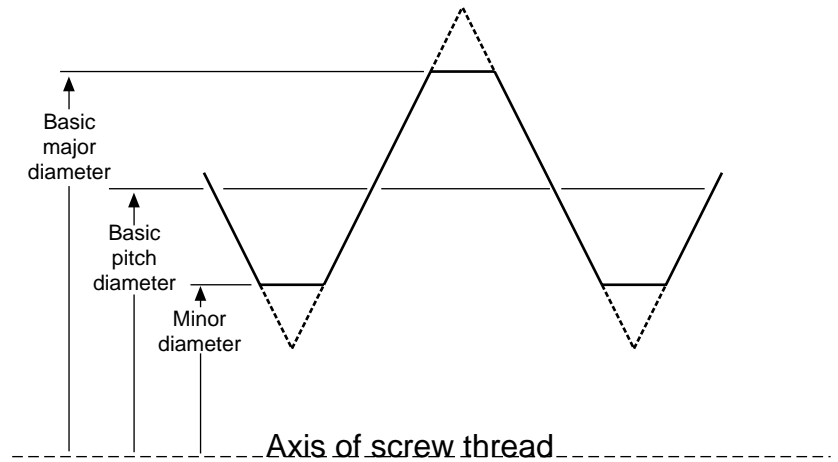
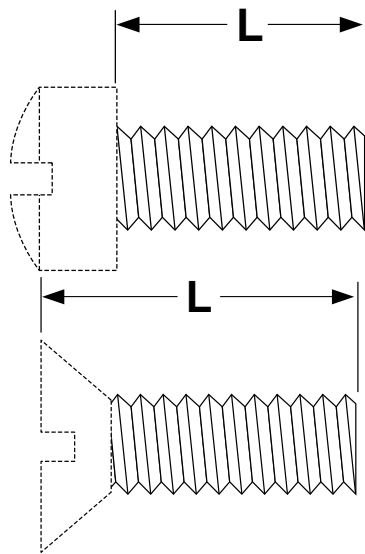


# Thread Dimensions

# Machine Screws



## EXTERNAL THREADS FOR MACHINE SCREWS AND SEMS

ASME B 1.1

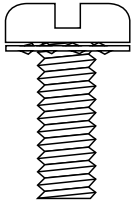
Nominal Size & Threads per Inch	Series Designation	Allowance	Major Diameter		Pitch Diameter			Stress Area, in <sup>2</sup>	Tensile Strength, <sup>a</sup> lb., min.
			Max	Min	Max	Min	Tolerance		
0-80 0.060	UNF	.0005	.0595	.0563	.0514	.0496	.0018	-	-
1-64 0.073	UNC	.0006	.0724	.0686	.0623	.0603	.0020	-	-
2-56 0.086	UNC	.0006	.0854	.0813	.0738	.0717	.0021	-	-
3-48 0.099	UNC	.0007	.0983	.0938	.0848	.0825	.0023	-	-
4-40 0.112	UNC	.0008	.1112	.1061	.0950	.0925	.0025	0.00604	360
5-40 0.125	UNC	.0008	.1242	.1191	.1080	.1054	.0026	0.00796	470
6-32 0.138	UNC	.0008	.1372	.1312	.1169	.1141	.0028	0.00909	550
8-32 0.164	UNC	.0009	.1631	.1571	.1428	.1399	.0029	0.0140	850
10-24 0.190	UNC	.0010	.1890	.1818	.1619	.1586	.0033	0.0175	1050
10-32 0.190	UNF	.0009	.1891	.1831	.1688	.1658	.0030	0.0200	1200
12-24 0.216	UNC	.0010	.2150	.2078	.1879	.1845	.0034	0.0242	1450
1/4-20 0.250	UNC	.0011	.2489	.2408	.2164	.2127	.0037	0.0318	1900
1/4-28 0.250	UNF	.0010	.2490	.2425	.2258	.2225	.0033	0.0364	2200
5/16-18 0.312	UNC	.0012	.3113	.3026	.2752	.2712	.0040	0.0524	3150
3/8-16 0.375	UNC	.0013	.3737	.3643	.3331	.3287	.0044	0.0775	4650
1/2-13 0.500	UNC	.0015	.4985	.4876	.4485	.4435	.0050	0.1419	8500

Tolerance on Length	Nominal Screw Size	Nominal Screw Length			
		Up to 1/2 in., incl.	Over 1/2 to 1 in., incl.	Over 1 to 2 in., incl.	Over 2 in.
L	0 thru 12	-0.02	-0.03	-0.06	-0.09
	1/4 thru 3/4	-0.03	-0.03	-0.06	-0.09

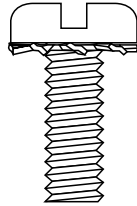
<sup>a</sup>Tensile strength values are based on 60,000 psi. and apply to carbon steel screws and SEMS only. Hex and Hex Washer head machine screws of sufficient length may be wedge tensile tested. Other head styles may be axial tensile tested.

# Machine Screws *Mechanical & Performance Requirements* SEMS

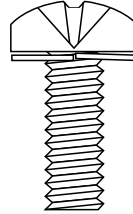
## MACHINE SCREWS WITH FREE-SPINNING LOCKWASHERS



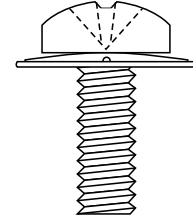
Internal Tooth



External Tooth



Split-Lock



Square-Cone®

<b>Description</b>	A machine screw and free-spinning lock-washer manufactured as one assembly. Steel SEMS are available with the following types of washers: internal tooth, external tooth, split-lock and square-cone®. Stainless SEMS are offered with external tooth lock washers.
<b>Applications/ Advantages</b>	The washer/screw assembly makes this a locking screw with the washer providing the locking action. Machine pre-assembly provides cost savings to the end user. <i>Internal Tooth SEMS:</i> Recommended when it is desirable to hide the teeth for appearance or to prevent snagging. <i>External Tooth SEMS:</i> Preferred over the internal tooth style as the teeth provide greater torsional resistance being on the larger radius. <i>Split-Lock SEMS:</i> Preferred over tooth lockwasher SEMS for use with hardened bearing surfaces. <i>Square-Cone® SEMS:</i> Provides a higher retained clamp load & improved compensation for thermal cycling and vibration. Can accept a high tension load and maintain spring action. The washer design makes for better control during installation, and improved tool bit life. Ideal for clamping fragile materials and for spanning large clearance holes.
<b>Material</b>	<b>Steel Screws--</b> AISI 1022 or equivalent steel. <b>Steel Washers--</b> <u>Split-lock:</u> SAE 1055-1065 carbon steel; <u>Tooth-lock:</u> SAE 1050-1065; <u>Square-Cone®:</u> SAE 1050. <b>Stainless Screws--</b> SAE 18-8 stainless steel, passivated. <b>Stainless Washers--</b> <u>Tooth-lock:</u> SAE 410 stainless steel.
<b>Hardness</b>	<b>Steel Screws--</b> Rockwell B70 - B100. <b>Steel Washers--</b> <u>Split-lock:</u> Rockwell C38 - 46; <u>Tooth-lock:</u> Rockwell C40 - 50; <u>Square-Cone®:</u> Rockwell C42 - 46. <b>Stainless Washers--</b> <u>Tooth-lock:</u> Rockwell C40 - 50.
<b>Tensile Strength</b>	<b>Steel:</b> 60,000 psi. minimum. No. 2 diameter SEMS screws are not subject to tensile testing. No. 4 SEMS screws shorter than 1/2" are not subject to tensile testing. SEMS screws of diameters No. 6 to 10 inclusive, which are shorter than 1/2" or 3D (where D is the nominal screw size in inches) are not subject to tensile testing. Such SEMS screws of a size to be tested shall meet the tensile load requirements given on page 54. <b>Stainless:</b> No. 4: 99,000 psi. minimum; No. 6 & No. 8: 96,000 psi. minimum. <u>Note:</u> No. 4, No. 6 and No. 8 SEMS screws which are shorter than 1/2" are not subject to tensile testing.
<b>Plating</b>	See Appendix-A for information on the plating of steel SEMS.

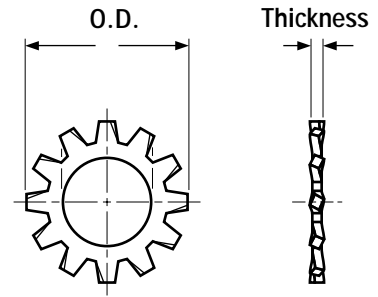
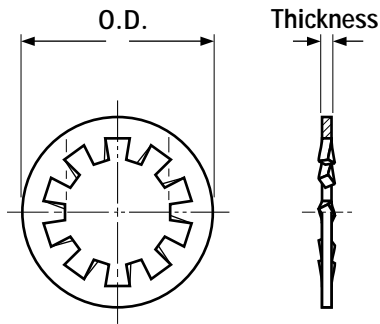
### HOW SEMS SPECIFICATIONS VARY FROM MACHINE SCREWS

- The maximum diameter of the unthreaded shank shall be less than the maximum major diameter of the thread by an amount sufficient to prevent disassembly of the washer from the screw.
- The unthreaded length on fully threaded screws is measured to the contacting face of the washer instead of to the bearing face of the screw.
- The minimum underhead fillet radius is equivalent to 5% of the basic screw diameter.

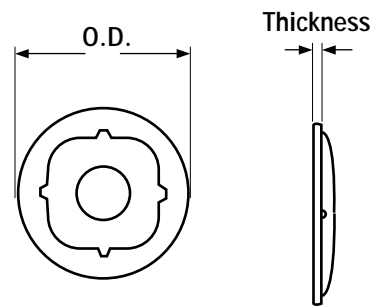
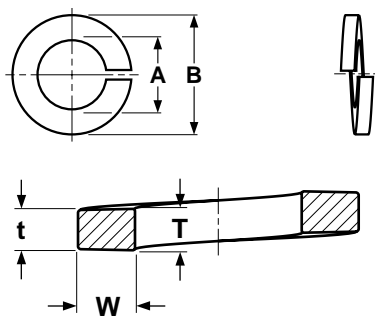
# Tooth-lock, Split & Conical

# SEMS Washer Specs

# Machine Screws



WASHERS FOR TOOTH-LOCK SEMS										ASME B18.13
Nominal Size or Basic Screw Diameter		Internal Tooth				External Tooth				
		Washer Thickness		Washer Outside Diameter		Washer Thickness		Washer Outside Diameter		
		Max	Min	Max	Min	Max	Min	Max	Min	
2	.0860	.016	.010	.185	.175	.016	.010	.180	.170	
4	.1120	.019	.015	.268	.258	.020	.012	.230	.220	
6	.1380	.021	.017	.288	.278	.020	.014	.285	.270	
8	.1640	.023	.018	.338	.327	.023	.018	.320	.305	
10	.1900	.025	.020	.383	.372	.024	.018	.381	.365	
1/4	.2500	.028	.023	.478	.466	.028	.023	.510	.494	



WASHERS FOR SPLIT-LOCK & SQUARE-CONE® SEMS										ASME B18.13, Shakeproof*
Nominal Size or Basic Screw Diameter		Split-Lock					Square Cone®*			
		Washer Inside Diameter A		Washer Section Min		Washer Outside Diameter B		Washer Thickness	Washer Outside Diameter	
		Max	Min	Width W	Thickness $\frac{T+t}{2}$	Max	Min	Ref	Max	Min
4	.1120	.106	.101	.055	.034	.222	.211	.015	.250	.244
6	.1380	.129	.124	.062	.034	.261	.248	.025	.320	.307
8	.1640	.155	.149	.078	.040	.319	.305	.030	.383	.370
10	.1900	.179	.173	.093	.047	.373	.359	.032	.446	.433

\*Dimensions of Square-Cone® washers are to Shakeproof specifications.