



### BlackStar Bushings

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# QD Style Bushings

## Installation Instructions

### INSTALLATION

1. Make sure that the shaft is within the tolerances shown in Table 1.
2. Remove all dirt, oil, paint, etc. from all surfaces involved in mounting.
3. Clean shaft, bushing bore, bushing OD, and component tapered bore.
4. **DO NOT USE ANTI-SEIZE LUBRICANT** on bore or tapered surfaces or bolt threads; this will void any and all warranties.
5. Insert the bushing into the hub in the desired orientation. Align non-threaded holes with threaded holes as desired for installation.
6. Thread screws by hand, leaving the bushing loose to allow for sliding along the shaft.
7. Install the key in the shaft and mount the assembly on the shaft in the desired orientation. Tighten setscrew over the keyway.
8. Gradually increase torque on the screws in an alternating fashion until torque values in Table 2 are reached.
9. A gap should remain at all times between the hub and flange. Check the remaining gap against specs shown in Table 3. If the gap is closed, please check your shaft tolerance against those shown in Table 1.

### REMOVAL

1. Loosen and remove all screws.
2. Thread screws into removal holes.
3. Alternately tighten screws to remove the bushing.
4. If bushing won't loosen, a wedge may be used between flange and hub.

**Warning:** Use of anti-seize lubricant on the mounting surfaces or threads may allow excessive pressures on the hub and result in damage to the component being mounted. This voids all manufacturer's warranties.

TABLE 1

Shaft Diameter		Shaft Tolerance	
Over	Including		
in. mm	in. mm	in. mm	in. mm
<b>0</b> 0	<b>1.500</b> 38.1	<b>+0.000</b> +0.0	<b>-0.002</b> -0.05
<b>1.500</b> 38.1	<b>2.500</b> 63.5	<b>+0.000</b> +0.0	<b>-0.003</b> -0.08
<b>2.500</b> 63.5	<b>4.000</b> 101.6	<b>+0.000</b> +0.0	<b>-0.004</b> -0.10
<b>4.000</b> 101.6	<b>6.000</b> 152.4	<b>+0.000</b> +0.0	<b>-0.005</b> -0.13
<b>6.000</b> 152.4	<b>8.000</b> 203.2	<b>+0.000</b> +0.0	<b>-0.006</b> -0.15

TABLE 2

Bushing Size	Cap Screw Size	Torque	
		in.-lbs.	N-m
JA	10-24	60	7
SH/SDS/SD	1/4-20	108	12
SK	5/16-18	180	20
SF	3/8-16	360	41
E	1/2-13	720	81
F	9/1-12	900	102
J	5/8-11	1620	183
M	3/4-10	2700	305
N	7/8-9	3600	407
P	1-8	5400	610

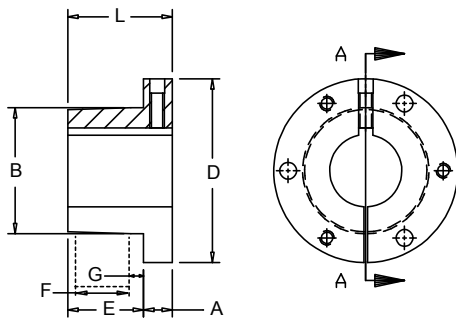
TABLE 3

Bushing Size	Gap
JA	1/8
SH/SDS/SD	3/16
SK	3/16
SF	1/4
E	5/16
F	3/8
J	3/8
M	3/8
N	7/16

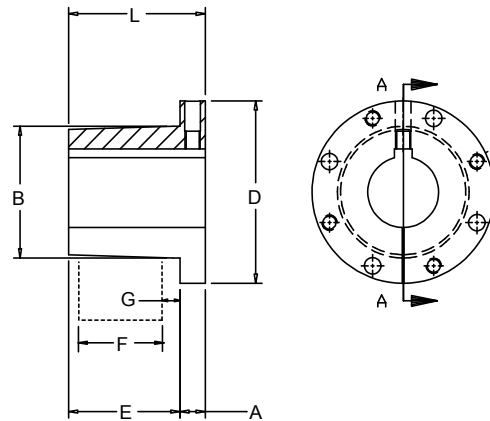
All dimensions in inches.

# QD Style Bushings

## JA TO J BUSHINGS



## M TO P BUSHINGS



## Dimensions

Bushing Type	Dimension (Inches)								Stock Bore Range			Cap Screws Required			Set Screw Size	Wrench-Torque inch-lbs.	Approx. Weight (lbs.)
	A	B	D	E	F	G	L	Bolt Circle	Minimum	Maximum		No.	Thread	Length			
										Standard Keyway	Shallow Keyway						
JA	3/8	1.375	2	11/16	9/16	1/8	1 1/16	1 21/32	3/8	1	1 1/4	3	10 - 24	1	10-24	60	0.9
SH	7/16	1.871	2 11/16	7/8	13/16	3/16	1 5/16	2 1/4	1/2	1 3/8	1 11/16	3	1/4 - 20	1 3/8	1/4	108	1.0
SDS	1/2	2.187	3 3/16	7/8	3/4	3/16	1 3/8	2 11/16	1/2	1 11/16	2	3	1/4 - 20	1 3/8	1/4	108	1.0
SD	1/2	2.187	3 3/16	1 5/16	1 1/4	3/16	1 13/16	2 11/16	1/2	1 11/16	1 15/16	3	1/4 - 20	1 7/8	1/4	108	1.5
SK	9/16	2.812	3 7/8	1 3/8	1 1/4	3/16	1 15/16	3 5/16	1/2	2 1/8	2 1/2	3	5/16 - 18	2	5/16	180	2.0
SF	9/16	3.125	4 5/8	1 1/2	1 1/4	1/4	2 1/16	3 7/8	1/2	2 5/16	2 13/16	3	3/8 - 16	2	5/16	360	3.0
E	3/4	3.834	6	1 7/8	1 5/8	5/16	2 5/8	5	7/8	2 7/8	3 1/2	3	1/2 - 13	2 1/2	3/8	720	10.0
F	13/16	4.437	6 5/8	2 13/16	2 1/2	3/8	3 5/8	5 5/8	1	3 5/16	3 15/16	3	9/16 - 12	3 5/8	1/2	900	11.5
J	1	5.148	7 1/4	3 1/2	3 13/16	3/8	4 1/2	6 1/4	1 7/16	3 3/4	4 1/2	3	5/8 - 11	4 1/2	5/8	1,620	18.0
M	1 1/4	6.500	9	5 1/2	5 3/16	3/8	6 3/4	7 7/8	1 15/16	4 3/4	5 1/2	4	3/4 - 10	6 3/4	3/4	2,700	37.0
N	1 1/2	7.000	10	6 5/8	6 1/4	7/16	8 1/8	8 1/2	2 7/16	5 1/8	6	4	7/8 - 9	8	3/4	3,600	57.0
P	1 3/4	8.250	11 3/4	7 5/8	7 1/4	1/2	9 3/8	10	2 15/16	5 15/16	7	4	1 - 8	9 1/2	7/8	5,400	120.0

G = Gap between QD Style bushing flange and hub.  
F = Length of mating bore.

All dimensions in inches.



# TL Bushings

## Installation Instructions

### INSTALLATION

1. Make sure that the shaft is within the tolerances shown in Table 1.
2. Remove all dirt, oil, paint, etc. from all surfaces involved in mounting.
3. Clean shaft, bushing bore, bushing OD, and component tapered bore.
4. **DO NOT USE ANTI-SEIZE LUBRICANT** on bore or tapered surfaces or bolt threads; this will void any and all warranties.
5. Insert the bushing into the hub. Align the non-threaded holes in bushing with the threaded portion of the hub.
6. Thread screws by hand into the holes that have the threaded portion in the hub.
7. Install the key in the shaft and mount the assembly on the shaft.
8. Gradually increase torque on the screws in an alternating fashion until torque values in Table 2 are reached.
9. On bushings 3535 and larger, drive the bushing into the hub using a hammer and sleeve, block or drift.
10. Repeat steps 8 and 9 using a torque wrench, until the torque on the screws is the same before and after hammering.
11. Fill all unoccupied holes with grease to exclude contaminants and reduce corrosion.

### REMOVAL

1. Loosen and remove all screws. Put oil on the thread and tip of setscrews or on the thread and under the head of cap screws.
2. Thread screws into removal holes. (Holes having the threaded half in bushing, and non-threaded half in hub.)
3. Alternately tighten screws to remove the bushing.

**Warning:** Use of anti-seize lubricant on the mounting surfaces or threads may allow excessive pressures on the hub and result in damage to the component being mounted. This voids all manufacturer's warranties.

TABLE 1

Shaft Diameter		Shaft Tolerance	
Over	Including		
in. mm	in. mm	in. mm	in. mm
<b>0</b> 0	<b>1.500</b> 38.1	<b>+0.000</b> +0.0	<b>-0.002</b> -0.05
<b>1.500</b> 38.1	<b>2.500</b> 63.5	<b>+0.000</b> +0.0	<b>-0.003</b> -0.08
<b>2.500</b> 63.5	<b>4.000</b> 101.6	<b>+0.000</b> +0.0	<b>-0.004</b> -0.10
<b>4.000</b> 101.6	<b>6.000</b> 152.4	<b>+0.000</b> +0.0	<b>-0.005</b> -0.13
<b>6.000</b> 152.4	<b>8.000</b> 203.2	<b>+0.000</b> +0.0	<b>-0.006</b> -0.15

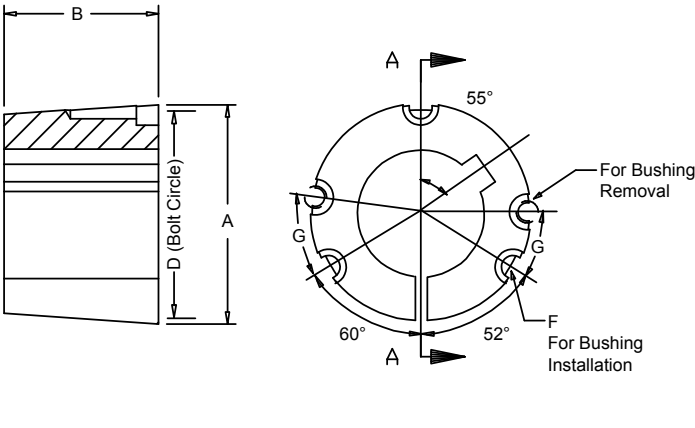
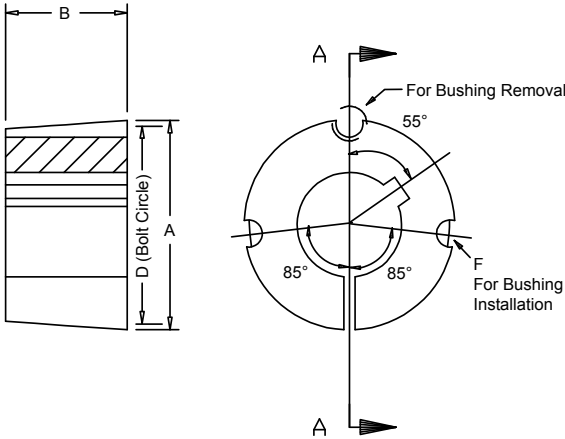
TABLE 2

Bushing Size	Screw Size	Torque	
		in.-lbs.	N-m
1008/1108	1/4 Setscrews	55	6
1210-1615	3/8 Setscrews	175	20
2012	7/16 Setscrews	280	32
2517/2525	1/2 Setscrews	430	49
3020/3030	5/8 Setscrews	800	90
3535	1/2 Capscrews	1000	113
4040	5/8 Capscrews	1700	192
4545	3/4 Capscrews	2450	277
5050	7/8 Capscrews	3100	884

All dimensions in inches.

## NO. 1008-3030 BUSHINGS

## NO. 3535-5050 BUSHINGS



### Dimensions

Bushing Number	A	B	D	F			G	Bore		Wrench-Torque inch-lbs.	Approx. Weight (lbs.)
				No.	Threads	Length		min	max		
1008	1.386	7/8	1 21/64	2	1/4	1/2	—	1/2	1	55	0.2
1108	1.511	7/8	1 29/64	2	1/4	1/2	—	1/2	1 1/8	55	0.2
1210	1 7/8	1	1 3/4	2	3/8	5/8	—	1/2	1 1/4	175	0.5
1215	1 7/8	1 1/2	1 3/4	2	3/8	5/8	—	1/2	1 1/4	175	0.6
1310	2	1	1 7/8	2	3/8	5/8	—	1/2	1 3/8	175	0.6
1610	2 1/4	1	2 1/8	2	3/8	5/8	—	1/2	1 5/8	175	0.7
1615	2 1/4	1 1/2	2 1/8	2	3/8	5/8	—	1/2	1 5/8	175	0.9
2012	2 3/4	1 1/4	2 5/8	2	7/16	7/8	—	1/2	2	280	1.4
2517	3 3/8	1 3/4	3 1/4	2	1/2	1	—	1/2	2 1/2	430	3.0
2525	3 3/8	2 1/2	3 1/4	2	1/2	1	—	3/4	2 1/2	430	4.0
3020	4 1/4	2	4	2	5/8	1 1/4	—	15/16	3	800	5.4
3030	4 1/4	3	4	2	5/8	1 1/4	—	15/16	3	800	7.5
3535	5	3 1/2	4.83	3	1/2	1 1/2	39°	1 3/16	3 1/2	1,000	12.0
4040	5 3/4	4	5.54	3	5/8	1 3/4	40°	1 7/8	4	1,700	17.0
4545	6 3/8	4 1/2	6.13	3	3/4	2	40°	1 15/16	4 1/2	2,450	24.0
5050	7	5	6.72	3	7/8	2 1/4	37°	2 5/16	5	3,100	31.0

# Split Taper Bushings

## Installation Instructions

### INSTALLATION

1. Make sure that the shaft is within the tolerances shown in Table 1.
2. Remove all dirt, oil, paint, etc. from all surfaces involved in mounting.
3. Clean shaft, bushing bore, bushing OD, and component tapered bore.
4. **DO NOT USE ANTI-SEIZE LUBRICANT** on bore or tapered surfaces or bolt threads; this will void any and all warranties.
5. Install the external drive key in the bushing as necessary. Insert the bushing into the hub and align the non-threaded holes in the bushing with the threaded holes in the part.
6. Thread screws by hand, leaving the bushing loose to allow for sliding along the shaft.
7. Install the key in the shaft if required by type, and mount the assembly on the shaft in the desired orientation.
8. Gradually increase torque on the screws in an alternating fashion until torque values in Table 2 are reached.
9. A gap should remain at all times between the hub and flange. Check the remaining gap against specs shown in Table 3. If the gap is closed, please check your shaft tolerance against those shown in Table 1.

### REMOVAL

1. Loosen and remove all screws.
2. Thread screws into removal holes.
3. Alternately tighten screws to remove the bushing.
4. If bushing won't loosen, a wedge may be used between flange and hub.

**Warning:** Use of anti-seize lubricant on the mounting surfaces or threads may allow excessive pressures on the hub and result in damage to the component being mounted. This voids all manufacturer's warranties.

TABLE 1

Shaft Diameter		Shaft Tolerance	
Over	Including		
in. mm	in. mm	in. mm	in. mm
<b>0</b> 0	<b>1.500</b> 38.1	<b>+0.000</b> +0.0	<b>-0.002</b> -0.05
<b>1.500</b> 38.1	<b>2.500</b> 63.5	<b>+0.000</b> +0.0	<b>-0.003</b> -0.08
<b>2.500</b> 63.5	<b>4.000</b> 101.6	<b>+0.000</b> +0.0	<b>-0.004</b> -0.10
<b>4.000</b> 101.6	<b>6.000</b> 152.4	<b>+0.000</b> +0.0	<b>-0.005</b> -0.13
<b>6.000</b> 152.4	<b>8.000</b> 203.2	<b>+0.000</b> +0.0	<b>-0.006</b> -0.15

TABLE 2

Bushing Size	Bolt Size	Torque	
		in.-lbs.	N-m
G	1/4-20	95	11
H	1/4-20	95	11
P1/P2/P3	5/16-18	192	22
B	5/16-18	192	22
Q1/Q2/Q3	3/8-16	348	39
R1/R2	3/8-16	348	39
S1/S2	1/2-13	840	95
U0/U1/U2	5/8-11	1680	190

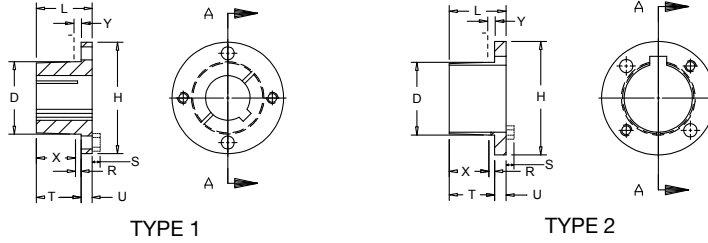
TABLE 3

Bushing Size	Gap
G	3/16
H	3/16
P1/P2/P3	7/32
B	7/32
Q1/Q2/Q3	7/32
R1/R2	1/4
S1/S2	5/16
U0/U1/U2	7/16

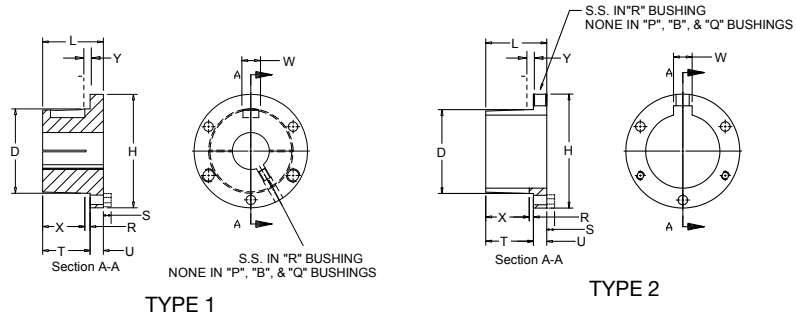
All dimensions in inches.

# Split Taper Bushings

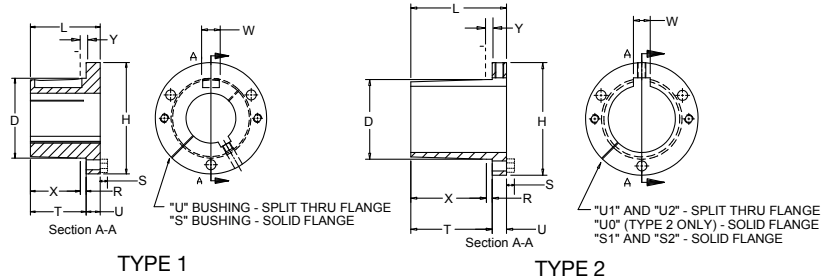
## G & H BUSHINGS



## P, B, Q & R BUSHINGS



## S & U BUSHINGS



## Dimensions

Bushings Type	Dimensions												Bore Range				Cap Screws			Wrench Torque inch-lbs	Approx Weight (lbs)
	L	U	T	D		H	S	W	X	Y	R	Bolt Circle	Type 1		Type 2		No. of Screws	Size	Length		
				Large End	Small End								min.	max.	min.	max.					
G	1	1/4	3/4	1.172	1.133	2	3/16	—	5/8	3/16	1/8	1 9/16	3/8	15/16	—	1	2	1/4 - 20	5/8	95	0.5
H	1 1/4	1/4	1	1.625	1.570	2 1/2	3/16	—	7/8	3/16	1/8	2	3/8	1 3/8	1 7/16	1 1/2	2	1/4 - 20	3/4	95	0.8
P1	1 15/16	13/32	1 17/32	1.938	1.856	3	1/4	3/8	1 5/16	7/32	7/32	2 7/16	1/2	1 7/16	1 1/2	1 3/4	3	5/16 - 18	1	192	1.3
P2	2 15/16	13/32	2 17/32	1.938	1.793	3	1/4	3/8	2 5/16	7/32	7/32	2 7/16	3/4	1 7/16	1 1/2	1 3/4	3	5/16 - 18	1	192	1.5
P3	4 7/16	13/32	4 1/32	1.938	1.699	3	1/4	3/8	3 13/16	7/32	7/32	2 7/16	1 1/8	1 3/8	—	1 5/8	3	5/16 - 18	1	192	2.0
B	1 15/16	1/2	1 7/16	2.625	2.557	3 11/32	1/4	1/2	1 3/16	7/32	1/4	3 1/8	1/2	1 15/16	2	2 7/16	3	5/16 - 18	1 1/4	192	1.8
Q1	2 1/2	17/32	1 31/32	2.875	2.766	4 1/8	9/32	1/2	1 3/4	7/32	7/32	3 3/8	3/4	2 1/16	2 1/8	2 11/16	3	3/8 - 16	1 1/4	348	3.5
Q2	3 1/2	17/32	2 31/32	2.875	2.703	4 1/8	9/32	1/2	2 3/4	7/32	7/32	3 3/8	1	2 1/16	2 1/8	2 5/8	3	3/8 - 16	1 1/4	348	4.5
Q3	5	17/32	4 15/16	2.875	2.609	4 1/8	9/32	1/2	4 3/4	7/32	7/32	3 3/8	1 3/8	2 1/16	2 1/8	2 1/2	3	3/8 - 16	1 1/4	348	5.5
R1	2 7/8	5/8	2 1/4	4.000	3.875	5 3/8	9/32	3/4	2	1/4	1/4	4 5/8	1 1/8	2 13/16	2 7/8	3 3/4	3	3/8 - 16	1 3/4	348	7.5
R2	4 7/8	5/8	4 1/4	4.000	3.750	5 3/8	9/32	3/4	4	1/4	1/4	4 5/8	1 3/8	2 13/16	2 7/8	3 5/8	3	3/8 - 16	1 3/4	348	11.0
S1	4 7/8	3/4	3 5/8	4.625	4.418	6 3/8	3/8	3/4	3 5/16	5/16	5/16	5 3/8	1 11/16	3 3/16	3 1/4	4 1/4	3	1/2 - 13	2 1/4	840	13.5
S2	6 3/4	3/4	6	4.625	4.270	6 3/8	3/8	3/4	5 11/16	5/16	5/16	5 3/8	1 7/8	3 3/16	3 1/4	4 3/16	3	1/2 - 13	2 1/4	840	19.0
U0	5 1/4	1 1/16	4 3/16	6.000	5.766	8 3/8	15/32	1 1/4	3 3/4	7/16	7/16	7	2 3/8	3 1/16	—	—	3	5/8 - 11	2 3/4	1,680	30.0
U0	4 15/16	3/4	4 3/16	6.000	5.766	8 3/8	15/32	1 1/4	3 3/4	7/16	7/16	7	3 1/4	4 1/4	4 3/8	5 1/2	3	5/8 - 11	2 3/4	1,680	27.0
U1	7 1/8	1 1/16	6 1/16	6.000	5.649	8 3/8	15/32	1 1/4	5 5/8	7/16	7/16	7	2 3/8	4 1/4	4 3/8	5 1/2	3	5/8 - 11	2 3/4	1,680	40.0
U2	10 1/8	1 1/16	9 1/16	6.000	5.461	8 3/8	15/32	1 1/4	8 5/8	7/16	7/16	7	2 7/16	4 1/4	4 3/8	5	3	5/8 - 11	2 3/4	1,680	50.0

Y = Gap between Split Taper bushing flange and hub.

All dimensions in inches.



# Standard Keyway and Key Dimensions

Shaft Size	Keyway	Key
3/8	None	None
7/16	None	None
1/2	1/8 x 1/16	1/8 x 1/8
9/16	1/8 x 1/16	1/8 x 1/8
5/8	3/16 x 3/32	3/16 x 3/16
11/16	3/16 x 3/32	3/16 x 3/16
3/4	3/16 x 3/32	3/16 x 3/16
13/16	3/16 x 3/32	3/16 x 3/16
7/8	3/16 x 3/32	3/16 x 3/16
15/16	1/4 x 1/8	1/4 x 1/4
1	1/4 x 1/8	1/4 x 1/4
1 1/16	1/4 x 1/8	1/4 x 1/4
1 1/8	1/4 x 1/8	1/4 x 1/4
1 3/16	1/4 x 1/8	1/4 x 1/4
1 1/4	1/4 x 1/8	1/4 x 1/4
1 5/16	5/16 x 5/32	5/16 x 5/16
1 3/8	5/16 x 5/32	5/16 x 5/16
1 7/16	3/8 x 3/16	3/8 x 3/8
1 1/2	3/8 x 3/16	3/8 x 3/8
1 9/16	3/8 x 3/16	3/8 x 3/8
1 5/8	3/8 x 3/16	3/8 x 3/8
1 11/16	3/8 x 3/16	3/8 x 3/8
1 3/4	3/8 x 3/16	3/8 x 3/8
1 13/16	1/2 x 1/4	1/2 x 1/2
1 7/8	1/2 x 1/4	1/2 x 1/2
1 15/16	1/2 x 1/4	1/2 x 1/2
2	1/2 x 1/4	1/2 x 1/2
2 1/16	1/2 x 1/4	1/2 x 1/2
2 1/8	1/2 x 1/4	1/2 x 1/2
2 3/16	1/2 x 1/4	1/2 x 1/2
2 1/4	1/2 x 1/4	1/2 x 1/2
2 5/16	5/8 x 5/16	5/8 x 5/8
2 3/8	5/8 x 5/16	5/8 x 5/8
2 7/16	5/8 x 5/16	5/8 x 5/8
2 1/2	5/8 x 5/16	5/8 x 5/8
2 9/16	5/8 x 5/16	5/8 x 5/8
2 5/8	5/8 x 5/16	5/8 x 5/8
2 11/16	5/8 x 5/16	5/8 x 5/8
2 3/4	5/8 x 5/16	5/8 x 5/8
2 13/16	3/4 x 3/8	3/4 x 3/4
2 7/8	3/4 x 3/8	3/4 x 3/4
2 15/16	3/4 x 3/8	3/4 x 3/4

Shaft Size	Keyway	Key
3	3/4 x 3/8	3/4 x 3/4
3 1/16	3/4 x 3/8	3/4 x 3/4
3 1/8	3/4 x 3/8	3/4 x 3/4
3 3/16	3/4 x 3/8	3/4 x 3/4
3 1/4	3/4 x 3/8	3/4 x 3/4
3 5/16	7/8 x 7/16	7/8 x 7/8
3 3/8	7/8 x 7/16	7/8 x 7/8
3 7/16	7/8 x 7/16	7/8 x 7/8
3 1/2	7/8 x 7/16	7/8 x 7/8
3 9/16	7/8 x 7/16	7/8 x 7/8
3 5/8	7/8 x 7/16	7/8 x 7/8
3 11/16	7/8 x 7/16	7/8 x 7/8
3 3/4	7/8 x 7/16	7/8 x 7/8
3 13/16	1 x 1/2	1 x 1
3 7/8	1 x 1/2	1 x 1
3 15/16	1 x 1/2	1 x 1
4	1 x 1/2	1 x 1
4 3/16	1 x 1/2	1 x 1
4 1/4	1 x 1/2	1 x 1
4 3/8	1 x 1/2	1 x 1
4 7/16	1 x 1/2	1 x 1
4 1/2	1 x 1/2	1 x 1
4 3/4	1 1/4 x 5/8	1 1/4 x 1 1/4
4 7/8	1 1/4 x 5/8	1 1/4 x 1 1/4
4 15/16	1 1/4 x 5/8	1 1/4 x 1 1/4
5	1 1/4 x 5/8	1 1/4 x 1 1/4
5 3/16	1 1/4 x 5/8	1 1/4 x 1 1/4
5 1/4	1 1/4 x 5/8	1 1/4 x 1 1/4
5 7/16	1 1/4 x 5/8	1 1/4 x 1 1/4
5 1/2	1 1/4 x 5/8	1 1/4 x 1 1/4
5 3/4	1 1/2 x 3/4	1 1/2 x 1 1/2
5 15/16	1 1/2 x 3/4	1 1/2 x 1 1/2
6	1 1/2 x 3/4	1 1/2 x 1 1/2
6 1/4	1 1/2 x 3/4	1 1/2 x 1 1/2
6 1/2	1 1/2 x 3/4	1 1/2 x 1 1/2
6 3/4	1 3/4 x 3/4	1 3/4 x 1 3/4
7	1 3/4 x 3/4	1 3/4 x 1 3/4

All dimensions in inches.



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