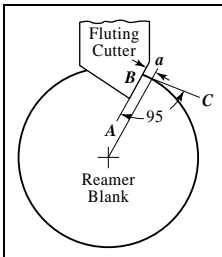


REAMERS

Hand Reamers.—Hand reamers are made with both straight and helical flutes. Helical flutes provide a shearing cut and are especially useful in reaming holes having keyways or grooves, as these are bridged over by the helical flutes, thus preventing binding or chattering. Hand reamers are made in both solid and expansion forms. The American standard dimensions for solid forms are given in the accompanying table. The expansion type is useful whenever, in connection with repair or other work, it is necessary to enlarge a reamed hole by a few thousandths of an inch. The expansion form is split through the fluted section and a slight amount of expansion is obtained by screwing in a tapering plug. The diameter increase may vary from 0.005 to 0.008 inch for reamers up to about 1 inch diameter and from 0.010 to 0.012 inch for diameters between 1 and 2 inches. Hand reamers are tapered slightly on the end to facilitate starting them properly. The actual diameter of the shanks of commercial reamers may be from 0.002 to 0.005 inch under the reamer size. That part of the shank that is squared should be turned smaller in diameter than the shank itself, so that, when applying a wrench, no burr may be raised that may mar the reamed hole if the reamer is passed clear through it.

When fluting reamers, the cutter is so set with relation to the center of the reamer blank that the tooth gets a slight negative rake; that is, the cutter should be set *ahead* of the center, as shown in the illustration accompanying the table giving the amount to set the cutter ahead of the radial line. The amount is so selected that a tangent to the circumference of the reamer at the cutting point makes an angle of approximately 95 degrees with the front face of the cutting edge.

Amount to Set Cutter Ahead of Radial Line to Obtain Negative Front Rake

	Size of Reamer	Dimension <i>a</i> , Inches	Size of Reamer	Dimension <i>a</i> , Inches	Size of Reamer	Dimension <i>a</i> , Inches
	$\frac{1}{4}$	0.011	$\frac{7}{8}$	0.038	2	0.087
$\frac{3}{8}$	0.016	1	0.044	$2\frac{1}{4}$	0.098	
$\frac{1}{2}$	0.022	$1\frac{1}{4}$	0.055	$2\frac{1}{2}$	0.109	
$\frac{5}{8}$	0.027	$1\frac{1}{2}$	0.066	$2\frac{3}{4}$	0.120	
$\frac{3}{4}$	0.033	$1\frac{3}{4}$	0.076	3	0.131	

When fluting reamers, it is necessary to “break up the flutes”; that is, to space the cutting edges unevenly around the reamer. The difference in spacing should be very slight and need not exceed two degrees one way or the other. The manner in which the breaking up of the flutes is usually done is to move the index head to which the reamer is fixed a certain amount more or less than it would be moved if the spacing were regular. A table is given showing the amount of this additional movement of the index crank for reamers with different numbers of flutes. When a reamer is provided with helical flutes, the angle of spiral should be such that the cutting edges make an angle of about 10 or at most 15 degrees with the axis of the reamer.

The relief of the cutting edges should be comparatively slight. An eccentric relief, that is, one where the land back of the cutting edge is convex, rather than flat, is used by one or two manufacturers, and is preferable for finishing reamers, as the reamer will hold its size longer. When hand reamers are used merely for removing stock, or simply for enlarging holes, the flat relief is better, because the reamer has a keener cutting edge. The width of the land of the cutting edges should be about $\frac{1}{32}$ inch for a $\frac{1}{4}$ -inch, $\frac{1}{16}$ inch for a 1-inch, and $\frac{3}{32}$ inch for a 3-inch reamer.

Irregular Spacing of Teeth in Reamers

Number of flutes in reamer	4	6	8	10	12	14	16
Index circle to use	39	39	39	39	39	49	20
Before cutting	Move Spindle the Number of Holes below More or Less than for Regular Spacing						
2d flute	8 less	4 less	3 less	2 less	4 less	3 less	2 less
3d flute	4 more	5 more	5 more	3 more	4 more	2 more	2 more
4th flute	6 less	7 less	2 less	5 less	1 less	2 less	1 less
5th flute	...	6 more	4 more	2 more	3 more	4 more	2 more
6th flute	...	5 less	6 less	2 less	4 less	1 less	2 less
7th flute	...	...	2 more	3 more	4 more	3 more	1 more
8th flute	...	...	3 less	2 less	3 less	2 less	2 less
9th flute	...	...	...	5 more	2 more	1 more	2 more
10th flute	...	...	...	1 less	2 less	3 less	2 less
11th flute	...	...	...	...	3 more	3 more	1 more
12th flute	...	...	...	...	4 less	2 less	2 less
13th flute	...	...	...	...	...	2 more	2 more
14th flute	...	...	...	...	...	3 less	1 less
15th flute	...	...	...	...	...	...	2 more
16th flute	...	...	...	...	...	...	2 less

Threaded-end Hand Reamers.—Hand reamers are sometimes provided with a thread at the extreme point in order to give them a uniform feed when reaming. The diameter on the top of this thread at the point of the reamer is slightly smaller than the reamer itself, and the thread tapers upward until it reaches a dimension of from 0.003 to 0.008 inch, according to size, below the size of the reamer; at this point, the thread stops and a short neck about $\frac{1}{16}$ inch wide separates the threaded portion from the actual reamer, which is provided with a short taper from $\frac{3}{16}$ to $\frac{7}{16}$ inch long up to where the standard diameter is reached. The length of the threaded portion and the number of threads per inch for reamers of this kind are given in the accompanying table. The thread employed is a sharp V-thread.

Dimensions for Threaded-End Hand Reamers

Sizes of Reamers	Length of Threaded Part	No. of Threads per Inch	Dia. of Thread at Point of Reamer	Sizes of Reamers	Length of Threaded Part	No. of Threads per Inch	Dia. of Thread at Point of Reamer
			Full diameter				Full diameter
$\frac{1}{8}$ – $\frac{5}{16}$	$\frac{3}{8}$	32	–0.006	$1\frac{1}{32}$ – $1\frac{1}{2}$	$\frac{9}{16}$	18	–0.010
$\frac{11}{32}$ – $\frac{1}{2}$	$\frac{7}{16}$	28	–0.006	$1\frac{17}{32}$ –2	$\frac{9}{16}$	18	–0.012
$\frac{17}{32}$ – $\frac{3}{4}$	$\frac{1}{2}$	24	–0.008	$2\frac{1}{32}$ – $2\frac{1}{2}$	$\frac{9}{16}$	18	–0.015
$\frac{25}{32}$ –1	$\frac{9}{16}$	18	–0.008	$2\frac{17}{32}$ –3	$\frac{9}{16}$	18	–0.020

Fluted Chucking Reamers.—Reamers of this type are used in turret lathes, screw machines, etc., for enlarging holes and finishing them smooth and to the required size. The best results are obtained with a floating type of holder that permits a reamer to align itself with the hole being reamed. These reamers are intended for removing a small amount of metal, 0.005 to 0.010 inch being common allowances. Fluted chucking reamers are provided either with a straight shank or a standard taper shank. (See table for standard dimensions.)

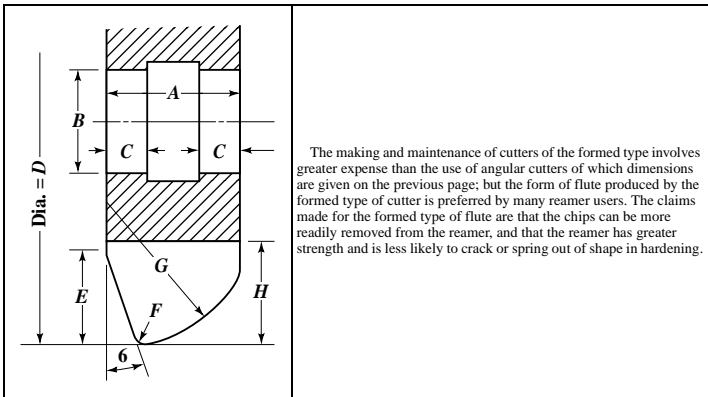
Rose Chucking Reamers.—The rose type of reamer is used for enlarging cored or other holes. The cutting edges at the end are ground to a 45-degree bevel. This type of reamer will remove considerable metal in one cut. The cylindrical part of the reamer has no cutting

edges, but merely grooves cut for the full length of the reamer body, providing a way for the chips to escape and a channel for lubricant to reach the cutting edges. There is no relief on the cylindrical surface of the body part, but it is slightly back-tapered so that the diameter at the point with the beveled cutting edges is slightly larger than the diameter farther back. The back-taper should not exceed 0.001 inch per inch. This form of reamer usually produces holes slightly larger than its size and it is, therefore, always made from 0.005 to 0.010 inch smaller than its nominal size, so that it may be followed by a fluted reamer for finishing. The grooves on the cylindrical portion are cut by a convex cutter having a width equal to from one-fifth to one-fourth the diameter of the rose reamer itself. The depth of the groove should be from one-eighth to one-sixth the diameter of the reamer. The teeth at the end of the reamer are milled with a 75-degree angular cutter; the width of the land of the cutting edge should be about one-fifth the distance from tooth to tooth. If an angular cutter is preferred to a convex cutter for milling the grooves on the cylindrical portion, because of the higher cutting speed possible when milling, an 80-degree angular cutter slightly rounded at the point may be used.

Fluting Cutters for Reamers

Reamer Dia.	Fluting Cutter Dia.	Fluting Cutter Thickness	Hole Dia. in Cutter	Radius between Cutting Faces	Reamer Dia.	Fluting Cutter Dia.	Fluting Cutter Thickness	Hole Dia. in Cutter	Radius between Cutting Faces
	A	B	C	D		A	B	C	D
$\frac{1}{8}$	$1\frac{3}{4}$	$\frac{3}{16}$	$\frac{3}{4}$	sharp corner, no radius	1	$2\frac{1}{4}$	$\frac{1}{2}$	1	$\frac{3}{64}$
					$1\frac{1}{4}$	$2\frac{1}{4}$	$\frac{9}{16}$	1	$\frac{1}{16}$
$\frac{3}{16}$	$1\frac{3}{4}$	$\frac{3}{16}$	$\frac{3}{4}$	sharp corner, no radius	$1\frac{1}{2}$	$2\frac{1}{4}$	$\frac{5}{8}$	1	$\frac{1}{16}$
					$1\frac{3}{4}$	$2\frac{1}{4}$	$\frac{5}{8}$	1	$\frac{5}{64}$
$\frac{1}{4}$	$1\frac{3}{4}$	$\frac{3}{16}$	$\frac{3}{4}$	$\frac{1}{64}$	2	$2\frac{1}{2}$	$\frac{3}{4}$	1	$\frac{5}{64}$
$\frac{3}{8}$	2	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{64}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$\frac{3}{4}$	1	$\frac{5}{64}$
$\frac{1}{2}$	2	$\frac{5}{16}$	$\frac{3}{4}$	$\frac{1}{32}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$\frac{7}{8}$	1	$\frac{3}{16}$
$\frac{5}{8}$	2	$\frac{3}{8}$	$\frac{3}{4}$	$\frac{1}{32}$	$2\frac{3}{4}$	$2\frac{1}{2}$	$\frac{7}{8}$	1	$\frac{3}{16}$
$\frac{3}{4}$	2	$\frac{7}{16}$	$\frac{3}{4}$	$\frac{3}{64}$	3	$2\frac{1}{2}$	1	1	$\frac{3}{16}$

Dimensions of Formed Reamer Fluting Cutters



The making and maintenance of cutters of the formed type involves greater expense than the use of angular cutters of which dimensions are given on the previous page; but the form of flute produced by the formed type of cutter is preferred by many reamer users. The claims made for the formed type of flute are that the chips can be more readily removed from the reamer, and that the reamer has greater strength and is less likely to crack or spring out of shape in hardening.

Reamer Size	No. of Teeth in Reamer	Cutter Dia. D	Cutter Width A	Hole Dia. B	Bearing Width C	Bevel Length E	Radius F	Radius F	Tooth Depth H	No. of Cutter Teeth
$\frac{1}{8}$ - $\frac{3}{16}$	6	$1\frac{3}{4}$	$\frac{3}{16}$	$\frac{7}{8}$	...	0.125	0.016	$\frac{7}{32}$	0.21	14
$\frac{1}{4}$ - $\frac{5}{16}$	6	$1\frac{3}{4}$	$\frac{1}{4}$	$\frac{7}{8}$	...	0.152	0.022	$\frac{7}{32}$	0.25	13
$\frac{3}{8}$ - $\frac{7}{16}$	6	$1\frac{7}{8}$	$\frac{3}{8}$	$\frac{7}{8}$	$\frac{1}{8}$	0.178	0.029	$\frac{1}{2}$	0.28	12
$\frac{1}{2}$ - $1\frac{1}{16}$	6-8	2	$\frac{7}{16}$	$\frac{7}{8}$	$\frac{1}{8}$	0.205	0.036	$\frac{9}{16}$	0.30	12
$\frac{3}{4}$ -1	8	$2\frac{1}{8}$	$\frac{1}{2}$	$\frac{7}{8}$	$\frac{5}{32}$	0.232	0.042	$1\frac{1}{16}$	0.32	12
$1\frac{1}{16}$ - $1\frac{1}{2}$	10	$2\frac{1}{4}$	$\frac{9}{16}$	$\frac{7}{8}$	$\frac{5}{32}$	0.258	0.049	$\frac{3}{4}$	0.38	11
$1\frac{1}{16}$ - $2\frac{1}{8}$	12	$2\frac{3}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	$\frac{3}{16}$	0.285	0.056	$2\frac{7}{32}$	0.40	11
$2\frac{1}{4}$ -3	14	$2\frac{5}{8}$	$1\frac{1}{16}$	$\frac{7}{8}$	$\frac{3}{16}$	0.312	0.062	$\frac{7}{8}$	0.44	10

Cutters for Fluting Rose Chucking Reamers.—The cutters used for fluting rose chucking reamers on the end are 80-degree angular cutters for $\frac{1}{4}$ - and $\frac{5}{16}$ -inch diameter reamers; 75-degree angular cutters for $\frac{3}{8}$ - and $\frac{7}{16}$ -inch reamers; and 70-degree angular cutters for all larger sizes. The grooves on the cylindrical portion are milled with convex cutters of approximately the following sizes for given diameters of reamers: $\frac{5}{32}$ -inch convex cutter for $\frac{1}{2}$ -inch reamers; $\frac{5}{16}$ -inch cutter for 1-inch reamers; $\frac{3}{8}$ -inch cutter for $1\frac{1}{2}$ -inch reamers; $1\frac{1}{32}$ -inch cutters for 2-inch reamers; and $1\frac{5}{32}$ -inch cutters for $2\frac{1}{2}$ -inch reamers. The smaller sizes of reamers, from $\frac{1}{4}$ to $\frac{3}{8}$ inch in diameter, are often milled with regular double-angle reamer fluting cutters having a radius of $\frac{1}{64}$ inch for $\frac{1}{4}$ -inch reamer, and $\frac{1}{32}$ inch for $\frac{5}{16}$ - and $\frac{3}{8}$ -inch sizes.

Vertical Adjustment of Tooth-rest for Grinding Clearance on Reamers

Size of Reamer	Hand Reamer for Steel. Cutting Clearance Land 0.006 inch Wide		Hand Reamer for Cast Iron and Bronze. Cutting Clearance Land 0.025 inch Wide		Chucking Reamer for Cast Iron and Bronze. Cutting Clearance Land 0.025 inch Wide		Rose Chucking Reamers for Steel
	For Cutting Clearance	For Second Clearance	For Cutting Clearance	For Second Clearance	For Cutting Clearance	For Second Clearance	For Cutting Clearance on Angular Edge at End
1/2	0.012	0.052	0.032	0.072	0.040	0.080	0.080
5/8	0.012	0.062	0.032	0.072	0.040	0.090	0.090
3/4	0.012	0.072	0.035	0.095	0.040	0.100	0.100
7/8	0.012	0.082	0.040	0.120	0.045	0.125	0.125
1	0.012	0.092	0.040	0.120	0.045	0.125	0.125
1 1/8	0.012	0.102	0.040	0.120	0.045	0.125	0.125
1 1/4	0.012	0.112	0.045	0.145	0.050	0.160	0.160
1 3/8	0.012	0.122	0.045	0.145	0.050	0.160	0.175
1 1/2	0.012	0.132	0.048	0.168	0.055	0.175	0.175
1 5/8	0.012	0.142	0.050	0.170	0.060	0.200	0.200
1 3/4	0.012	0.152	0.052	0.192	0.060	0.200	0.200
1 7/8	0.012	0.162	0.056	0.196	0.060	0.200	0.200
2	0.012	0.172	0.056	0.216	0.064	0.224	0.225
2 1/8	0.012	0.172	0.059	0.219	0.064	0.224	0.225
2 1/4	0.012	0.172	0.063	0.223	0.064	0.224	0.225
2 3/8	0.012	0.172	0.063	0.223	0.068	0.228	0.230
2 1/2	0.012	0.172	0.065	0.225	0.072	0.232	0.230
2 5/8	0.012	0.172	0.065	0.225	0.075	0.235	0.235
2 3/4	0.012	0.172	0.065	0.225	0.077	0.237	0.240
2 7/8	0.012	0.172	0.070	0.230	0.080	0.240	0.240
3	0.012	0.172	0.072	0.232	0.080	0.240	0.240
3 1/8	0.012	0.172	0.075	0.235	0.083	0.240	0.240
3 1/4	0.012	0.172	0.078	0.238	0.083	0.243	0.245
3 3/8	0.012	0.172	0.081	0.241	0.087	0.247	0.245
3 1/2	0.012	0.172	0.084	0.244	0.090	0.250	0.250
3 5/8	0.012	0.172	0.087	0.247	0.093	0.253	0.250
3 3/4	0.012	0.172	0.090	0.250	0.097	0.257	0.255
3 7/8	0.012	0.172	0.093	0.253	0.100	0.260	0.255
4	0.012	0.172	0.096	0.256	0.104	0.264	0.260
4 1/8	0.012	0.172	0.096	0.256	0.104	0.264	0.260
4 1/4	0.012	0.172	0.096	0.256	0.106	0.266	0.265
4 3/8	0.012	0.172	0.096	0.256	0.108	0.268	0.265
4 1/2	0.012	0.172	0.100	0.260	0.108	0.268	0.265
4 5/8	0.012	0.172	0.100	0.260	0.110	0.270	0.270
4 3/4	0.012	0.172	0.104	0.264	0.114	0.274	0.275
4 7/8	0.012	0.172	0.106	0.266	0.116	0.276	0.275
5	0.012	0.172	0.110	0.270	0.118	0.278	0.275

Reamer Difficulties.—Certain frequently occurring problems in reaming require remedial measures. These difficulties include the production of oversize holes, bellmouth holes, and holes with a poor finish. The following is taken from suggestions for correction of these difficulties by the National Twist Drill and Tool Co. and Winter Brothers Co.*

Oversize Holes: The cutting of a hole oversize from the start of the reaming operations usually indicates a mechanical defect in the setup or reamer. Thus, the wrong reamer for the workpiece material may have been used or there may be inadequate workpiece support, inadequate or worn guide bushings, or misalignment of the spindles, bushings, or workpiece or runout of the spindle or reamer holder. The reamer itself may be defective due to chamfer runout or runout of the cutting end due to a bent or nonconcentric shank.

When reamers gradually start to cut oversize, it is due to pickup or galling, principally on the reamer margins. This condition is partly due to the workpiece material. Mild steels, certain cast irons, and some aluminum alloys are particularly troublesome in this respect.

Corrective measures include reducing the reamer margin widths to about 0.005 to 0.010 inch, use of hard case surface treatments on high-speed-steel reamers, either alone or in combination with black oxide treatments, and the use of a high-grade finish on the reamer faces, margins, and chamfer relief surfaces.

Bellmouth Holes: The cutting of a hole that becomes oversize at the entry end with the oversize decreasing gradually along its length always reflects misalignment of the cutting portion of the reamer with respect to the hole. The obvious solution is to provide improved guiding of the reamer by the use of accurate bushings and pilot surfaces. If this solution is not feasible, and the reamer is cutting in a vertical position, a flexible element may be employed to hold the reamer in such a way that it has both radial and axial float, with the hope that the reamer will follow the original hole and prevent the bellmouth condition.

In horizontal setups where the reamer is held fixed and the workpiece rotated, any misalignment exerts a sideways force on the reamer as it is fed to depth, resulting in the formation of a tapered hole. This type of bellmouthing can frequently be reduced by shortening the bearing length of the cutting portion of the reamer. One way to do this is to reduce the reamer diameter by 0.010 to 0.030 inch, depending on size and length, behind a short full-diameter section, $\frac{1}{8}$ to $\frac{1}{2}$ inch long according to length and size, following the chamfer. The second method is to grind a high back taper, 0.008 to 0.015 inch per inch, behind the short full-diameter section. Either of these modifications reduces the length of the reamer tooth that can cause the bellmouth condition.

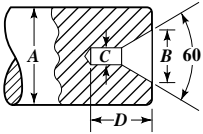
Poor Finish: The most obvious step toward producing a good finish is to reduce the reamer feed per revolution. Feeds as low as 0.0002 to 0.0005 inch per tooth have been used successfully. However, reamer life will be better if the maximum feasible feed is used.

The minimum practical amount of reaming stock allowance will often improve finish by reducing the volume of chips and the resulting heat generated on the cutting portion of the chamfer. Too little reamer stock, however, can be troublesome in that the reamer teeth may not cut freely but will deflect or push the work material out of the way. When this happens, excessive heat, poor finish, and rapid reamer wear can occur.

Because of their superior abrasion resistance, carbide reamers are often used when fine finishes are required. When properly conditioned, carbide reamers can produce a large number of good-quality holes. Careful honing of the carbide reamer edges is very important.

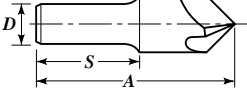
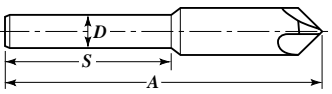
*“Some Aspects of Reamer Design and Operation,” *Metal Cuttings*, April 1963.

Dimensions of Centers for Reamers and Arbors



Arbor Dia. A	Large Center Dia. B	Drill No. C	Hole Depth D	Arbor Dia. A	Large Center Dia. B	Drill No. C	Hole Depth D
3/4	3/8	25	7/16	2 1/2	1 1/16	J	27/32
13/16	13/32	20	1/2	2 3/8	4/64	K	7/8
7/8	7/16	17	17/32	2 3/4	23/32	L	29/32
15/16	15/32	12	9/16	2 7/8	4/64	M	29/32
1	1/2	8	19/32	3	3/4	N	15/16
1 1/8	33/64	5	5/8	3 1/8	4/64	N	31/32
1 1/4	17/32	3	21/32	3 1/4	23/32	O	31/32
1 3/8	35/64	2	21/32	3 3/8	51/64	O	1
1 1/2	9/16	1	11/16	3 1/2	13/16	P	1
...	...	Letter	...	3 3/8	5/64	Q	1 1/16
1 5/8	37/64	A	23/32	3 3/4	27/32	R	1 1/16
1 3/4	19/32	B	23/32	3 7/8	5/64	R	1 1/16
1 7/8	39/64	C	3/4	4	7/8	S	1 1/8
2	5/8	E	3/4	4 1/4	29/32	T	1 1/8
2 1/8	41/64	F	25/32	4 1/2	15/16	V	1 3/16
2 1/4	21/32	G	13/16	4 3/4	31/32	W	1 1/4
2 3/8	43/64	H	27/32	5	1	X	1 1/4

Straight Shank Center Reamers and Machine Countersinks
ANSI B94.2-1983, R1988

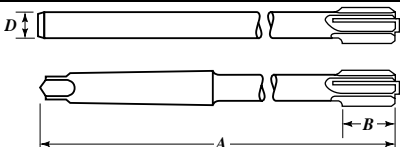



Center Reamers (Short Countersinks)				Machine Countersinks			
Dia. of Cut	Approx. Length Overall A	Length of Shank S	Dia. of Shank D	Dia. of Cut	Approx. Length Overall A	Length of Shank S	Dia. of Shank D
1/4	1 1/2	3/4	3/16	1/2	3 7/8	2 1/4	1/2
3/8	1 3/4	7/8	1/4	5/8	4	2 1/4	1/2
1/2	2	1	3/8	3/4	4 1/8	2 1/4	1/2
5/8	2 1/4	1	3/8	7/8	4 1/4	2 1/4	1/2
3/4	2 5/8	1 1/4	1/2	1	4 3/8	2 1/4	1/2

All dimensions are given in inches. Material is high-speed steel. Reamers and countersinks have 3 or 4 flutes. Center reamers are standard with 60, 82, 90, or 100 degrees included angle. Machine countersinks are standard with either 60 or 82 degrees included angle.

Tolerances: On overall length A, the tolerance is $\pm 1/8$ inch for center reamers in a size range of from 1/4 to 3/8 inch, incl., and machine countersinks in a size range of from 1/2 to 5/8 inch, incl.; $\pm 3/16$ inch for center reamers, 1/2 to 3/4 inch, incl.; and machine countersinks, 3/4 to 1 inch, incl. On shank diameter D, the tolerance is -0.0005 to -0.002 inch. On shank length S, the tolerance is $\pm 1/16$ inch.

Expansion Chucking Reamers—Straight and Taper Shanks ANSI B94.2-1983, R1988



Dia of Reamer	Length, A	Flute Length, B	Shank Dia., D		Dia. of Reamer	Length, A	Flute Length, B	Shank Dia., D	
			Max.	Min.				Max.	Min.
3/8	7	3/4	0.3105	0.3095	1 1/32	10 1/2	1 3/8	0.8745	0.8730
13/32	7	3/4	0.3105	0.3095	1 1/8	11	1 3/4	0.8745	0.8730
7/16	7	3/8	0.3730	0.3720	1 1/32	11	1 3/4	0.8745	0.8730
15/32	7	7/8	0.3730	0.3720	1 3/16	11	1 3/4	0.9995	0.9980
1/2	8	1	0.4355	0.4345	1 1/32	11	1 3/4	0.9995	0.9980
17/32	8	1	0.4355	0.4345	1 1/4	11 1/2	1 7/8	0.9995	0.9980
9/16	8	1 1/8	0.4355	0.4345	1 3/16	11 1/2	1 7/8	0.9995	0.9980
19/32	8	1 1/8	0.4355	0.4345	1 3/8	12	2	0.9995	0.9980
5/8	9	1 1/4	0.5620	0.5605	1 7/16	12	2	1.2495	1.2480
21/32	9	1 1/4	0.5620	0.5605	1 1/2	12 1/2	2 1/8	1.2495	1.2480
11/16	9	1 1/4	0.5620	0.5605	1 9/16 ^a	12 1/2	2 1/8	1.2495	1.2480
23/32	9	1 1/4	0.5620	0.5605	1 5/8	13	2 1/4	1.2495	1.2480
3/4	9 1/2	1 3/8	0.6245	0.6230	1 11/16 ^a	13	2 1/4	1.2495	1.2480
25/32	9 1/2	1 3/8	0.6245	0.6230	1 3/4	13 1/2	2 3/8	1.2495	1.2480
13/16	9 1/2	1 3/8	0.6245	0.6230	1 13/16 ^a	13 1/2	2 3/8	1.4995	1.4980
27/32	9 1/2	1 3/8	0.6245	0.6230	1 7/8	14	2 1/2	1.4995	1.4980
1	10	1 1/2	0.7495	0.7480	1 15/16 ^a	14	2 1/2	1.4995	1.4980
29/32	10	1 1/2	0.7495	0.7480	2	14	2 1/2	1.4995	1.4980
15/16	10	1 1/2	0.7495	0.7480	2 1/8 ^b	14 1/2	2 3/4	...	...
31/32	10	1 1/2	0.7495	0.7480	2 1/4 ^b	14 1/2	2 3/4	...	...
1 1/32	10 1/2	1 3/8	0.8745	0.8730	2 3/8 ^b	15	3	...	...
1 1/16	10 1/2	1 3/8	0.8745	0.8730	2 1/2 ^b	15	3	...	...
			0.8745	0.8730	...	...	...	...	...

^a Straight shank only.

^b Taper shank only.

All dimensions in inches. Material is high-speed steel. The number of flutes is as follows: 3/8- to 15/32-inch sizes, 4 to 6; 1/2- to 31/32-inch sizes, 6 to 8; 1- to 1 1/16-inch sizes, 8 to 10; 1 1/4- to 1 15/16-inch sizes, 8 to 12; 2- to 2 1/4-inch sizes, 10 to 12; 2 3/8- and 2 1/2-inch sizes, 10 to 14. The expansion feature of these reamers provides a means of adjustment that is important in reaming holes to close tolerances. When worn undersize, they may be expanded and reground to the original size.

Tolerances: On reamer diameter, 3/8- to 1-inch sizes, incl., +0.0001 to +0.0005 inch; over 1-inch size, +0.0002 to +0.0006 inch. On length A and flute length B, 3/8- to 1-inch sizes, incl., ±1/16 inch; 1 1/32- to 2-inch sizes, incl., ±3/32 inch; over 2-inch sizes, ±1/8 inch.

Taper is Morse taper: No. 1 for sizes 3/8 to 19/32 inch, incl.; No. 2 for sizes 5/8 to 29/32 inch, incl.; No. 3 for sizes 15/16 to 1 1/32 inch, incl.; No. 4 for sizes 1 1/4 to 1 3/8 inch, incl.; and No. 5 for sizes 1 3/4 to 2 1/2 inch, incl. For amount of taper, see Table 1b on page 908.

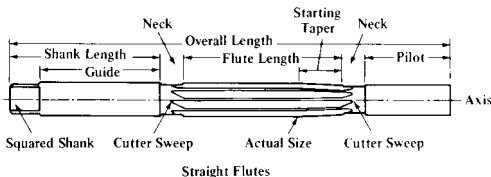


Illustration of Terms Applying to Reamers—1

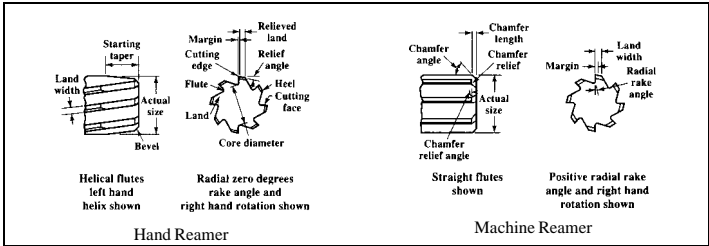
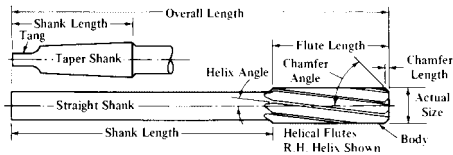


Illustration of Terms Applying to Reamers—2



Chucking Reamer, Straight and Taper Shank

American National Standard Fluted Taper Shank Chucking Reamers—
Straight and Helical Flutes, Fractional Sizes ANSIB94.2-1983, R1988

Reamer Dia.	Length Overall A	Flute Length B	No. of Morse Taper Shank ^a	No. of Flutes	Reamer Dia.	Length Overall A	Flute Length B	No. of Morse Taper Shank ^a	No. of Flutes
1/4	6	1 1/2	1	4 to 6	27/32	9 1/2	2 1/2	2	8 to 10
3/16	6	1 1/2	1	4 to 6	7/8	10	2 3/8	2	8 to 10
3/8	7	1 3/4	1	4 to 6	29/32	10	2 3/8	2	8 to 10
7/16	7	1 3/4	1	6 to 8	15/16	10	2 3/8	3	8 to 10
1/2	8	2	1	6 to 8	31/32	10	2 3/8	3	8 to 10
17/32	8	2	1	6 to 8	1	10 1/2	2 3/4	3	8 to 12
9/16	8	2	1	6 to 8	1 1/16	10 1/2	2 3/4	3	8 to 12
19/32	8	2	1	6 to 8	1 1/8	11	2 3/8	3	8 to 12
5/8	9	2 1/4	2	6 to 8	1 1/8	11	2 7/8	3	8 to 12
21/32	9	2 1/4	2	6 to 8	1 1/4	11 1/2	3	4	8 to 12
11/16	9	2 1/4	2	6 to 8	1 1/16	11 1/2	3	4	8 to 12
23/32	9	2 1/4	2	6 to 8	1 3/8	12	3 1/4	4	10 to 12
3/4	9 1/2	2 1/2	2	6 to 8	1 7/16	12	3 1/2	4	10 to 12
25/32	9 1/2	2 1/2	2	8 to 10	1 1/2	12 1/2	3 1/2	4	10 to 12
13/16	9 1/2	2 1/2	2	8 to 10	...	...	...	...	...

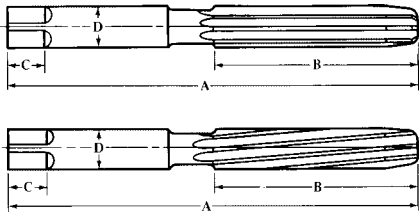
^a American National Standard self-holding tapers (see Table 7a on page 913.)

All dimensions are given in inches. Material is high-speed steel.

Helical flute reamers with right-hand helical flutes are standard.

Tolerances: On reamer diameter, 1/4-inch size, +.0001 to +.0004 inch; over 1/4- to 1-inch size, +.0001 to +.0005 inch; over 1-inch size, +.0002 to +.0006 inch. On length overall A and flute length B, 1/4- to 1-inch size, incl., ±1/16 inch; 1 1/16- to 1 1/2-inch size, incl., 3/32 inch.

Hand Reamers—Straight and Helical Flutes ANSI B94.2-1983, R1988

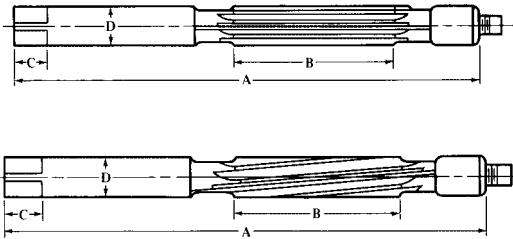


Reamer Diameter			Length Overall A	Flute Length B	Square Length C	Size of Square	No. of Flutes
Straight Flutes	Helical Flutes	Decimal Equivalent					
1/8	...	0.1250	3	1 1/2	5/32	0.095	4 to 6
5/32	...	0.1562	3 1/4	1 5/8	7/32	0.115	4 to 6
3/16	...	0.1875	3 1/2	1 3/4	7/32	0.140	4 to 6
7/32	...	0.2188	3 3/4	1 7/8	1/4	0.165	4 to 6
1/4	1/4	0.2500	4	2	1/4	0.185	4 to 6
9/32	...	0.2812	4 1/4	2 1/8	1/4	0.210	4 to 6
5/16	5/16	0.3125	4 1/2	2 1/4	5/16	0.235	4 to 6
11/32	...	0.3438	4 3/4	2 3/8	5/16	0.255	4 to 6
3/8	3/8	0.3750	5	2 1/2	3/8	0.280	4 to 6
13/32	...	0.4062	5 1/4	2 5/8	3/8	0.305	6 to 8
7/16	7/16	0.4375	5 1/2	2 3/4	7/16	0.330	6 to 8
15/32	...	0.4688	5 3/4	2 7/8	7/16	0.350	6 to 8
1/2	1/2	0.5000	6	3	1/2	0.375	6 to 8
17/32	...	0.5312	6 1/4	3 1/8	1/2	0.400	6 to 8
9/16	9/16	0.5625	6 1/2	3 1/4	9/16	0.420	6 to 8
19/32	...	0.5938	6 3/4	3 3/8	9/16	0.445	6 to 8
5/8	5/8	0.6250	7	3 1/2	5/8	0.470	6 to 8
21/32	...	0.6562	7 3/8	3 11/16	5/8	0.490	6 to 8
11/16	11/16	0.6875	7 1/4	3 5/8	11/16	0.515	6 to 8
23/32	...	0.7188	8 1/8	4 1/16	11/16	0.540	6 to 8
3/4	3/4	0.7500	8 3/8	4 3/16	3/4	0.560	6 to 8
...	13/16	0.8125	9 1/8	4 7/16	13/16	0.610	8 to 10
7/8	7/8	0.8750	9 3/4	4 7/8	7/8	0.655	8 to 10
...	15/16	0.9375	10 1/4	5 1/8	15/16	0.705	8 to 10
1	1	1.0000	10 7/8	5 1/16	1	0.750	8 to 10
1 1/8	1 1/8	1.1250	11 3/8	5 13/16	1	0.845	8 to 10
1 1/4	1 1/4	1.2500	12 1/4	6 1/8	1	0.935	8 to 12
1 3/8	1 3/8	1.3750	12 5/8	6 7/16	1	1.030	10 to 12
1 1/2	1 1/2	1.5000	13	6 1/2	1 1/8	1.125	10 to 14

All dimensions in inches. Material is high-speed steel. The nominal shank diameter D is the same as the reamer diameter. Helical-flute hand reamers with left-hand helical flutes are standard. Reamers are tapered slightly on the end to facilitate proper starting.

Tolerances: On diameter of reamer, up to 1/2-inch size, incl., +.0001 to +.0004 inch; over 1/4- to 1-inch size, incl., +.0001 to +.0005 inch; over 1-inch size, +.0002 to +.0006 inch. On length overall A and flute length B , 1/8- to 1-inch size, incl., $\pm 1/16$ inch; 1/8- to 1 1/2-inch size, incl., $\pm 3/32$ inch. On length of square C , 1/8- to 1 inch size, incl., $\pm 1/32$ inch; 1/8- to 1 1/2-inch size, incl., $\pm 1/16$ inch. On shank diameter D , 1/8- to 1-inch size, incl., -.001 to -.005 inch; 1/8- to 1 1/2-inch size, incl., -.0015 to -.006 inch. On size of square, 1/8- to 1/2-inch size, incl., -.004 inch; 1/32- to 1-inch size, incl., -.006 inch; 1/8- to 1 1/2-inch size, incl., -.008 inch.

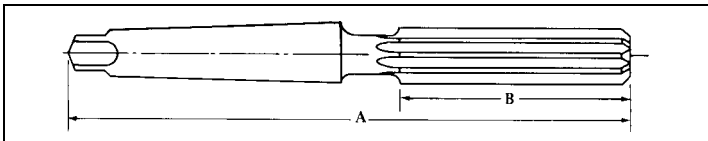
American National Standard Expansion Hand Reamers—Straight and Helical Flutes, Squared Shank ANSI B94.2-1983, R1988



Reamer Dia.	Length Overall A		Flute Length B		Length of Square C	Shank Dia. D	Size of Square	Number of Flutes
	Max	Min	Max	Min				
Straight Flutes								
1/4	4 3/8	3 3/4	1 3/4	1 1/2	1/4	1/4	0.185	6 to 8
5/16	4 3/8	4	1 3/4	1 1/2	3/16	5/16	0.235	6 to 8
3/8	5 3/8	4 1/4	2	1 3/4	3/8	3/8	0.280	6 to 9
7/16	5 3/8	4 1/2	2	1 3/4	7/16	7/16	0.330	6 to 9
1/2	6 1/2	5	2 1/2	1 3/4	1/2	1/2	0.375	6 to 9
9/16	6 1/2	5 3/8	2 1/2	1 7/8	9/16	9/16	0.420	6 to 9
5/8	7	5 3/4	3	2 1/4	5/8	5/8	0.470	6 to 9
11/16	7 3/8	6 1/4	3	2 1/2	11/16	11/16	0.515	6 to 10
3/4	8	6 1/2	3 1/2	2 5/8	3/4	3/4	0.560	6 to 10
7/8	9	7 1/2	4	3 3/8	7/8	7/8	0.655	8 to 10
1	10	8 3/8	4 1/2	3 3/8	1	1	0.750	8 to 10
1 1/8	10 1/2	9	4 3/4	3 1/2	1	1 1/8	0.845	8 to 12
1 1/4	11	9 3/4	5	4 1/4	1	1 1/4	0.935	8 to 12
Helical Flutes								
1/4	4 3/8	3 3/8	1 3/4	1 1/2	1/4	1/4	0.185	6 to 8
5/16	4 3/8	4	1 3/4	1 1/2	3/16	5/16	0.235	6 to 8
3/8	6 1/8	4 1/4	2	1 3/4	3/8	3/8	0.280	6 to 9
7/16	6 1/4	4 1/2	2	1 3/4	7/16	7/16	0.330	6 to 9
1/2	6 1/2	5	2 1/2	1 3/4	1/2	1/2	0.375	6 to 9
5/8	8	6	3	2 1/4	5/8	5/8	0.470	6 to 9
3/4	8 3/8	6 1/2	3 1/2	2 5/8	3/4	3/4	0.560	6 to 10
7/8	9 3/8	7 1/2	4	3 3/8	7/8	7/8	0.655	6 to 10
1	10 1/4	8 3/8	4 1/2	3 3/8	1	1	0.750	6 to 10
1 1/4	11 3/8	9 3/4	5	4 1/4	1	1 1/4	0.935	8 to 12

All dimensions are given in inches. Material is carbon steel. Reamers with helical flutes that are left hand are standard. Expansion hand reamers are primarily designed for work where it is necessary to enlarge reamed holes by a few thousandths. The pilots and guides on these reamers are ground under-size for clearance. The maximum expansion on these reamers is as follows: .006 inch for the 1/4- to 7/16-inch sizes, .010 inch for the 1/2- to 7/8-inch sizes and .012 inch for the 1- to 1 1/4-inch sizes.

Tolerances: On length overall A and flute length B, $\pm 1/16$ inch for 1/4- to 1-inch sizes, $\pm 3/32$ inch for 1 1/8- to 1 1/4-inch sizes; on length of square C, $\pm 1/32$ inch for 1/4- to 1-inch sizes, $\pm 1/16$ inch for 1 1/8- to 1 1/4-inch sizes; on shank diameter D, -.001 to -.005 inch for 1/4- to 1-inch sizes, -.0015 to -.006 inch for 1 1/8- to 1 1/4-inch sizes; on size of square, -.004 inch for 1/4- to 1/2-inch sizes, -.006 inch for 7/16- to 1-inch sizes, and -.008 inch for 1 1/8- to 1 1/4-inch sizes.

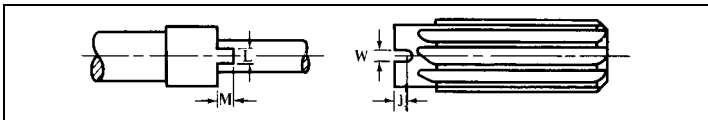
Taper Shank Jobbers Reamers—Straight Flutes *ANSI B94.2-1983, R1988*


Reamer Diameter		Length Overall A	Length of Flute B	No. of Morse Taper Shank ^a	No. of Flutes
Fractional	Dec. Equiv.				
1/4	0.2500	5 3/16	2	1	6 to 8
5/16	0.3125	5 1/2	2 1/4	1	6 to 8
3/8	0.3750	5 13/16	2 1/2	1	6 to 8
7/16	0.4375	6 1/8	2 3/4	1	6 to 8
1/2	0.5000	6 7/16	3	1	6 to 8
9/16	0.5625	6 3/4	3 1/4	1	6 to 8
5/8	0.6250	7 7/16	3 1/2	2	6 to 8
11/16	0.6875	8	3 3/8	2	8 to 10
3/4	0.7500	8 3/8	4 3/16	2	8 to 10
13/16	0.8125	8 13/16	4 1/8	2	8 to 10
7/8	0.8750	9 3/16	4 3/8	2	8 to 10
15/16	0.9375	10	5 1/8	3	8 to 10
1	1.0000	10 3/8	5 1/2	3	8 to 10
1 1/16	1.0625	10 5/8	5 3/4	3	8 to 10
1 1/8	1.1250	10 7/8	5 13/16	3	8 to 10
1 1/4	1.1875	11 1/8	6	3	8 to 12
1 1/2	1.2500	12 9/16	6 3/4	4	8 to 12
1 3/8	1.3750	12 13/16	6 5/8	4	10 to 12
1 1/2	1.5000	13 3/8	6 1/2	4	10 to 12

^a American National Standard self-holding tapers (Table 7a on page 913.)

All dimensions in inches. Material is high-speed steel.

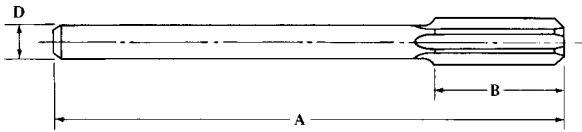
Tolerances: On reamer diameter, 1/4-inch size, +.0001 to +.0004 inch; over 1/4- to 1-inch size, incl., +.0001 to +.0005 inch; over 1-inch size, +.0002 to +.0006 inch. On overall length A and length of flute B, 1/4- to 1-inch size, incl., ±1/16 inch; and 1 1/16- to 1 1/2-inch size, incl., ±3/32 inch.

American National Standard Driving Slots and Lugs for Shell Reamers or Shell Reamer Arbors *ANSI B94.2-1983, R1988*


Arbor Size No.	Fitting Reamer Sizes	Driving Slot		Lug on Arbor		Reamer Hole Dia. at Large End
		Width W	Depth J	Width L	Depth M	
4	3/4	5/32	3/16	9/64	5/32	0.375
5	13/16 to 1	3/16	1/4	11/64	7/32	0.500
6	1 1/16 to 1 1/4	3/16	1/4	11/64	7/32	0.625
7	1 3/16 to 1 3/8	1/4	5/16	15/64	9/32	0.750
8	1 11/16 to 2	1/4	5/16	15/64	9/32	1.000
9	2 1/16 to 2 1/2	5/16	3/8	19/64	11/32	1.250

All dimension are given in inches. The hole in shell reamers has a taper of 1/8 inch per foot, with arbors tapered to correspond. Shell reamer arbor tapers are made to permit a driving fit with the reamer.

Straight Shank Chucking Reamers—Straight Flutes, Wire Gage Sizes
ANSI B94.2-1983, R1988

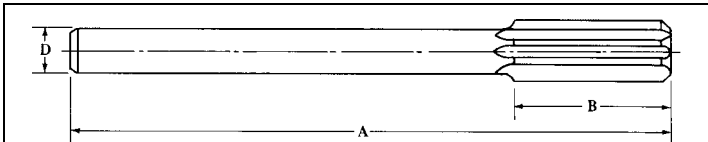


Reamer Diameter		Lgth. Overall A	Lgth. of Flute B	Shank Dia. D		No. of Flutes	Reamer Diameter		Lgth. Overall A	Lgth. of Flute B	Shank Dia. D		No. of Flutes
Wire Gage	Inch			Max	Min		Wire Gage	Inch			Max	Min	
60	.0400	2½	½	.0390	.0380	4	49	.0730	3	¾	.0660	.0650	4
59	.0410	2½	½	.0390	.0380	4	48	.0760	3	¾	.0720	.0710	4
58	.0420	2½	½	.0390	.0380	4	47	.0785	3	¾	.0720	.0710	4
57	.0430	2½	½	.0390	.0380	4	46	.0810	3	¾	.0771	.0701	4
56	.0465	2½	½	.0455	.0445	4	45	.0820	3	¾	.0771	.0761	4
55	.0520	2½	½	.0510	.0500	4	44	.0860	3	¾	.0810	.0800	4
54	.0550	2½	½	.0510	.0500	4	43	.0890	3	¾	.0810	.0800	4
53	.0595	2½	½	.0585	.0575	4	42	.0935	3	¾	.0880	.0870	4
52	.0635	2½	½	.0585	.0575	4	41	.0960	3½	⅞	.0928	.0918	4 to 6
51	.0670	3	¾	.0660	.0650	4	40	.0980	3½	⅞	.0928	.0918	4 to 6
50	.0700	3	¾	.0660	.0650	4	39	.0995	3½	⅞	.0928	.0918	4 to 6
38	.1015	3½	⅞	.0950	.0940	4 to 6	19	.1660	4½	1⅛	.1595	.1585	4 to 6
37	.1040	3½	⅞	.0950	.0940	4 to 6	18	.1695	4½	1⅛	.1595	.1585	4 to 6
36	.1065	3½	⅞	.1030	.1020	4 to 6	17	.1730	4½	1⅛	.1645	.1635	4 to 6
35	.1100	3½	⅞	.1030	.1020	4 to 6	16	.1770	4½	1⅛	.1704	.1694	4 to 6
34	.1110	3½	⅞	.1055	.1045	4 to 6	15	.1800	4½	1⅛	.1755	.1745	4 to 6
33	.1130	3½	⅞	.1055	.1045	4 to 6	14	.1820	4½	1⅛	.1755	.1745	4 to 6
32	.1160	3½	⅞	.1120	.1110	4 to 6	13	.1850	4½	1⅛	.1805	.1795	4 to 6
31	.1200	3½	⅞	.1120	.1110	4 to 6	12	.1890	4½	1⅛	.1805	.1795	4 to 6
30	.1285	3½	⅞	.1190	.1180	4 to 6	11	.1910	5	1¼	.1860	.1850	4 to 6
29	.1360	4	1	.1275	.1265	4 to 6	10	.1935	5	1¼	.1860	.1850	4 to 6
28	.1405	4	1	.1350	.1340	4 to 6	9	.1960	5	1¼	.1895	.1885	4 to 6
27	.1440	4	1	.1350	.1340	4 to 6	8	.1990	5	1¼	.1895	.1885	4 to 6
26	.1470	4	1	.1430	.1420	4 to 6	7	.2010	5	1¼	.1945	.1935	4 to 6
25	.1495	4	1	.1430	.1420	4 to 6	6	.2040	5	1¼	.1945	.1935	4 to 6
24	.1520	4	1	.1460	.1450	4 to 6	5	.2055	5	1¼	.2016	.2006	4 to 6
23	.1540	4	1	.1460	.1450	4 to 6	4	.2090	5	1¼	.2016	.2006	4 to 6
22	.1570	4	1	.1510	.1500	4 to 6	3	.2130	5	1¼	.2075	.2065	4 to 6
21	.1590	4½	1⅛	.1530	.1520	4 to 6	2	2210	6	1½	.2173	.2163	4 to 6
20	.1610	4½	1⅛	.1530	.1520	4 to 6	1	.2280	6	1½	.2173	.2163	4 to 6

All dimensions in inches. Material is high-speed steel.

Tolerances: On diameter of reamer, plus .0001 to plus .0004 inch. On overall length A, plus or minus 1/16 inch. On length of flute B, plus or minus 1/16 inch.

Straight Shank Chucking Reamers—Straight Flutes, Letter Sizes ANSI B94.2-1983, R1988

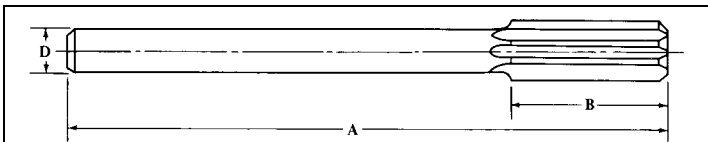


Reamer Diameter		Lgth. Overall A	Lgth. of Flute B	Shank Dia. D		No. of Flutes	Reamer Diameter		Lgth. Overall A	Lgth. of Flute B	Shank Dia. D		No. of Flutes
Letter	Inch			Max	Min		Letter	Inch			Max	Min	
A	0.2340	6	1½	0.2265	.2255	4 to 6	N	0.3020	6	1½	0.2792	0.2782	4 to 6
B	0.2380	6	1½	0.2329	.2319	4 to 6	O	0.3160	6	1½	0.2792	0.2782	4 to 6
C	0.2420	6	1½	0.2329	.2319	4 to 6	P	0.3230	6	1½	0.2792	0.2782	4 to 6
D	0.2460	6	1½	0.2329	.2319	4 to 6	Q	0.3320	6	1½	0.2792	0.2782	4 to 6
E	0.2500	6	1½	0.2405	.2395	4 to 6	R	0.3390	6	1½	0.2792	0.2782	4 to 6
F	0.2570	6	1½	0.2485	.2475	4 to 6	S	0.3480	7	1¾	0.3105	0.3095	4 to 6
G	0.2610	6	1½	0.2485	.2475	4 to 6	T	0.3580	7	1¾	0.3105	0.3095	4 to 6
H	0.2660	6	1½	0.2485	.2475	4 to 6	U	0.3680	7	1¾	0.3105	0.3095	4 to 6
I	0.2720	6	1½	0.2485	.2475	4 to 6	V	0.3770	7	1¾	0.3105	0.3095	4 to 6
J	0.2770	6	1½	0.2485	.2475	4 to 6	W	0.3860	7	1¾	0.3105	0.3095	4 to 6
K	0.2810	6	1½	0.2485	.2475	4 to 6	X	0.3970	7	1¾	0.3105	0.3095	4 to 6
L	0.2900	6	1½	0.2792	.2782	4 to 6	Y	0.4040	7	1¾	0.3105	0.3095	4 to 6
M	0.2950	6	1½	0.2792	.2782	4 to 6	Z	0.4130	7	1¾	0.3730	0.3720	6 to 8

All dimensions in inches. Material is high-speed steel.

Tolerances: On diameter of reamer, for sizes A to E, incl., plus .0001 to plus .0004 inch and for sizes F to Z, incl., plus .0001 to plus .0005 inch. On overall length A, plus or minus 1/16 inch. On length of flute B, plus or minus 1/16 inch.

Straight Shank Chucking Reamers—Straight Flutes, Decimal Sizes ANSI B94.2-1983, R1988

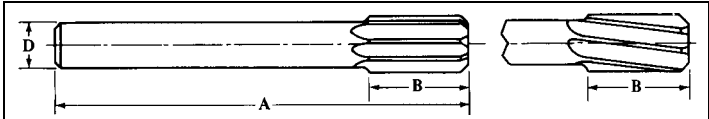


Reamer Dia.	Lgth. Overall A	Lgth. of Flute B	Shank Diameter D		No. of Flutes	Reamer Dia.	Lgth. Overall A	Lgth. of Flute B	Shank Diameter D		No. of Flutes
			Max.	Min.					Max.	Min.	
0.1240	3½	7/8	0.1190	0.1180	4 to 6	0.3135	6	1½	0.2792	0.2782	4 to 6
0.1260	3½	7/8	0.1190	0.1180	4 to 6	0.3740	7	1¾	0.3105	0.3095	6 to 8
0.1865	4½	1⅛	0.1805	0.1795	4 to 6	0.3760	7	1¾	0.3105	0.3095	6 to 8
0.1885	4½	1⅛	0.1805	0.1795	4 to 6	0.4365	7	1¾	0.3730	0.3720	6 to 8
0.2490	6	1½	0.2405	0.2395	4 to 6	0.4385	7	1¾	0.3730	0.3720	6 to 8
0.2510	6	1½	0.2405	0.2395	4 to 6	0.4990	8	2	0.4355	0.4345	6 to 8
0.3115	6	1½	0.2792	0.2782	4 to 6	0.5010	8	2	0.4355	0.4345	6 to 8

All dimensions in inches. Material is high-speed steel.

Tolerances: On diameter of reamer, for 0.124 to 0.249-inch sizes, plus .0001 to plus .0004 inch and for 0.251 to 0.501-inch sizes, plus .0001 to plus .0005 inch. On overall length A, plus or minus 1/16 inch. On length of flute B, plus or minus 1/16 inch.

American National Standard Straight Shank Rose Chucking and Chucking Reamers—Straight and Helical Flutes, Fractional Sizes ANSIB94.2-1983 (R1988)



Reamer Diameter		Length Overall A	Flute Length B	Shank Dia. D		No. of Flutes
Chucking	Rose Chucking			Max	Min	
3/64	...	2 1/2	1/2	0.0455	0.0445	4
1/16	...	2 1/2	1/2	0.0585	0.0575	4
5/64	...	3	3/4	0.0720	0.0710	4
3/32	...	3	3/4	0.0880	0.0870	4
7/64	...	3 1/2	7/8	0.1030	0.1020	4 to 6
1/8	1/8 ^a	3 1/2	7/8	0.1190	0.1180	4 to 6
9/64	...	4	1	0.1350	0.1340	4 to 6
5/32	...	4	1	0.1510	0.1500	4 to 6
11/64	...	4 1/2	1 1/8	0.1645	0.1635	4 to 6
3/16	3/16 ^a	4 1/2	1 1/8	0.1805	0.1795	4 to 6
13/64	...	5	1 1/4	0.1945	0.1935	4 to 6
7/32	...	5	1 1/4	0.2075	0.2065	4 to 6
15/64	...	6	1 1/2	0.2265	0.2255	4 to 6
1/4	1/4 ^a	6	1 1/2	0.2405	0.2395	4 to 6
17/64	...	6	1 1/2	0.2485	0.2475	4 to 6
9/32	...	6	1 1/2	0.2485	0.2475	4 to 6
19/64	...	6	1 1/2	0.2792	0.2782	4 to 6
5/16	5/16 ^a	6	1 1/2	0.2792	0.2782	4 to 6
21/64	...	6	1 1/2	0.2792	0.2782	4 to 6
11/32	...	6	1 1/2	0.2792	0.2782	4 to 6
23/64	...	7	1 3/4	0.3105	0.3095	4 to 6
3/8	3/8 ^a	7	1 3/4	0.3105	0.3095	4 to 6
25/64	...	7	1 3/4	0.3105	0.3095	4 to 6
13/32	...	7	1 3/4	0.3105	0.3095	4 to 6
27/64	...	7	1 3/4	0.3730	0.3720	6 to 8
7/16	7/16 ^a	7	1 3/4	0.3730	0.3720	6 to 8
29/64	...	7	1 3/4	0.3730	0.3720	6 to 8
15/32	...	7	1 3/4	0.3730	0.3720	6 to 8
31/64	...	8	2	0.4355	0.4345	6 to 8
1/2	1/2 ^a	8	2	0.4355	0.4345	6 to 8
17/32	...	8	2	0.4355	0.4345	6 to 8
9/16	...	8	2	0.4355	0.4345	6 to 8
19/32	...	8	2	0.4355	0.4345	6 to 8
5/8	...	9	2 1/4	0.5620	0.5605	6 to 8
21/32	...	9	2 1/4	0.5620	0.5605	6 to 8
11/16	...	9	2 1/4	0.5620	0.5605	6 to 8
23/32	...	9	2 1/4	0.5620	0.5605	6 to 8
3/4	...	9 1/2	2 1/2	0.6245	0.6230	6 to 8
25/32	...	9 1/2	2 1/2	0.6245	0.6230	8 to 10
13/16	...	9 1/2	2 1/2	0.6245	0.6230	8 to 10
27/32	...	9 1/2	2 1/2	0.6245	0.6230	8 to 10
7/8	...	10	2 5/8	0.7495	0.7480	8 to 10
29/32	...	10	2 5/8	0.7495	0.7480	8 to 10
15/16	...	10	2 5/8	0.7495	0.7480	8 to 10
31/32	...	10	2 5/8	0.7495	0.7480	8 to 10
1	...	10 1/2	2 3/4	0.8745	0.8730	8 to 12
1 1/16	...	10 1/2	2 3/4	0.8745	0.8730	8 to 12
1 1/8	...	11	2 7/8	0.8745	0.8730	8 to 12
1 1/4	...	11	2 7/8	0.9995	0.9980	8 to 12
1 1/2	...	11 1/2	3	0.9995	0.9980	8 to 12
1 5/8	...	11 1/2	3	0.9995	0.9980	10 to 12
1 3/4	...	12	3 1/4	0.9995	0.9980	10 to 12
1 7/8	...	12	3 1/4	1.2495	1.2480	10 to 12
1 1/2	...	12 1/2	3 1/2	1.2495	1.2480	10 to 12

^a Reamer with straight flutes is standard only.

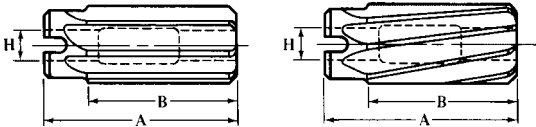
^b Reamer with helical flutes is standard only.

All dimensions are given in inches. Material is high-speed steel. Chucking reamers are end cutting on the chamfer and the relief for the outside diameter is ground in back of the margin for the full length of land. Lands of rose chucking reamers are not relieved on the periphery but have a relatively large amount of back taper.

Tolerances: On reamer diameter, up to $\frac{1}{4}$ -inch size, incl., +.0001 to +.0004 inch; over $\frac{1}{4}$ -to 1-inch size, incl., +.0001 to +.0005 inch; over 1-inch size, +.0002 to +.0006 inch. On length overall *A* and flute length *B*, up to 1-inch size, incl., $\pm\frac{1}{16}$ inch; $\frac{1}{16}$ -to $1\frac{1}{2}$ -inch size, incl., $\pm\frac{3}{32}$ inch.

Helical flutes are right- or left-hand helix, right-hand cut, except sizes $1\frac{1}{16}$ through $1\frac{1}{2}$ inches, which are right-hand helix only.

Shell Reamers—Straight and Helical Flutes ANSI B94.2-1983, R1988



Diameter of Reamer	Length Overall <i>A</i>	Flute Length <i>B</i>	Hole Diameter Large End <i>H</i>	Fitting Arbor No.	Number of Flutes
$\frac{3}{4}$	$2\frac{1}{4}$	$1\frac{1}{2}$	0.375	4	8 to 10
$\frac{7}{8}$	$2\frac{1}{2}$	$1\frac{3}{4}$	0.500	5	8 to 10
$1\frac{1}{16}$ ^a	$2\frac{1}{2}$	$1\frac{3}{4}$	0.500	5	8 to 10
1	$2\frac{1}{2}$	$1\frac{3}{4}$	0.500	5	8 to 10
$1\frac{1}{16}$	$2\frac{3}{4}$	2	0.625	6	8 to 12
$1\frac{1}{8}$	$2\frac{3}{4}$	2	0.625	6	8 to 12
$1\frac{3}{16}$	$2\frac{3}{4}$	2	0.625	6	8 to 12
$1\frac{1}{4}$	$2\frac{3}{4}$	2	0.625	6	8 to 12
$1\frac{5}{16}$	3	$2\frac{1}{4}$	0.750	7	8 to 12
$1\frac{3}{8}$	3	$2\frac{1}{4}$	0.750	7	8 to 12
$1\frac{7}{16}$	3	$2\frac{1}{4}$	0.750	7	8 to 12
$1\frac{1}{2}$	3	$2\frac{1}{2}$	0.750	7	10 to 14
$1\frac{9}{16}$	3	$2\frac{1}{4}$	0.750	7	10 to 14
$1\frac{5}{8}$	3	$2\frac{1}{4}$	0.750	7	10 to 14
$1\frac{11}{16}$	$3\frac{1}{2}$	$2\frac{1}{2}$	1.000	8	10 to 14
$1\frac{3}{4}$	$3\frac{1}{2}$	$2\frac{1}{2}$	1.000	8	12 to 14
$1\frac{13}{16}$	$3\frac{1}{2}$	$2\frac{1}{2}$	1.000	8	12 to 14
$1\frac{7}{8}$	$3\frac{1}{2}$	$2\frac{1}{2}$	1.000	8	12 to 14
$1\frac{15}{16}$	$3\frac{1}{2}$	$2\frac{1}{2}$	1.000	8	12 to 14
2	$3\frac{1}{2}$	$2\frac{1}{2}$	1.000	8	12 to 14
$2\frac{1}{16}$ ^a	$3\frac{3}{4}$	$2\frac{3}{4}$	1.250	9	12 to 16
$2\frac{1}{8}$	$3\frac{3}{4}$	$2\frac{3}{4}$	1.250	9	12 to 16
$2\frac{3}{16}$ ^a	$3\frac{3}{4}$	$2\frac{3}{4}$	1.250	9	12 to 16
$2\frac{1}{4}$	$3\frac{3}{4}$	$2\frac{3}{4}$	1.250	9	12 to 16
$2\frac{5}{8}$ ^a	$3\frac{3}{4}$	$2\frac{3}{4}$	1.250	9	14 to 16
$2\frac{1}{2}$ ^a	$3\frac{3}{4}$	$2\frac{3}{4}$	1.250	9	14 to 16

^a Helical flutes only.

All dimensions are given in inches. Material is high-speed steel. Helical flute shell reamers with left-hand helical flutes are standard. Shell reamers are designed as a sizing or finishing reamer and are held on an arbor provided with driving lugs. The holes in these reamers are ground with a taper of $\frac{1}{8}$ inch per foot.

Tolerances: On diameter of reamer, $\frac{3}{4}$ -to 1-inch size, incl., +.0001 to +.0005 inch; over 1-inch size, +.0002 to +.0006 inch. On length overall *A* and flute length *B*, $\frac{3}{4}$ -to 1-inch size, incl., $\pm\frac{1}{16}$ inch; $1\frac{1}{16}$ -to 2-inch size, incl., $\pm\frac{3}{32}$ inch; $2\frac{1}{16}$ -to $2\frac{1}{2}$ -inch size, incl., $\pm\frac{1}{8}$ inch.

**American National Standard Arbors for Shell Reamers—
Straight and Taper Shanks ANSI B94.2-1983, R1988**

Arbor Size No.	Overall Length A	Approximate Length of Taper L	Reamer Size	Taper Shank No. ^a	Straight Shank Dia. D
4	9	2¼	¾	2	½
5	9½	2½	13/16 to 1	2	¾
6	10	2¾	1½/16 to 1¼	3	¾
7	11	3	1½/16 to 1⅜	3	7/8
8	12	3½	1½/16 to 2	4	1⅛
9	13	3¾	2½/16 to 2½	4	1⅜

^a American National Standard self-holding tapers (see Table 7a on page 913.)

All dimensions are given in inches. These arbors are designed to fit standard shell reamers (see table). End which fits reamer has taper of ⅛ inch per foot.

Stub Screw Machine Reamers—Helical Flutes ANSI B94.2-1983, R1988

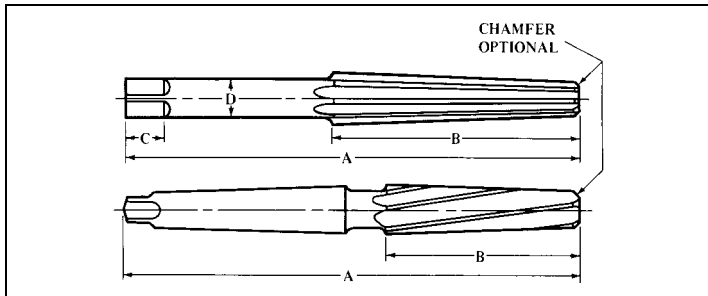
Series No.	Diameter Range	Length Overall	Length of Flute	Dia. of Shank	Size of Hole	Flute No.	Series No.	Diameter Range	Length Overall	Length of Flute	Dia. of Shank	Size of Hole	Flute No.
		A	B	D	H				A	B	D	H	
00	.0600-.066	1¾	½	⅛	⅛/16	4	12	.3761-.407	2½	1¼	½	⅜/16	6
0	.0661-.074	1¾	½	⅛	⅛/16	4	13	.4071-.439	2½	1¼	½	⅜/16	6
1	.0741-.084	1¾	½	⅛	⅛/16	4	14	.4391-.470	2½	1¼	½	⅜/16	6
2	.0841-.096	1¾	½	⅛	⅛/16	4	15	.4701-.505	2½	1¼	½	⅜/16	6
3	.0961-.126	2	¾	⅛	⅛/16	4	16	.5051-.567	3	1½	¾	¼	6
4	.1261-.158	2¼	1	¼	⅜/32	4	17	.5671-.630	3	1½	¾	¼	6
5	.1581-.188	2¼	1	¼	⅜/32	4	18	.6301-.692	3	1½	¾	¼	6
6	.1881-.219	2¼	1	¼	⅜/32	6	19	.6921-.755	3	1½	¾	⅜/16	8
7	.2191-.251	2¼	1	¼	⅜/32	6	20	.7551-.817	3	1½	¾	⅜/16	8
8	.2511-.282	2¼	1	⅜	⅛	6	21	.8171-.880	3	1½	¾	⅜/16	8
9	.2821-.313	2¼	1	¾	⅛	6	22	.8801-.942	3	1½	¾	⅜/16	8
10	.3131-.344	2½	1¼	¾	⅛	6	23	.9421-1.010	3	1½	¾	⅜/16	8
11	.3441-.376	2½	1¼	¾	⅛	6	...	...	...	...	...	...	...

All dimensions in inches. Material is high-speed steel.

These reamers are standard with right-hand cut and left-hand helical flutes within the size ranges shown.

Tolerances: On diameter of reamer, for sizes 00 to 7, incl., plus .0001 to plus .0004 inch and for sizes 8 to 23, incl., plus .0001 to plus .0005 inch. On overall length A, plus or minus ⅛ inch. On length of flute B, plus or minus ⅛ inch. On diameter of shank D, minus .0005 to minus .002 inch.

American National Standard Morse Taper Finishing Reamers
ANSI B94.2-1983, R1988



Straight Flutes and Squared Shank

Taper No. ^a	Small End Dia. (Ref.)	Large End Dia. (Ref.)	Length Overall A	Flute Length B	Square Length C	Shank Dia. D	Square Size
0	0.2503	0.3674	3 $\frac{3}{4}$	2 $\frac{1}{4}$	$\frac{5}{16}$	$\frac{5}{16}$	0.235
1	0.3674	0.5170	5	3	$\frac{7}{16}$	$\frac{7}{16}$	0.330
2	0.5696	0.7444	6	3 $\frac{1}{2}$	$\frac{5}{8}$	$\frac{5}{8}$	0.470
3	0.7748	0.9881	7 $\frac{1}{4}$	4 $\frac{1}{4}$	$\frac{7}{8}$	$\frac{7}{8}$	0.655
4	1.0167	1.2893	8 $\frac{1}{2}$	5 $\frac{1}{4}$	1	1 $\frac{1}{8}$	0.845
5	1.4717	1.8005	9 $\frac{3}{4}$	6 $\frac{1}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{2}$	1.125

Straight and Spiral Flutes and Taper Shank

Squared and Taper Shank

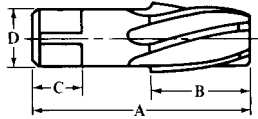
Taper No. ^a	Small End Dia. (Ref.)	Large End Dia. (Ref.)	Length Overall A	Flute Length B	Taper Shank No. ^a	Number of Flutes
0	0.2503	0.3674	5 $\frac{11}{32}$	2 $\frac{1}{4}$	0	4 to 6 incl.
1	0.3674	0.5170	6 $\frac{5}{16}$	3	1	6 to 8 incl.
2	0.5696	0.7444	7 $\frac{3}{8}$	3 $\frac{1}{2}$	2	6 to 8 incl.
3	0.7748	0.9881	8 $\frac{7}{8}$	4 $\frac{1}{4}$	3	8 to 10 incl.
4	1.0167	1.2893	10 $\frac{7}{8}$	5 $\frac{1}{4}$	4	8 to 10 incl.
5	1.4717	1.8005	13 $\frac{1}{8}$	6 $\frac{1}{4}$	5	10 to 12 incl.

^aMorse. For amount of taper see Table 1b on page 908.

All dimension are given in inches. Material is high-speed steel. The chamfer on the cutting end of the reamer is optional. Squared shank reamers are standard with straight flutes. Tapered shank reamers are standard with straight or spiral flutes. Spiral flute reamers are standard with left-hand spiral flutes.

Tolerances: On overall length A and flute length B, in taper numbers 0 to 3, incl., $\pm\frac{1}{16}$ inch, in taper numbers 4 and 5, $\pm\frac{3}{32}$ inch. On length of square C, in taper numbers 0 to 3, incl., $\pm\frac{1}{32}$ inch; in taper numbers 4 and 5, $\pm\frac{1}{16}$ inch. On shank diameter D, - .0005 to - .002 inch. On size of square, in taper numbers 0 and 1, - .004 inch; in taper numbers 2 and 3, - .006 inch; in taper numbers 4 and 5, - .008 inch.

Taper Pipe Reamers—Spiral Flutes ANSI B94.2-1983, R1988



Nom. Size	Diameter		Length Overall A	Flute Length B	Square Length C	Shank Diameter D	Size of Square	No. of Flutes
	Large End	Small End						
1/8	0.362	0.316	2 3/8	3/4	3/8	0.4375	0.328	4 to 6
1/4	0.472	0.406	2 7/16	1 1/16	7/16	0.5625	0.421	4 to 6
3/8	0.606	0.540	2 9/16	1 1/16	1/2	0.7000	0.531	4 to 6
1/2	0.751	0.665	3 3/8	1 3/8	5/8	0.6875	0.515	4 to 6
3/4	0.962	0.876	3 1/4	1 3/8	1 1/16	0.9063	0.679	6 to 10
1	1.212	1.103	3 3/4	1 3/4	1 3/16	1.1250	0.843	6 to 10
1 1/4	1.553	1.444	4	1 3/4	1 5/16	1.3125	0.984	6 to 10
1 1/2	1.793	1.684	4 1/4	1 3/4	1	1.5000	1.125	6 to 10
2	2.268	2.159	4 1/2	1 3/4	1 1/8	1.8750	1.406	8 to 12

All dimensions are given in inches. These reamers are tapered 3/4 inch per foot and are intended for reaming holes to be tapped with American National Standard Taper Pipe Thread taps. Material is high-speed steel. Reamers are standard with left-hand spiral flutes.

Tolerances: On length overall A and flute length B, 1/8- to 3/4-inch size, incl., ±1/16 inch; 1- to 1 1/2-inch size, incl., ±3/32 inch; 2-inch size, ±1/8 inch. On length of square C, 1/8- to 3/4-inch size, incl., ±1/32 inch; 1- to 2-inch size, incl., ±1/16 inch. On shank diameter D, 1/8-inch size, - .0015 inch; 1/4- to 1-inch size, incl., - .002 inch; 1 1/4- to 2-inch size, incl., - .003 inch. On size of square, 1/8-inch size, - .004 inch; 1/4- to 3/4-inch size, incl., - .006 inch; 1- to 2-inch size, incl., - .008 inch.

B & S Taper Reamers—Straight and Spiral Flutes, Squared Shank

Taper No. ^a	Dia., Small End	Dia., Large End	Overall Length	Square Length	Flute Length	Dia. of Shank	Size of Square	No. of Flutes
1	0.1974	0.3176	4 3/4	1/4	2 7/8	3/32	0.210	4 to 6
2	0.2474	0.3781	5 1/8	3/16	3 3/8	1/32	0.255	4 to 6
3	0.3099	0.4510	5 1/2	3/8	3 3/8	1/32	0.305	4 to 6
4	0.3474	0.5017	5 7/8	7/16	3 11/16	7/16	0.330	4 to 6
5	0.4474	0.6145	6 3/8	1/2	4	7/16	0.420	4 to 6
6	0.4974	0.6808	6 7/8	5/8	4 3/8	3/8	0.470	4 to 6
7	0.5974	0.8011	7 1/2	3/4	4 7/8	3/4	0.560	6 to 8
8	0.7474	0.9770	8 1/8	13/16	5 1/2	13/16	0.610	6 to 8
9	0.8974	1.1530	8 3/4	7/8	6 1/8	1	0.750	6 to 8
10	1.0420	1.3376	9 3/4	1	6 7/8	1 1/8	0.845	6 to 8

^aFor taper per foot, see Table 10 on page 916.

These reamers are no longer ANSI Standard.

All dimensions are given in inches. Material is high-speed steel. The chamfer on the cutting end of the reamer is optional. All reamers are finishing reamers. Spiral flute reamers are standard with left-hand spiral flutes. (Tapered reamers, especially those with left-hand spirals, should not have circular lands because cutting must take place on the outer diameter of the tool.) B & S taper reamers are designed for use in reaming out Brown & Sharpe standard taper sockets.

Tolerances: On length overall A and flute length B, taper nos. 1 to 7, incl., ±1/16 inch; taper nos. 8 to 10, incl., ±3/32 inch. On length of square C, taper nos. 1 to 9, incl., ±1/32 inch; taper no. 10, ±1/16 inch. On shank diameter D, - .0005 to - .002 inch. On size of square, taper nos. 1 to 3, incl., - .004 inch; taper nos. 4 to 9, incl., - .006 inch; taper no. 10, - .008 inch.

American National Standard Die-Maker's Reamers ANSI B94.2-1983, R1988



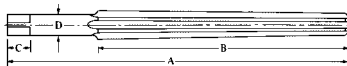
Letter Size	Diameter		Length		Letter Size	Diameter		Length		Letter Size	Diameter		Length	
	Small End	Large End	A	B		Small End	Large End	A	B		Small End	Large End	A	B
AAA	0.055	0.070	2¼	1½	G	0.135	0.158	3	1¾	O	0.250	0.296	5	3½
AA	0.065	0.080	2¼	1¾	H	0.145	0.169	3¼	1¾	P	0.275	0.327	5½	4
A	0.075	0.090	2¼	1¾	I	0.160	0.184	3¼	1¾	Q	0.300	0.358	6	4½
B	0.085	0.103	2¾	1¾	J	0.175	0.199	3¼	1¾	R	0.335	0.397	6½	4¾
C	0.095	0.113	2½	1¾	K	0.190	0.219	3½	2¼	S	0.370	0.435	6¾	5
D	0.105	0.126	2¾	1¾	L	0.205	0.234	3½	2¼	T	0.405	0.473	7	5¼
E	0.115	0.136	2¾	1¾	M	0.220	0.252	4	2½	U	0.440	0.511	7¼	5½
F	0.125	0.148	3	1¾	N	0.235	0.274	4½	3	...	...	...	...	...

All dimensions in inches. Material is high-speed steel. These reamers are designed for use in die-making, have a taper of ¼ degree included angle or 0.013 inch per inch, and have 2 or 3 flutes. Reamers are standard with left-hand spiral flutes.

Tip of reamer may have conical end.

Tolerances: On length overall A and flute length B, ± $\frac{1}{16}$ inch.

Taper Pin Reamers — Straight and Left-Hand Spiral Flutes, Squared Shank; and Left-Hand High-Spiral Flutes, Round Shank ANSI B94.2-1983, R1988



No. of Taper Pin Reamer	Diameter at Large End of Reamer (Ref.)	Diameter at Small End of Reamer (Ref.)	Overall Length of Reamer A	Length of Flute B	Length of Square C ^a	Diameter of Shank D	Size of Square ^a
8/0 ^b	0.0514	0.0351	1¾	¾	...	¼	...
7/0	0.0666	0.0497	1¾	¾	¾	¾	0.060
6/0	0.0806	0.0611	1¾	¾	¾	¾	0.070
5/0	0.0966	0.0719	2¾	1¾	¾	¾	0.080
4/0	0.1142	0.0869	2¾	1¾	¾	¾	0.095
3/0	0.1302	0.1029	2¾	1¾	¾	¾	0.105
2/0	0.1462	0.1137	2¾	1¾	¾	¾	0.115
0	0.1638	0.1287	2¾	1¾	¾	¾	0.130
1	0.1798	0.1447	2¾	1¾	¾	¾	0.140
2	0.2008	0.1605	3¾	1¾	¾	¾	0.150
3	0.2294	0.1813	3¾	1¾	¾	¾	0.175
4	0.2604	0.2071	4¾	2¾	¾	¾	0.200
5	0.2994	0.2409	4¾	2¾	¾	¾	0.235
6	0.3540	0.2773	5¾	3¾	¾	¾	0.270
7	0.4220	0.3297	6¾	4¾	¾	¾	0.305
8	0.5050	0.3971	7¾	5¾	¾	¾	0.330
9	0.6066	0.4805	8¾	6¾	¾	¾	0.420
10	0.7216	0.5799	9¾	6¾	¾	¾	0.470

^a Not applicable to high-spiral flute reamers.

^b Not applicable to straight and left-hand spiral fluted, squared shank reamers.

All dimensions in inches. Reamers have a taper of ¼ inch per foot and are made of high-speed steel. Straight flute reamers of carbon steel are also standard. The number of flutes is as follows; 3 or 4, for 7/0 to 4/0 sizes; 4 to 6, for 3/0 to 0 sizes; 5 or 6, for 1 to 5 sizes; 6 to 8, for 6 to 9 sizes; 7 or 8, for the 10 size in the case of straight- and spiral-flute reamers; and 2 or 3, for 8/0 to 8 sizes; 2 to 4, for the 9 and 10 sizes in the case of high-spiral flute reamers.

Tolerances: On length overall A and flute length B, ± $\frac{1}{16}$ inch. On length of square C, ± $\frac{1}{32}$ inch. On shank diameter D, -0.001 to -0.005 inch for straight- and spiral-flute reamers and -0.005 to -0.002 inch for high-spiral flute reamers. On size of square, -0.004 inch for 7/0 to 7 sizes and -0.006 inch for 8 to 10 sizes.