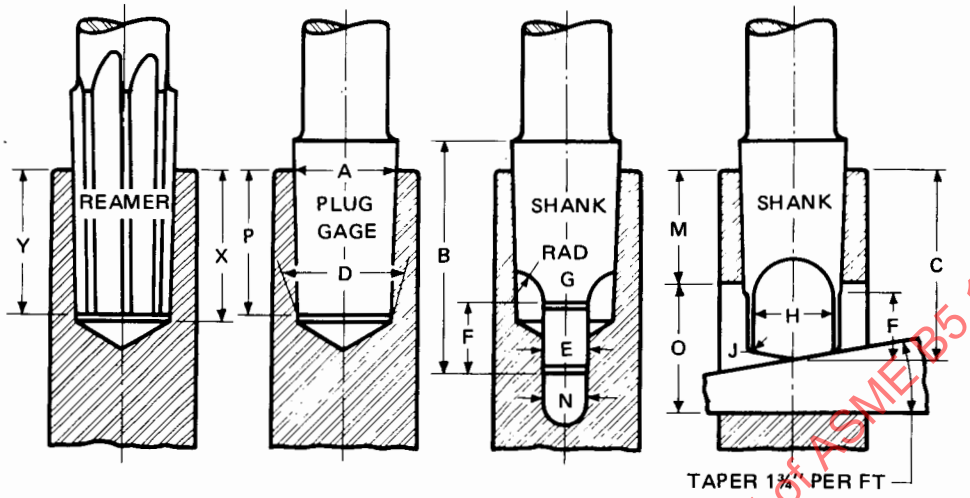


Table C Morse Stub Tapers

No. of Taper	Taper per Foot[1]	Taper per Inch[2]	Diameter of Plug at Small End[2] D	Diameter at End of Socket[1] A	Shank		Tang					Socket				Tang Slot	
					Total Length of Shank B	Depth C	Thickness E	Length F	Radius of Mill G	Diameter H	Radius J	Plug Depth P	Min. Depth of Tapered Hole: Drilled X	Min. Depth of Tapered Hole: Reamed Y	End of Socket to Tang Slot M	Width N	Length O
1	0.59858	0.049882	0.4314	0.475	1.31	1.13	0.203	0.31	0.19	0.41	0.05	0.88	0.94	0.91	0.78	0.219	0.72
2	0.59941	0.049951	0.6469	0.700	1.69	1.43	0.297	0.44	0.22	0.61	0.06	1.06	1.16	1.11	0.94	0.313	0.94
3	0.60235	0.050196	0.8753	0.938	2.00	1.75	0.391	0.56	0.28	0.81	0.08	1.25	1.38	1.31	1.06	0.406	1.13
4	0.62326	0.051938	1.1563	1.231	2.38	2.06	0.516	0.69	0.38	1.09	0.09	1.44	1.56	1.50	1.19	0.531	1.38
5	0.63151	0.052626	1.6526	1.748	3.00	2.68	0.750	0.94	0.56	1.59	0.13	1.81	1.94	1.88	1.44	0.781	1.75

All dimensions given in inches.
[1]Taper per foot and diameter at end of socket (Col. A) basic dimensions.
[2]Taper per inch and dimensions in Column "D" calculated for reference only.

TOLERANCES

Diameter of shank at end of socket (A)
All sizes +0.002, -0.000
Diameter of hole at end of socket (A)
All sizes +0.000, -0.002
Thickness of tang (E) up to and including No. 4 +0.000, -0.006. Larger than No. 4 +0.000, -0.008
Width of tang slot (N) Up to and including No. 4 +0.006, -0.000. Larger than No. 4 +0.008, -0.000

Centrality of tang (E) with centerline of taper 0.0025 (0.005 Total Indicator Variation).
Centrality of tang slot (N) with centerline of taper 0.0025 (0.005 Total Indicator Variation).
On rate of taper, all sizes 0.002 per foot.
This tolerance may be applied on *shanks* only in the direction which *increases* the rate of taper and on *sockets* only in the direction which *decreases* the rate of taper.

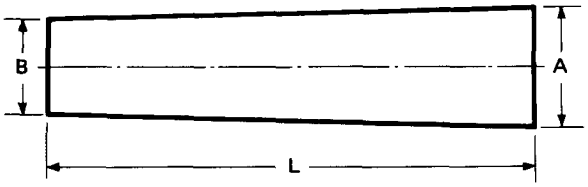


Table D Jarno Taper

No. of Taper	Taper per Foot	Taper per Inch	Dia. at Large End A	Dia. at Small End B	Length of Taper L
1	0.6	0.05	0.125	0.10	0.5
2	0.6	0.05	0.250	0.20	1.0
3	0.6	0.05	0.375	0.30	1.5
4	0.6	0.05	0.500	0.40	2.0
5	0.6	0.05	0.625	0.50	2.5
6	0.6	0.05	0.750	0.60	3.0
7	0.6	0.05	0.875	0.70	3.5
8	0.6	0.05	1.000	0.80	4.0
9	0.6	0.05	1.125	0.90	4.5
10	0.6	0.05	1.250	1.00	5.0
11	0.6	0.05	1.375	1.10	5.5
12	0.6	0.05	1.500	1.20	6.0
13	0.6	0.05	1.625	1.30	6.5
14	0.6	0.05	1.750	1.40	7.0
15	0.6	0.05	1.875	1.50	7.5
16	0.6	0.05	2.000	1.60	8.0
17	0.6	0.05	2.125	1.70	8.5
18	0.6	0.05	2.250	1.80	9.0
19	0.6	0.05	2.375	1.90	9.5
20	0.6	0.05	2.500	2.00	10.0

All dimensions in inches.

TOLERANCE

On rate of taper, all sizes 0.002 per foot.

This tolerance may be applied on *shanks* only in the direction which *increases* the rate of taper and on *sockets* only in the direction which *decreases* the rate of taper.

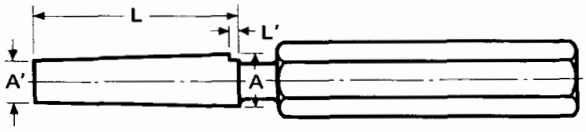


Table E Plug Gages
Brown & Sharpe Tapers

No. of Taper	Taper per Foot[1] (Basic)	Taper per Inch[2]	Diameter of Plug at Large End[3] A	Tolerances for Diameter A′ Class X Gage	Class Y Gage	Class Z Gage	Diameter at Small End[1] A′	Length L	Depth of Gaging Notch L′ (Optional)	E Taper Deviation[4] Class X Gage	Class Y Gage	Class Z Gage
1	For Plug Gages for Brown & Sharpe Nos. 1 See Table 10 Tapers Nos.						0.239					
2					2		0.299					
3					3		0.375					
4	0.50240	0.041867	0.4206	+0.00004	+0.00007	+0.00010	0.3500	1.69	0.048	0.00004	0.00007	0.00010
4	0.50240	0.041867	0.4023	+0.00004	+0.00007	+0.00010	0.3500	1.25	0.048	0.00004	0.00007	0.00010
5	0.50160	0.041800	0.5388	+0.00004	+0.00007	+0.00010	0.4500	2.13	0.048	0.00004	0.00007	0.00010
5	0.50160	0.041800	0.5232	+0.00004	+0.00007	+0.00010	0.4500	1.75	0.048	0.00004	0.00007	0.00010
6	0.50329	0.041941	0.5996	+0.00004	+0.00007	+0.00010	0.5000	2.38	0.048	0.00004	0.00007	0.00010
7	0.50147	0.041789	0.7201	+0.00004	+0.00007	+0.00010	0.6000	2.88	0.048	0.00004	0.00007	0.00010
7	0.50147	0.041789	0.7254	+0.00004	+0.00007	+0.00010	0.6000	3.00	0.048	0.00004	0.00007	0.00010
8	0.50100	0.041750	0.8987	+0.00004	+0.00007	+0.00010	0.7500	3.56	0.048	0.00004	0.00007	0.00010
9	0.50085	0.041738	1.0775	+0.00006	+0.00009	+0.00012	0.9001	4.25	0.048	0.00006	0.00009	0.00012
9	0.50085	0.041738	1.0671	+0.00006	+0.00009	+0.00012	0.9001	4.00	0.048	0.00006	0.00009	0.00012
10	0.51612	0.043010	1.2597	+0.00006	+0.00009	+0.00012	1.04465	5.00	0.048	0.00006	0.00009	0.00012
10	0.51612	0.043010	1.2893	+0.00006	+0.00009	+0.00012	1.04465	5.69	0.048	0.00006	0.00009	0.00012
11	0.50100	0.041750	1.4978	+0.00006	+0.00009	+0.00012	1.24995	5.94	0.048	0.00006	0.00009	0.00012
11	0.50100	0.041750	1.5318	+0.00006	+0.00009	+0.00012	1.24995	6.75	0.048	0.00006	0.00009	0.00012
12	0.49973	0.041644	1.7968	+0.00006	+0.00009	+0.00012	1.5001	7.13	0.048	0.00006	0.00009	0.00012
13	0.50020	0.041683	2.0731	+0.00008	+0.00012	+0.00016	1.75005	7.75	0.048	0.00008	0.00012	0.00016
14	0.50000	0.041666	2.3438	+0.00008	+0.00012	+0.00016	2.0000	8.25	0.048	0.00008	0.00012	0.00016
15	0.50000	0.041666	2.6146	+0.00008	+0.00012	+0.00016	2.2500	8.75	0.048	0.00008	0.00012	0.00016
16	0.50000	0.041666	2.8854	+0.00008	+0.00012	+0.00016	2.5000	9.25	0.048	0.00008	0.00012	0.00016
17	0.50000	0.041666	3.1563	+0.00010	+0.00015	+0.00020	2.7500	9.75	0.048	0.00010	0.00015	0.00020
18	0.50000	0.041666	3.4271	+0.00010	+0.00015	+0.00020	3.0000	10.25	0.048	0.00010	0.00015	0.00020

All dimensions given in inches.

[1]Taper per foot and diameter of plug at small end (Col. A′) are basic.

[2]Calculated from Taper per Foot which is basic.

[3]Diameter of Plug at Large End (Col. A) calculated for reference only.

[4]Taper deviation is the permissible allowance from true taper at any point of diameter in the length of the gage. On taper *plug* gages, this deviation may be applied only in the direction which *decreases* the rate of taper.