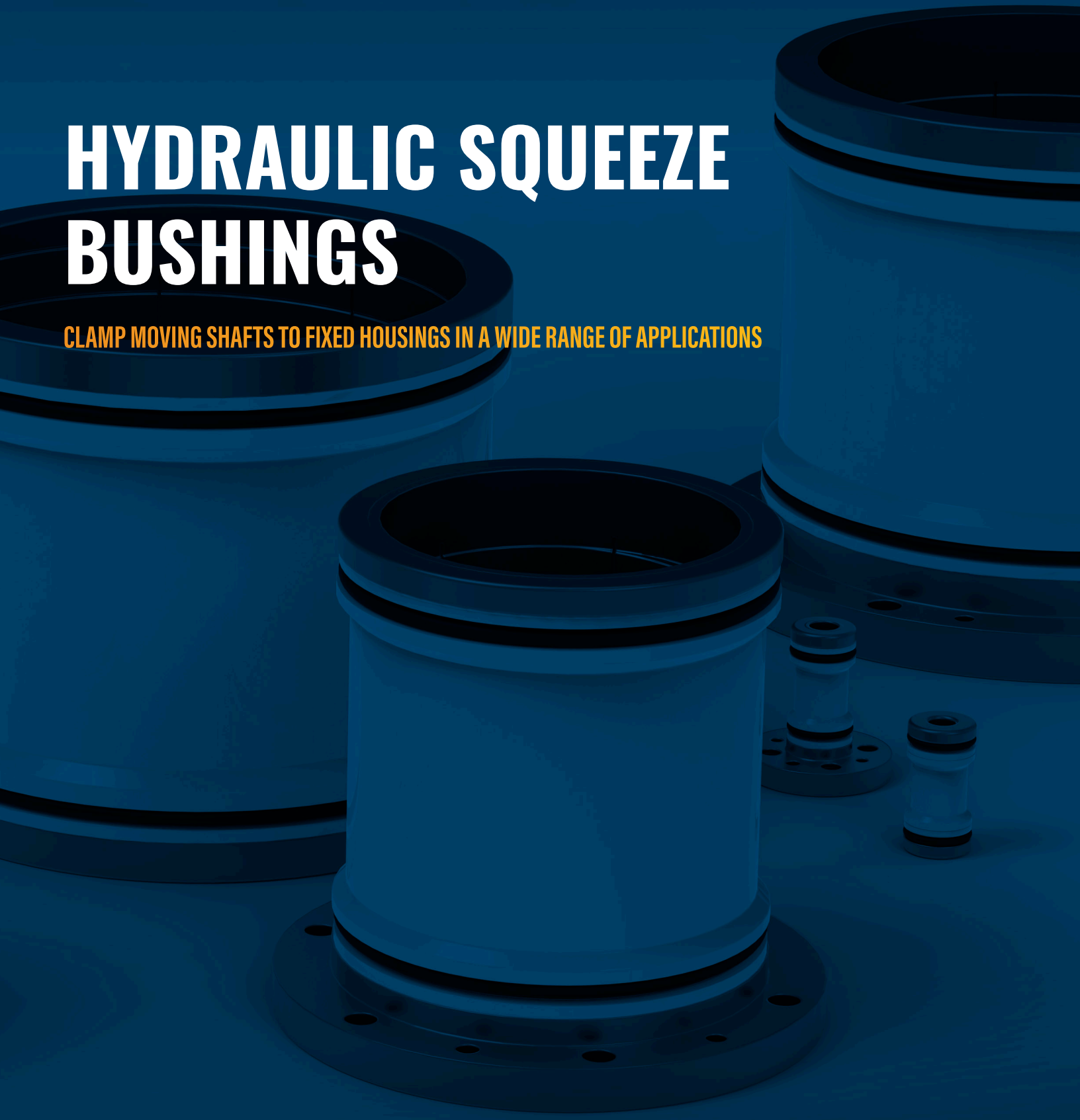
HENNIG®

HYDRAULIC SQUEEZE BUSHINGS

CLAMP MOVING SHAFTS TO FIXED HOUSINGS IN A WIDE RANGE OF APPLICATIONS



HYDRAULIC SQUEEZE BUSHINGS

AMBUSH Hydraulic Squeeze Bushings by AME are used to clamp moving shafts to fixed housings in a wide range of applications. They deliver reliable, uniform 360° clamping for accurate, repeatable workpiece location and orientation. Using a unique design that expands radially against the bore, they eliminate the need for additional locating features or set screws. Squeeze Bushings are ideal for applications requiring precise concentricity and minimal setup time, such as fixture construction, precision machining, and high-volume production.

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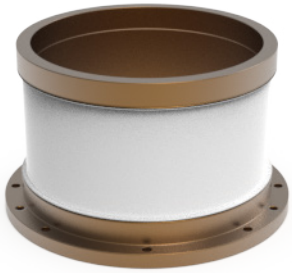
ASA SQUEEZE BUSHINGS

Precision clamping devices designed to resist axial forces in fixturing and reciprocating shaft applications. These bushings clamp securely to the shaft (not the outer diameter) to ensure reliable axial load transmission through the bushing ends, while the integrated flange resists torque.



AST SQUEEZE BUSHINGS

AST Squeeze Bushings are robust clamping solutions designed to resist both axial and torque loads, making them ideal for applications where secure, concentric shaft retention is required. Featuring a long clamping length for superior holding power, these bushings effectively grip the shaft while transmitting torque through the flange, ensuring reliable performance in demanding industrial environments.

OVERVIEW

Our hydraulic squeeze bushings are made of high-quality alloy bronze or spring steel with a special plastic molded over the slotted squeeze surface. Seals are provided at each end to resist hydraulic pressure up to 5,000 psi (340 bar) depending on diameter. for higher pressure (up to 10,000 psi) contact our engineering department.

KEY FEATURES

Uniform Clamping | Provides a consistent 360° squeeze that ensures superior concentricity and repeatability.

Fast, Easy Installation | Eliminates the need for set screws or complex locating features.

Versatile Fit | Easily accommodates a range of bore tolerances while maintaining precise workpiece alignment.

Repeatable Accuracy | Maintains consistent gripping force and location across multiple uses.

Durable Construction | Designed for long-lasting performance in demanding industrial environments.

TOLERANCES & MATERIAL OF MATING PARTS

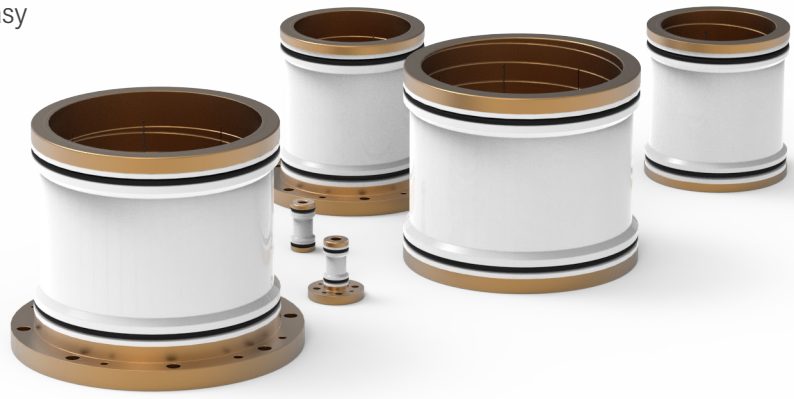
Housing bore diameter ISO H7 | Surface finish in seal area is 32 micro inches. Ferrous or non-ferrous materials can be used, but must have sufficient strength to resist the hydraulic pressure.

Shaft diameters of ISO f6 | Surface finish of 63 micro inches or better. Shaft materials can also be ferrous or non-ferrous, soft or hard.

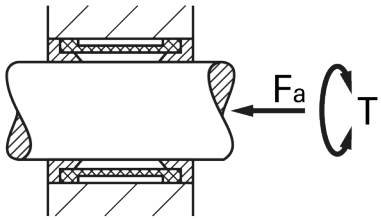
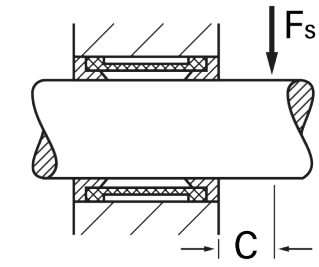
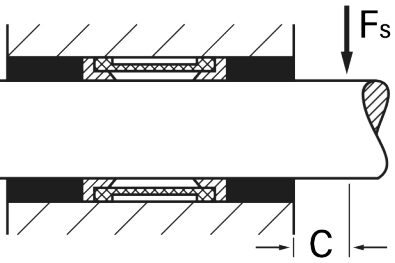
Note: Some surface treatments of the shaft may reduce the coefficient of friction and thus the holding force.

DESIGN TIPS

- Provide polished chamfer on bore to permit assembly without pinching to O-rings (see assembly instructions on page 7).
- The housing wall should be thick enough to resist the same pressure that is used to clamp the squeeze bushing.
- Provide for air bleeding at the highest point of the bushing's O.D. relief pocket and hydraulic lines.
- To prevent axial movement under load, bushings must be preloaded. Preload must be 0.0002 to 0.0003 x length (inches). If preload is too high, bushings will not function properly!
- Tapped holes are provided in the flanges for easy removal of the AST squeeze bushing.
- Be sure that lubrication oil is not trapped on the I.D. of the squeeze bushing, which reduces clamping force.
- Locate oil inlet or bleed holes not closer than s+12mm (s+.50") from each end. Oil inlet hole size ~4mm (.157") diameter.
- Provide shoulders on each end of the bushings to help support hydraulic and thrust forces. Maximum clearance in 0.25mm (.010") for diameters 0.1mm (.004) for axial location (see Figures 1 & 2 on page 7).



HOLDING FORCE & TORQUE CALCULATIONS

Application	Inch	Metric
Axial Holding Force and Holding Torque Calculation		
Holding Force		$F_a = d \cdot (l - 2 \cdot s) \cdot \pi \cdot P_{hyd} \cdot \mu$
Torque		$T = F_a \cdot \frac{d}{2}$
Side Load Calculations		
without bearing		$F_s = \frac{P_{surf}}{S} \cdot \frac{f \cdot l \cdot d}{(l + C)}$ f = 0.12 inch | f = 3.0 mm $n < \frac{10000}{S}$ $v < B \cdot \frac{d}{2}$
with one or two bearings		$F_s = \frac{P_{surf}}{S} \cdot \frac{0.75 \cdot l^2 \cdot d}{(1.75 \cdot l + C)}$

Squeeze bushings are not designed to take heavy sideloads. For this reason, auxiliary bearings are offered for each size of squeeze bushing. The performance of a bearing is influenced by the conditions of speed, mating materials, clearance, temperature, lubrication, type of loading, etc.

Of primary importance is the maintenance of an oil film between the bearing surface to reduce friction, dissipate heat and retard wear by minimizing metal to metal contact. The most critical periods of operation are during starting and stopping. Recommended oil for moderate speeds is SAE20.

Symbol	Description		Inch		Metric	
			Value	Unit	Value	Unit
F_a	Axial holding force			lb		N
d	I.D. of squeeze bushing		see table	inch	see table	mm
l	Length of squeeze bushing		see table	inch	see table	mm
s	Shoulder width of squeeze bushing		see table	inch	see table	mm
P_{hyd}	Available hydraulic pressure			psi		N/mm²
μ	Coefficient of friction	well lubricated	.1	-	.1	-
		normal	.12	-	.12	-
		dry	.15	-	.15	-
T	Holding torque			in-lbs		Nm
F_s	Sideload (maximum)			lb		N
P_{surf}	Surface pressure (maximum)		3000	psi	20	N/mm²
S	Safety factor		(3)*	-	(3)*	-
n	Revolutions of the rod			RPM		1/min
v	Linear velocity of the rod (axial)			ft/s		m/s
B	Bearing factor		0.53	1/s	43.50	1/s

*recommendation

Conversion factors:

1 N = 0.225 lbs

1 bar = 0.1 N/mm² = 14.5 psi

1 Nm = 8.8583 in-lbs

25.4 mm = 1 in

TYPICAL APPLICATIONS

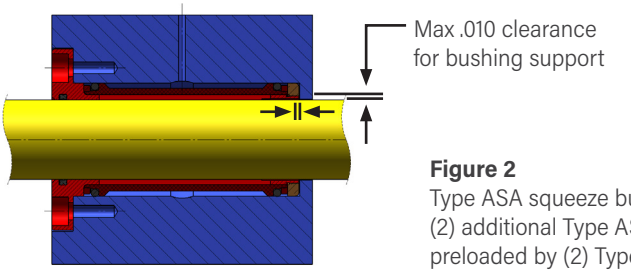
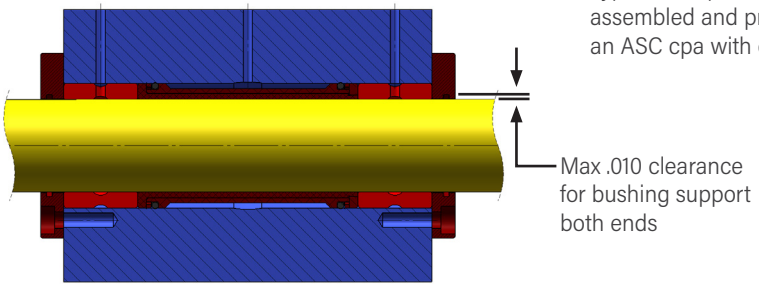


Figure 1
Type AST squeeze bushing (with quadring), pinned and bolted to housing to resist torque loads

Figure 2
Type ASA squeeze bushing with (2) additional Type ASB bearings preloaded by (2) Type ASC caps with quadrings. Assembly will resist higher side loads of shaft.



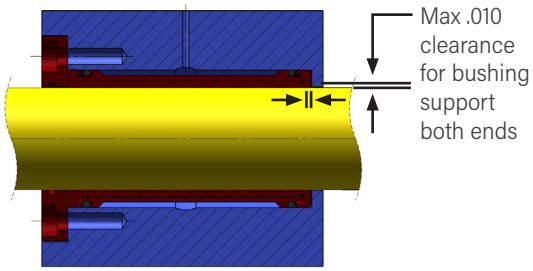


Figure 3
Type ASA squeeze bushing assembled and preloaded by an ASC cpa with quadring

ASSEMBLY INSTRUCTIONS

1. Provide chamfer (Figure 4), clean, debur, and polish I.D. of housing to avoid damage to the O-rings. When O-ring must be pushed over cross-drilled port, the hole should be deburred and polished (see Figures 5 & 6).
2. Oil and grease O-rings and housing before assembly.
3. For AST bushings, use longer mounting screws to push the bushing evenly into bore.
4. For AST bushings, we suggest using our assembly tool (available upon request). This is a special plastic sleeve with sharp edges on one side and a chamfer on the other side. Put the ASA bushing into the housing and make sure that the O-ring is still covered by the assembly tool. Tap bushing carefully through the polished chamfer into housing to avoid shearing of O-rings (See Figures 5 & 6).
5. Provide slight axial preload on type ASA squeeze bushing (preload = .0002 to .0003 x length/inches).
6. Do not allow more than .02" clearance on diameter and .004" on end of bushings to guarantee solid backup, especially at higher hydraulic pressure.
7. For accurate, concentric locating of shafts, apply hydraulic pressure on type AST bushings before reaming pin holes through cap.
8. Bleed air at highest point of pressure line.

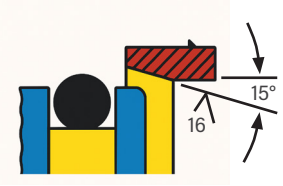


Figure 4
Chamfer hole and polish bore

Figure 5
Chamfer hole and polish bore

-or-

Figure 6
Undercut bore and polish

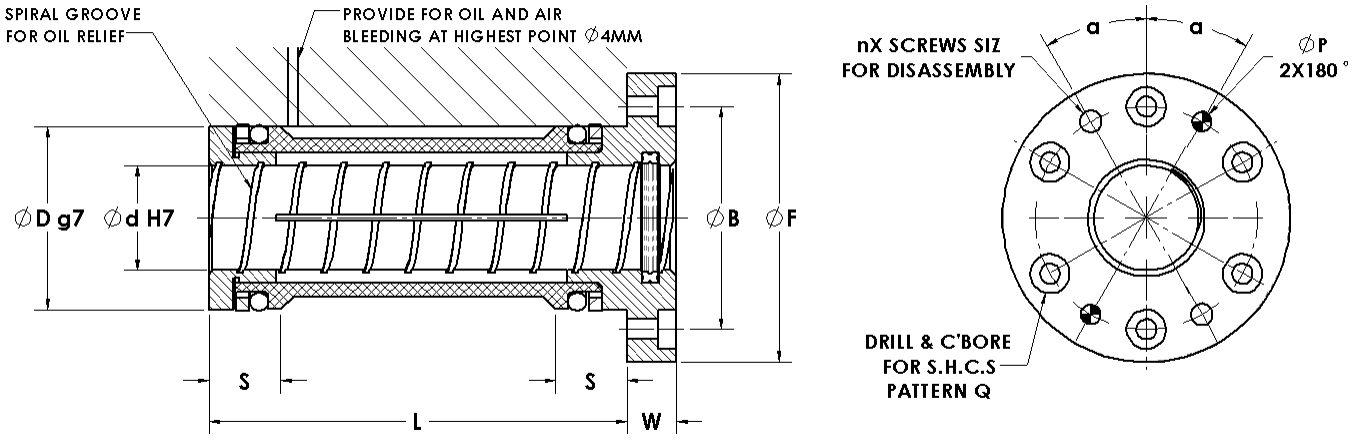
NOTES

- **Never apply hydraulic pressure if shaft is not inserted in bore to prevent damage to bushing.**
- **The squeeze bushings are manufactured to high tolerances, but may deform slightly during final testing. However, roundness and concentricity will be reestablished after assembly in housing.**
- **Handle these precision bushings with care, as the bronze may become distorted if bumped or dropped.**
- **The O.D. tolerance of the plastic sleeve may deviate slightly from the bronze diameter's tolerance, due to temperature and moisture.**

DISASSEMBLY INSTRUCTIONS

1. To disassemble type ASA bushings, we recommend using an expanding removal tool to avoid damage to the bushing.
2. Type AST bushings can be removed by using screw holes provided on cap.

AST DIMENSIONS (INCH)

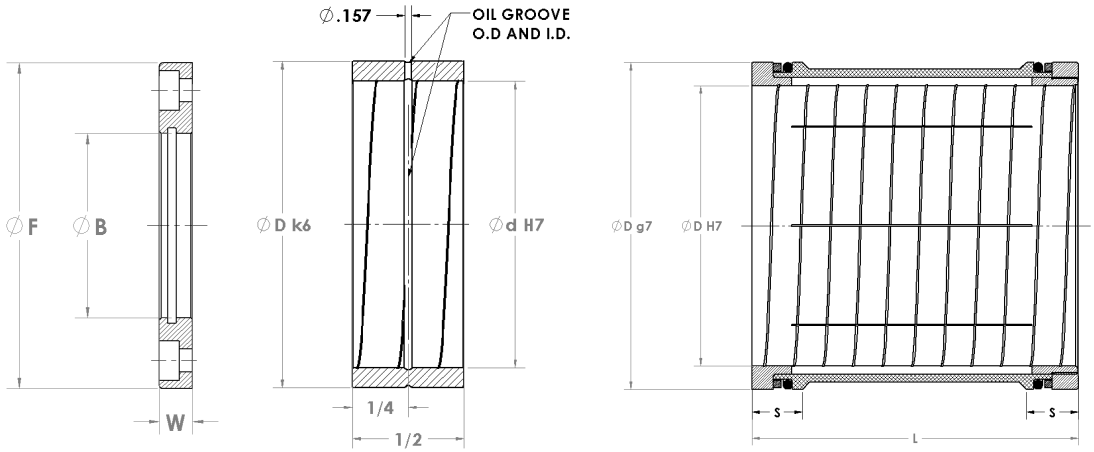


All dimensions in inches. Specs for AST can be found on the table below and continue onto the next page (7).

ASA/AST Size	Diameter		Length	Mating Parts	
d x l	Inside Ød (H7)	Outside ØD (g7)	l (.000/-.003)	Shaft Ød f6	Housing ØD (H7)
0.250 x 1.250	0.250	0.625	1.250	-.0005 / -.0009	.0000 / +.0007
0.375 x 1.250	0.375	0.750	1.250	-.0005 / -.0009	.0000 / +.0008
0.500 x 2.000	0.500	0.875	2.000	-.0006 / -.0011	.0000 / +.0008
0.625 x 2.000	0.625	1.000	2.000	-.0006 / -.0011	.0000 / +.0008
0.750 x 2.000	0.750	1.125	2.000	-.0008 / -.0013	.0000 / +.0008
0.875 x 2.500	0.875	1.250	2.500	-.0008 / -.0013	.0000 / +.0010
1.000 x 2.500	1.000	1.375	2.500	-.0008 / -.0013	.0000 / +.0010
1.125 x 2.500	1.125	1.563	2.500	-.0008 / -.0013	.0000 / +.0010
1.250 x 3.000	1.250	1.688	3.000	-.0010 / -.0016	.0000 / +.0010
1.375 x 3.000	1.375	1.813	3.000	-.0010 / -.0016	.0000 / +.0010
1.500 x 3.000	1.500	1.938	3.000	-.0010 / -.0016	.0000 / +.0010
1.750 x 3.500	1.750	2.188	3.500	-.0010 / -.0016	.0000 / +.0012
2.000 x 3.500	2.000	2.625	3.500	-.0012 / -.0019	.0000 / +.0012
2.250 x 3.500	2.250	2.875	3.500	-.0012 / -.0019	.0000 / +.0012
2.500 x 4.000	2.500	3.125	4.000	-.0012 / -.0019	.0000 / +.0012
2.750 x 4.000	2.750	3.375	4.000	-.0012 / -.0019	.0000 / +.0014
3.000 x 4.000	3.000	3.750	4.000	-.0012 / -.0019	.0000 / +.0014
3.500 x 4.500	3.500	4.250	4.500	-.0014 / -.0023	.0000 / +.0014
4.000 x 4.500	4.000	4.750	4.500	-.0014 / -.0023	.0000 / +.0016
4.500 x 4.500	4.500	5.250	4.500	-.0014 / -.0023	.0000 / +.0016
5.000 x 5.000	5.000	5.875	5.000	-.0017 / -.0027	.0000 / +.0016
5.500 x 5.000	5.500	6.375	5.000	-.0017 / -.0027	.0000 / +.0016
6.000 x 5.000	6.000	6.875	5.000	-.0017 / -.0027	.0000 / +.0016
6.500 x 5.000	6.500	7.375	5.000	-.0017 / -.0027	.0000 / +.0018
7.000 x 5.000	7.000	7.875	5.000	-.0017 / -.0027	.0000 / +.0018
7.500 x 6.000	7.500	8.375	6.000	-.0020 / -.0031	.0000 / +.0018
8.000 x 6.000	8.000	8.875	6.000	-.0020 / -.0031	.0000 / +.0018
8.500 x 6.000	8.500	9.375	6.000	-.0020 / -.0031	.0000 / +.0018
9.000 x 6.000	9.000	10.000	6.000	-.0020 / -.0031	.0000 / +.0020
9.500 x 6.000	9.500	10.500	6.000	-.0020 / -.0031	.0000 / +.0020
10.000 x 7.000	10.000	11.000	7.000	-.0022 / -.0035	.0000 / +.0020
10.500 x 7.000	10.500	11.500	7.000	-.0022 / -.0035	.0000 / +.0020
11.000 x 7.000	11.000	12.000	7.000	-.0022 / -.0035	.0000 / +.0020
11.500 x 7.000	11.500	12.500	7.000	-.0022 / -.0035	.0000 / +.0022
12.000 x 7.000	12.000	13.000	7.000	-.0022 / -.0035	.0000 / +.0022

1. Ream at assembly, or drill for standard roll pins
2. Axial force based on 1,000 psi and coefficient friction of .12
3. Side load at 1" axial distance to squeeze bushing, based on safety factor 3 and P_{surf} = 3000 lbs/in²

ASA DIMENSIONS (INCH)

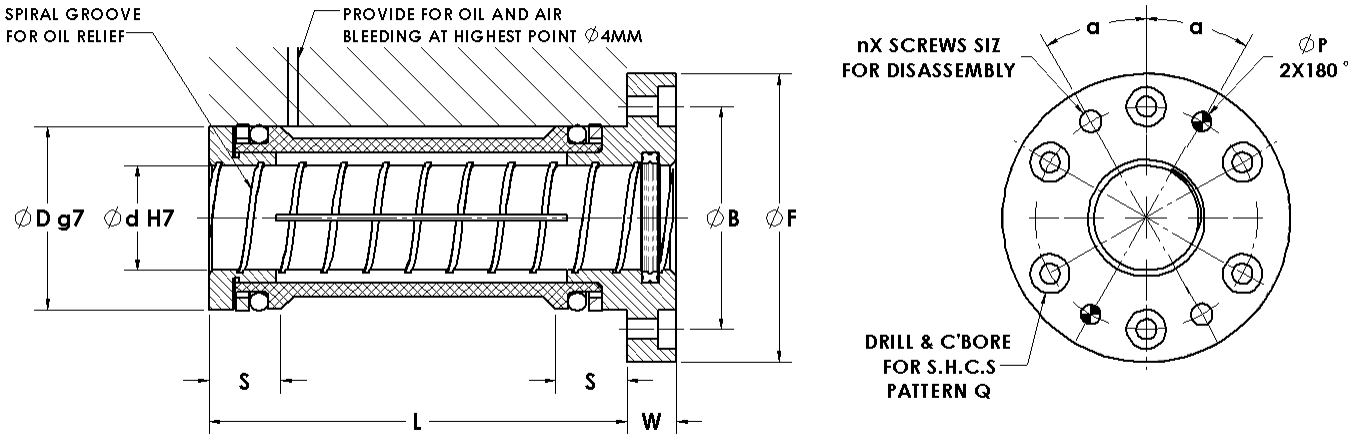


All dimensions in inches. Specs for ASA can be found on the table below and on the previous page (6).

S	W	ØF	ØB	Screws			ØP 1)	a	Axial Holding Force 2)	Max Side Load 3)	ASA/AST Size
		±.015	±.008	Pattern Q	Screw Size	Qty. n			lb	lb	d x l
0.342	0.236	1.38	0.936	4 x 90°	8-32	2	0.113	45°	18	15	.250 x 1.250
0.342	0.236	1.5	1.064	4 x 90°	8-32	2	0.113	45°	60	20	.375 x 1.250
0.342	0.236	1.63	1.193	4 x 90°	8-32	2	0.113	45°	220	40	.500 x 2.000
0.342	0.236	1.75	1.318	4 x 90°	8-32	2	0.113	45°	280	50	.625 x 2.000
0.342	0.236	1.88	1.443	4 x 90°	8-32	2	0.113	45°	330	60	.750 x 2.000
0.342	0.236	2	1.574	4 x 90°	8-32	2	0.113	45°	550	80	.875 x 2.500
0.372	0.315	2.13	1.699	4 x 90°	8-32	2	0.113	45°	630	90	1.000 x 2.500
0.372	0.315	2.38	1.886	6 x 60°	10-24	2	0.177	30°	710	100	1.125 x 2.500
0.372	0.315	2.5	2.011	6 x 60°	10-24	2	0.177	30°	1030	110	1.250 x 3.000
0.372	0.315	2.75	2.214	6 x 60°	10-24	2	0.177	30°	1130	120	1.375 x 3.000
0.372	0.315	2.88	2.339	6 x 60°	10-24	2	0.177	30°	1240	140	1.500 x 3.000
0.372	0.315	3.13	2.589	6 x 60°	10-24	2	0.177	30°	1770	160	1.750 x 3.500
0.526	0.394	3.625	3.062	6 x 60°	1/4-20	2	0.177	30°	1710	190	2.000 x 3.500
0.526	0.394	3.875	3.312	6 x 60°	1/4-20	2	0.177	30°	1920	210	2.250 x 3.500
0.526	0.394	4.125	3.562	6 x 60°	1/4-20	2	0.177	30°	2610	240	2.500 x 4.000
0.556	0.394	4.38	3.815	6 x 60°	1/4-20	2	0.177	30°	2870	260	2.750 x 4.000
0.66	0.394	4.75	4.188	6 x 60°	1/4-20	2	0.177	30°	2700	290	3.000 x 4.000
0.66	0.394	5.25	4.687	6 x 60°	1/4-20	2	0.177	30°	3810	350	3.500 x 4.500
0.818	0.512	6	5.251	8 x 45°	5/16-18	4	0.238	22.5°	3880	400	4.000 x 4.500
0.878	0.512	6.5	5.813	8 x 45°	5/16-18	4	0.238	22.5°	4370	450	4.500 x 4.500
0.878	0.512	7	6.375	8 x 45°	5/16-18	4	0.238	22.5°	5800	500	5.000 x 5.000
0.878	0.512	7.625	6.938	8 x 45°	5/16-18	4	0.238	22.5°	6380	550	5.500 x 5.000
0.878	0.512	8.188	7.5	8 x 45°	5/16-18	4	0.238	22.5°	6960	600	6.000 x 5.000
0.878	0.512	8.63	7.938	8 x 45°	5/16-18	4	0.238	22.5°	7540	650	6.500 x 5.000
0.878	0.512	9.065	8.438	8 x 45°	5/16-18	4	0.238	22.5°	8120	690	7.000 x 5.000
0.878	0.512	9.625	8.938	8 x 45°	5/16-18	4	0.238	22.5°	11530	780	7.500 x 6.000
0.878	0.512	10.125	9.438	8 x 45°	5/16-18	4	0.238	22.5°	12290	830	8.000 x 6.000
0.878	0.512	10.625	9.938	8 x 45°	5/16-18	4	0.238	22.5°	13060	840	8.500 x 6.000
0.977	0.63	11.375	10.625	8 x 45°	3/8/2016	4	0.302	22.5°	12560	930	9.000 x 6.000
0.977	0.63	11.375	10.625	8 x 45°	3/8-16	4	0.302	22.5°	13250	970	9.500 x 6.000
0.977	0.63	12.375	11.625	8 x 45°	3/8-16	4	0.302	22.5°	17720	1050	10.000 x 7.000
0.977	0.63	12.875	12.125	8 x 45°	3/8-16	4	0.302	22.5°	18610	1100	10.500 x 7.000
0.977	0.63	13.375	12.625	8 x 45°	3/8-16	4	0.302	22.5°	19490	1160	11.000 x 7.000
0.977	0.63	13.875	13.125	8 x 45°	3/8-16	4	0.302	22.5°	20380	1200	11.500 x 7.000
0.977	0.63	14.375	13.625	8 x 45°	3/8-16	4	0.302	22.5°	21270	1260	12.000 x 7.000

Specifications and dimensions are subject to change without notification. Other sizes or special shapes are available upon request.

AST DIMENSIONS (METRIC)

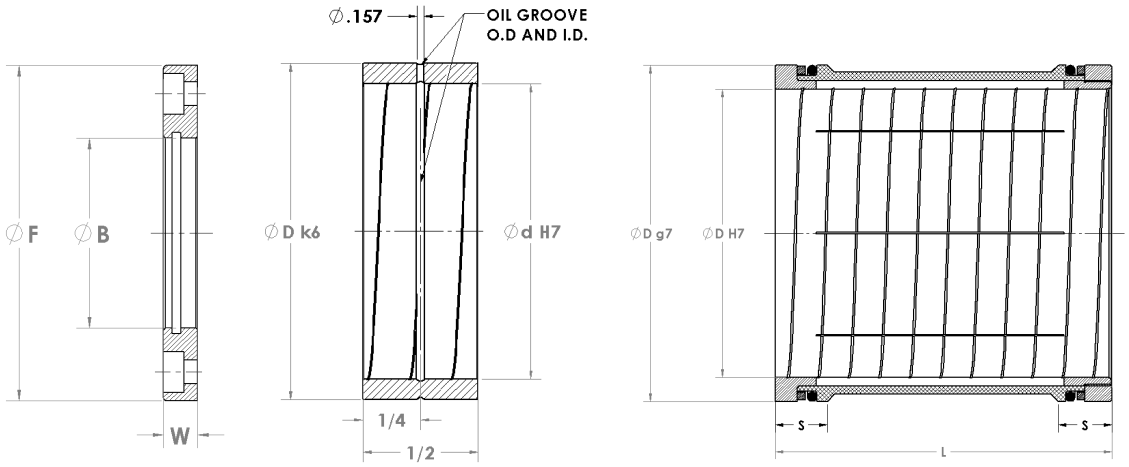


All dimensions in mm. Specs for AST can be found on the table below and continue onto the next page (9).

ASA/AST Size	Diameter		Length	Mating Parts	
d x l	Inside Ød	Outside ØD	l (.00/-.08)	Shaft Ød (f6)	Housing ØD (H7)
10 x 40	10	20	40	-0.013 / -0.022	0.000 / +0.021
15 x 50	15	25	50	-0.016 / -0.027	0.000 / +0.021
20 x 65	20	30	65	-0.020 / -0.033	0.000 / +0.021
25 x 80	25	35	80	-0.020 / -0.033	0.000 / +0.025
30 x 80	30	40	80	-0.020 / -0.033	0.000 / +0.025
35 x 80	35	45	80	-0.025 / -0.041	0.000 / +0.025
40 x 100	40	50	100	-0.025 / -0.041	0.000 / +0.025
45 x 100	45	55	100	-0.025 / -0.041	0.000 / +0.030
50 x 100	50	65	100	-0.025 / -0.041	0.000 / +0.030
60 x 100	60	75	100	-0.030 / -0.049	0.000 / +0.030
70 x 120	70	85	120	-0.030 / -0.049	0.000 / +0.035
80 x 120	80	100	120	-0.030 / -0.049	0.000 / +0.035
100 x 140	100	125	140	-0.036 / -0.058	0.000 / +0.040
120 x 140	120	140	140	-0.036 / -0.058	0.000 / +0.040
150 x 140	150	175	140	-0.043 / -0.068	0.000 / +0.040
180 x 140	180	205	140	-0.043 / -0.068	0.000 / +0.046
200 x 140	200	225	140	-0.050 / -0.079	0.000 / +0.046
220 x 140	220	245	140	-0.050 / -0.079	0.000 / +0.046
250 x 160	250	280	160	-0.050 / -0.079	0.000 / +0.057
300 x 160	300	330	160	-0.056 / -0.088	0.000 / +0.057

1. Ream at assembly, or drill for standard roll pins
2. Axial force based on 70 bar and coefficient friction of .12
3. Side load at 25mm axial distance to squeeze bushing, based on safety factor 3 and P_{surf} = 20 N/mm²

ASA DIMENSIONS (METRIC)



All dimensions in mm. Specs for ASA can be found on the table below and on the previous page (8).

S	W	ØF	ØB	Screws			2) ØP	a	3) Axial Holding Force	4) Max Side Load	ASA/AST Size
		±0.4	±0.2	Pattern Q	Screw Size	Qty. n			N	N	d x l
8.7	6	39	28	4 x 90°	M4 x 0.70	2	3.7	45°	510	130	10 x 40
8.7	6	44	33	4 x 90°	M4 x 0.70	2	3.7	45°	1170	200	15 x 50
8.7	6	49	38	4 x 90°	M4 x 0.70	2	3.7	45°	2350	280	20 x 65
8.7	6	54	43	4 x 90°	M4 x 0.70	2	3.7	45°	3930	380	25 x 80
9.4	8	62	49	6 x 60°	M5 x 0.80	2	4.7	30°	4710	450	30 x 80
9.4	8	67	54	6 x 60°	M5 x 0.80	2	4.7	30°	5550	540	35 x 80
9.4	8	72	59	6 x 60°	M5 x 0.80	2	4.7	30°	8400	640	40 x 100
9.4	8	77	64	6 x 60°	M5 x 0.80	2	4.7	30°	9450	720	45 x 100
13.4	10	89	75	6 x 60°	M6 x 1.00	2	5.7	30°	9070	800	50 x 100
13.4	10	99	85	6 x 60°	M6 x 1.00	2	5.7	30°	10890	960	60 x 100
14.1	10	109	95	6 x 60°	M6 x 1.00	2	5.7	30°	16400	1160	70 x 120
16.7	10	124	110	6 x 60°	M6 x 1.00	2	5.7	30°	16720	1320	80 x 120
20.8	13	155	137	8 x 45°	M8 x 1.25	4	7.7	22.5°	24060	1690	100 x 140
22.3	13	172	154	8 x 45°	M8 x 1.25	4	7.7	22.5°	28880	2030	120 x 140
22.3	13	207	189	8 x 45°	M8 x 1.25	4	7.7	22.5°	36100	2540	150 x 140
22.3	13	237	219	8 x 45°	M8 x 1.25	4	7.7	22.5°	43320	3070	180 x 140
22.3	13	257	239	8 x 45°	M8 x 1.25	4	7.7	22.5°	48130	3390	200 x 140
22.3	13	277	259	8 x 45°	M8 x 1.25	4	7.7	22.5°	52940	3770	220 x 140
24.8	16	317	296	8 x 45°	M10 x 1.50	4	9.7	22.5°	67020	4320	250 x 160
24.8	16	367	346	8 x 45°	M10 x 1.50	4	9.7	22.5°	80430	5180	300 x 160

Specifications and dimensions are subject to change without notification. Other sizes or special shapes are available upon request.

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