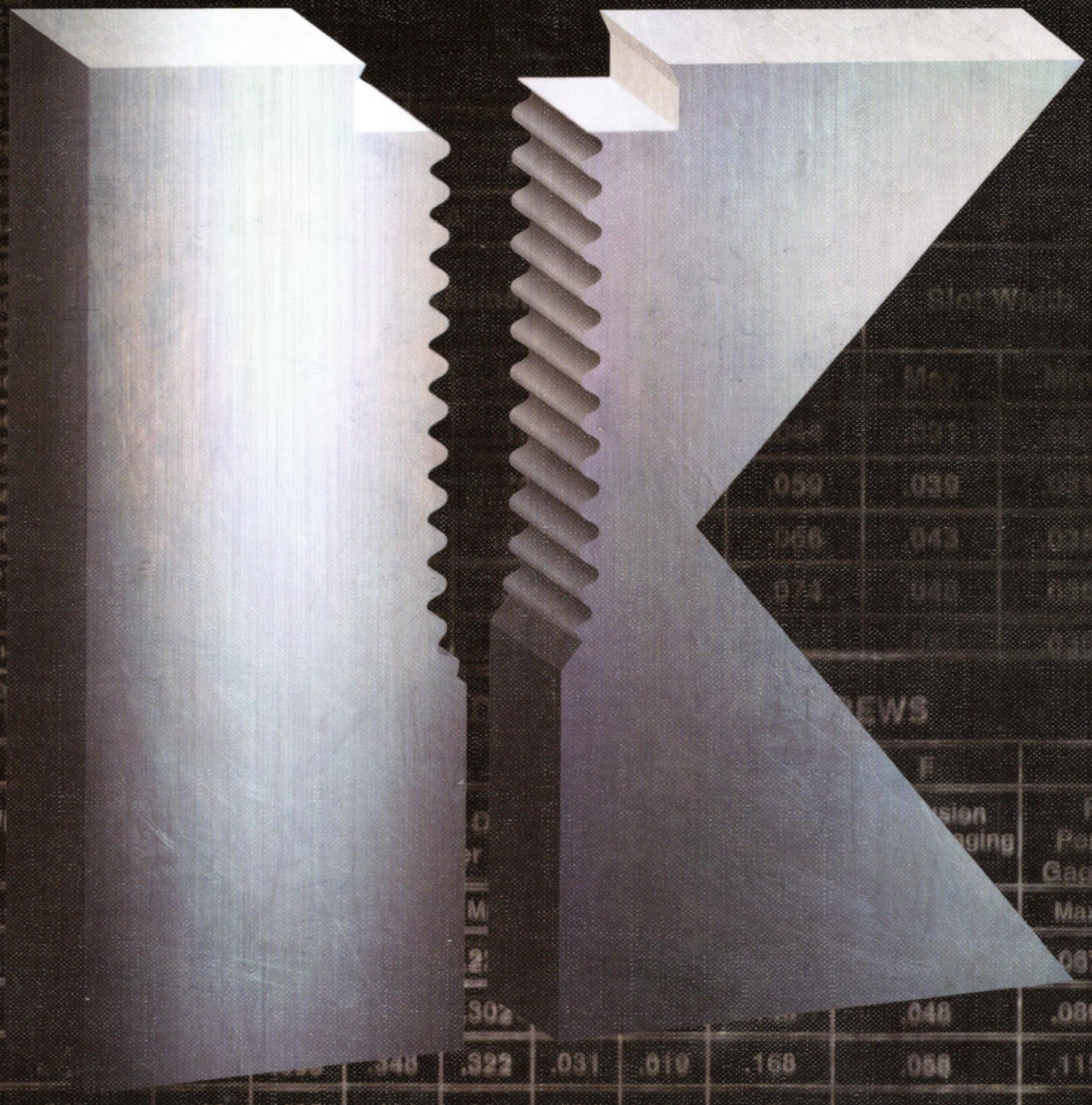
KANEBRIDGE

SPECIFICATION GUIDE



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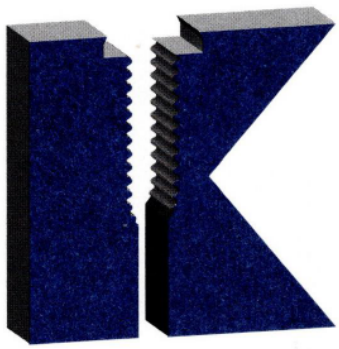
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KANEBRIDGE FASTENER SPECIFICATION GUIDE

6th Edition

Compiled and Published
by
Kanebridge Corporation
Oakland, NJ



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ACKNOWLEDGEMENTS

Kanebridge Corporation acknowledges with gratitude its appreciation to Jim Speck for his input and guidance during the compilation of this Specification Guide.

Kanebridge thanks John Groshans for his direction and editorial assistance with the Metric section of this guide.

FORWARD

The Kanebridge Corporation proudly presents this Sixth Edition of the ***Kanebridge Fastener Specification Guide***, its most in-depth compilation of fastener specifications to-date. The latest edition follows the same formula that has been well received by readers of previous ***Specification Guides***. The book is designed to make it easy to find and understand the information one needs without wasting time searching for it.

There are many other resources that professionals can access to obtain standards and specifications for fasteners. The ***Kanebridge Fastener Specification Guide, 6th Edition*** does not attempt to replace any of them. As always, the ***Guide*** aims to present technical information about the form, fit and function of fasteners in a format that is simple to use.

Kanebridge and its employees are not experts on fastener usage or fastener design. Each fastener application has its own unique variables and issues to consider. It is the responsibility of the purchasers and users of fasteners to select the proper parts and test those parts at a level commensurate with the nature of the application. Kanebridge renews its commitment to supplying the readers of the ***Fastener Specification Guide*** with the technical information necessary to properly service their customers in the fastener industry.

James H. Meiman
Kanebridge Corporation

TABLE OF CONTENTS

1 **Self-Tapping Screws**
Thread-Forming, Thread-Cutting, High-Low, Taptite II®, Plastite®, Self-Drilling, Self-Piercing, Drywall, Deck & U-Drive Screws

75 **Machine Screws & SEMS**
Head and Thread Dimensions, SEMS Washer Dimensions, Thread Gaging information

106 **Cap Screws & Bolts**
Includes Hex & Square Bolts, Lags, Round Head Bolts, Flange Bolts, Serrated Flange Screws, Structural Bolts, Hanger Bolts, B7 Studs & more.

156 **Nuts, Spring Clips & Hooks**
Includes Finished, Regular and Jam Nuts; Lock, Wing, Cage, Spring & Prevailing Torque Nuts; U-Clips, S-Hooks and more.

227 **Washers**
Flat washers, Lockwashers, Beveled washers, Finishing washers, Structural washers and more.

258 **Rivets**
Standard Blind Break-stem, Multi-Grip, Drive-Pin, Bulbing, Semi-Tubular, Solid, Split & Structural Rivets; Rivet Nuts and more

334 **Sockets**
Includes Socket Head Cap, Low-Head, Button Head, Flat Head, Set Screws, Shoulder Screws, Pipe Plugs and Hex Keys.

355 **Retaining Rings**
Internal, External and E-Rings

361 **Pins**
Hitch Pin Clips, Cotter, Spring, Dowel, Clevis, Coiled, Grooved and Taper Pins

370 **Thumb and Wing Screws**
Plain pattern, Shoulder pattern and Knurled Thumb Screws; Stamped and Cold-formed Wing Screws

376 **Woodworking Screws**
Cut and Rolled thread Wood Screws; Deep Thread Wood Screws, Face Framing, Hinge, Pole Barn Screws & more

428 **Anchors**
Includes Wedge, Sleeve, Drop-in, Split Drive, Hammer Drive, Nail-in, Hollow Wall, Toggle-Style, One-Step Anchors and more.

461 **Weld Screws & Weld Nuts**
With and Without Welding Projections; Includes Tab, Hex and Straight Barrel Weld Nuts

478 **Electronic Hardware**
Includes Clinch Studs, Broaching Studs, Spacers, Female Standoffs, Male-Female Standoffs, Self-Clinch Standoffs, Jack Screws and more.

496 **Nylon Fasteners**
Pan Machine Screws, Hex Nuts, Flat Washers, Shoulder Washers, Cable Clamps

504 **Insert Bits**
Standard Insert Bits, Power Bits, Bit Holders and Nutsetters

512 **Metric Fasteners**
Self-Tapping Screws, Machine Screws, SEMS, Cap Screws, Flange Screws, Bolts, Nuts, Washers, Sockets, Standoffs & Weld Nuts

640 **Appendices**
Plating, Heat-treating and Thread-fit information; Effects of Temperature Change; Glossary

649 **Index**

SELF- TAPPING SCREWS

Head Style Reference Chart 2

Drive Type Reference Chart 3

Hole Size Data 4

Head & Drive Dimensions

Pan, Phillips & Slotted 6
100° Flat, Phillips & Slotted 6
82° Flat, Phillips & Slotted 7
Flat Undercut, Phillips & Slotted 8
Oval, Phillips & Slotted 9
Oval Undercut, Phillips & Slotted 10
Round, Phillips & Slotted 11
Round Washer Phillips 11
Truss, Phillips & Slotted 12
Hex Washer Phillips 12
Hex, Slotted and Unslotted 13
Hex Washer, Slotted and Unslotted 13
Square Flat 14
Square Pan 14
Six-Lobe Pan 15
Combination Pan 15
Six-Lobe Flat 16
Six-Lobe Flat Undercut 16
Bugle, Phillips & Square Recess 17
Square Flat Undercut 17
Pan Phillips with Serrations 18
Six-Lobe Round Washer 18
Six-Lobe Truss 19
Square Truss 19
Wafer Phillips & Square Recess 20
Wafer Six-Lobe & Phillips-Square Combo 21
Hex Washer Combo & Square 22

Thread & Hole Dimensions; Mechanical & Performance Requirements
Thread Forming Screws

High Low 23
Type A 27
Type AB 28
Types AB & B Serrated Hex Washer 29
Type B 30

Thread Cutting Screws

Type 25 31
Type 23 32
Type 1 33
Type F 34
Type F Floorboard 35

Thread & Hole Dimensions; Mechanical & Performance Requirements (continued)
Thread Rolling Screws

Plastite® 36
Taptite® II 37

Self Drilling Screws

Trim Head 43
Type BSD, #2 & #3 Drill points 44
Type CSD, #2 & #3 Drill points 44
#4 & #5 Drill points, Unified Thread 46
#4 & #5 Drill points, Spaced Thread 47
#1 Drill point, Spaced Thread 48
High Hex Washer Hd 49
Serrated Hex Washer, #2, #3 & #4 points 50
Serrated Hex Washer, MS Thread 51
Hex Washer 1/4" with #12 Head 52
#5 Drill point with Neo-EPDM Washer 53
#4 Drill point with Wings, MS Thread 54
Modified Truss Phillips 55
Modified Truss Six-Lobe 56
Modified Truss Square Recess 56
Framing Screw, Sharp & Drill Points 57
High Low with Spade Point 58
Wafer, Spaced thread 59
Round Washer, Spaced thread 60
Flat Phillips w/Nibs, Point w/Wings 61
Types BSD & CSD w/Neo-EPDM Washer 62

Self Piercing Screws

Hex Washer Slotted 63
With Neo-EPDM Washer 63-64
Hex Washer Combo 65
Modified Truss Phillips 66

Drywall Screws

Fine Thread, Sharp & Drill points 67
High-Low 68
Trim Head, Phillips & Square Recess 69
Ty-17 Trim Head, Six-Lobe & Square Recess 70
Coarse Thread, Phillips & Square Recess 71

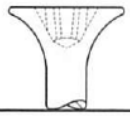
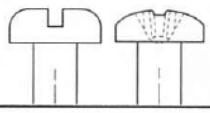
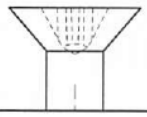
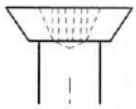
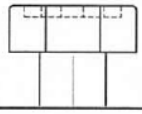
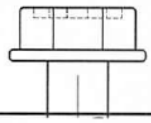
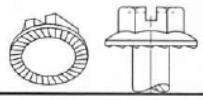
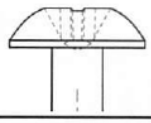
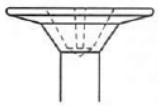
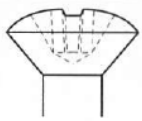
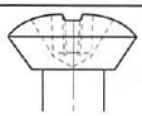
Type-17 Deck Screws

Bugle Head, Square Recess 72
Flat Head w/Nibs, Square Recess 73

Drive Screws, Type U 74

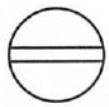
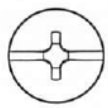
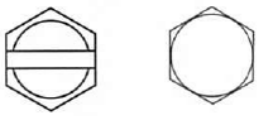
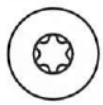
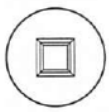
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HEAD STYLES

Schematic	Head Style	Description	Applications/Advantages
	Bugle	A countersunk head with a flat top surface and a concave underhead bearing surface	Designed specifically for use in drywall. Distributes bearing stress over a wider area than flat heads.
	Pan	Slotted pan heads have a flat or gently rounded top surface, cylindrical sides and a flat bearing surface.	For general application. Can be substituted in most applications for round, truss, or binding heads.
	Flat 82	A countersunk head with a flat top sufrace and a cone-shpaed bearing surface with a head angle of approximately 82°.	Used in applications where protrusion of the fastener above the mating surface is unacceptable. Use a protrusion gage when measuring head height.
	Flat Undercut	Similar to an 82° flat head except that the head is undert to 70% of its normal side height.	Standard for short lengths because it allows greater length of threads. Also avoids transition fillet and assembly interference.
	Indented Hex	Has an indented top surface, six flat sides, and a flat bearing surface.	Preferred in high volume assembly where pneumatic equipment is used to drive the screw. Can transmit significantly higher tightening torque levels other head styles.
	Indented Hex Washer	Has an indented top surface, six flat sides with a flat washer which projects beyond the sides and provides a flat bearing surface. The washer and hex head are formed together as one piece.	Increased bearing area reduces likelihood of crushing mating surfaces.
	Serrated Hex Washer	Same as an Indented Hex Washer head but with serrations formed into the bearing surface on the underside of the washer.	Serration geometry is oriented to resist loosening. Also slows the screw at the point of engagement wiht the mating piece of sheet metal so as to minimize stripping.
	Truss	Has a low rounded top with a flat bearing surfae greater in area than a round-head screw of the same nonimal size.	Weaker than pan or round heads but preferred in applications where minimal clearance exists above the head. Truss profile provides a trim, finished appearance.
	Wafer	A countersunk head with a flat top surface and a cone-shaped bearing surface. The wafer's 70°conical underhead area does not extend to the outer edge of the head, providing a bearing surface of 16° around the circumference of the underhead.	Preferred head style for Type–CSD self-drilling screws. Provides teh necessary bearing surface and flush fit in wood and softer materials. The head/ shankfillet contoured to strenghten the underhead area.
	Oval	A countersunk head with a rounded top surface and a cone-shaped bearing surface of approximately 82°	Preferred over a flat head in conical applications, or when a more decorative finished look is desired. The countersunk surface nests into mating countersunk application sites.
	Oval Undercut	Similar to an 82° oval head except that the head is undercut to 70% of its normal side height.	Standard for short lengths because it allows greater length of threads.
	Round (U-Drive)	Has a semi-elliptical top surface and a flat bearing surface.	Standard head style for drive screws. Provides efficient non-torque fastening for high-speed assembly.

DRIVE TYPES

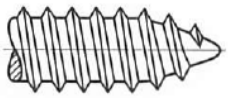
Drive Types for Self-Tapping Screws

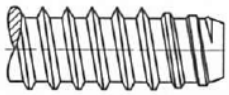
Schematic	Drive Type	Uses
	Phillips	Most recommended drive type. Provides good control in driving. Alwayhs use a driver bit of the proper size which is in good condition.
	Slotted	Accepts standard blade screwdriver. Required less downward pressure to drive parts than those with recessed openings. Use proper fitting balde to minimize slippage.
	Combination: Phillips/Slotted	Accepts phillips and standard blade screwdrivers. Often used when fastener is expected to be driven and backed-out several times.
	Hex / Slotted Hex	Accepts hex wrench. Slotted drive is added to make it easier to removed the fastener.
	Six-Lobe	Positive-engaging, fast-locating method which transmits drive torque with less required downward pressure. Good fastening appearance.
	Square	Increases productivity with excellent torque transmission and resists cam-out. Distinctive appearance which discourages tinkering.
	Pozidriv -Alternative (Type 1A)	Deisgn offers even greater control in driving than phillips drive. Used in automotive and appliance anaufacturing.

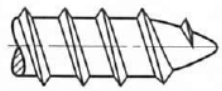
Pozidriv® is a registered trademark of the Phillips Screw Company. Kanebridge Type-1A drive fasteners are not manufactured by or connected with the producers of Pozidriv® screws.

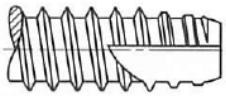
HOLE SIZE DATA

Types A, AB, B, 25

AB 

B 

A 

25 

Suggested Test Plate Thicknesses & Hole Sizes for Types AB - B - 25					
Nominal Screw Size & No. of Threads per Inch	Thickness			Hole Size	
	Gage	Max	Min	Drill Size	Hole Diam.
2-32	18	.0500	.0460	48	.0760
3-28	18	.0500	.0460	46	.0810
4-24	18	.0500	.0460	44	.0860
5-20	18	.0500	.0460	36	.1065
6-20	14	.0770	.0730	32	.1160
7-19	14	.0770	.0730	30	.1285
8-18	14	.1270	.1230	29	.1360
10-16	1/8	.1270	.1230	21	.1590
12-14	1/8	.1270	.1230	3/16	.1875
1/4-14	3/16	.1905	.1845	5.5 mm	.2165
5/16-12	3/16	.1905	.1845	I	.2720
3/8-12	3/16	.1905	.1845	21/64	.3281

Suggested Hole Sizes for Type A		
Nominal Screw Size	Hole Size	
	Drill Size	Hole Diam.
6-18	#32	0.1160
7-16	#30	0.1285
8-15	#29	0.1360
10-12	#21	0.1590
12-11	3/16	0.1875
14-10	5.5mm	0.2165
20-9	L	0.2900
24-9	11/32	0.3438

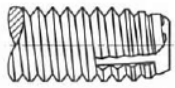
Notes Regarding Hole Preparation:

- Preformed holes can be drilled, cored, punched, pierced or extruded. If edge burrs can cause assembly difficulty, they should be removed. Wall ovality and/or taper can affect load carrying ability.

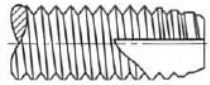
- "Minimum torsional strength" is the torque that free standing screws must accept without evidence of damage or failure.

Types 1, 23, F, U & High-Low HOLE SIZE DATA

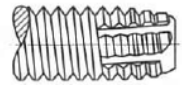
Type 1



Type 23



Type F



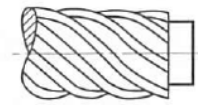
Suggested Test Plate Thicknesses & Hole Sizes for Types 1, 23 & F Thread Cutting Screws

Nominal Screw Size & Thread Pitch	Thickness			Hole Size	
	Gage	Max	Min	Drill Size	Hole Diam.
2-56	18	.0800	.0760	49	0.0730
3-48	18	.0960	.0920	46	0.0810
4-40	18	.1110	.1070	41	0.0960
5-40	18	.1110	.1070	37	0.1010
6-32	14	.1425	.1385	31	0.1200
8-32	14	.1905	.1845	26	0.1470
10-24	1/8	.1905	.1845	17	0.1730
10-32	1/8	.1905	.1845	16	0.1770
12-24	1/8	.1905	.1845	8	0.1990
1/4-20	3/16	.2530	.2470	1	0.2280
5/16-18	3/16	.3155	.3095	L	0.2900
3/8-16	3/16	.3780	.3720	T	0.3580
1/2-13	3/16	.471	.443	29/64	0.4531

Plastite® - alternatives: See p. 36

Taptite® - alternatives: See pp. 37-42

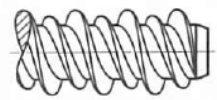
Type U Drive Screw



Recommended Hole Sizes -- Type-U Drive Screws

Screw Size	Drill Size No.	Hole Diameter
00	55	.052
0	51	.067
2	44	.086
4	37	.104
6	31	.120
7	29	.136
8	27	.144
10	20	.161
12	11	.191
14	2	.221

High-Low



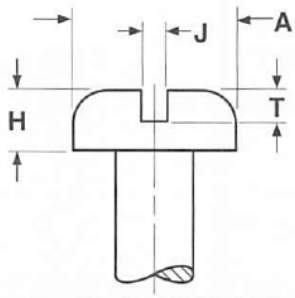
Suggested Hole Sizes -- High-Low Screws

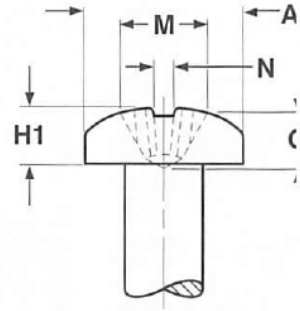
Nominal Screw Size & Number of Threads per Inch	Pilot Hole Diameter Flexural Modulus of Plastic	
	Up to 200,000 P.S.I.	200,000-400,000 P.S.I.
2-32	.0670	.0700
3-28	.0730	.0781
4-24	.0810	.0860
5-20	.0935	.0995
6-19	.1015	.1100
7-19	.1200	.1250
8-18	.1200	.1285
10-16	.1360	.1440
12-16	.1570	.1660
1/4-15	.1890	.2010
5/16-14	.2380	.2500

Taptite® II and Paptite® are registered trademarks of REMINC (Research Engineering & Manufacturing Inc.)

HEAD DIMENSIONS

Pan, 100° Flat

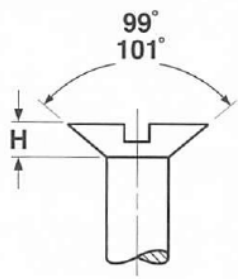


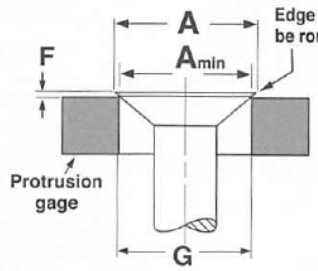


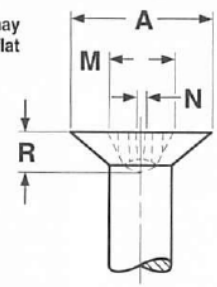
PAN HEADS FOR SELF-TAPPING AND DRILLING SCREWS

ASME B18.6.3—2013

Nominal Size	A		H		H1		J		T		M		G	N	Phillips Driver Size
	Head Diameter		Height of Head				Width of Slot		Depth of Slot		Dimensions of Recess				
			Slotted		Recessed						Diameter		Depth	Width	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
2	.167	.155	.053	.045	.062	.053	.031	.023	.031	.022	.104	.091	.059	.017	1
3	.193	.180	.060	.051	.071	.062	.035	.027	.036	.026	.112	.099	.068	.019	1
4	.219	.205	.068	.058	.080	.070	.039	.031	.040	.030	.122	.109	.078	.019	1
5	.245	.231	.075	.065	.089	.079	.043	.035	.045	.034	.158	.145	.083	.028	2
6	.270	.256	.082	.072	.097	.087	.048	.039	.050	.037	.166	.153	.091	.028	2
7	.296	.281	.089	.079	.106	.096	.048	.039	.054	.041	.176	.163	.100	.029	2
8	.322	.306	.096	.085	.115	.105	.054	.045	.058	.045	.182	.169	.108	.030	2
10	.373	.357	.110	.099	.133	.122	.060	.050	.068	.053	.199	.186	.124	.031	2
12	.425	.407	.125	.112	.151	.139	.067	.056	.077	.061	.259	.246	.141	.034	3
14	.476	.457	.139	.126	.169	.156	.075	.064	.085	.068	.281	.268	.148	.036	3
1/4	.492	.473	.144	.130	.175	.162	.075	.064	.087	.070	.281	.268	.161	.036	3
5/16	.615	.594	.178	.162	.218	.203	.084	.072	.106	.085	.350	.337	.193	.059	4
3/8	.740	.716	.212	.195	.261	.244	.094	.081	.124	.100	.389	.376	.233	.065	4





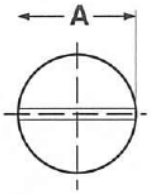


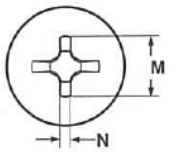
FLAT HEAD 100° FOR SELF-TAPPING SCREWS

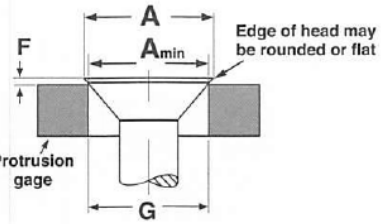
ASME B18.6.3—2013

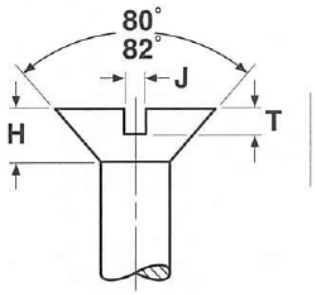
Nominal Size	A		H		J		T		M	R	N	F		G	Phillips Driver Size
	Head Dimensions				Slot Dimensions				Recess Dimensions			Protrusion Above Gaging Diameter		Gaging Diameter	
	Diameter		Height		Width		Depth		Diam.	Depth	Width				
	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Ref	Ref	Max	Min		
4	.212	.188	.049	.039	.039	.031	.024	.017	.110	.070	.018	.025	.016	.167	1
6	.262	.235	.060	.049	.048	.039	.030	.022	.148	.074	.027	.028	.017	.214	2
8	.312	.282	.072	.060	.054	.045	.036	.027	.162	.090	.028	.031	.019	.261	2
10	.362	.329	.083	.070	.060	.050	.042	.031	.178	.104	.030	.034	.021	.307	2
1/4	.477	.437	.110	.094	.075	.064	.055	.042	.240	.124	.033	.040	.025	.415	3

82° Flat HEAD DIMENSIONS

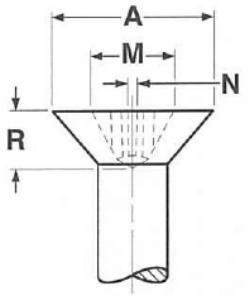








Slotted



Phillips

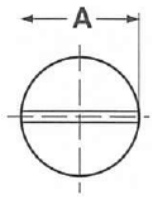
FLAT HEADS FOR SELF-TAPPING SCREWS

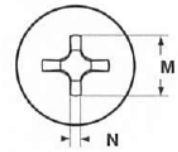
ASME B18.6.3—2013

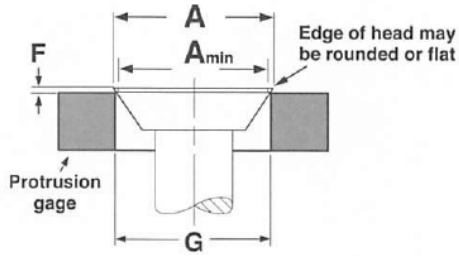
Nominal Size	These Lengths or Shorter are Undercut		A		H		J		T		M	R	N	F		G	
			Head Dimensions				Slot Dimensions				Phillips Dimensions			Protrusion Above Gaging Diameter		Gaging Diameter	Phillips Driver Size
			Diameter		Height		Width		Depth		Diam.	Depth	Width				
	Types A & AB	Other Types	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Ref	Ref	Max	Min		
0	3/16	1/8	.112	.096	.035	.026	.023	.016	.015	.010	.062	.035	.014	.026	.016	.078	0
1	3/16	5/32	.137	.120	.043	.033	.026	.019	.019	.012	.070	.043	.015	.028	.016	.101	0
2	3/16	3/16	.162	.144	.051	.040	.031	.023	.023	.015	.096	.055	.017	.029	.017	.124	1
3	7/32	7/32	.187	.167	.061	.047	.035	.027	.027	.017	.100	.060	.018	.031	.018	.148	1
4	1/4	1/4	.212	.191	.067	.055	.039	.031	.030	.020	.122	.081	.018	.032	.019	.172	1
5	1/4	1/4	.237	.215	.075	.062	.043	.035	.034	.022	.148	.074	.027	.034	.020	.196	2
6	5/16	5/16	.262	.238	.083	.069	.048	.039	.038	.024	.168	.094	.029	.036	.021	.220	2
7	3/8	3/8	.287	.262	.091	.076	.048	.039	.041	.027	.176	.102	.030	.037	.022	.243	2
8	7/16	7/16	.312	.285	.100	.084	.054	.045	.045	.029	.182	.110	.030	.039	.023	.267	2
10	1/2	1/2	.362	.333	.116	.098	.060	.050	.053	.034	.198	.124	.032	.042	.025	.313	2
12	9/16	9/16	.412	.380	.132	.112	.067	.056	.060	.039	.262	.144	.035	.045	.027	.362	3
14	5/8	-	.462	.427	.148	.126	.075	.064	.068	.044	.276	.160	.036	.049	.029	.410	3
1/4	5/8	5/8	.477	.442	.153	.131	.075	.064	.070	.046	.276	.160	.036	.050	.029	.424	3
5/16	13/16	5/8	.597	.556	.191	.165	.084	.072	.088	.058	.358	.205	.061	.057	.034	.539	4
3/8	-	5/8	.717	.670	.230	.200	.094	.081	.106	.070	.386	.234	.065	.065	.039	.653	4
1/2	-	3/4	.815	.765	.223	.186	.106	.091	.103	.065	.418	.265	.069	.081	.049	.739	4

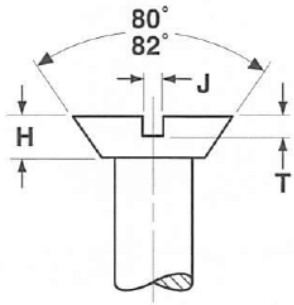
HEAD DIMENSIONS

Flat Undercut

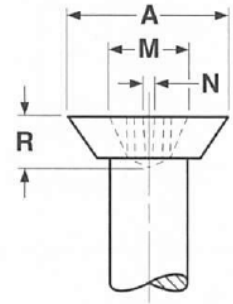








Slotted

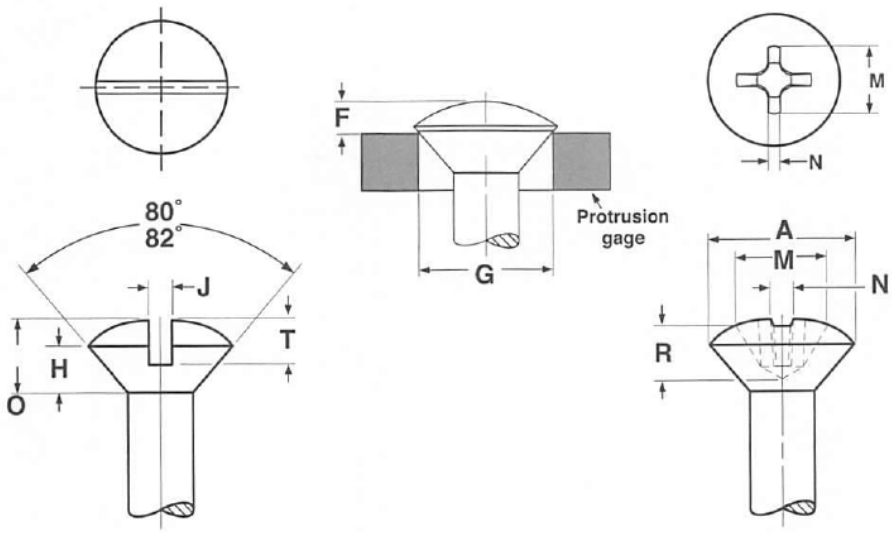


Phillips

UNDERCUT FLAT HEADS FOR SELF-TAPPING SCREWS ASME B18.6.3—2013

Nominal Size	These Lengths or Shorter are Undercut		A		H		J		T		M	R	N	F		G	Phillips Driver Size
			Head Dimensions				Slot Dimensions				Recess Dimensions			Protrusion Above Gaging Diameter		Gaging Diameter	
			Diameter		Height		Width		Depth		Diam.	Depth	Width				
	Types A & AB	Other Types	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Ref	Ref	Max	Min		
0	3/16	1/8	.112	.096	.025	.018	.023	.016	.011	.007	.062	.035	.014	-	-	-	0
1	3/16	5/32	.137	.120	.031	.023	.026	.019	.014	.009	.070	.043	.015	-	-	-	0
2	3/16	3/16	.162	.144	.036	.028	.031	.023	.016	.011	.088	.048	.017	.029	.017	.124	1
3	7/32	7/32	.187	.167	.042	.033	.035	.027	.019	.012	.096	.055	.018	.031	.018	.148	1
4	1/4	1/4	.212	.191	.047	.038	.039	.031	.022	.014	.110	.070	.018	.032	.019	.172	1
5	1/4	1/4	.237	.215	.053	.043	.043	.035	.024	.016	.122	.081	.018	.034	.020	.196	1
6	5/16	5/16	.262	.238	.059	.048	.048	.039	.027	.017	.140	.066	.025	.036	.021	.220	2
7	3/8	3/8	.287	.262	.064	.053	.048	.039	.030	.019	.148	.074	.027	.037	.022	.243	2
8	7/16	7/16	.312	.285	.070	.058	.054	.045	.032	.021	.168	.094	.029	.039	.023	.267	2
10	1/2	1/2	.362	.333	.081	.068	.060	.050	.037	.024	.182	.110	.030	.042	.025	.313	2
12	9/16	9/16	.412	.380	.092	.078	.067	.056	.043	.028	.226	.110	.030	.045	.027	.362	3
1/4	5/8	5/8	.477	.442	.107	.092	.075	.064	.050	.032	.244	.124	.032	.050	.029	.424	3
5/16	13/16	5/8	.597	.556	.134	.116	.084	.072	.062	.041	.310	.157	.053	.057	.034	.539	4
3/8	-	5/8	.717	.670	.161	.140	.094	.081	.075	.049	.358	.205	.061	.065	.039	.653	4

Oval HEAD DIMENSIONS



Slotted **Phillips**

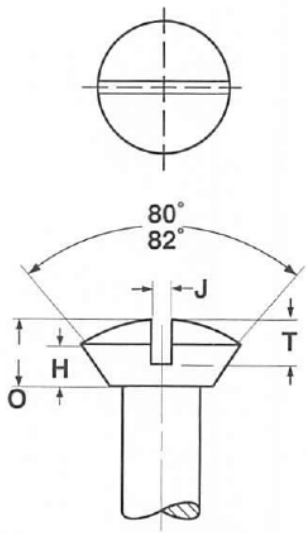
OVAL HEADS FOR SELF-TAPPING SCREWS

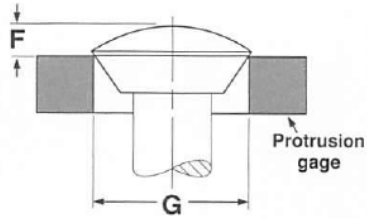
ASME B18.6.3—2013

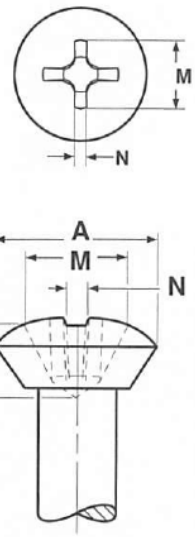
Nominal Size	A		H	O	J		T		M	R	N	F		G	Phillips Driver Size
	Head Diameter		Height of Head		Width of Slot		Depth of Slot		Dimensions of Recess			Protrusion Above Gaging Diameter		Gaging Diam.	
			Side	Total					Diam	Depth	Width				
	Max	Min	Max	Max	Max	Min	Max	Min	Ref	Ref	Ref	Max	Min		
0	.112	.096	.035	.056	.023	.016	.030	.025	.068	.036	.014	.047	.031	.078	0
1	.137	.120	.043	.068	.026	.019	.038	.031	.070	.039	.015	.053	.035	.101	0
2	.162	.144	.051	.080	.031	.023	.045	.037	.106	.060	.018	.058	.039	.124	1
3	.187	.167	.059	.092	.035	.027	.052	.043	.118	.072	.019	.064	.044	.148	1
4	.212	.191	.067	.104	.039	.031	.059	.049	.130	.086	.019	.069	.048	.172	1
5	.237	.215	.075	.116	.043	.035	.067	.055	.152	.073	.028	.075	.053	.196	2
6	.262	.238	.083	.128	.048	.039	.074	.060	.172	.092	.030	.080	.057	.220	2
7	.287	.262	.091	.140	.048	.039	.081	.066	.176	.098	.030	.085	.062	.243	2
8	.312	.285	.100	.152	.054	.045	.088	.072	.186	.107	.031	.091	.066	.267	2
10	.362	.333	.116	.176	.060	.050	.103	.084	.202	.125	.033	.102	.075	.313	2
12	.412	.380	.132	.200	.067	.056	.117	.096	.264	.140	.038	.113	.084	.362	3
14	.462	.427	.148	.224	.075	.064	.132	.108	.282	.152	.039	.125	.093	.410	3
1/4	.477	.442	.153	.232	.075	.064	.136	.112	.284	.160	.040	.129	.095	.424	3
5/16	.597	.556	.191	.290	.084	.072	.171	.141	.384	.226	.065	.155	.117	.539	4
3/8	.717	.670	.230	.347	.094	.081	.206	.170	.404	.245	.068	.182	.139	.653	4
7/16	.760	.715	.223	.345	.094	.081	.210	.174	.416	.257	.070	.195	.150	.690	4
1/2	.815	.765	.223	.354	.106	.091	.216	.176	.430	.271	.071	.212	.163	.739	4

HEAD DIMENSIONS

Oval Undercut





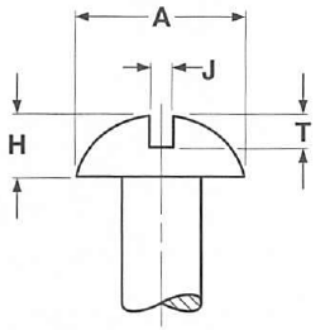


Slotted **Phillips**

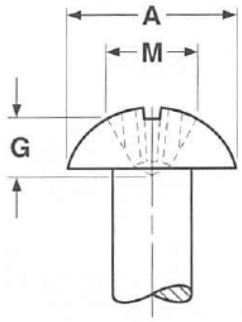
UNDERCUT OVAL HEADS FOR SELF-TAPPING SCREWS — ASME B18.6.3—2013

Nominal Size	These Lengths or Shorter are Undercut		A		H	O		J		T		M	R	N	F		G	Phillips Driver Size
	Head Dimensions							Slot Dimensions				Recess Dimensions			Protrusion Above Gaging Diameter		Gaging Diameter	
	Diameter				Side Height	Total Height		Width		Depth		Diam	Depth	Width				
	Type AB	Other Types	Max	Min	Ref	Max	Min	Max	Min	Max	Min	Ref	Ref	Ref	Max	Min		
0	3/16	1/8	0.112	0.096	0.025	0.046	0.033	0.023	0.016	0.028	0.022	0.068	0.036	0.014	0.047	0.031	0.078	0
1	3/16	5/32	0.137	0.120	0.031	0.056	0.042	0.026	0.019	0.034	0.027	0.070	0.039	0.015	0.053	0.035	0.101	0
2	3/16	3/16	0.162	0.144	0.036	0.065	0.050	0.031	0.023	0.040	0.033	0.106	0.060	0.018	0.058	0.039	0.124	1
3	7/32	7/32	0.187	0.167	0.042	0.075	0.059	0.035	0.027	0.047	0.038	0.118	0.072	0.019	0.064	0.044	0.148	1
4	1/4	1/4	0.212	0.191	0.047	0.084	0.067	0.039	0.031	0.053	0.043	0.130	0.086	0.019	0.069	0.048	0.172	1
5	1/4	1/4	0.237	0.215	0.053	0.094	0.076	0.043	0.035	0.059	0.048	0.152	0.073	0.028	0.075	0.053	0.196	2
6	5/16	5/16	0.262	0.238	0.059	0.104	0.084	0.048	0.039	0.065	0.053	0.172	0.092	0.030	0.080	0.057	0.220	2
7	3/8	3/8	0.287	0.262	0.064	0.113	0.093	0.048	0.039	0.071	0.059	0.176	0.098	0.030	0.085	0.062	0.243	2
8	7/16	7/16	0.312	0.285	0.070	0.123	0.101	0.054	0.045	0.078	0.064	0.186	0.107	0.031	0.091	0.066	0.267	2
10	1/2	1/2	0.362	0.333	0.081	0.142	0.118	0.060	0.050	0.090	0.074	0.202	0.125	0.033	0.102	0.075	0.313	2
12	9/16	9/16	0.412	0.380	0.092	0.161	0.135	0.067	0.056	0.103	0.085	0.264	0.140	0.038	0.113	0.084	0.362	3
1/4	5/8	5/8	0.477	0.442	0.107	0.186	0.158	0.075	0.064	0.119	0.098	0.284	0.160	0.040	0.129	0.095	0.424	3
5/16	13/16	5/8	0.597	0.556	0.134	0.232	0.198	0.084	0.072	0.149	0.124	0.374	0.214	0.065	0.155	0.117	0.539	4
3/8	-	5/8	0.717	0.670	0.161	0.278	0.239	0.094	0.081	0.179	0.149	0.394	0.233	0.068	0.182	0.139	0.653	4
7/16	-	3/4	0.760	0.715	0.156	0.279	0.239	0.094	0.081	0.184	0.154	0.404	0.245	0.070	0.195	0.150	0.690	4
1/2	-	3/4	0.815	0.765	0.156	0.288	0.244	0.106	0.091	0.204	0.169	0.416	0.257	0.071	0.212	0.163	0.739	4

Round & Round Washer HEAD DIMENSIONS



Slotted

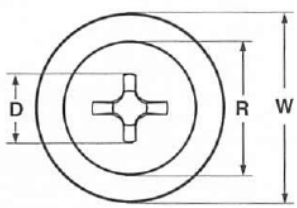


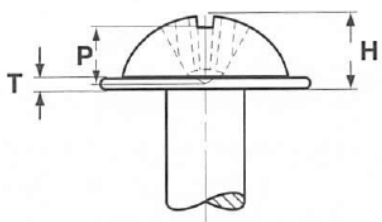
Phillips

Round Heads for Self Tapping Screws

ASME B18.6.3—2013

Nominal Size	A		H		J		T		M	G	N	Recess Penetration Gaging Depth		Phillips Driver Size
	Head Diameter		Height of Head		Slot Width		Slot Depth		Dimensions of Recess					
									Diameter	Depth	Width			
	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Ref	Ref	Max	Min	
2	.162	.146	.069	.059	.031	.023	.048	.037	.094	.044	.017	.046	.027	1
4	.211	.193	.086	.075	.039	.031	.058	.044	.112	.062	.019	.065	.046	1
6	.260	.240	.103	.091	.048	.039	.068	.051	.156	.070	.027	.073	.045	2
8	.309	.287	.120	.107	.054	.045	.077	.058	.172	.088	.030	.090	.064	2
10	.359	.334	.137	.123	.060	.050	.087	.065	.188	.106	.031	.108	.082	2
12	.408	.382	.153	.139	.067	.056	.096	.073	.242	.112	.032	.108	.082	3
14	.457	.429	.170	.155	.075	.064	.106	.080	.258	.129	.034	.125	.099	3
1/4	.472	.443	.175	.160	.075	.064	.109	.082	.262	.134	.034	.130	.104	3





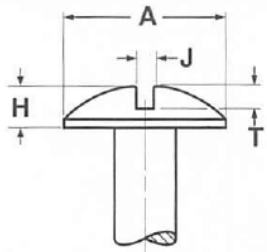
Round Washer Heads for Self Tapping Screws

ASME B18.6.3—2013

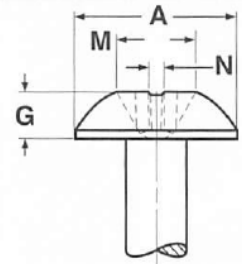
Nominal Size	W		T	R	H		D	P	Recess Penetration Gaging Depth		Phillips Driver Size
	Washer Outside Diameter		Washer Thick-ness	Crown Diameter	Overall Head Height		Recess Diameter	Recess Depth			
	Max	Min	Ref	Ref	Max	Min	Ref	Ref	Max	Min	
6	.321	.301	.040	.218	.096	.084	.147	.058	.061	.033	2
8	.380	.358	.040	.259	.113	.101	.161	.073	.076	.048	2
10	.439	.416	.050	.300	.130	.118	.177	.091	.093	.066	2
1/4	.576	.548	.050	.396	.170	.157	.244	.110	.107	.080	3

HEAD DIMENSIONS

Truss & Hex Washer Phillips



Slotted

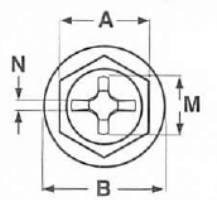


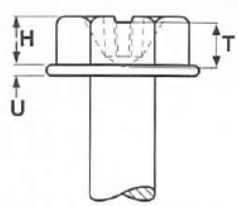
Phillips

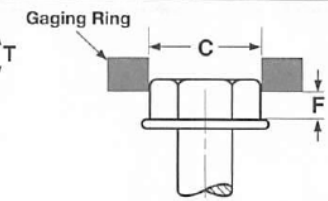
Truss Heads for Self-Tapping Screws

ASME B18.6.3—2013

Nominal Size	A		H		J		T		M		G	N	Phillips Driver Size
	Head Diameter		Height of Head		Slot Width		Slot Depth		Dimensions of Recess				
									Diameter		Depth	Width	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
2	.194	.180	.053	.044	.031	.023	.031	.022	.104	.091	.050	.018	1
4	.257	.241	.069	.059	.039	.031	.040	.030	.112	.099	.069	.018	1
5	.289	.272	.078	.066	.043	.035	.045	.034	.128	.115	.076	.019	1
6	.321	.303	.086	.074	.048	.039	.050	.037	.158	.145	.084	.027	2
7	.352	.333	.094	.081	.048	.039	.054	.041	.165	.152	.078	.028	2
8	.384	.364	.102	.088	.054	.045	.058	.045	.173	.160	.099	.029	2
10	.448	.425	.118	.103	.060	.050	.068	.053	.188	.175	.115	.030	2
12	.511	.487	.134	.118	.067	.056	.077	.061	.248	.235	.128	.032	3
14	.557	.530	.146	.129	.075	.064	.085	.068	.263	.250	.130	.033	3
1/4	.573	.546	.150	.133	.075	.064	.087	.070	.263	.250	.143	.033	3
5/16	.698	.666	.183	.162	.084	.072	.106	.085	.352	.339	.193	.059	4
3/8	.823	.787	.215	.191	.094	.081	.124	.100	.383	.370	.226	.063	4







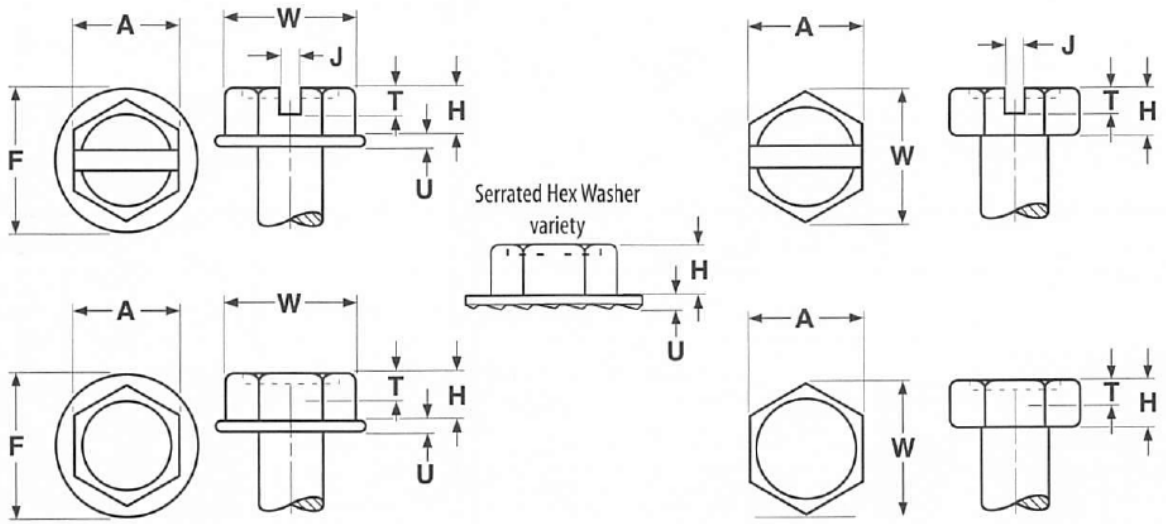
Phillips Hex Washer Heads for Tapping Screws

ASME B18.6.3-2013

Nominal Size	A		C	H		B		U		M	F	T		Phillips Driver Size
	Width Across Flats		Width Across Corners	Head Height		Washer Diameter		Washer Thickness		Recess Diameter	Protrusion Beyond Gaging Ring	Recess Penetration Gaging Depth		
	Max	Min	Min	Max	Min	Max	Min	Max	Min	Ref	Min	Max	Min	
4	.188	.181	.202	.060	.049	.243	.225	.019	.011	.097	.029	.067	.049	1
6	.250	.244	.272	.093	.080	.328	.302	.025	.015	.148	.048	.089	.064	2
8	.250	.244	.272	.110	.096	.348	.322	.031	.019	.168	.058	.115	.090	2
10	.312	.305	.340	.120	.105	.414	.384	.031	.019	.178	.063	.127	.102	2
12	.312	.305	.340	.155	.139	.432	.398	.039	.022	.247	.083	.152	.127	3
14	.375	.367	.409	.190	.172	.520	.480	.050	.030	.277	.103	.186	.161	3
1/4	.375	.367	.409	.190	.172	.520	.480	.050	.030	.277	.103	.186	.161	3
5/16	.500	.489	.545	.230	.208	.676	.624	.055	.035	.358	.125	.234	.219	4
3/8	.562	.551	.614	.295	.270	.780	.720	.063	.037	.386	.162	.267	.243	4

Hex & Hex Washer Heads

HEAD DIMENSIONS

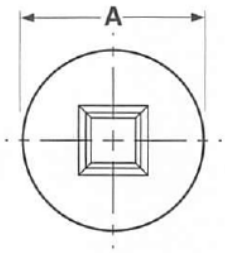


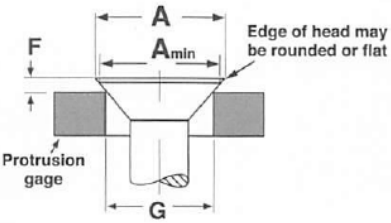
HEX & HEX WASHER HEADS FOR SELF-TAPPING & SELF-DRILLING SCREWS												ASME B18.6.3—2013*	
Nominal Size	A		W	H		F		U		J		T	
	Width Across Flats		Width Across Corners	Height of Head		Diameter of Washer		Thickness of Washer		Width of Slot		Depth of Slot	
	Max	Min	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4	.188	.181	.202	.060	.049	.243	.225	.019	.011	.039	.031	.036	.025
6	.250	.244	.272	.093	.080	.328	.302	.025	.015	.048	.039	.046	.033
7	.250	.244	.272	.093	.080	.328	.302	.029	.017	.048	.039	.054	.040
8	.250	.244	.272	.110	.096	.348	.322	.031	.019	.054	.045	.066	.052
10	.312	.305	.340	.120	.105	.414	.384	.031	.019	.060	.050	.072	.057
12	.312	.305	.340	.155	.139	.432	.398	.039	.022	.067	.056	.093	.077
14	.375	.367	.409	.190	.172	.520	.480	.050	.030	.075	.064	.101	.083
1/4	.375	.367	.409	.190	.172	.520	.480	.050	.030	.075	.064	.101	.083
5/16	.500	.489	.545	.230	.208	.676	.624	.055	.035	.084	.072	.122	.100
3/8	.562	.551	.614	.295	.270	.780	.720	.063	.037	.094	.081	.156	.131
1/2*	.750	.735	.820	.400	.367	1.040	.960	.085	.050	.106	.091	.190	.165

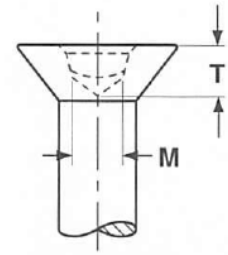
* Slot dimentions for 1/2-inch diameter hex washer head tapping screws are independent of ASME B18.6.3

HEAD DIMENSIONS

Square; Flat & Pan





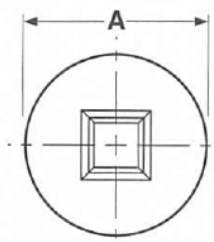


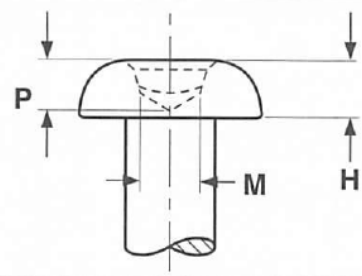
SQUARE RECESS FLAT HEADS

ASME B18.6.3—2013

Nominal Size or Basic Screw Diameter		A		M	F		G	T		Driver Size
		Head Diameter		Recess Across the Flats	Protrusion Above Gaging Diameter		Gaging Diameter	Recess Penetration Gaging Depth		
		Max	Min	Ref	Max	Min		Max	Min	
4	.1120	.212	.191	.070	.032	.019	0.172	.038	.028	0
6	.1380	.262	.238	.091	.036	.021	0.220	.055	.040	1S
8	.1640	.312	.285	.112	.039	.023	0.267	.063	.048	2S
10	.1900	.362	.333	.112	.042	.025	0.313	.075	.060	2R
12	.2160	.412	.380	.133	.045	.027	0.362	.095	.080	3R
14	.2420	.462	.427	.133	.050	.029	0.410	.095	.080	3R
1/4	.2500	.477	.442	.133	.050	.029	0.424	.095	.080	3R
5/16	.3125	.597	.556	.191	.057	.034	0.539	.100	.085	4R

This type of recess has a square center opening, slightly tapered side walls and a conical bottom.





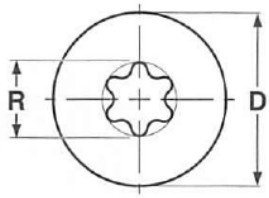
SQUARE RECESS PAN HEADS FOR SELF-TAPPING SCREWS

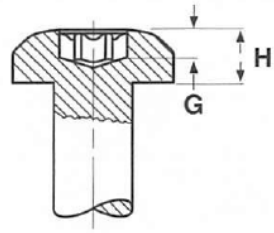
ASME B18.6.3—2013

Nominal Size or Basic Screw Diameter		A		H		M	T	Driver Size	P	
		Head Diameter		Head Height		Recess Across Flats	Recess Depth		Penetrating Gauging Depth	
		Max	Min	Max	Min	Ref	Ref		Max	Min
4	.1120	.219	.205	.086	.076	.070	.066	0	.038	.028
6	.1380	.270	.256	.103	.093	.091	.106	1R	.065	.050
8	.1640	.322	.306	.120	.110	.112	.127	2R	.075	.060
10	.1900	.373	.357	.137	.126	.112	.127	2R	.075	.060
12	.2160	.425	.407	.153	.141	.133	.158	3R	.095	.080
14	.2420	.476	.457	.169	.156	.133	.158	3R	.095	.080
1/4	.2500	.492	.473	.175	.160	.133	.165	3R	.095	.085

This type of recess has a square center opening, slightly tapered side walls and a conical bottom.

Pan; Six-Lobe & Combo HEAD DIMENSIONS

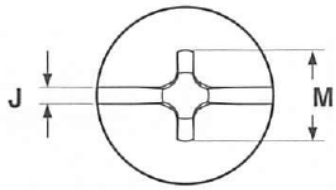


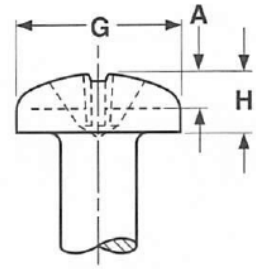


Six-Lobe Pan Heads

ASME B18.6.3-2013

Screw Size	D		H		R	G		Driver Size
	Head Dimensions				Recess Dimensions			
	Head Diameter		Head Height		Ref	Gauge Penetration Min	(Fallaway) Max Penetration	
	Max	Min	Max	Min				
2	.167	.155	.062	.053	.094	.030	.019	T8
4	.219	.205	.080	.070	.111	.035	.022	T10
6	.270	.256	.097	.087	.132	.045	.026	T15
8	.322	.306	.115	.105	.155	.055	.031	T20
10	.373	.357	.133	.122	.178	.070	.036	T25
12	.425	.407	.151	.139	.200	.070	.040	T27
1/4	.492	.473	.175	.162	.221	.085	.044	T30
5/16	.615	.594	.218	.203	.266	.105	.047	T40





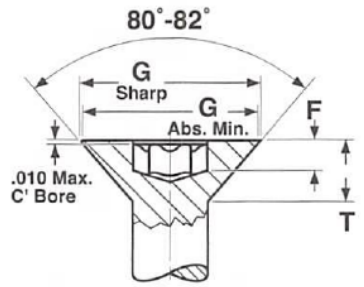
Phillips and Slotted Combination Drive Pan Heads

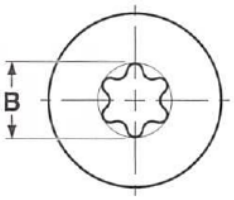
ASME B18.6.3-2013

Nominal Screw Size	G		H		J		A		M			Phillips Driver Size
	Head Dimensions				Slot Dimensions				Recess Dimensions	Recess Penetration Gaging Depth		
	Head Diameter		Head Height		Width		Depth		Diameter			
	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Max	Min	
4	.219	.205	.080	.070	.039	.031	.040	.027	.115	.071	.053	1
6	.270	.256	.097	.087	.048	.039	.050	.033	.159	.080	.055	2
7	.296	.281	.106	.096	.048	.039	.054	.041	.170	.089	.064	2
8	.322	.306	.115	.105	.054	.045	.058	.041	.175	.097	.071	2
10	.373	.357	.133	.122	.060	.050	.068	.048	.192	.113	.089	2
12	.425	.407	.151	.139	.067	.056	.077	.055	.252	.124	.098	3
1/4	.492	.473	.175	.162	.075	.064	.087	.063	.274	.144	.118	3

HEAD DIMENSIONS

Six-Lobe; Flat & Flat Undercut

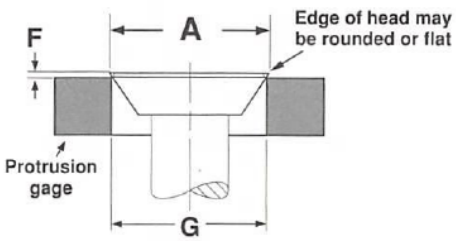


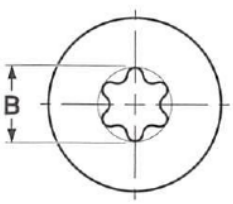


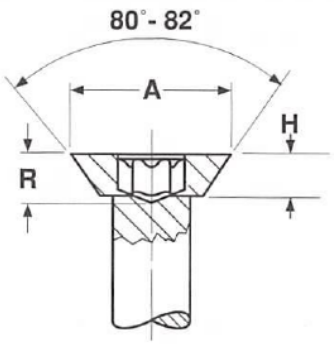
Six-Lobe Drive Flat Heads

ASME B18.6.3-2013

Nominal Size	G		T	B	F	Fallaway	Driver Size
	Head Diameter		Head Height	Recess Diameter	Gauge Penetration		
	Max	Min	Ref	Ref	Min	Max	
2	.162	.144	.051	.069	.017	.014	T6
4	.212	.191	.067	.094	.028	.019	T8
5	.237	.215	.075	.111	.035	.022	T10
6	.262	.238	.083	.111	.035	.022	T10
8	.312	.285	.100	.132	.040	.026	T15
10	.362	.333	.116	.155	.050	.031	T20
1/4	.477	.442	.153	.200	.075	.040	T27





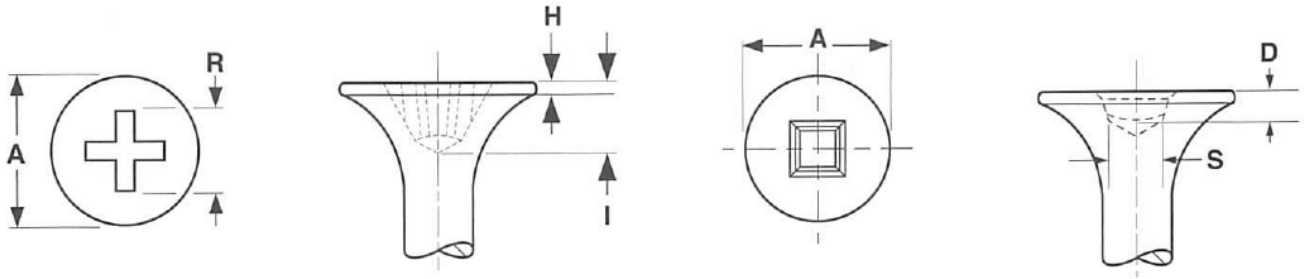


Six-Lobe Drive Flat Undercut Heads

Camcar

Nominal Size	A		H		B	F		Recess Penetration Gaging Depth	Driver Size
	Head Diameter		Head Height		Recess Diameter	Protrusion Above Gaging Diameter			
	Max	Min	Max	Min	Ref	Max	Min	Max	
4	.225	.195	.047	.038	.094	.032	.019	.020	T8
6	.279	.244	.059	.048	.111	.036	.021	.024	T10
8	.332	.292	.070	.058	.132	.039	.023	.035	T15
10	.385	.340	.081	.068	.155	.042	.025	.045	T20
12	.438	.389	.092	.078	.178	.045	.027	.050	T25
1/4	.507	.452	.107	.092	.200	.050	.029	.055	T27

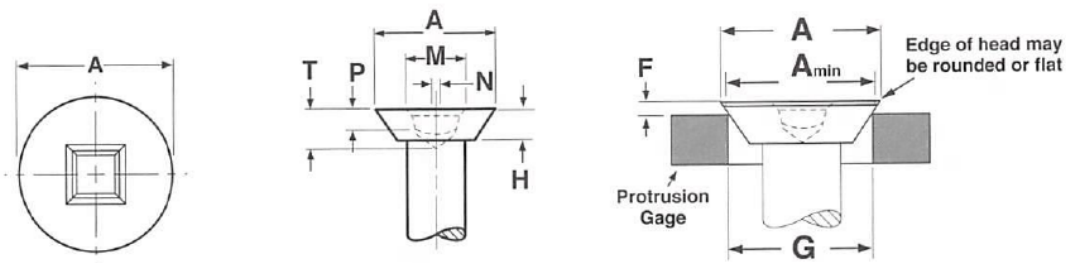
Bugle & Flat Undercut Square HEAD DIMENSIONS



Bugle Heads for Drywall, Particle Board & Deck Screws

Nominal Size	A		H		R		I	Phillips Driver Size (Reduced Diameter Bit for #6 thru #10)	S		D		Square Recess Driver Size
	Head Diameter		Head Thickness		Phillips Recess Drive				Square Recess Drive				
					Diameter		Depth		Recess Square		Depth		
	Max	Min	Max	Min	Max	Min	Ref		Max	Min	Max	Min	
6	.347	.315	.031	.020	.201	.176	.106	2	106	.090	.071	.055	1
7	.355	.315	.031	.020	.201	.176	.118	2	-	-	-	-	-
8	.363	.315	.039	.020	.201	.176	.124	2	.113	.110	.075	.064	2
9	.363	.334	.039	.020	.201	.176	.124	2	-	-	-	-	-
10	.363	.334	.039	.020	.204	.190	.124	2	.113	.110	.075	.064	2
12	.415	.390	.055	.042	.265	.250	.144	3	-	-	-	-	-
1/4	.472	.450	.058	.047	.277	.260	.160	3	-	-	-	-	-

In the abscence of a single industry standard for Bugle Heads, these dimensions are offered as a guide; slight deviations are acceptable.



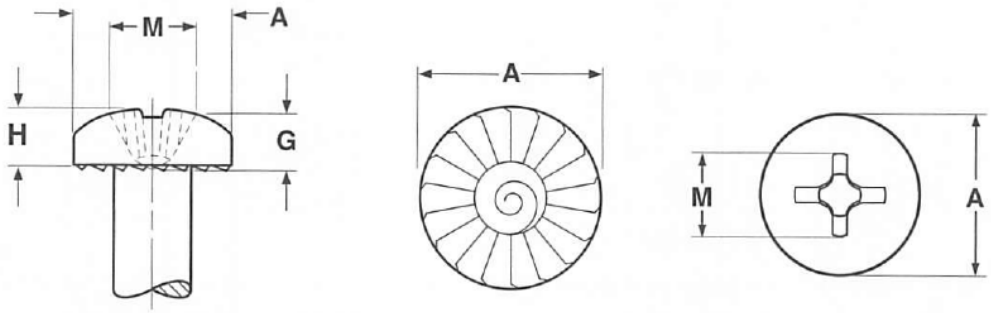
Flat Undercut Square Recess Heads for Tapping Screws

ASME B18.6.3-2013

Nominal Size	A		H		M	T	Recess Size	P		F		G
	Head Diameter		Head Height		Recess Across Flats	Recess Depth		Recess Penetrating Gaging Depth		Protrusion Above Gaging Diameter		Gaging Diameter
	Max	Min	Max	Min	Ref	Ref		Max	Min	Max	Min	
6	.262	.238	.059	.048	.091	.070	1SS	.027	.017	.036	.021	.220
8	.312	.285	.070	.058	.112	.091	2SS	.037	.027	.039	.023	.267
10	.362	.333	.081	.068	.112	.091	2SS	.037	.027	.042	.025	.313
12	.412	.380	.092	.078	.133	.138	3SS	.073	.063	.045	.027	.362
1/4	.477	.442	.107	.092	.133	.143	3S	.080	.065	.050	.029	.424

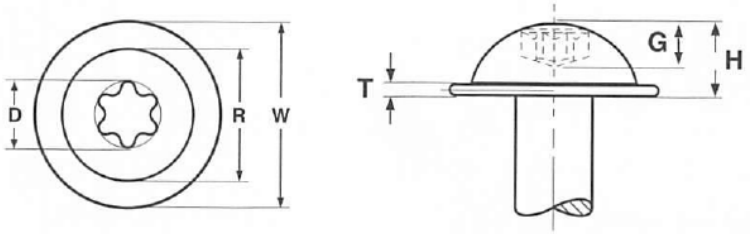
HEAD DIMENSIONS

Serrated Pan Phillips & Round Washer 6-lobe



Serrated Pan Phillips for Tapping Screws

Nominal Size	A		H		M	G		Recess Size
	Head Diameter		Head Height		Recess Diameter	Recess Penetrating Gaging Depth		
	Max	Min	Max	Min	Ref	Min	Max	
4	.219	.205	.080	.070	.115	.071	.053	1
6	.270	.256	.097	.087	.159	.080	.055	2
8	.322	.306	.115	.105	.176	.097	.071	2
10	.373	.357	.133	.122	.192	.113	.089	2
1/4	.492	.473	.175	.162	.274	.144	.118	3



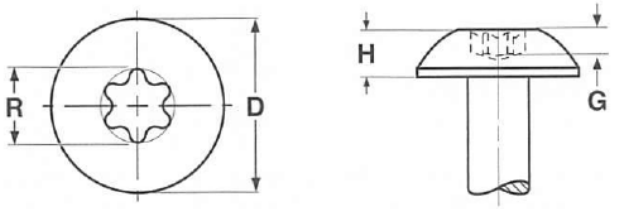
Six-Lobe Recess Round Washer Head

ASME B18.6.3-2013

Nominal Screw Size	W		T	R	H		D	G		(Fallaway) Max Penetration	Driver Size
	Washer Outside Diameter		Washer Thickness	Head Outside Diameter	Overall Head Height		Recess Diameter	Gauge Penetration			
	Max	Min	Ref	Ref	Max	Min	Ref	Max	Min		
8	.380	.358	.040	.259	.113	.101	.155	.065	.050	.031	T20

Truss: Six-Lobe & Square Recess

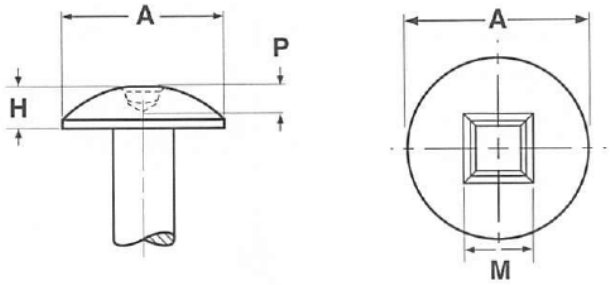
HEAD DIMENSIONS



Six-Lobe Recess Drive Truss Heads

Camcar

Screw Size	D		H		R	G		Driver Size
	Head Dimensions				Recess Dimensions			
	Head Diameter		Head Height		Ref	Gauge Penetration Min	(Fallaway) Max Penetration	
	Max	Min	Max	Min				
1/4	.573	.546	.150	.133	.200	.070	.040	T27



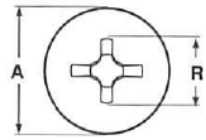
Truss Square Recess Heads for Tapping Screws

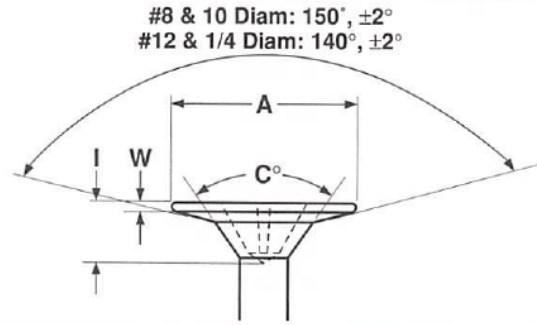
ASME B18.6.3-2013

Nominal Size	A		H		M	Recess Size	P	
	Head Diameter		Head Height		Recess Across Flats		Recess Penetrating Gaging Depth	
	Max	Min	Max	Min	Ref		Max	Min
4	.257	.241	.069	.059	.070	0	.038	.028
6	.321	.303	.086	.074	.091	1S	.055	.040
8	.384	.364	.102	.088	.112	2S	.063	.048
10	.448	.425	.128	.113	.112	2R	.075	.060
1/4	.573	.546	.150	.133	.133	3S	.080	.065

HEAD DIMENSIONS

Wafer: Phillips & Square Recess

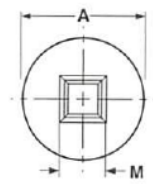


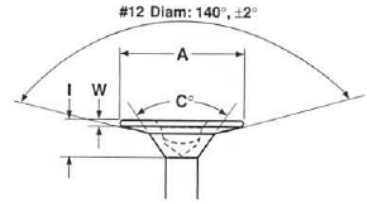


WAFER PHILLIPS HEAD FOR SELF-DRILLING SCREWS

Nominal Size	A		R		I	W		Bottom Countersink Angle	Phillips Driver Size
	Head Diameter		Recess Diameter		Recess Depth	Wafer Thickness			
	Max.	Min.	Max	Min	Ref.	Max	Min	± 2°	
8	.380	.359	.189	.176	.255	.035	.025	50°	2
10	.516	.441	.204	.190	.322	.040	.031	80°	2
12	.552	.511	.268	.254	.377	.040	.031	70°	3
1/4	.620	.580	.282	.267	.160	.042	.033	70°	3

NOTE: There is no single standard for Wafer head dimensions. These values are offered as a guide; deviations from these specifications may occur



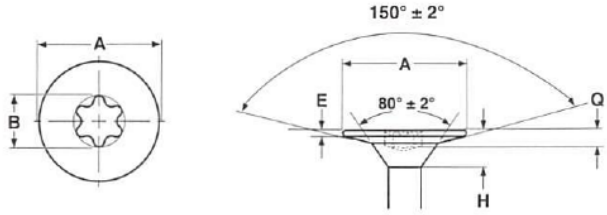


WAFER SQUARE RECESS HEAD FOR SELF-DRILLING SCREWS

Nominal Size	A		M	I		W		C	Phillips Driver Size
	Head Diameter		Recess Width	Recess Depth		Wafer Thickness		Bottom Countersink Angle	
	Max.	Min.	Ref	Max	Min	Max	Min	± 2°	
12	.551	.512	.133	.095	.080	.039	.031	70°	3

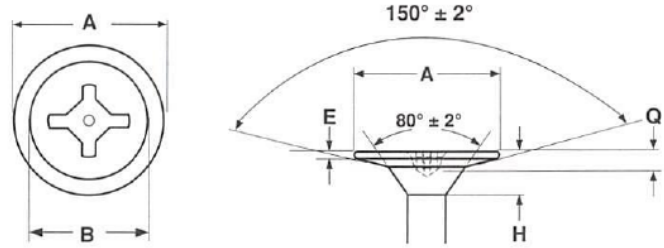
NOTE: There is no single standard for Wafer head dimensions. These values are offered as a guide; deviations from these specifications may occur

Wafer: Six-Lobe & Combo Square-Phillips HEAD DIMENSIONS



WAFER SIX-LOBE HEAD FOR SELF-DRILLING SCREWS							
Nominal Size	A		B	H	W		Six-Lobe Recess Size
	Head Diameter		Recess Diameter	Total Head Height	Wafer Thickness		
	Max.	Min.	Ref	Max	Max	Min	
10	.516	.441	.155	.095	.039	.031	3

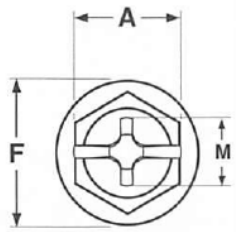
NOTE: There is no single standard for Wafer head dimensions. These values are offered as a guide; deviations from these specifications may occur

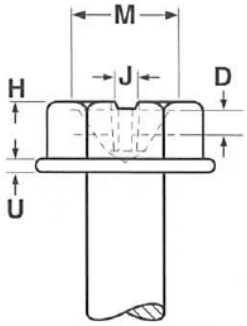


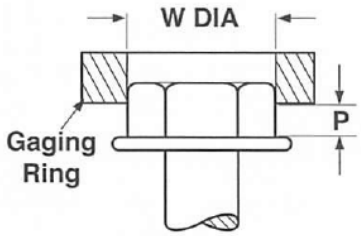
WAFER SQUARE-PHILLIPS COMBO HEAD FOR SELF-DRILLING SCREWS								
Nominal Size	A		B		H	W		Six-Lobe Recess Size
	Head Diameter		Recess Penetration Depth		Total Head Height	Wafer Thickness		
	Max.	Min.	Max.	Min.	Max	Max	Min	
10	.515	.440	.076	.064	.157	.040	.030	3

HEAD DIMENSIONS

Hex Washer Combo
Hex Washer Square



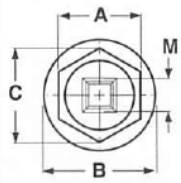


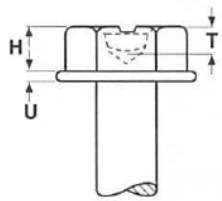


Combination Hex Washer Heads

ASME B18.6.3- 2013

Nom Size	A		H		F		U		J		D		P	M	Recess Penetrating Gaging Depth		Phillips Driver Size
	Width Across Flats		Head Height		Washer Diameter		Washer Thickness		Slot Width		Slot Depth		Protrusion Beyond Gaging Ring	Recess Diameter			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Min	Ref	Max	Min	
6	.250	.244	.093	.080	.328	.302	.025	.015	.048	.039	.053	.033	.048	.148	.089	.064	2
8	.250	.244	.110	.096	.348	.322	.031	.019	.054	.045	.074	.052	.058	.168	.115	.090	2
10	.312	.305	.120	.105	.414	.384	.031	.019	.060	.050	.080	.057	.063	.178	.127	.102	2
12	.312	.305	.155	.139	.432	.398	.039	.022	.067	.056	.103	.077	.083	.247	.152	.127	3
1/4	.375	.367	.190	.172	.520	.480	.050	.030	.075	.064	.111	.083	.103	.277	.186	.161	3



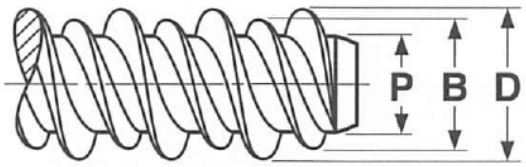


Square Recess Hex Washer Heads

Nominal Size	A		C	H		B		U		M	T		Square Recess Size
	Width Across Flats		Width Across Corners	Head Height		Washer Diameter		Washer Thickness		Recess Diameter	Recess Penetration Gaging Depth		
	Max	Min	Min	Max	Min	Max	Min	Max	Min	Ref	Max	Min	
8	.250	.244	.272	.110	.096	.348	.322	.031	.019	.168	.085	.060	1

High-Low Style

THREAD FORMING



THREAD AND HOLE DIMENSIONS FOR HIGH-LOW THREAD FORMING SCREWS					Elco*, ASME B18.6.3
Screw Size	D	B	P	Pilot Hole Diameter Flexural Modulus of Plastic	Minimum Torsional Strength, lb. in. (STEEL SCREWS ONLY)
	High Thread Diameter	Low Thread Diameter	Point Diameter	Up to 200,000 P.S.I.	200,000-400,000 P.S.I.
2-32	.084 - .090	.069	.050 - .058	.0670	.0700	-
3-28	.095 - .105	.078	.057 - .065	.0730	.0781	-
4-24	.105 - .115	.086	.061 - .070	.0810	.0860	4
5-20	.119 - .125	.100	.073 - .082	.0935	.0995	9
6-19	.135 - .145	.108	.080 - .090	.1015	.1100	13
7-19	.148 - .158	.130	.089 - .100	.1200	.1250	18
8-18	.160 - .170	.130	.095 - .105	.1200	.1285	18
10-16	.185 - .195	.145	.099 - .110	.1360	.1440	30
12-16	.210 - .220	.167	.125 - .137	.1570	.1660	39
1/4-15	.250 - .260	.200	.161 - .175	.1890	.2010	56
5/16-14	.307 - .317	.250	.200 - .212	.2380	.2500	142
Tolerance on Length			Up to 1 in., Incl.: +0, -3/64		Over 1 in.: +0, -1/16

Description	A thread forming screw with a double-lead, consisting of a high and low thread. The lower thread varies in height from 1/3 to 1/2 that of the higher thread, which is sharper and flatter than a standard thread.
Applications/ Advantages	For use in plastic, nylon, wood or other low-density materials. Thread design reduces driving torques, enhances resistance to thread stripping, improves pullout strength and lessens risk of cracking the work piece.
Material	***Steel***: 1019-1022 or equivalent steel. ***Stainless***: 410 martensitic or 18-8 austenitic stainless steel
Heat Treatment	***Steel:*** Screws shall be quenched in liquid and then tempeared by reheating to 650°F minimum. ***410 Stainless:*** Screws shall be annealed by heating to 1850-1950°F, held at least 1/2 hour and rapid air- or oil-quenched then reheating to 525°F minimum for at least 1 hour and air cooled to provide the required tensile, yield and hardness properties.
Case Hardness	***Steel:*** Rockwell C45 minimum
Case Depth (steel)	No. 2 thru 6 diameter: .002 - .007 No. 8 thru 12 diameter: .004 - .009 1/4" diameter and larger: .005 - .011
Core Hardness	***Steel (after tempering):*** Rockwell C28 - 36 ***410 Stainless (after tempering):*** Rockwell C38 - 42 ***18-8 Stainless:*** Rockwell B100 (approximate)
Plating	See Appendix-A

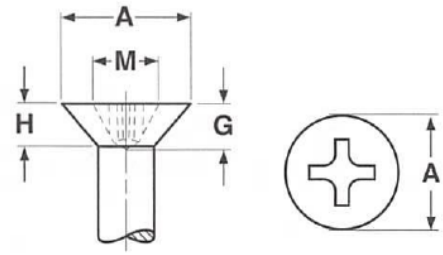
* Elco is the original writer of high-low screw dimentions

HEAD DIMENSIONS

High-Low Style

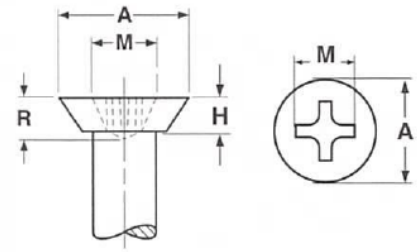
Head & Drive Dimensions for Phillips Flat High-Low

Nominal Size	A		H	M		G		Driver Size
	Head Diameter		Head Height	Recess Diameter		Recess Penetration Gaging Depth		
	Max	Min	Ref	Max	Min	Max	Min	
2	.162	.144	.051	.102	.089	.056	.040	1
4	.212	.191	.067	.128	.115	.082	.066	1
6	.262	.238	.083	.174	.161	.095	.072	2
8	.312	.285	.100	.189	.176	.110	.087	2
10	.362	.333	.116	.204	.191	.125	.102	2
12	.412	.380	.132	.268	.255	.139	.116	3
1/4	.477	.442	.153	.283	.270	.154	.131	3



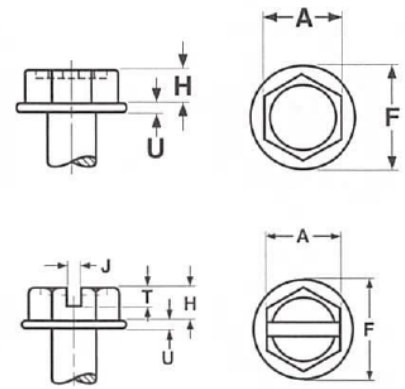
Head & Drive Dimensions for Phillips Flat Undercut High-Low

Nominal Size	A		H		M	G		Driver Size
	Head Diameter		Head Height		Recess Diameter	Recess Penetration Gaging Depth		
	Max	Min	Max	Min	Ref	Max	Min	
4	.212	.191	.047	.038	.110	.071	.055	1
6	.262	.238	.059	.048	.140	.067	.044	2
8	.312	.285	.070	.058	.168	.095	.072	2
10	.362	.333	.081	.068	.182	.110	.087	2

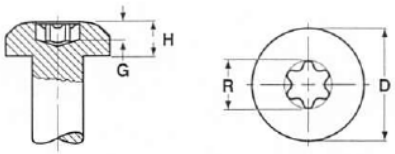


Head & Drive Dimensions For Hex Washer High-Low

Nominal Size	A		T		J		H		F		U	
	Width Across Flats		Slot Depth		Slot Width		Height of Head		Diameter of Washer		Thickness of Washer	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4	.125	.120	-	-	-	-	.055	.044	.177	.163	.016	.010
6	.187	.181	.049	.030	.043	.035	.070	.058	.260	.240	.025	.015
8	.250	.244	.053	.033	.048	.039	.093	.080	.328	.302	.025	.015
10	.250	.244	.074	.052	.054	.045	.110	.096	.348	.322	.031	.019
12	.312	.305	.103	.077	.067	.056	.155	.139	.432	.398	.039	.022
1/4	.375	.367	.111	.083	.075	.064	.190	.172	.520	.480	.050	.030
5/16	.375	.367	.111	.083	.075	.064	.190	.172	.520	.480	.050	.030

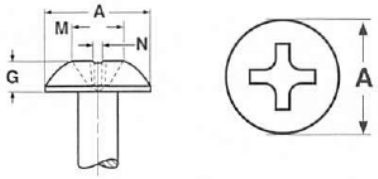


High-Low Style HEAD DIMENSIONS



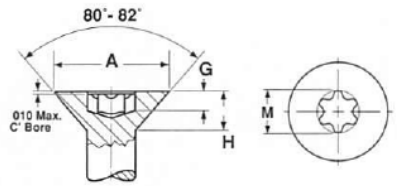
Head & Drive Dimensions for Six-Lobe Pan High-Low Screws

Nominal Size	A		H		R	G	Fallaway Gauge Penetration	Driver Size
	Head Diameter		Head Height		Recess Diameter	Recess Gauge Penetration		
	Max	Min	Max	Min	Ref	Min	Max	
2	.167	.155	.062	.053	.094	.030	.019	T8
4	.193	.180	.071	.062	.094	.033	.019	T8
6	.254	.240	.097	.087	.111	.035	.022	T10
8	.270	.256	.097	.087	.132	.045	.026	T15
10	.322	.306	.115	.105	.155	.055	.031	T20
1/4	.492	.473	.175	.162	.221	.085	.044	T30



Head & Drive Dimensions for Truss Phillips High-Low

Nominal Size	A		H		M	N	G		Driver Size
	Head Diameter		Head Height		Recess Diameter	Recess Width	Recess Penetration Gaging Depth		
	Max	Min	Max	Min	Ref	Ref	Max	Min	
4	.226	.211	.061	.051	.104	.018	.059	.042	1
6	.289	.272	.078	.066	.122	.019	.078	.060	1
8	.321	.303	.086	.074	.152	.027	.073	.048	2
10	.384	.364	.102	.088	.166	.029	.088	.063	2



Head & Drive Dimensions for Six-Lobe Flat High-Low Screws

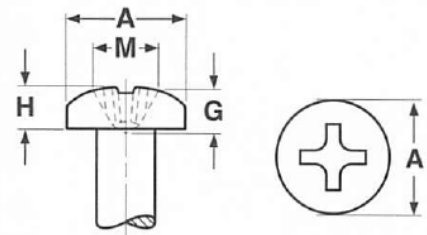
Nominal Size	A		H	R	G		Fallaway	Driver Size
	Head Diameter		Head Height	Recess Diameter	Recess Gauge Penetration			
	Max	Min	Ref	Ref	Max	Min	Max	
2	.162	.144	.051	.069	.056	.040	.014	T6
4	.212	.191	.067	.094	.082	.066	.019	T8
6	.262	.238	.083	.111	.095	.072	.022	T10
8	.312	.285	.100	.132	.110	.087	.026	T15
10	.362	.333	.116	.155	.125	.102	.031	T20
1/4	.477	.442	.153	.200	.154	.131	.044	T27

HEAD DIMENSIONS

High-Low Style

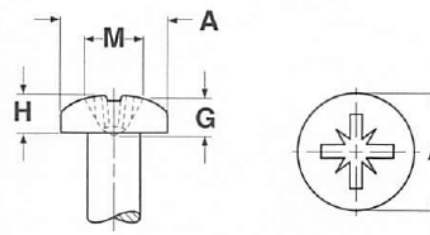
Head & Drive Dimensions for Phillips Pan High-Low

Nominal Size	A		H		M		G		Driver Size
	Head Diameter		Head Height		Recess Diameter		Recess Penetration Gaging Depth		
	Max	Min	Max	Min	Max	Min	Max	Min	
2	.167	.155	.062	.053	.104	.091	.052	.034	1
3	.167	.155	.062	.053	.104	.091	.052	.034	1
4	.193	.180	.071	.062	.112	.099	.061	.043	1
5	.219	.205	.080	.070	.122	.109	.071	.053	1
6	.254	.240	.097	.087	.158	.145	.072	.046	2
7 & 8	.270	.256	.097	.087	.166	.153	.080	.055	2
10	.322	.306	.115	.105	.182	.169	.097	.071	2
12	.373	.357	.133	.122	.199	.186	.113	.089	2
1/4	.492	.473	.175	.162	.281	.268	.144	.118	3

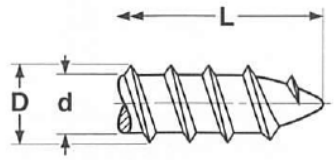


Head & Drive Dimensions for Pozi Pan High-Low

Nominal Size	A		H		M	G		Driver Size
	Head Diameter		Head Height		Recess Diameter	Recess Penetration Gaging Depth		
	Max	Min	Max	Min	Ref	Max	Min	
4	.193	.180	.071	.062	.105	.062	.046	1
6	.254	.240	.097	.087	.155	.076	.058	2
8	.270	.256	.097	.087	.155	.076	.058	2
10	.322	.306	.115	.105	.170	.092	.074	2



Type A THREAD FORMING



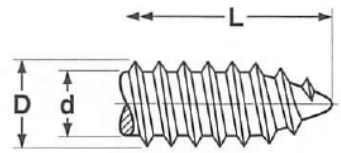
Threads For Self-Tapping Screws Type A

ASME B18.6.3-2013

Nominal Size or Basic Screw Diameter		Threads Per Inch	D		d		L		Minimum Torsional Strength, lb.-in. (STEEL SCREWS ONLY)
			Major Diameter		Minor Diameter		These Lengths or Shorter Have AB Threads		
			Max	Min	Max	Min	90° Heads	Csk Heads	
6	0.1380	18	.141	.136	.102	.096	1/4	5/16	24
7	0.1510	16	.158	.152	.114	.108	5/16	3/8	30
8	0.1640	15	.168	.162	.123	.116	3/8	7/16	39
10	0.1900	12	.194	.188	.133	.126	3/8	1/2	48
12	0.2160	11	.221	.215	.162	.155	7/16	9/16	83
14	0.2420	10	.254	.248	.185	.178	1/2	5/8	125
20	0.3200	9	.333	.327	.234	.226	11/16	13/16	250
24	0.3720	9	.390	.383	.291	.282	3/4	1	492
Tolerance on Length				Up to 1" Incl.: ±0.03			Over 1": ±0.05		

Description	A thread forming tapping screw with wider spaced threads than a Type-AB and a gimlet point.
Applications/ Advantages	For self starting in thin (.015-.050 thick) metal or resin-filled plywood. 18-8 Stainless steel tapping screws may be used in applications which require general atmospheric corrosion resistance. Fastening stainless steel parts to aluminum or steel can cause a type of corrosion known as a galvanic couple in some environments.
Material	**Steel**: AISI 1016 - 1024 or equivalent steel. **Stainless**: Austenitic 18-8 stainless steel
Heat Treatment (Steel only)	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.
Surface Hardness	Steel: Rockwell C45 minimum
Case Depth (Steel only)	No. 6 diameter: .002 - .007 No. 8 thru 12 diameter: .004 - .009 1/4" and larger: .005 - .011
Core Hardness (after tempering)	**Steel**: Rockwell C28 - 38
Plating	See Appendix-A for information on plating of steel screws.

THREAD FORMING — Type AB



THREADS FOR SELF-TAPPING SCREWS TYPE AB

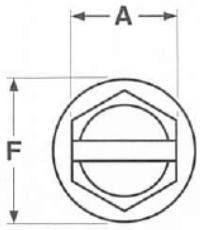
ASME B18.6.3-2013

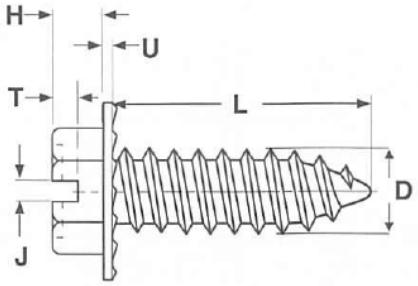
Nominal Size or Basic Screw Diameter		Threads Per Inch	D		d		L		Minimum Torsional Strength, lb.- in. (STEEL SCREWS ONLY)
			Major Diameter		Minor Diameter		Minimum Practical Screw Length		
			Max	Min	Max	Min	90° Heads	Csk Heads	
2	.0860	32	.088	.082	.064	.060	3/16	7/32	4
3	.0990	28	.101	.095	.075	.071	3/16	1/4	9
4	.1120	24	.114	.108	.086	.082	7/32	9/32	13
5	.1250	20	.130	.123	.094	.090	1/4	5/16	18
6	.1380	20	.139	.132	.104	.099	9/32	11/32	24
7	.1510	19	.154	.147	.115	.109	5/16	3/8	30
8	.1640	18	.166	.159	.122	.116	5/16	3/8	39
10	.1900	16	.189	.182	.141	.135	3/8	7/16	56
12	.2160	14	.215	.208	.164	.157	7/16	21/32	88
1/4	.2500	14	.246	.237	.192	.185	1/2	19/32	142
5/16	.3125	12	.315	.306	.244	.236	5/8	3/4	290
3/8	.3750	12	.380	.371	.309	.299	3/4	29/32	590
Tolerance on Length				Up to 1" Incl.: ±0.03			Over 1": ±0.05		

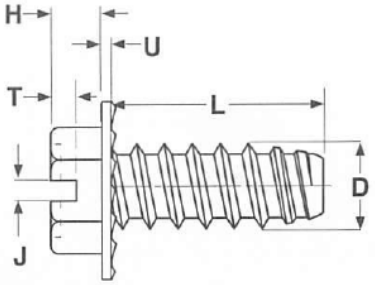
Description	A thread forming tapping screw with spaced threads and a gimlet point.		
Applications/ Advantages	For self starting in thin (.015-.050 thick) metal or resin-filled plywood. Recommended over a Type-A, particularly in brittle materials.	For self starting in thin stainless sheet when corrosion resistance is required.	For self-starting in thin stainless sheet when a harder material is preferred.
Material	**Steel**: AISI 1016 - 1024 or equivalent steel	**18-8 Stainless**: Austenitic 18-8 stainless steel	**410 Stainless**: Martensitic 410 stainless steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.	-	**410 Stainless:** Screws shall be annealed by heating to 1850-1950°F, held at least for 1/2 hour and rapid air- or oil-quenched then reheating to 525°F minimum for at least 1 hour and air cooled to provide the required tensile, yield and hardness properties.
Surface Hardness	Steel: Rockwell C45 minimum	-	-
Case Depth (Steel only)	No. 4 thru 6 diameter: .002 - .007 No. 8 thru 12 diameter: .004 - .009 1/4" and larger: .005 - .011	-	-
Core Hardness (after tempering)	**Steel**: Rockwell C28 - 38		**410 Stainless**: Rockwell C38 - 42
Plating	See Appendix-A for plating information.		

Serrated Hex Washer Type AB & B

THREAD FORMING





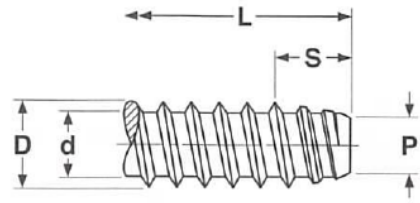


Serrated Hex Washer Self Tapping Screws - Type-AB / B

Nominal Size & Number of Threads per Inch	A		H		F		U		J		T		D		Drive Test Results				
	Width Across Flats		Head Height		Washer Diameter		Washer Thickness		Slot Width		Slot Depth		Major Diameter		Test Plate		Drive Torque	Strip Torque	Strip to Drive Ratio
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Hole Diam.	Thickness			
4-24	.188	.181	.060	.049	.243	.225	.019	.011	.039	.031	.036	.025	.114	.108	-	-	-	-	-
6-20	.250	.244	.093	.080	.328	.302	.025	.015	.048	.039	.046	.033	.139	.132	.081	.025	5	20	4.0:1
8-18	.250	.244	.110	.096	.348	.322	.031	.019	.054	.045	.066	.052	.166	.159	.090	.025	6.6	31	4.7:1
10-16	.312	.305	.120	.105	.414	.384	.031	.019	.060	.050	.072	.057	.189	.182	.110	.025	10	56	5.6:1
12-14	.312	.305	.155	.139	.432	.398	.039	.022	.067	.056	.093	.077	.215	.208	.187	.125	47	139	3.0:1
1/4-14	.375	.367	.190	.172	.520	.480	.050	.030	.075	.064	.101	.083	.246	.237	.2615	.125	37	148	4.0:1
5/16-12	.500	.489	.230	.208	.676	.624	.055	.035	.084	.072	.134	.100	.315	.306					
3/8-12	.562	.551	.295	.270	.780	.720	.063	.037	.094	.081	.168	.131	.380	.371					
Tolerance on Length							Up to 1" Incl.: ±0.03								Over 1": ±0.05				

Description	A slotted hex washer head thread forming tapping screw with serrations on the underside of the washer face and spaced threads. The Type-AB screw has a gimlet point while the Type-B has a blunt point.
Applications/ Advantages	The serrations on the underside of the washer face allow this part to perform two main functions: (1) act as a locking fastener, and (2) break drive torque during installation which lessens the chance of reaming out the mating hole in the bearing surface. The torque-breaking feature slows the rotation of the screw when it meets the mating surface. The serrations allow for more pitch body diameter under the head giving the mating sheet metal more travel so as not to snap over the last bit of major diameter thread crest. Appliance manufacturers use these screws to reduce the thickness of the sheet metal they require, which reduces the cost of production.
Material	AISI 1016 - 1024 or equivalent steel.
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.
Surface Hardness	Rockwell C45 minimum
Case Depth	No. 6 diameter: .002 - .007 No. 8 thru 12 diameter: .004 - .009 1/4" diameter: .005 - .011
Core Hardness (after tempering)	Rockwell C28 - 38
Plating	See Appendix-A for plating information.

THREAD FORMING — Type B



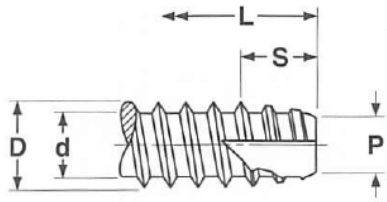
THREADS FOR SELF-TAPPING SCREWS TYPE-B

ASME B18.6.3--2013

Nominal Size or Basic Screw Diameter		Threads Per Inch	D		d		P		S		L		Minimum Torsional Strength, lb.- in. (STEEL SCREWS ONLY)
			Major Diameter		Minor Diameter		Point Diameter		Point Taper Length		Minimum Practical Screw Length		
			Max	Min	Max	Min	Max	Min	Max	Min	90° Heads	Csk Heads	
2	.0860	32	.088	.082	.064	.060	.058	.054	.062	.047	5/32	3/16	4
3	.0990	28	.101	.095	.075	.071	.068	.064	.071	.054	3/16	7/32	9
4	.1120	24	.114	.108	.086	.082	.079	.074	.083	.063	3/16	1/4	13
5	.1250	20	.130	.123	.094	.090	.087	.082	.100	.075	7/32	9/32	18
6	.1380	20	.139	.132	.104	.099	.095	.089	.100	.075	1/4	9/32	24
7	.1510	19	.154	.147	.115	.109	.105	.099	.105	.079	1/4	5/16	30
8	.1640	18	.166	.159	.122	.116	.112	.106	.111	.083	9/32	11/32	39
10	.1900	16	.189	.182	.141	.135	.130	.123	.125	.094	5/16	3/8	56
12	.2160	14	.215	.208	.164	.157	.152	.145	.143	.107	11/32	7/16	88
1/4	.2500	14	.246	.237	.192	.185	.179	.171	.143	.107	3/8	1/2	142
5/16	.3125	12	.315	.306	.244	.236	.230	.222	.167	.125	15/32	19/32	290
3/8	.3750	12	.380	.371	.309	.299	.293	.285	.167	.125	17/32	11/16	590
Tolerance on Length			Up to 3/4 in., Incl.: -0.03				Over 3/4 to 1-1/2 in., Incl.: -0.05				Over 1-1/2 in.: -0.06		

Description	A thread forming tapping screw with spaced threads and a blunt point with incomplete entering threads.
Applications/ Advantages	For molded or through holes in thin metal, non-ferrous castings, plastics or resin-filled plywood.
Material	**Steel**: AISI 1016 - 1024 or equivalent steel. **Stainless**: 18-8 Stainless steel
Heat Treatment (steel only)	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.
Surface Hardness	**Steel**: Rockwell C45 minimum
Case Depth (steel only)	No. 4 thru 6 diameter: .002 - .007 No. 8 thru 12 diameter: .004 - .009 1/4" and larger: .005 - .011
Core Hardness (after tempering)	**Steel**: Rockwell C28 - 38
Plating	See Appendix-A for plating information.

Type 25 THREAD CUTTING



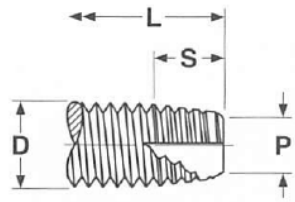
Threads For Thread Cutting Screws Type 25

ASME B18.6.3-2013

Nominal Size or Basic Screw Diameter		Threads Per Inch	D		d		P	S		L		Minimum Torsional Strength, lb.- in. (STEEL SCREWS ONLY)
			Major Diameter		Minor Diameter		Point Diameter	Point Taper Length		Minimum Practical Screw Length		
			Max	Min	Max	Min	Ref	Max	Min	90° Heads	Csk Heads	
2	.0860	32	.088	.082	.064	.060	.058	.062	.047	5/32	3/16	4
4	.1120	24	.114	.108	.086	.082	.079	.083	.063	3/16	1/4	13
5	.1250	20	.130	.123	.094	.090	.087	.100	.075	7/32	9/32	18
6	.1380	20	.139	.132	.104	.099	.095	.100	.075	1/4	9/32	24
7	.1510	19	.154	.147	.115	.109	.105	.105	.079	1/4	5/16	30
8	.1640	18	.166	.159	.122	.116	.112	.111	.083	9/32	11/32	39
10	.1900	16	.189	.182	.141	.135	.130	.125	.094	5/16	3/8	56
12	.2160	14	.215	.208	.164	.157	.152	.143	.107	11/32	7/16	88
1/4	.2500	14	.246	.237	.192	.185	.179	.143	.107	3/8	1/2	142
5/16	.3125	12	.315	.306	.244	.236	.230	.167	.125	15/32	19/32	290
3/8	.3750	12	.380	.371	.309	.299	.293	.167	.125	17/32	11/16	590
Tolerance on Length			Up to 3/4", Incl.: -0.03					Over 3/4" to 1-1/2", Incl.: -0.05				

Description	A thread cutting screw with spaced threads, a blunt point, tapered entering threads, a single wide cutting edge, and a chip cavity.	
	Steel	Stainless
Applications/ Advantages	For molded or through holes in plastics and other soft materials. Provides excellent chip clearing capability.	Stainless screws offer greater corrosion resistance than steel screws but have a more limited range of applications due to being a softer metal. When using any thread-cutting screw, the material in which the threads are cut should have a a lower hardness by 10-20 Rockwell hardness points.
Material	AISI 1016 - 1024 or equivalent steel.	18-8 stainless steel.
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.	18-8 thread-cutting screws are not heat-treated.
Surface Hardness	Rockwell C45 minimum	-
Case Depth	No. 4 thru 6 diameter: .002 - .007 No. 8 thru 10 diameter: .004 - .009 1/4" diameter and larger: .005 - .011	-
Core Hardness (after tempering)	Rockwell C28 - 38	Rockwell B90 - C20
Plating	See Appendix-A for plating information.	

THREAD CUTTING — Type 23



Threads and Points for Type 23 Thread Cutting Screws

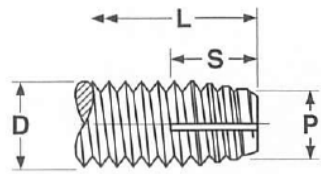
ASME B18.6.3-2013

Nominal Size or Basic Screw Diameter		Threads Per Inch	D		P	S				L				Minimum Torsional Strength, lb.-in. (STEEL parts only)
			Major Diameter		Point Diameter	Point Taper Length				Determinant Length for Point Taper		Minimum Practical Nominal Screw Lengths		
						Short Screws		Long Screws						
			Max	Min	Ref	Max	Min	Max	Min	90° Heads	Csk Heads	90° Heads	Csk Heads	
2	.0860	56	.0860	.0813	.068	.062	.045	.080	.062	5/32	3/16	5/32	3/16	5
3	.0990	48	.0990	.0938	.078	.073	.052	.094	.073	3/16	7/32	5/32	7/32	9
4	.1120	40	.1120	.1061	.087	.088	.062	.112	.088	7/32	1/4	3/16	1/4	13
5	.1250	40	.1250	.1191	.100	.088	.062	.112	.088	7/32	9/32	3/16	1/4	18
6	.1380	32	.1380	.1312	.107	.109	.078	.141	.109	1/4	5/16	1/4	5/16	23
8	.1640	32	.1640	.1571	.132	.109	.078	.141	.109	1/4	11/32	1/4	5/16	42
10	.1900	24	.1900	.1818	.148	.146	.104	.188	.146	11/32	7/16	5/16	13/32	56
10	.1900	32	.1900	.1831	.158	.109	.078	.141	.109	1/4	11/32	1/4	5/16	74
12	.2160	24	.2160	.2078	.174	.146	.104	.188	.146	11/32	7/16	5/16	13/32	93
1/4	.2500	20	.2500	.2408	.200	.175	.125	.225	.175	13/32	17/32	3/8	1/2	140
5/16	.3125	18	.3125	.3026	.257	.194	.139	.250	.194	15/32	19/32	7/16	9/16	306
3/8	.3750	16	.3750	.3643	.312	.219	.156	.281	.219	1/2	11/16	15/32	5/8	560

Tolerance on Length	Up to 3/4 in., Incl.: -0.03	Over 3/4 to 1-1/2 in., Incl.: -0.05	Over 1-1/2 in.: -0.06

Description	A thread cutting screw with machine screw thread pitch, a blunt point, tapered entering threads, a single wide cutting edge, and a chip cavity.
Applications/ Advantages	Steel type-23's are well-suited for cast iron and zinc, aluminum die castings, and plastics. The type-23 design provides excellent chip clearing with minimum tightening torques. 18-8 stainless screws offer additional resistance to corrosion. When using any thread-cutting screw, the material in which the threads are cut should have a lower hardness by at least 10 to 20 Rockwell hardness points.
Material	**Steel**: AISI 1016 - 1024 or equivalent steel; Stainless:18-8 stainless steel.
Heat Treatment	**Steel**: Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.
Surface Hardness	**Steel**: Rockwell C45˚ minimum
Case Depth (steel)	No. 2 thru 6 diameter: .002 - .007 No. 8 thru 12 diameter: .004 - .009 1/4" diameter and larger: .005 - .011
Core Hardness	**Steel (after tempering)**: Rockwell C28 - 38 **Stainless**: Rockwell B90 - C20
Plating	See Appendix-A for plating of steel thread-cutting screws.

Type 1 THREAD CUTTING



THREADS AND POINTS FOR TYPE 1 THREAD CUTTING SCREWS

ASME B18.6.3-2013

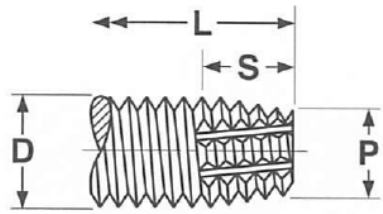
Nominal Size or Basic Screw Diameter		Threads Per Inch	D		P	S				L				Minimum Torsional Strength, lb.-in. (STEEL parts only)
			Major Diameter		Point Diameter	Point Taper Length				Determinant Length for Point Taper		Minimum Practical Nominal Screw Lengths		
						Short Screws		Long Screws						
			Max	Min	Ref	Max	Min	Max	Min	90° Heads	Csk Heads	90° Heads	Csk Heads	
2	.0860	56	.0860	.0813	.068	.062	.045	.080	.062	5/32	3/16	5/32	3/16	5
4	.1120	40	.1120	.1061	.087	.088	.062	.112	.088	7/32	1/4	3/16	1/4	13
6	.1380	32	.1380	.1312	.107	.109	.078	.141	.109	1/4	5/16	1/4	5/16	23
8	.1640	32	.1640	.1571	.132	.109	.078	.141	.109	1/4	11/32	1/4	5/16	42
10	.1900	24	.1900	.1818	.148	.146	.104	.188	.146	11/32	7/16	5/16	13/32	56
10	.1900	32	.1900	.1831	.158	.109	.078	.141	.109	1/4	11/32	1/4	5/16	74
12	.2160	24	.2160	.2078	.174	.146	.104	.188	.146	11/32	7/16	5/16	13/32	93
1/4	.2500	20	.2500	.2408	.200	.175	.125	.225	.175	13/32	17/32	3/8	1/2	140
5/16	.3125	18	.3125	.3026	.257	.194	.139	.250	.194	15/32	19/32	7/16	9/16	306
3/8	.3750	16	.3750	.3643	.312	.219	.156	.281	.219	1/2	11/16	15/32	5/8	560
1/2	.5000	13	.5000	.4876	.423	.269	.192	.346	.269	5/8	25/32	19/32	3/4	1075

Tolerance on Length	Up to 3/4 in., Incl.: -0.03	Over 3/4 to 1-1/2 in., Incl.: -0.05	Over 1-1/2 in.: -0.06

Description	A thread cutting screw with machine screw thread pitch, blunt point, tapered entering threads and a single cutting edge.	
	Steel	*Stainless*
Applications/ Advantages	May be used in steel sheets, structural shapes, special alloy steels, cast iron, brass or plastics.	Stainless screws offer greater corrosion resistance than steel screws but have a more limited range of applications due to being a softer metal. When using any thread-cutting screw, the material in which the threads are cut should have a lower hardness by 10-20 Rockwell hardness points.
Material	AISI 1016 - 1024 or equivalent steel.	18-8 stainless steel.
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.	18-8 thread-cutting screws are not heat-treated.
Surface Hardness	Rockwell C45 minimum	-
Case Depth	No. 4 thru 6 diameter: .002 - .007 No. 8 thru 12 diameter: .004 - .009 1/4" diameter and larger: .005 - .011	-
Core Hardness (after tempering)	Rockwell C28 - 38	Rockwell B90 - C20
Plating	See Appendix-A for plating information.	

THREAD CUTTING

Type F



THREADS AND POINTS FOR TYPE-F THREAD CUTTING SCREWS

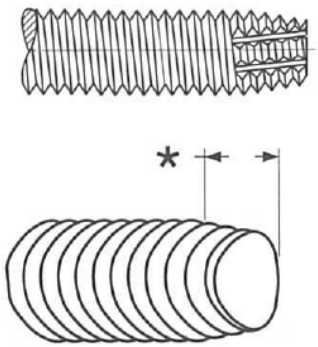
ASME B18.6.3-2013

Nominal Size or Basic Screw Diameter		Threads Per Inch	D		P	S				L				Minimum Torsional Strength, lb.-in. (STEEL SCREWS ONLY)
			Major Diameter		Point Diameter	Point Taper Length				Determinant Length for Point Taper		Minimum Practical Screw Lengths		
						Short Screws		Long Screws						
			Max	Min	Ref	Max	Min	Max	Min	90° Heads	Csk Heads	90° Heads	Csk Heads	
2	.0860	56	.0860	.0813	.068	.062	.045	.080	.062	5/32	3/16	5/32	3/16	5
4	.1120	40	.1120	.1061	.087	.088	.062	.112	.088	7/32	1/4	3/16	1/4	13
5	.1250	40	.1250	.1191	.100	.088	.062	.112	.088	7/32	9/32	3/16	1/4	18
6	.1380	32	.1380	.1312	.107	.109	.078	.141	.109	1/4	5/16	1/4	5/16	23
8	.1640	32	.1640	.1571	.132	.109	.078	.141	.109	1/4	11/32	1/4	5/16	42
10	.1900	24	.1900	.1818	.148	.146	.104	.188	.146	11/32	7/16	5/16	13/32	56
10	.1900	32	.1900	.1831	.158	.109	.078	.141	.109	1/4	11/32	1/4	5/16	74
12	.2160	24	.2160	.2078	.174	.146	.104	.188	.146	11/32	7/16	5/16	13/32	93
1/4	.2500	20	.2500	.2408	.200	.175	.125	.225	.175	13/32	17/32	3/8	1/2	140
5/16	.3125	18	.3125	.3026	.257	.194	.139	.250	.194	15/32	19/32	7/16	9/16	306
3/8	.3750	16	.3750	.3643	.312	.219	.156	.281	.219	.. 1/2	11/16	15/32	5/8	560
1/2	.5000	13	.5000	.4876	.423	.269	.192	.346	.269	5/8	25/32	19/32	3/4	1075

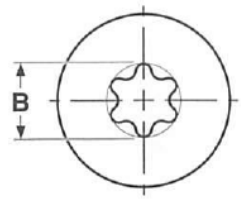
Tolerance on Length	Up to 3/4 in., incl.: -0.03	Over 3/4 to 1-1/2 in., incl.: -0.05	Over 1-1/2 in.: -0.06

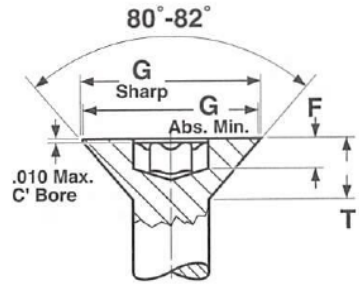
Description	A thread cutting screw with machine screw thread pitch, blunt point, tapered entering threads and multiple cutting edges.
Applications/ Advantages	Steel thread-cutters are used in heavy gauge sheet metal, aluminum, zinc and lead die castings, cast iron, brass and plastic. Stainless screws offer additional resistance to corrosion, 18-8 moreso than 410. When using any thread-cutting screw, the material in which the threads are cut should have a lower hardness by at least 10 to 20 Rockwell hardness points.
Material	**Steel:** AISI 1016 - 1024 or equivalent steel. Stainless: 410 martensitic stainless steel or 18-8 stainless steel.
Heat Treatment	**410 Stainless:** Screws shall be annealed by heating to 1850-1950°F, held at least for 1/2 hour and rapid air- or oil-quenched then reheating to 525°F minimum for at least 1 hour and air cooled to provide the required tensile, yield and hardness properties.
Surface Hardness	**Steel**: Rockwell C45 minimum
Case Depth (steel)	No. 4 thru 6 diameter: .002 - .007 No. 8 thru 12 diameter: .004 - .009 1/4" diameter & larger: .005 - .011
Core Hardness	**Steel (after tempering)**: Rockwell C28 - 38 **410 Stainless**: Rockwell C38 - 42; 18-8 Stainless: Rockwell B90 - C20
Plating	See Appendix-A for information on plating of steel thread cutting screws.

Type F FLOORBOARD THREAD CUTTING



*2-3 Pitch Lead Length





Six-Lobe Recess Flat Heads (Floorboard)

ASME B18.6.3-2013•

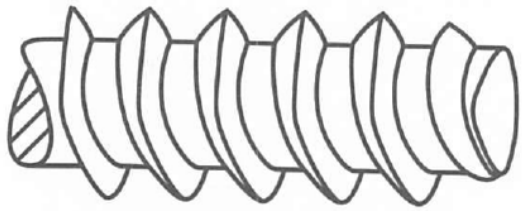
Nominal Size or Basic Screw Diameter		G Head Diameter		T Head Height	B Recess Diameter	F Gauge Penetration		Drive Size
		Max	Min	Ref	Ref	Max	Min	
•6 (U-Cut)	.138	.279	.244	.059	.111	.028	.024	T10
8	.164	.312	.285	.100	.132	.051	.040	T15
10	.190	.362	.333	.116	.155	.065	.050	T20
12	.216	.412	.380	.132	.178	.070	.055	T25
1/4	.250	.477	.442	.153	.200	.090	.075	T30
5/16	.312	.597	.556	.191	.266	.105	.087	T40
3/8	.375	.717	.670	.230	.266	.135	.115	T40
1/2**	.500	.815	.765	.223	.352	.135	.120	T50

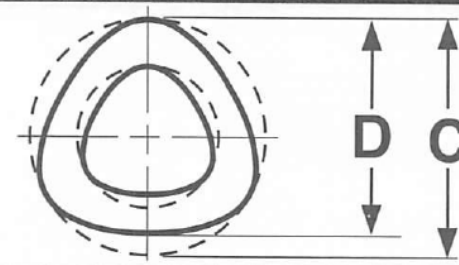
•#6 Undercut dimensions are not addressed within the ASME B18.6.3 standard.
** 1/2" diameter floorboard screws have a trilobular point, not a Type-F.

Description	A countersunk,six-lobe drive thread cutting screw with machine screw thread pitch, blunt point, tapered entering threads, and multiple cutting edges. Larger diameter sizes may also be supplied as a thread rolling screw rather than thread cutting. Floorboard screws are, by definition, available in much longer sizes than standard type-F screws.
Applications/ Advantages	Floorboard screws are specifically designed for installing wood floors into truck trailers.
Material	AISI 1016 - 1024 or equivalent steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.
Surface Hardness	Rockwell C45 minimum
Case Depth	*No. 8 thru 12 diameter*: .004 - .009 *1/4 diameter & larger:* .005 - .011
Core Hardness (after tempering)	Rockwell C28 - 38
Thread Dimensions	*#8 thru 3/8 diameters*: Same as those for Type-F thread cutting screws. 1/2" diameter: Same as those for a thread rolling screw.
Plating	See Appendix-A for information on the plating of floorboard screws.

THREAD ROLLING

Plastite® 48-2





PLASTITE® 48-2 THREAD ROLLING SCREWS

REMINC·

Nominal Screw Size and Threads Per Inch	C		D		Minimum Out-Of-Round	Recommended Pilot Hole Sizes	
	Diameter of Circumscribing Circle		Measurements Across Center				
	Max	Min	Max	Min		Soft Ductile Materials	Brittle Materials
• 0 - 40	.0665	.0635	.0635	.0605	.002	.0498	.0490
2 - 28	.092	.086	.089	.083	.002	.076	.080
3 - 24	.110	.104	.106	.100	.002	.088	.094
4 - 20	.127	.121	.123	.117	.002	.100	.106
• 5 - 20	.136	.132	.133	.129	.002	-	-
6 - 19	.147	.141	.143	.137	.003	.122	.128
7 - 18	.166	.160	.160	.154	.004	.134	.142
8 - 16	.185	.179	.179	.173	.004	.149	.158
9 - 15	.199	.193	.193	.187	.004	.162	.172
10 - 14	.212	.206	.208	.202	.004	.175	.185
12 - 11	.232	.226	.226	.220	.005	.195	.205
1/4 - 10	.276	.270	.268	.262	.006	.224	.240
5/16 - 9	.345	.335	.335	.325	.006	.286	.303

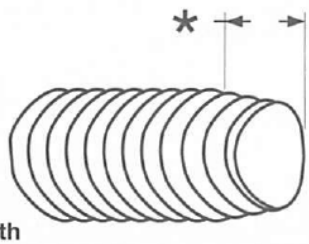
Tolerance on Length	Thru 3/4": ±.030"	Over 3/4": ±.050"	Over 1/4" Diameter, All Lengths: ±.050"

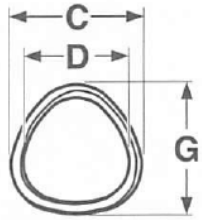
• Specifications for the 0-40 & 5-20 diameters are independent from the REMINC standard and are listed here for reference purposes only.

Description	Trilobular thread-rolling screw with extra wide spacing between 48° profile threads; twin lead threads with a 1-2 thread point taper.	
Applications/ Advantages	Thermoplastics, engineering resins and certain thermosets. Sharper thread profile increases holding strength while reducing material displacement. Drive and strip torques are higher, reducing the need for inserts or reinforcing clips.	
Material	*Steel*	*Stainless*
	AISI 1022 steel	*18-8:* 18-8 stainless steel *410:* 410 austenitic stainless steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.	*410:* Screws shall be annealed by heating to 1850°-1950°F, held at least 1/2 hr & rapid air- or oil-quenched; then reheated to 525°F min. for at least 1 hr & air cooled to provide the required mechanical properties.
Case Hardness	Rockwell C45 minimum	-
Case Depth	*No. 2 thru 6 diameters:* .002 - .007 *No. 8 thru 10 diameters:* .004 - .009 *1/4 diameter:* .005 - .011	-
Core Hardness (after tempering)	Rockwell C28-38	18-8: Rockwell B90 - C20 410: Rockwell C34 - 42
Plating	Various finishes with wax coating (see Appendix-A)	Stainless thread rolling screws are supplied passivated & waxed.

*Plastite® is a registered trademark of REMINC. Kanebridge's screws are not authorized or made by licensed REMINC manufacturers.

Steel Taptite® II THREAD ROLLING





*2-3 Pitch Lead Length

TAPTITE® II THREAD ROLLING SCREWS

REMINC

Nominal Screw Width	C		D		G
	Screw Body Dimensions				Point
	Diameter of Circumscribing Circle		Measurement Across Center		Diameter of Circumscribing Circle
	Max	Min	Max	Min	Max
2-56	.0875	.0835	.0840	.0800	.070
3-48	.1010	.0970	.0970	.0930	.081
4-40	.1145	.1105	.1095	.1055	.090
5-40	.1275	.1235	.1225	.1185	.103
6-32	.1410	.1350	.1350	.1290	.111
8-32	.1670	.1610	.1610	.1550	.137
10-24	.1940	.1880	.1860	.1800	.153
10-32	.1930	.1870	.1870	.1810	.163
12-24	.2200	.2140	.2120	.2060	.179
1/4-20	.2550	.2490	.2450	.2390	.206
5/16-18	.3180	.3120	.307	.301	.264
3/8-16	.3810	.3750	.3685	.3625	.320
1/2-13	.5075	.5015	.4920	.4860	.432

Tolerance on Length	Nominal Screw Size	Nominal Screw Length		
		To 3/4" Incl.	Over 3/4" to 1.5" Incl.	Over 1.5"
	All Diameters	-0.03	-0.05	-0.06

Description	Trilobular thread rolling screw. As each lobe of the screw moves through the pilot hole in the nut material, it forms and work-hardens the nut thread metal, producing an uninterrupted grain flow.	
Applications/ Advantages	For drilled, punched or corred holes in all ductile metals and punch extruded metals. Eliminates chips, requires low drive torque and provides excellent resistance to vibrational loosening.	
Material	***Steel***	***Stainless***
	Steel thread rolling screws shall be made from cold-heading steel conforming to the following chemical composition: ***Carbon***: 0.13-0.27%; ***Manganese***: 0.64-1.71%	***18-8:*** 18-8 stainless steel ***410:*** 410 austenitic stainless steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.	***410:*** Screws shall be annealed by heating to 1850° - 1950°F, held at least for 1/2 hr & rapid air- or oil-quenched; then reheated to 525°F min. for at least 1 hr & air cooled to provide the required mechanical properties.
Case Hardness	Rockwell C45 minimum	-
Case Depth	***2-56 through 6-32 diameters:*** .002 - .007 ***8-32 through 12-24 diameters:*** .004 - .009 ***1/4-20 diameter & larger:*** .005 - .011	-
Core Hardness (after tempering)	Rockwell C28-38	***18-8:*** Rockwell B90 - C20 ***410:*** Rockwell C34 - 42
Plating	See Appendix-A for information on the plating of Taptite II screws.	Stainless thread rolling screws are supplied passivated and waxed.

*Taptite® is a registered trademark of REMINC. Kanebridge's screws are not authorized or made by licensed REMINC manufacturers.

HOLE SIZE DATA

Steel Taptite® II

TAPTITE® II RECOMMENDED PILOT HOLE SIZES FOR VARIOUS MATERIAL THICKNESSES — REMINC

Application Duty Class	Light 0.3 Diameter of Material			Medium-Light 0.5 Diameter of Material			Medium-Heavy 0.75 Diameter of Material			Full Strength 1.0 Diameter of Material			Extended 1.25 Diameter of Material		
% of Thread	90%			85%			80%			75%			70%		
Nominal Size	Material Thick-ness	Pilot Hole	Drill Size	Material Thick-ness	Pilot Hole	Drill Size	Material Thick-ness	Pilot Hole	Drill Size	Material Thick-ness	Pilot Hole	Drill Size	Material Thick-ness	Pilot Hole	Drill Size
2-56	.017-.034	.0756	.0748	.034-.052	.0761	.076	.052-.073	.0767	.0763	.073-.095	.0773	.0781	.095-.169	.0779	.0781
3-48	.020-.040	.0868	.0866	.040-.059	.0875	.0866	.059-.084	.0882	.089	.084-.110	.0888	.089	.110-.141	.0895	.089
4-40	.022-.045	.0974	.098	.045-.067	.0982	.098	.067-.095	.099	.0995	.095-.126	.0998	.0995	.126-.157	.1006	.0995
5-40	.025-.051	.1104	.1102	.051-.075	.1112	.111	.075-.106	.112	.113	.106-.141	.1128	.113	.141-.175	.1136	.113
6-32	.028-.066	.1197	.120	.066-.083	.1207	.120	.083-.117	.1218	.122	.117-.152	.1228	.122	.152-.193	.1238	.125
8-32	.033-.066	.1457	.1457	.066-.098	.1467	.147	.098-.141	.1478	.1476	.141-.180	.1488	.1496	.180-.230	.1498	.1496
10-24	.038-.079	.1656	.166	.079-.114	.167	.1673	.114-.162	.1683	.1695	.162-.209	.1697	.1695	.209-.266	.171	.1719
10-32	.038-.079	.1717	.1719	.079-.114	.1727	.173	.114-.162	.1738	.173	.162-.209	.1748	.1732	.209-.266	.1758	.177
12-24	.043-.086	.1916	.191	.086-.130	.193	.1929	.130-.184	.1943	.196	.184-.238	.1957	.196	.238-.302	.197	.1969
1/4-20	.050-.100	.2208	.221	.100-.150	.2224	.2244	.150-.213	.224	.2244	.213-.275	.2256	.2264	.275-.350	.2273	.228
5/16-18	.062-.126	.2800	.2795	.126-.188	.2818	.2812	.188-.266	.2836	.2835	.266-.345	.2854	.2854	.345-.438	.2872	.2874
3/8-16	.075-.150	.3384	.3386	.150-.225	.3405	.3386	.225-.319	.3425	.3425	.319-.413	.3445	.3455	.413-.525	.3466	.3465
1/2-13	.100-.200	.455	.4531	.200-.300	.4575	.4531	.300-.425	.460	.4531	.425 - .550	.4625	.4688	.550-700	.465	.4688

TAPTITE® II SUGGESTED HOLE SIZES AT VARIOUS PERCENTAGES OF THREAD ENGAGEMENT — REMINC

Nominal Screw Size	Percent Thread													
	100	95	90(1)	85(1)	80	75	70	65	60	55	50	45	40	35
	Pilot Hole Sizes													
2-56	.0744	.0750	.0756	.0761	.0767	.0773	.0779	.0785	.0790	.0796	.0802	.0808	.0814	.0819
3-48	.0855	.0861	.0868	.0875	.0882	.0888	.0895	.0902	.0909	.0916	.0922	.0929	.0936	.0943
4-40	.0958	.0966	.0974	.0982	.0990	.0998	.1006	.1014	.1023	.1031	.1039	.1047	.1055	.1063
5-40	.1088	.1096	.1104	.1112	.1120	.1128	.1136	.1144	.1153	.1161	.1169	.1177	.1185	.1193
6-32	.1177	.1187	.1197	.1207	.1218	.1228	.1238	.1248	.1258	.1268	.1278	.1289	.1299	.1309
8-32	.1437	.1447	.1457	.1467	.1478	.1488	.1498	.1508	.1518	.1528	.1538	.1549	.1559	.1569
10-24	.1629	.1643	.1656	.1670	.1683	.1697	.1710	.1724	.1738	.1751	.1765	.1778	.1792	.1805
10-32	.1697	.1707	.1717	.1727	.1738	.1748	.1758	.1768	.1778	.1788	.1798	.1809	.1819	.1829
12-24	.1889	.1903	.1916	.1930	.1943	.1957	.1970	.1984	.1998	.2011	.2025	.2038	.2052	.2065
1/4-20	.2175	.2191	.2208	.2224	.2240	.2256	.2273	.2289	.2305	.2321	.2338	.2354	.2370	.2386
5/16-18	.2764	.2782	.2800	.2818	.2836	.2854	.2872	.2890	.2908	.2926	.2944	.2963	.2981	.2999
3/8-16	.3344	.3364	.3384	.3405	.3425	.3445	.3466	.3486	.3506	.3527	.3547	.3567	.3588	.3608
1/2-13	.4500	.4525	.4550	.4575	.4600	.4625	.4650	.4675	.4700	.4725	.4750	.4775	.4800	.4825

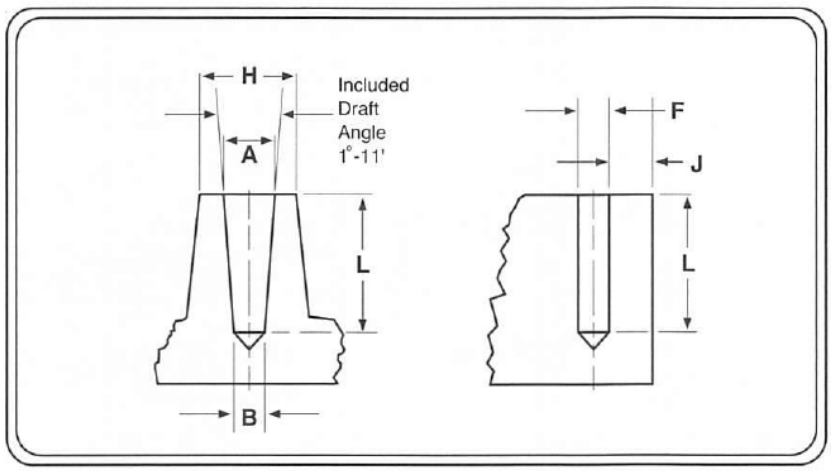
(1) Pilot holes listed under 90% & 85% (thread percent) also recommended for single punch extruded holes. See suggested extruded hole chart.

Notes:

- The above values are based on a linear relation between hole size and percentage thread engagement, the hole data becomes less accurate for engagement less than 70%. The chart indicates that a 10-32 screw in a .1738 hole size provides 80% thread engagement.
- These holes are based on teh U.S. basic thread depth of .6495 times the pitch and are calculated using nominal screw diameters.

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Steel Taptite® II HOLE SIZE DATA







TAPTITE® II SUGGESTED HOLE SIZES FOR ALUMINUM OR ZINC DIE CASTING

REMINC

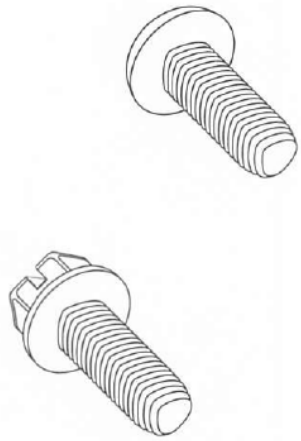
Screw Size	A		B		F	L	H	J
	Top		Bottom		Hole Diameter as Drilled	Length of Thread Engagement	Boss Diameter	Distance to Edge for No Measurable Distortion
	Hole Diameter as Cast Std. Taper							
	Max	Min	Max	Min			Min	Min
2-56	.081	.078	.077	.074	.077	.172	.197	.046
3-48	.093	.090	.088	.085	.088	.198	.208	.054
4-40	.105	.102	.099	.096	.099	.224	.220	.065
5-40	.118	.115	.112	.109	.112	.250	.232	.065
6-32	.128	.125	.122	.119	.122	.276	.242	.081
8-32	.155	.152	.148	.145	.148	.328	.272	.081
10-24	.177	.174	.168	.165	.168	.380	.315	.108
10-32	.182	.179	.174	.171	.174	.380	.315	.081
12-24	.203	.200	.194	.191	.194	.432	.359	.108
1/4-20	.235	.232	.224	.221	.224	.500	.415	.130
5/16-18	.297	.294	.284	.281	.284	.625	.519	.144
3/8-16	.359	.356	.343	.340	.343	.750	.623	.162
1/2-13	.481	.478	.460	.457	.460	1.000	.830	.200

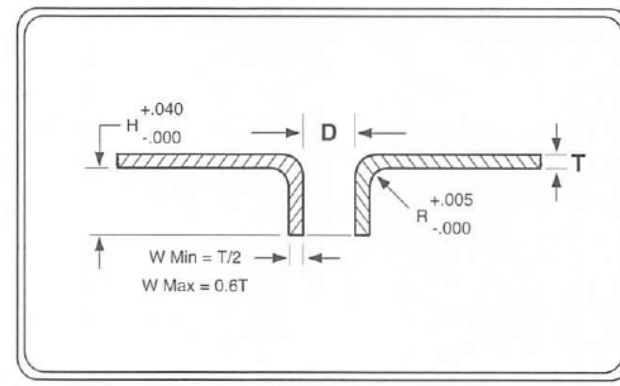
Note:
- The minimum length of thread engagement should be equal to twice the diameter of teh screw (to approach utilizing available screw strength). The diameter, to ensure optimum performance, should provide for 65% to 75% thread engagement.

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HOLE SIZE DATA

Steel Taptite® II





TAPTITE® II SUGGESTED EXTRUDED HOLES IN LIGHT-GAUGE STEEL													REMINC
Inch Thickness T	.02	.03	.04	.06	.09	.13	.16	.19	.22	.25	.31	.38	
Screw Size	Hole Sizes - D												
6-32	.118 .120	.118 .121	.119 .122	.120 .123	.122 .125	-	-	-	-	-	-	-	D HOLE DIAMETER
8-32	.144 .146	.144 .147	.145 .148	.146 .149	.147 .150	.148 .152	-	-	-	-	-	-	
10-24	.163 .165	.163 .166	.164 .167	.165 .168	.166 .170	.168 .173	-	-	-	-	-	-	
10-32	.170 .172	.170 .173	.171 .174	.172 .175	.173 .176	.174 .177	-	-	-	-	-	-	
12-24	.189 .191	.189 .192	.190 .193	.191 .194	.192 .196	.193 .197	.195 .200	.198 .203	-	-	-	-	
1/4-20	-	-	.218 .220	.218 .221	.219 .223	.221 .225	.224 .228	.227 .231	.228 .233	.230 .235	-	-	
5/16-18	-	-	-	.277 .279	.278 .280	.279 .281	.280 .283	.281 .285	.283 .288	.285 .290	-	-	
3/8-16	-	-	-	-	-	.335 .337	.336 .338	.337 .340	.337 .340	.342 .346	.344 .349	-	
1/2-13	-	-	-	-	-	-	-	.450 .453	.452 .455	.454 .457	.455 .460	.459 .464	

NOTES:

Taptite® || screws will develop almost twice the failure torque in extrded holes, providing maximum joint integrity.

The above chart indicates that an extruded hole diameter of .166" to .170" is suggested in .090" inch thick when using a 10-24 Taptie® || screw.

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Steel Taptite® II HOLE SIZE DATA

TAPTITE® II TYPICAL TORQUE PERFORMANCE IN COLD ROLLED STEEL

REMINC

Screw Size	Plate Thickness	Hole Size	Nearest Drill Size	Thread Forming Torque	Prevailing First Removal Torque	Recommended Assembly Torque	Failure Torque
2-56	.0469	.075	1.9mm	1-2	.5-1	4	6-7*
	.0625	.076	#48	1-2	.5-1	4	8-10*
	.0938	.079	#47	1-2	.5-1	5	11-14•
3-48	.0625	.087	2.2mm	3-4	1-2	6	14-15*
	.0938	.089	#43	3-5	1-2	7	15-16*
	.1250	.090	#43	4-6	1-2	7	15-18•
4-40	.0312	.098	#40	2-3	1-2	6	8-11*
	.0625	.102	2.6mm	3-4	1-2	9	15-18*
	.0938	.102	2.6mm	3-4	1-2	11	22-27•
5-40	.0625	.111	#34	4-5	2-3	12	22-29*
	.0938	.113	#33	4-7	3-4	18	34-41*
	.1250	.116	#32	6-8	4-5	20	38-46•
6-32	.0625	.120	#31	4-7	3-4	14	25-30*
	.0938	.120	#31	6-9	3-5	20	35-45*•
	.1250	.125	1/8	6-9	4-6	22	39-45•
8-32	.0938	.147	#26	10-13	5-7	30	65-75*
	.1250	.150	3.8mm	11-14	4-7	45	75-85*•
	.1875	.150	3.8mm	16-20	8-11	45	75-95•
10-24	.0938	.172	11/64	14-18	5-8	35	65-80*
	.1250	.172	11/64	14-18	5-8	45	80-90*
	.1875	.172	11/64	17-22	9-13	55	100-115•
10-32	.0938	.173	#17	11-14	9-13	35	80-95*
	.1250	.177	#16	12-16	9-13	50	100-120*
	.1875	.177	#16	19-25	12-16	70	115-140*
12-24	.1250	.196	#9	19-24	9-12	65	95-115*
	.1875	.199	#8	21-26	9-13	75	135-155*
	.2500	.203	13/64	21-26	10-14	85	150-170•
1/4-20	.1250	.224	5.7mm	30-36	18-25	85	170-195*
	.1875	.224	5.7mm	45-55	25-35	125	205-235•
	.2500	.228	#1	55-65	25-35	125	205-235•
5/16-18	.1875	.281	K	75-85	40-50	160	380-410*
	.2500	.285	7.25mm	75-85	40-50	225	425-465*•
	.3125	.285	7.25mm	80-90	55-65	250	450-500•
3/8-16	.2500	.348	S	90-100	45-55	350	825-875*
	.3125	.348	S	110-125	50-60	400	950-1000*
	.3750	.354	9mm	95-110	30-45	450	950-1000*
1/2-13	.250	.465	29/64	150-180	60-80	500	975-1075*
	.3750	.469	15/32	185-215	60-90	850	1600-1800*
	.5000	.469	15/32	235-275	75-105	1000	1900-2200•

*Indicates probability that nut threads will strip. •Indicates probability that screw will break.

NOTES: • Torque values are listed in pound-inches. Plate dimensions are listed in inches.

• Torque values were developed using hex washer head screws, zinc plated plus wax, driven at low speed under laboratory-controlled conditions. The values shown only represent these controlled conditions and should not be used in lieu of proper application testing. The date is presented to provide the user with an estimate of what could be achieved in an actual application having a thicker or thinner nut member, harder or softer material, different hole or fastener all contribute to variations in torque performance.

•Recommended tightening torque is intended to induce approximately 30,000 to 50,000 psi claming force.

•Prevailing first removal torque, the torque necessary to remove the screw after the head has been unseated, is an indication of Taptite® II screws' inherent resistance to loosening under vibration, even without the screw head being seated.

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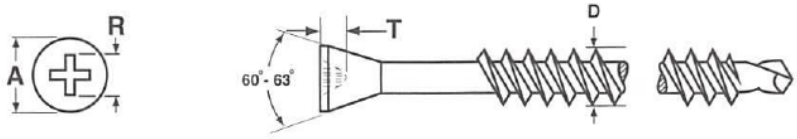
THREAD ROLLING

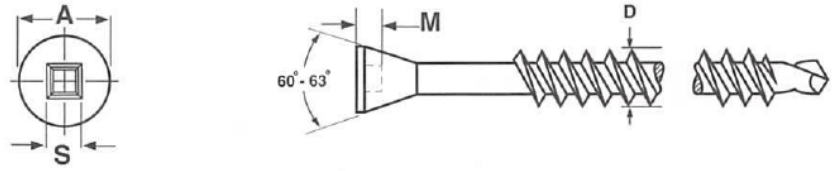
410 Stainless Taptite® II

Mechanical Properties of Hardened 410 Stainless Steel Taptite® II Thread Rolling Screws	
Nominal Diameter and Thread Pitch	Torsional Strength (Inch-Lbs.)
	Min.
4-40	11.5
5-40	17.8
6-32	21.3
8-32	42.2
10-24	57.3
10-32	73.7
12-24	95.6
1/4-20	142
1/4-28	184

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SELF-DRILLING





Trim Head Self Drilling Screws

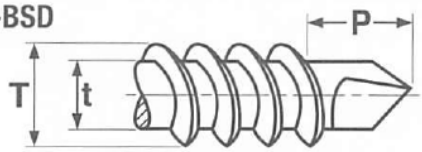
Nominal Size & Number of Threads per Inch	D		R		T		S		M		A		Phillips Driver Size	Square Recess Driver Size	Torque Test (KG/ CM)
	Major Thread Diameter		Phillips Drive				Square Drive				Head Diameter				
			Recess Diameter		Recess Penetration Gaging Depth		Recess Square		Recess Depth						
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min			Min
6-20	.142	.133	.136	.121	.082	.066	.091	.089	.063	.047	.236	.216	1	1R	28
8-18	.169	.161	.136	.121	.082	.066	.091	.089	.063	.047	.275	.255	1	1R	45
8-18	.169	.161	.182	.168	.104	.079	.113	.110	.075	.060	.275	.255	2	2R	45
10-16	.189	.182	.182	.168	.110	.086	.113	.110	.075	.060	.331	.291	2	2R	70
14-14	.246	.240	-	-	-	-	.135	.131	.095	.080	.362	.333	-	3R	-
Tolerance on Length									± 0.06						

Description	A steel fastener with a spaced thread, a point that drills its own hole, and a countersunk flat head of a width 1/3 less than a standard self drilling screw.
Applications/ Advantages	Ideal for attaching base board or trim through one or two layers of drywall to 12 - 20 gauge metal studs:
Material	AISI 1016 - 1022 or equivalent steel.
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 625°F minimum.
Surface Hardness	Vickers HV 550 - 800
Case Depth	.004 minimum
Core Hardness (after tempering)	Vickers HV 270 - 450
Plating	Trim head self-drilling screws are commonly available in zinc plated coatings. See Appendix-A for details.

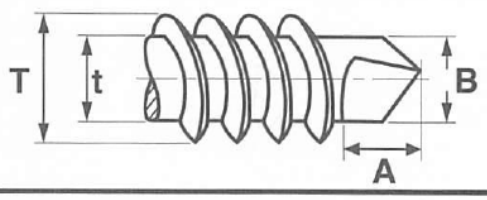
SELF-DRILLING

Type-BSD
Type-CSD

Type-BSD



5/16 & 3/8 Diameter
#3 Point



Self-Drilling Screws, Type BSD

*SAE J78-2013

Nominal Size or Basic Screw Diameter		Threads Per Inch	T		t		P		Minimum Practical Nominal Screw Lengths, Formed Points				Minimum Torsional Strength, lb.- in. (STEEL SCREWS ONLY)
			Major Diameter		Minor Diameter		Protrusion Allowance						
			Max	Min	Max	Min	#2 Pt.	#3 Pt.	90° Head, #2 Pt	Csk Head, #2 Pt	90° Head, #3 Pt	Csk Head, #3 Pt	
4	.1120	24	.114	.110	.086	.082	.163	-	5/16	3/8	-	-	14
6	.1380	20	.139	.135	.104	.099	.190	.220	5/16	3/8	3/8	7/16	24
7*	.1510	19	.153	.146	.113	.109	.137	.157	5/16	3/8	3/8	7/16	-
8	.1640	18	.166	.161	.122	.116	.211	.251	3/8	7/16	7/16	1/2	42
10	.1900	16	.189	.183	.141	.135	.235	.300	7/16	1/2	1/2	9/16	61
12	.2160	14	.215	.209	.164	.157	.283	.353	1/2	5/8	1/2	5/8	92
1/4	.2500	14	.246	.240	.192	.185	.318	.393	1/2	5/8	1/2	5/8	150

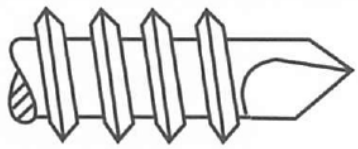
*SAE J78 does not include Specifications for #7 diameter drill screws.

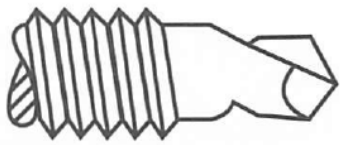
Coarse Thread Self Drilling Screws - 5/16 & 3/8 Diameters, #3 Point

Nominal Size or Basic Screw Diameter		Threads Per Inch	T		t		A		B	
			Major Diameter		Minor Diameter		Drill Point Length		Drill Point Diameter	
			Max	Min	Max	Min	Max	Min	Max	Min
5/16	.3125	12	.315	.307	.272	.263	.421	.361	.270	.265
3/8	.3750	12	.380	.370	.308	.298	.354	.314	.338	.330

	Steel	*Stainless*
Description	***Type BSD***: A tapping screw with spaced threads and a drill point which drills its own hole. ***Type CSD***: A wafer head thread forming screw with machine screw thread pitch and a drill point which drills its own hole. Both types allow the screw to form mating threads and produce a complete fastening system in a single operation.	
Applications/ Advantages	***Type BSD:*** May be used to attach plywood, soft woods or composition board to metal, or attach metal to metal. ***Type CSD:*** The finer thread pitch reduces friction and driving torques. Type-CSD screws are normally used with thicker materials. The wafer head design allows the screw to set flush in wood and softer materials and provides a clean, finished appearance. All self-drilling screws offer economical benefits: reduces labor and tooling costs; reduces or eliminates drill bits and taps.	***Type BSD:*** The 18-8 stainless drill screw offers superior corrosion resistance while the 410 stainless screw will drill through harder material than the 18-8. The hardness of the material to be drilled should be a minimum of 10-20 Rockwell hardness points less than the screw's hardness. Minimum torques are the same for stainless and steel self-drill screws. Drill time is 2.5 seconds for a 1mm thick plate.
Material	AISI 1016 - 1024 or equivalent steel	410 or 18-8 stainless steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 625°F minimum.	410 stainless screws shall be hardened and tempered by heating to 1800°-1900°F sufficient for austenitization, held for at least 1/2 hour and rapid air or oil-quenched then reheating to 500°-600°F for at least 1 hour and air cooled to provide the specified hardness.
Case Hardness	Rockwell C52 -58	410 SS: Rockwell C55 minimum
Case Depth	***No. 4 and 6 diameter:*** .002 - .007 ***No. 8 thru 12 diameter:*** .004 - .009 ***1/4 diameter and larger:*** .005 - .011	
Core Hardness	Rockwell C32 - 40 (after tempering)	***410 SS:*** Rockwell C38 - 42 (after tempering) ***18-8 SS:*** Rockwell B90 - C25 (approx.)
Plating	See Appendix-A for plating information.	Stainless drill screws are usually supplied plain.

Type-BSD
Type-CSD
SELF-DRILLING





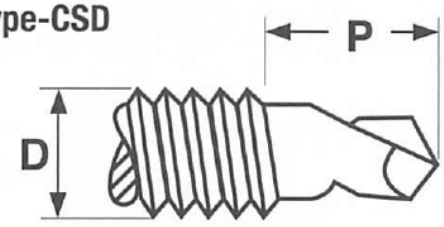
Type BSD Self-Drilling Screw Selection Chart

Nominal Screw Size	Point Number	Recommended Panel Thickness, in.	
		Min.	Max.
4	2	.035	.080
6	2	.035	.090
8	2	.035	.100
10	2	.035	.110
10	3	.110	.175
12	3	.110	.210
1/4	3	.110	.220
This table is only a guide and does not constitute a warranty of any type.			

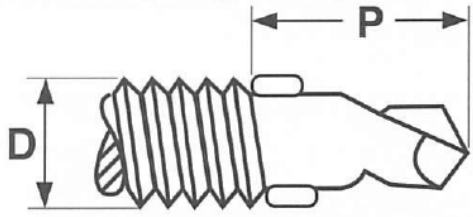
Type CSD Self Drilling Screw Selection Chart

Screw Size	Maximum Drilling Capacity*
10-24 x 3/4"	1/4" Plywood to .175 Metal
10-24 x 1"	3/8" Plywood to .175 Metal
10-24 x 1-1/4"	1/2" Plywood to .175 Metal
10-24 x 1-1/2"	1/2" Plywood to .175 Metal
10-24 x 1-7/16"	5/8 & 3/4" Wood to .175 Metal
*Drilling capacity may vary with type of material & hardness.	

Type-CSD



Reamer with Wings (Type-CSD)



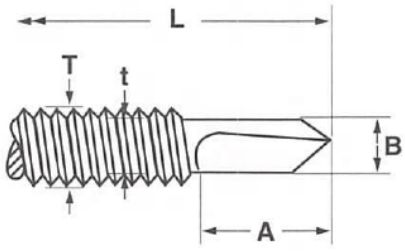
Steel Self-Drilling Screws, Type CSD — SAE J78-2013

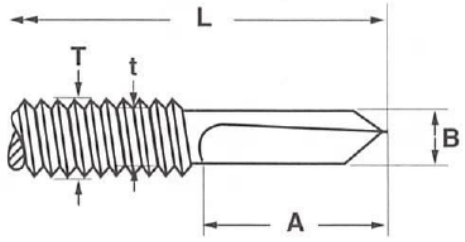
Nominal Size or Basic Screw Diameter		Threads Per Inch	D		P		Minimum Practical Nominal Screw Lengths, Countersunk Heads, Formed Points				Minimum Torsional Strength, lb.- in. (STEEL SCREWS ONLY)
			Major Diameter		Protrusion Allowance						
			Max	Min	#2 Pt	#3 Pt	90° Head, #2 Pt	90° Head, #3 Pt	Csk Head, #2 Pt	Csk Head, #3 Pt	
4	.1120	40	.1120	.1072	.130	-	5/16	-	3/8	-	14
6	.1380	32	.1380	.1326	.152	.172	5/16	3/8	3/8	7/16	24
8	.1640	32	.1640	.1586	.162	.202	7/16	1/2	7/16	1/2	48
10	.1900	24	.1900	.1834	.193	.258	1/2	9/16	1/2	9/16	65
12	.2160	24	.2160	.2094	.223	.293	5/8	5/8	5/8	5/8	100
1/4	.2500	20	.2500	.2428	.275	.350	5/8	5/8	5/8	5/8	156

Description	*Reamer with Wings*: A Type CSD self-drilling screw with reaming wings located at opposite sides of the shank, below the threads and above the drill point.
Applications/ Advantages	May be used for drilling through wood over 1/2" thick and the metal surface behind it. The wings drill out a clearance hole in wood or other soft materials, then snap off when in contact with the metal surface to be drilled.
Mechanical & Performance Requirements	Same as other Type CSD self-drilling screws (see previous page).

SELF-DRILLING

#4 & #5 Point with Unified Thread





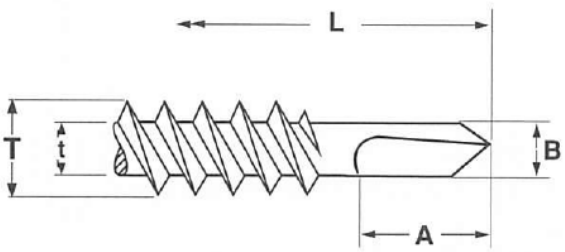
#4 Point **#5 Point**

#4 & #5 Point Self Drilling Screws, Unified Thread Pitch

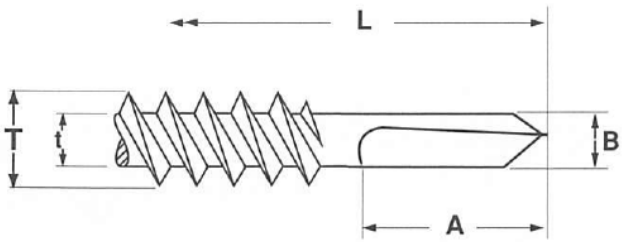
Diameter & Thread Pitch	Point Size	T		t		A		B		Drilling Capacity		Performance Info--STEEL Screws only		
		Major Thread Diameter		Minor Thread Diameter		Drill Point Length		Drill Point Diameter				Steel Gauge	Shear Strength (lapped steel) (lbs.)	Pullout Strength (lbs.)
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min			
10-24	#5	.189	.181	.162	.158	.413	.373	.173	.165	.250	.125	-	-	-
12-24	#4	.216	.207	.172	.168	.523	.495	.202	.190	.312	.145	12	2000	1500
12-24	#5	.216	.207	.172	.168	.640	.603	.202	.190	.500	.250	1/8	2700	2200
												1/4	2760	4000
1/4-20	#4	.246	.239	.192	.185	.511	.471	.227	.215	.312	.145	12	1800	-
1/4-20	#5	.249	.242	.192	.185	.629	.569	.227	.222	.500	.250	12	1800	-

Description	A tapping screw with an integrally formed hex washer head, unified threads, and a drill point significantly longer than that of a # 2 or #3 point drill screw.	
Applications/ Advantages	Designed to drill through a greater thickness of steel than a standard self drilling screw. Although it can assist in attaching metal deck to structural steel, the #4 & #5 point self drilling screws are not structural bolts and should not be used as such.	Will drill through thicker sheets of stainless than a #2 or #3 drill point. In the absence of industry test results, each user should carefully test to see if parts will work in desired application. The hardness of the material to be drilled should be a minimum of 10-20 Rockwell hardness points less than the hardness of the fastener.
Material	AISI 1022 or equivalent steel	410 Stainless
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 625°F minimum.	410 stainless screws shall be hardened and tempered by heating to 1800°-1900°F sufficient for austenitization, held for at least 1/2 hour and rapid air or oil-quenched then reheating to 500°-600°F for at least 1 hour and air cooled to provide the specified hardness.
Case Hardness	Rockwell C52 -58.	410 SS: Rockwell C55 minimum
Case Depth	*No. 10 & 12 diameter:* .004 - .009 *1/4 and larger:* .005 - .011	-
Core Hardness (after tempering)	Rockwell C21 - 43	Rockwell C38 - 42 (after tempering)
Shear Strength	The average ultimate values for shear strength are listed in the above table. Safety factors should be used when designing final applications.	-
Pull-out Strength	The average ultimate values for pull-out strength are listed in the above table. Safety factors should be used when designing final applications.	-
Plating	See Appendix-A for plating information.	Stainless drill screws are usually supplied without additional finish.

#4 & #5 Point with Spaced Thread SELF-DRILLING



#4 Point



#5 Point

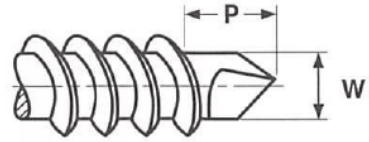
#4 & #5 Point Self Drilling Screws, Tapping Screw Thread

Diameter & Thread Pitch	L	Point Size	T		t		A		B		Drilling Capacity	
	Length (+0, -.050)		Major Thread Diameter		Minor Thread Diameter		Drill Point Length		Drill Point Diameter			
			Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
12-14	7/8 thru 1.25"	#4	.215	.209	.164	.157	..480	.455	.202	.188	.312	.145
12-14	3/4 thru 3"	#5	.215	.209	.164	.157	.630	.605	.202	.188	.500	.250
1/4-14	7/8 thru 3.5"	#4	.246	.240	.192	.185	.650	.625	.225	.215	.312	.145
1/4-14	1 thru 3"	#5	.246	.240	.192	.185	.755	.730	.225	.215	.500	.250
5/16-12	1 thru 1.5"	#4	.315	.307	.272	.263	.570	.515	.285	.275	.312	.110
5/16-12	1 thru 4"	#5	.315	.307	.244	.236	.708	.630	.283	.268	-	-

Description	A tapping screw with an integrally formed hex washer head, spaced threads, and a drill point significantly longer than that of a # 2 or #3 point drill screw.	
Applications/ Advantages	Designed to drill through a greater thickness of steel than a standard self drilling screw. Although it can assist in attaching metal deck to structural steel, the #4 & #5 point self drilling screws are not structural bolts and should not be used as such.	Will drill through thicker sheets of stainless than a #2 or #3 drill point. In the absence of industry test results, each user should carefully test to see if parts will work in desired application. The hardness of the material to be drilled should be a minimum of 10-20 Rockwell hardness points less than the hardness of the fastener.
Material	AISI 1022 or equivalent steel	410 Stainless
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 625°F minimum.	410 stainless screws shall be hardened and tempered by heating to 1800°-1900°F sufficient for austenitization, held for at least 1/2 hour and rapid air or oil-quenched then reheating to 500°-600°F for at least 1 hour and air cooled to provide the specified hardness.
Case Hardness	Rockwell C52 - 58	410 SS: Rockwell C55 minimum
Case Depth	*No. 12 diameter:* .004 - .009 *1/4 and larger.* .005 - .011	-
Core Hardness (after tempering)	Rockwell C32 - 40	Rockwell C38 - 42 (after tempering)
Shear Strength	The average ultimate values for shear strength are listed in the above table. Safety factors should be used when designing final applications.	-
Pull-out Strength	The average ultimate values for pull-out strength are listed in the above table. Safety factors should be used when designing final applications.	-
Plating	See Appendix-A for plating information.	Stainless drill screws are usually supplied without additional finish.

SELF-DRILLING

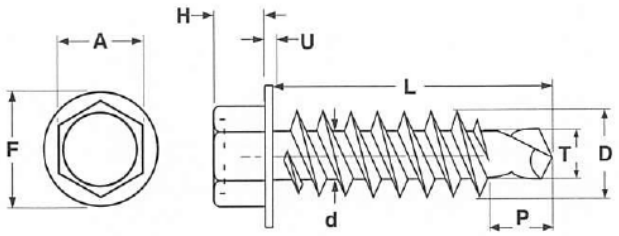
#1 Drill Point, Spaced Thread



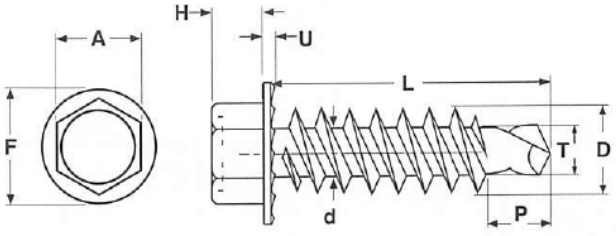
#1 Drill Point for Type-BSD Self-Drilling Screws					
Nominal Diameter	Threads per Inch	W		P	
		Drill Point Width		Length of Drill Point	
		Max	Min	Max	Min
10	16	0.157	0.149	0.197	0.157
12	14	0.183	0.173	0.236	0.197
1/4	14	0.220	0.210	0.284	0.244

Description	A drill point that is15 - 35% shorter than a #2 drill point of the same nominal diameter.
Applications/ Advantages	A #1 drill point is neccesary in rare occasions when the nominal length of the entire fastener is so short that a standard #2 point would not allow for a sufficient number of threads to engage the material it has drilled.
Material	AISI 1016 - 1024 or equivalent steel

High Hex Washer Head, Spaced Thread (includes *Serrated* variety) — SELF-DRILLING



Hex Washer High Head



Serrated Hex Washer High Head

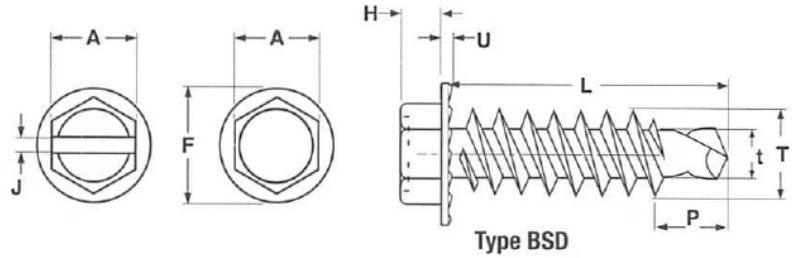
Unslotted Hex Washer High Head Self-Drilling Screws, Spaced Thread

Nominal Screw Size & Threads per Inch	A		H		F		U		D		d		P		T		Recommended Torque (Kg-cm)
	Width Across Flats		Head Height		Washer Diameter		Washer Thickness		Major Diameter		Minor Diameter		Point Length		Point Width		
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Min
10-16	.312	.305	.130	.125	.414	.384	031	.019	.189	.183	.141	.135	.295	.244	.157	.152	70

Description	An integrally formed hex washer head screw whose head is 10-20% higher than a standard hex washer head, and a drill point. Thread design is spaced (like a type-BSD drill screw).
Applications/ Advantages	The high head design provides a better-engaged drill screw during installation. Intended for use in heavier duty (up to 7 gauge) steel. Serrated washer design adds greater holding power to components subject to vibrations caused by repeated movements.
Material	AISI 1016 - 1024 or equivalent steel
Heat Treatment	Fasteners are heat treated in a carbonitriding or gas-carburizing system at a minimum temperature of 625°F, or in a cyaniding system (with consent of the buyer) at a minimum temperature of 450°F.
Case Hardness	Rockwell C 52 - 58
Case Depth	#10 Diameter: .004 - .009
Core Hardness	Rockwell C32 - 40
Plating	See Appendix-A for plating information

SELF-DRILLING

Serrated Hex Washer, SPACED Thread



Type BSD

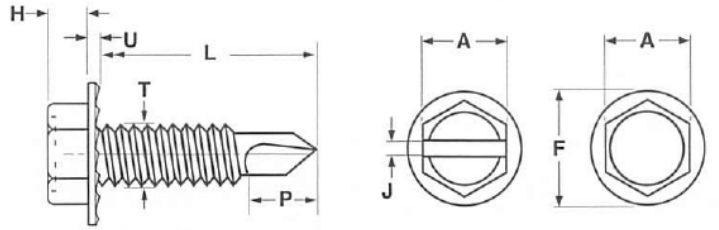
SERRATED HEX WASHER SELF-DRILLING SCREWS, SPACED THREAD

Nominal Screw Size & Threads per Inch	A		H		F		U		T		t		Drill Point Size	P	Drilling Thickness		Recommended Screw Gun Speed
	Width Across Head		Head Height		Washer Diameter		Washer Thickness		Major Diameter		Minor Diameter			Protrusion Allowance			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min			Max	Min	Max RPM
6-20	.250	.244	.093	.080	.328	.302	.030	.019	.139	.135	.104	.099	2	.190	.090	.035	2500
8-18	.250	.244	.110	.096	.348	.322	.036	.024	.166	.161	.122	.116	2	.211	.100	.035	2500
10-16	.312	.305	.120	.105	.414	.384	036	.024	.189	.183	.141	.135	2	.235	.110	.035	2500
1/4-14	.375	.367	.190	.172	.590	.551	.050	.029	.246	.240	.192	.185	3	.393	.220	.110	2000
1/4-14	.438	.428	.190	.172	.590	.560	.063	.037	.246	.240	.192	.185	3	.393	.220	.110	2000
5/16-12	.438	.428	.230	.208	.610	.580	.063	.037	.315	.307	.272	.263	4	.510	.312	.110	2000
5/16-12	.500	.489	.230	.208	.676	.624	.055	.035	.315	.307	.272	.263	3	-	.312	.110	2000

1/4 & 5/16" diameters are available with multiple head dimension configurations.

Description	An integrally formed hex washer head screw with serrations on the bearing surface side of the washer face and a drill point. Serrations extend from outer edge of washer face to the screw shank. Thread design is spaced (like a type-BSD drill screw).	
Applications/ Advantages	Used to attach plywood, soft wood or metal to metal. Serrated washer design adds greater holding power to components subject to vibrations caused by repeated movements. The 1/4-inch diameter screws, for instance, are commonly used to attach reinforcing strut or L-angle to garage doors.	The 18-8 stainless drill screw offers superior corrosion resistance but is a significantly softer metal than case-hardened carbon steel. The serrations can help create a fastening more resistant to loosening. The hardness of the material to be drilled should be a minimum of 10-20 Rockwell hardness points less than the screw's hardness.
Material	AISI 1016 - 1024 or equivalent steel	18-8 Stainless Steel
Heat Treatment	Fasteners are heat treated in a carbonitriding or gas-carburizing system at a minimum temperature of 625°F, or in a cyaniding system (with consent of the buyer) at a minimum temperature of 450°F.	-
Case Hardness	Rockwell C 52 - 58	-
Case Depth	#8 thru #12 Diameters: .004 - .009 1/4" Diameter & larger: .005 - .011	-
Core Hardness	Rockwell C32 - 40	-
Minimum Torsional Strength for ZINC-plated screws	#8 diameter: 41 lb.-in. #10 diameter: 55 lb.-in. 1/4" diameter: 132 lb.-in. 5/16" diameter: (no industry standard)	-
Plating	Serrated hex washer self-drilling screws are usually supplied with a clear zinc finish.	Stainless self-drilling screws are usually supplied without additional finish.

Serrated Hex Washer, MACHINE SCREW Thread — SELF-DRILLING



Type CSD

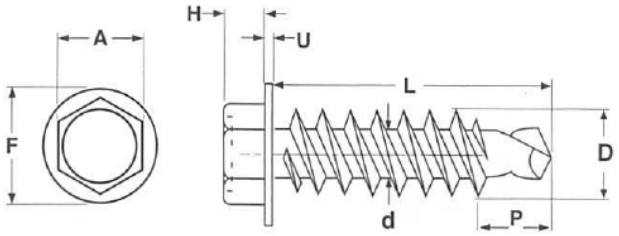
SERRATED HEX WASHER SELF-DRILLING SCREWS, MACHINE SCREW THREAD

Nominal Screw Size & Threads per Inch	A Width Across Head		H Head Height		F Washer Diameter		U Washer Thickness		T Major Diameter		Drill Point Size	P Protrusion Allowance	Drilling Thickness (Steel screws)		Recommended Screw Gun Speed
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min			Max	Min	Max RPM
8-32	.250	.244	.110	.096	.348	.322	.036	.024	.163	.157	2	.162	.100		2500
10-24	.312	.305	.120	.105	.414	.384	036	.024	.189	.181	2	.193	.110		2500
											3	.258	.175	.110	
10-32	.312	.305	.120	.105	.414	.384	036	.024	.189	.183	3	.258	.175	.110	2500
12-24	.312	.305	.155	.139	.432	.398	.029	.022	.215	.207	3	.293	.210	.110	2500
1/4-20	.375	.367	.190	.172	.590	.551	.063	.029	.250	.242	3	.350	.220	.110	2000
1/4-20	.438	.428	.190	.172	.590	.551	.063	.029	.250	.242	2	.275	.175	.035	2000
5/16-18	.438	.428	.229	.208	.610	.580	.063	.037	.315	.307	3	.421			

Description	An integrally formed hex washer head screw with serrations on the bearing surface side of the washer face and a drill point. Serrations extend from outer edge of washer face to the screw shank. Thread design is unified (type-CSD).	
Applications/ Advantages	Used to attach plywood, soft wood or metal to metal. Serrated washer design adds greater holding power to components subject to vibrations caused by repeated movements. The 1/4-inch diameter screws, for instance, are commonly used to attach reinforcing strut or L-angle to garage doors.	The 18-8 stainless drill screw offers superior corrosion resistance but is a significantly softer metal than case-hardened carbon steel. The serrations can help create a fastening more resistant to loosening. The hardness of the material to be drilled should be a minimum of 10-20 Rockwell hardness points less than the screw's hardness.
Material	AISI 1016 - 1024 or equivalent steel	18-8 Stainless
Heat Treatment	Fasteners are heat treated in a carbonitriding or gas-carburizing system at a minimum temperature of 625°F, or in a cyaniding system (with consent of the buyer) at a minimum temperature of 450°F.	-
Case Hardness	Rockwell C 52 - 58	-
Case Depth	#8 thru #12 Diameters: .004 - .009 1/4" Diameter & larger: .005 - .011	-
Core Hardness	Rockwell C32 - 40	-
Minimum Torsional Strength for ZINC-plated screws	#8 diameter: 41 lb.-in. #10 diameter: 55 lb.-in. 1/4" diameter: 132 lb.-in.	-
Plating	Serrated hex washer self-drilling screws are usually supplied with a clear zinc finish.	Stainless self-drilling screws are usually supplied without additional finish.

SELF-DRILLING

1/4" Diameter w/#12 Hex Washer Hd, SPACED Thread



Type BSD

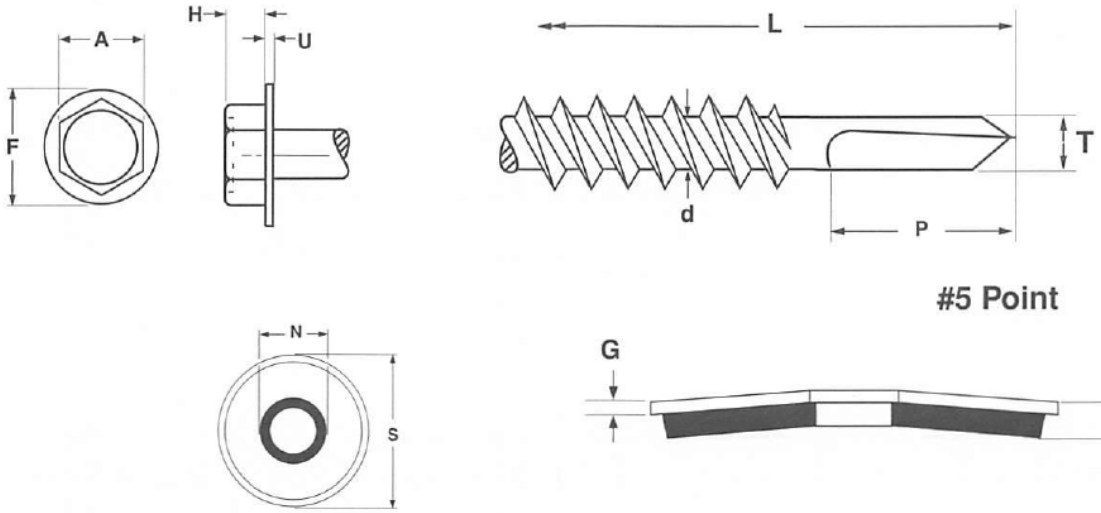
1/4" Nominal Diameter Self-Drilling Screw w/ #12 Head, Type BSD *SAE J78-2013

Nominal Size or Basic Screw Diameter		Threads Per Inch	D		d		P	A		F		H		U	
			Major Diameter		Minor Diameter		Protrusion Allowance	Width Across Flats		Washer Diameter		Head Height		Washer Thickness	
			Max	Min	Max	Min	#3 Pt.	Max	Min	Max	Min	Max	Min	Max	Min
1/4	.2500	14	.246	.240	.192	.185	.393	.312	.305	.432	.398	.155	.139	.039	.022

Description	An integrally formed hex washer head screw. The head is approximately 15 - 20% smaller than the standard head for the 1/4" diameter. Thread design is spaced (like a type-BSD drill screw).
Applications/ Advantages	Used to attach plywood, soft wood or metal to metal. The undersized head is preferred in applications with limited clearance, or when installers want to minimize the number of tools used on a job.
Material	AISI 1016 - 1024 or equivalent steel
Heat Treatment	Fasteners are heat treated in a carbonitriding or gas-carburizing system at a minimum temperature of 625°F, or in a cyaniding system (with consent of the buyer) at a minimum temperature of 450°F.
Case Hardness	Rockwell C 52 - 58
Case Depth	1/4" Diameter & larger: .005 - .011
Core Hardness	Rockwell C32 - 40
Minimum Torsional Strength for ZINC-plated screws	92 lb.-in.
Plating	Hex washer self-drilling screws are usually supplied with a clear zinc finish.

#5 Point with neo-EPDM Washer SPACED Thread

SELF-DRILLING



#5 Drill Point Hex Washer Self-Drilling Screw w/ Neo-EPDM Washer

Nominal Size	Threads Per Inch	D		d		P		T		A		F		H		U	
		Major Diameter		Minor Diameter		Point Length		Point Diameter		Width Across Flats		Washer Diameter		Head Height		Washer Thickness	
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
12	14	0.215	0.208	0.165	0.156	0.630	0.571	0.193	0.185	0.312	0.304	0.432	0.397	0.194	0.160	0.039	0.022

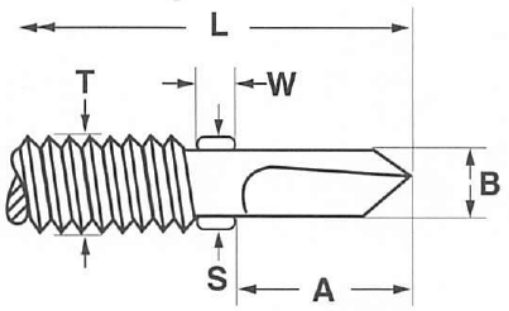
Neo-EPDM Washers used with Self Piercing & Self Drilling Screws

For Use with Screw of this Nominal Diameter	S		N		G		E	
	Outside Diameter of Steel Section		Inside Diameter of Steel Section		Thickness of Steel Section		Total Thickness (EPDM & Steel)	
	Max	Min	Max	Min	Max	Min	Max	Min
12	.558	.542	.243	.227	.039	.023	.125	.093

Description	A tapping screw with an integrally formed hex washer head, spaced threads, and a drill point significantly longer than that of a # 2 or #3 point drill screw. Beneath the head is a thin conically-shaped circular steel washer, bonded to a similarly shaped rubber-like piece which as a slightly smaller outside and inside diameter. When these washers are assembled (rubber side down) to self-piercing or self-drilling screws, those fasteners become "sealing screws".
Applications/ Advantages	Designed to drill through a greater thickness of steel than a standard self drilling screw. Although it can assist in attaching metal deck to structural steel, the #5 point self drilling screws are not structural bolts and should not be used as such. The neo-EPDM washer: (a) offers protection against leakage; (b) provides load bearing qualities superior to that of a regular flat washer; (c) reduces the chance of the fastening becoming loose due to vibration; (d) minimizes damage to the mating surface caused by contact with a steel washer.
Material	*Screw:* AISI 1016-1024 or equivalent steel; *Steel Section of washer*: 20 gauge steel; *Elastic Section of washer*: Style 40 EPDM sheet
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 625°F minimum.
Case Hardness	*Screw*: Rockwell C52 -58
Case Depth	*No. 12 diameter:* .004 - .009
Core Hardness (after tempering)	*Screw*: Rockwell C32 - 40 *Material*: Shore A 65 - 75 (Durometer scale)
Plating	See Appendix-A for plating information.

SELF-DRILLING

#4 Point with Wings, MACHINE SCREW Thread

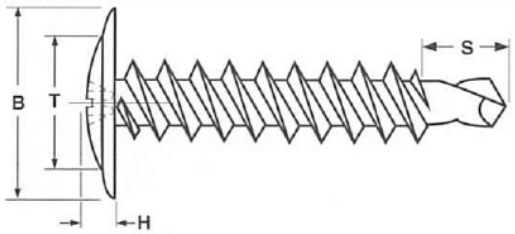


#4 Point Self-Drilling Screws with Reaming Wings, Machine-Screw Thread

Nominal Screw Size & Threads per Inch	A	B		S		W		K		T		Drill Point Size
	Point Length	Point Diameter		Wing Span		Wing Width		Wing Thickness		Major Diameter		
	Ref	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
10-24	0.394	.166	.159	.256	.236	.138	.098	.016	.011	.191	.183	4
12-24	0.433	.197	.190	.276	.255	.158	.118	.0157	.0118	.216	.209	4
1/4-20	0.491	.228	.222	.315	.294	.158	.118	.0157	.0118	.248	.242	4

	Steel	*Stainless*
Description	An externally threaded fastener with a machine screw thread pitch and an extended drill point which creates its own hole. The fastener also has two reaming wings located at opposite sides of the shank, below the threads and above the drill point.	
Applications/ Advantages	The unified thread pitch reduces friction and driving torques. Drill screws with this style thread are normally used with thicker materials, particularly when the materials being joined are thicker than a single spaced thread pitch. The reaming wings drill out a clearance hole in wood or other soft materials, then snap off when in contact with the metal surface to be drilled. The #4 point typically will drill through sheet metal from .145 to .312 inches thick.	Offers similar advantages as the steel screw of the same design but with better corrosion resistance. It is important to remember that the hardness of the material to be drilled should be a minimum of 10-20 Rockwell hardness points LESS than the hardness of the drill screw.
Material	AISI 1022 or equivalent steel	410 stainless steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 625°F minimum.	410 stainless screws shall be hardened and tempered by heating to 1800°-1900°F sufficient for austenitization, held for at least 1/2 hour and rapid air or oil-quenched then reheating to 500°-600°F for at least 1 hour and air cooled to provide the specified hardness.
Case Hardness	Rockwell C52 - 58	410 SS: Rockwell C55 minimum
Case Depth	***Nos. 10 & 12 diameter:*** .004 - .009 ***1/4 diameter and larger:*** .005 - .011	-
Core Hardness	Rockwell C32 - 40 (after tempering)	***410 SS:*** Rockwell C38 - 42 (after tempering)
Plating	See Appendix-A for plating information.	Stainless drill screws are usually supplied plain.

Modified Truss Phillips SELF-DRILLING





Modified Truss Head Phillips Self Drilling Screws

Nominal Size & Number of Threads per inch	B		H		D1		D2		Point Size	S		Phillips Driver Size
	Overall Head Diameter		Total Head Height		Minor Diameter		Major Diameter			Protrusion Allowance		
	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	
4-24	.261	.242	.079	.066	.086	.081	.114	.109	#2	.112	.082	1
6-20	.401	.385	.099	.070	.104	.098	.139	.131	#2	.158	.117	2
8-18	.446	.426	.098	.082	.122	.116	.165	.161	#2	.197	.149	2
10-16	.441	.425	.098	.079	.141	.135	.189	.183	#2	.228	.118	2
10-16	.441	.425	.098	.079	.141	.135	.189	.183	#3	.307	.256	2
12-14	.464	.440	.124	.101	.164	.156	.215	.208	#2	.250	.205	3
12-14	.464	.440	.124	.101	.164	.156	.215	.208	#3	.315	.275	3
1/4-14	.484	.459	.144	.121	.220	.214	.246	.239	#3	.374	.334	3

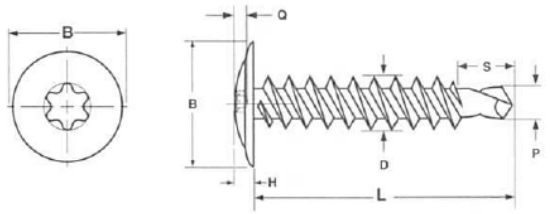
	Nominal Screw Size	Nominal Screw Length		
		Thru 1 in.	Over 1" to 2" incl.	Over 2 in.
Tolerance on Length	#4 thru #10	+0, -.03"	+0, -.047	+0, -.06
		Up to 3/4", incl.	3/4 to 1 1/2", incl.	Over 1 1/2"
	#12 thru 1/4"	+0, -.03"	+0, -.05"	+0, -.06"

NOTE: There is no single standard for Modified Truss self-drilling screws. These values are offered as a guide; deviations from these specifications may occur.

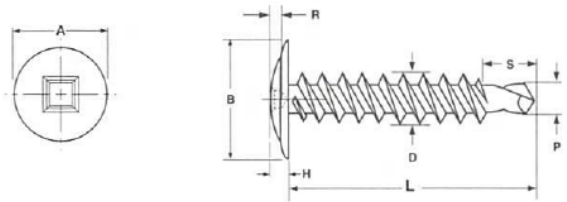
Description	A fastener with an extra wide head, twinfast thread and self drilling point. The head is an integrally formed round washer with a low rounded top that is approximately 75% the diameter of the washer.		
Applications/ Advantages	Common usage is to attach wire or metal lathe to metal studs of a thickness between 12 - 20 gauge. The head design offers low clearance and an extra large bearing surface. The recommended drive speed for installation is 2500 rpm.	Offers superior corrosion resistance, but can only be used in softer materials. Hardness of the material to be drilled should be a minimum of 10-20 Rockwell hardness points less than the fastener.	Not as corrosion-resistant as the 18-8 variety but will drill through harder materials than the 18-8 screw. The same hardness gradient rule applies: material drilled should be a minimum of 10-20 Rockwell hardness points less than the fastener.
Material	AISI 1016 - 1022 or equivalent steel.	18-8 stainless	410 stainless
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 625°F minimum.	-	Screws shall be hardened and tempered by heating to 1800°-1900°F sufficient for austenitization, held for at least 1/2 hour and rapid air or oil-quenched then reheating to 500°-600°F for at least 1 hour and air cooled to provide the required tensile, yield and hardness properties.
Surface Hardness	Rockwell C 52 - 58	-	Rockwell C 55 minimum
Case Depth	#4 & #6 diameters: .002 - .007 #8 thru #12 diameters: .004 - .009 1/4" diameter: .005 - .011	-	-
Core Hardness	Rockwell C 32 - 40 (after tempering)	-	Rockwell C38 - 42 (after tempering)
Plating	See Appendix-A for details.	Usually supplied without a secondary finish.	

SELF-DRILLING

Modified Truss Six-Lobe & Square Recess



Six-Lobe Recess



Square Recess

Modified Truss Head Self Drilling Screws—Six-Lobe & Square Recess

Nominal Size & Number of Threads per inch	B		H		D1		D2		Q		Six-Lobe Driver Size	R		Square Driver Size	S		Point Size
	Overall Head Diameter		Total Head Height		Minor Diameter		Major Diameter		Six-Lobe Recess Penetration			Square Recess Penetration			Point Length		
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min		Max	Min	
6-20	.401	.385	.099	.070	.104	.098	.139	.131		.045	T-10		.030	#1	.158	.117	#2
8-18	.446	.426	.098	.082	.122	.116	.166	.160	.052	.040	T-15	.063	.047	#2	.197	.149	#2
10-16	.441	.425	.098	.079	.141	.135	.189	.183	.065	.050	T-20	.063	.047	#2	.228	.118	#2
10-16	.441	.425	.098	.079	.141	.135	.189	.183	.065	.050	T-20	.063	.047	#2	.307	.256	#3
12-14	.464	.440	.124	.101	.164	.156	.215	.208	.071	.055	T-25	.063	.047	#2	.315	.275	#3
1/4-14	.583	.551	.134	.118	.222	.214	.246	.239	.080	.064	T-27	.095	.078	#3	.374	.334	#3

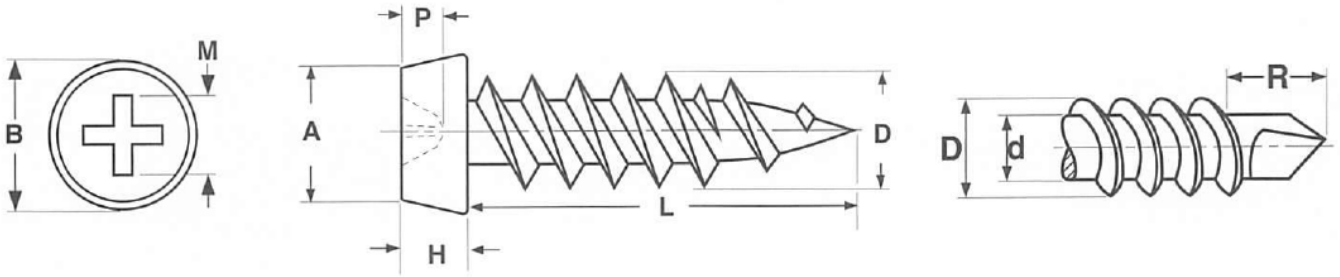
Tolerance on Length	Nominal Screw Size	Nominal Screw Length		
		Thru 1 in.	Over 1" to 2" incl.	Over 2 in.
	#5 thru #10	+0, -.03"	+0, -.047	+0, -.06
		Thru 3/4"	Over 3/4" to 1.5" incl.	Over 1.5"
	#12 and 1/4"	+0, -.03"	+0, - .05"	+0, - .06"

NOTE: There is no single standard for Modified Truss self-drilling screws. These values are offered as a guide; deviations from these specifications may occur.

Description	A steel fastener with an extra wide head, twinfast thread and self drilling point. The head is an integrally formed round washer with a low rounded top that is approximately 75% the diameter of the washer. The recess may be six-lobed or square.
Applications/ Advantages	Common usage is to attach wire or metal lathe to metal studs of a thickness between 12 - 20 gauge. The head design offers low clearance and an extra large bearing surface.
Material	AISI 1016 - 1022 or equivalent steel.
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 625°F minimum.
Surface Hardness	Rockwell C 52 - 58
Case Depth	#6 diameter: .002 - .007 #8 thru #12 diameters: .004 - .009 1/4" diameter: .005 - .011
Core Hardness (after tempering)	Rockwell C 32 - 40
Plating	Screws are commonly available in zinc or black phosphate coatings. See Appendix-A for details.

Sharp & Drill Points

FRAMING SCREWS



Pan Phillips Framing Screw — Sharp Point

Nominal Size	A		B		H		D		M		P	
	Top Head Diameter		Bottom Head Diameter		Head Height		Major Diameter		Recess Diameter		Recess Depth	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
7	.263	.224	.314	.295	.114	.098	.153	.142	.197	.171	.106	.086

Tolerance on Length	+.015, -.020

Pan Phillips Framing Screw — Drill Point

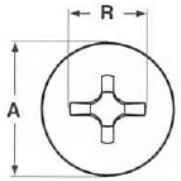
Nominal Size	A		B		H		D		d		M		P		R
	Top Head Diameter		Bottom Head Diameter		Head Height		Major Diameter		Minor Diameter		Recess Diameter		Recess Depth		Protrusion Allowance
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	#2 Point
6	.263	.224	.314	.295	.114	.098	.139	.135	.104	.099	.197	.171	.106	.086	.190

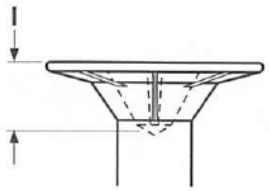
Minimum Torsional Strength	24 Lb.-Inch (Steel Screws Only)

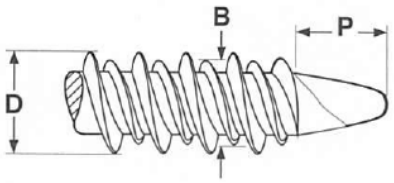
Description	A case hardened screw with either (a) a sharp point and twinfast thread, or (b) a drill point and single lead thread. The head has a trapezodal profile with a flat top and a flat underside.
Applications/ Advantages	For framing applications: the sharp point screwis used in thin gauge (less than .050 thick) metal studs & tracks; the drill point variety can be used in metals up to .090 thick.
Material	AISI 1018 steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.
Case Hardness	HV 550 - 800
Core Hardness	HV 270 - 450
Case Depth	.004 minimum
Torsional Strength	34 kg/cm minimum
Plating	Parts are usually supplied with a black phosphate finish.

SELF-DRILLING

Wafer Phillips High-Low w/ Spade Pt.







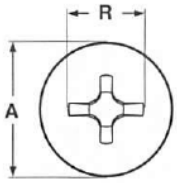
Wafer Phillips Spade Point High-Low Self Drilling Screws with Nibs under Head

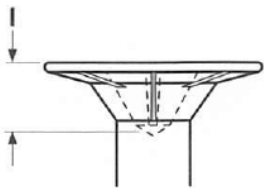
Screw Size	Threads per Inch	A		R		I		D		B		P		Phillips Drive Size
		Head Diameter		Recess Diameter		Recess Depth		Major Thread Diameter		Minor Thread Diameter		Point Length		
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
8	15	.417	.377	.209	.196	.148	.123	.201	.182	.169	.149	.228	.208	2
Tolerance on Length														

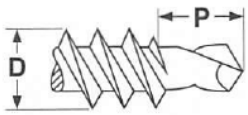
Description	A countersunk, flat head screw with a double lead, consisting of a high and low thread; and spade-shaped point designed to drill its own hole. The head has eight protrusions, or nibs, equidistantly spaced from each other, that run from the outer edge of the head down the cone-shaped bearing surface.
Applications/ Advantages	Specifically designed for attaching cement board to plywood.
Material	AISI 1018 - 1022 steel
Case Depth	.004 minimum
Surface Hardness	Vickers HV 450 - 800
Core Hardness	Vickers HV 290 - 450
Recommended Torque	45 kg/cm minimum
Finish	Screws have a green ceramic coating intended to withstand a salt-spray test of 500 hours.

Wafer Phillips w/ Drill Point

SELF-DRILLING







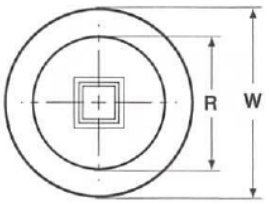
Wafer Phillips Self Drilling Screws with Nibs under the Head

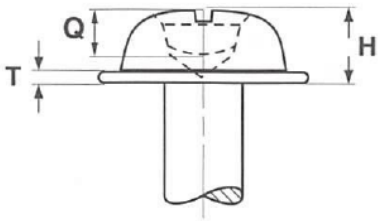
Screw Size	Threads per Inch	A		R		I		D		P	Phillips Drive Size
		Head Diameter		Recess Diameter		Recess Depth		Major Thread Diameter		Point Length	
		Max	Min	Max	Min	Max	Min	Max	Min	Min	
8	15	.417	.377	.209	.196	.148	.123	.169	.157	.156	2
Tolerance on Length											

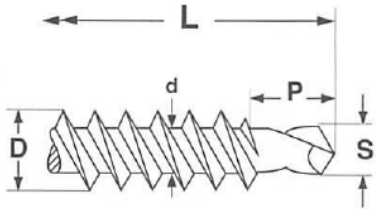
Description	A countersunk fastener with a flat head, spaced threads and self drilling point. The head has eight protrusions, or nibs, equidistantly spaced from each other, that run from the outer edge of the head down the cone-shaped bearing surface.
Applications/ Advantages	Specifically designed for attaching cement board to metal studs of a thickness from 14-20 gauge.
Material	AISI 1018 - 1022 steel
Case Depth	.004 minimum
Surface Hardness	Vickers HV 450 - 800
Core Hardness	Vickers HV 290 - 450
Recommended Torque	45 kg/cm minimum
Finish	Screws have a green ceramic coating intended to withstand a salt-spray test of 500 hours.

SELF-DRILLING

Round Washer, Square Recess







Round Washer Self Drilling Screws, Spaced Thread

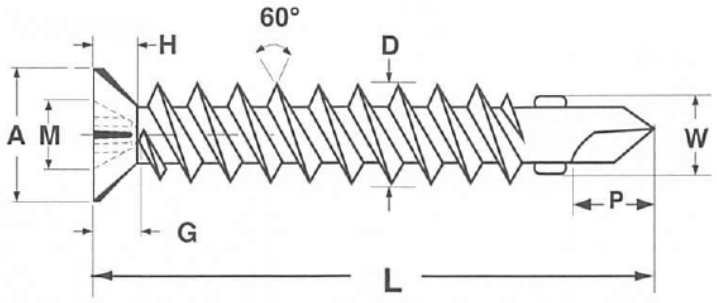
Nominal Size & Threads per Inch	W		R	T	H		Q		D		d		P		S		Driver Recess
	Head Washer Diameter		Top Diam-eter	Washer Thick-ness	Head Height		Recess Penetration		Major Diameter		Minor Diameter		Point Length		Point Diameter		
	Max	Min	Ref	Ref	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
8-18	.380	.357	.259	.040	.114	.101	.079	.062	.166	.160	.122	.115	.228	.176	.138	.131	2
10-16	.439	.415	.299	.050	.130	.117	.081	.064	.189	.182	.141	.134	.303	.243	.158	.151	2

Tolerance on Length	Nominal Screw Length		
	Less than 3/4"	3/4" to 1.5"	Over 1.5"
	+0, -0.03	+0, -0.05	+0, -0.06

Description	A steel fastener with an extra wide head, square socket recess, spaced thread and self drilling point. The head is an integrally formed round washer with a dome-shaped top that is approximately 70% the diameter of the washer.
Applications/ Advantages	Common usage is to attach plywood, soft wood or metal to tmetal. The wider head design offers greater protection to the mating surface while supplying excellent torque transmission that resists cam-out.
Material	AISI 1016 - 1022 or equivalent steel.
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 625°F minimum.
Surface Hardness	Rockwell C 52 - 58
Case Depth	#8 & #10 diameters: .004 - .009
Core Hardness (after tempering)	Rockwell C 32 - 40
Plating	Screws are commonly available in zinc or black phosphate coatings. See Appendix-A for details.

Phillips Flat Head w/Nibs Spaced Thread w/Wings

SELF-DRILLING



Flat Phillips w/Nibs Self Drilling Screws, Spaced Thread with Wings

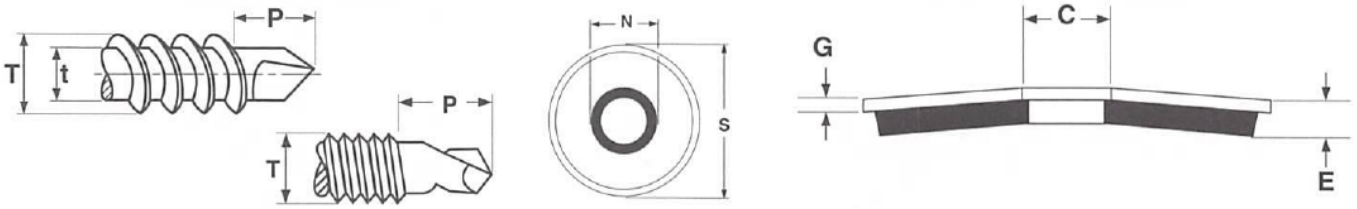
Nominal Size & Threads per Inch	H	A		M	G		W	D		P	Driver Recess
	Head Height	Head Diameter		Recess Diameter	Recess Penetration Gaging Depth		Total Wing Diameter	Major Diameter		Drill Point Length	
	Ref	Max	Min	Ref	Max	Min	Ref	Max	Min	Ref	
8-18	0.100	0.312	0.285	0.182	0.110	0.087	0.212	0.166	0.161	0.211	2

Tolerance on Length	Nominal Screw Length		
	Less than 3/4"	3/4" to 1.5"	Over 1.5"
	+0, -0.03	+0, -0.05	+0, -0.06

Description	A screw with a countersunk head, spaced thread and a self-drilling point with two protruding wings 180° from each other, located above the point but below the threaded portion of the shank. The underside of the head has four protruding nibs that extend from the top edge of the countersink to the area the head meets the shank.
Applications/ Advantages	For attaching wood to thin gauge metal studs. The wings help to clear a sufficient size hole so the threads don't engage with the wood and assist in countersinking the head. The nibs serve to assist seating the head without splitting surface materials such as laminates.
Material	AISI 1022 or equivalent steel.
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 625°F minimum.
Surface Hardness	Vickers HV 560 minimum
Core Hardness	Vickers HV 270 - 425
Drive Torque	49 Kg/cm minimum
Plating	Green Ruspert finish

SELF-DRILLING

With Neo-EPDM Washers



Self-Drilling Screws, Type BSD

SAE J78-2013

Nominal Size or Basic Screw Diameter		Threads Per Inch	T Major Diameter		t Minor Diameter		P Protrusion Allowance		Minimum Practical Nominal Screw Lengths, Formed Points				Minimum Torsional Strength, lb.- in. (STEEL SCREWS ONLY)
			Max	Min	Max	Min	#2 Pt.	#3 Pt.	90° Head, #2 Pt	Csk Head, #2 Pt	90° Head, #3 Pt	Csk Head, #3 Pt	
8	.1640	18	.166	.161	.122	.116	.211	.251	3/8	7/16	7/16	1/2	42
10	.1900	16	.189	.183	.141	.135	.235	.300	7/16	1/2	1/2	9/16	61
12	.2160	14	.215	.209	.164	.157	.283	.353	1/2	5/8	1/2	5/8	92
12	.2160	24	.216	.2094	-	-	.223	.293	1/2	5/8	1/2	5/8	100
1/4	.2500	14	.246	.240	.192	.185	.318	.393	1/2	5/8	1/2	5/8	150

Coarse Thread Self Drilling Screws - 5/16 & 3/8 Diameters, #3 Point

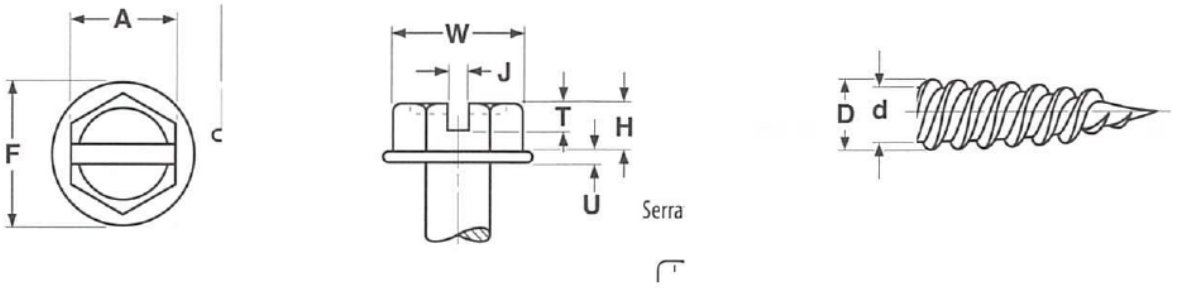
Nominal Size or Basic Screw Diameter		Threads Per Inch	T Major Diameter		t Minor Diameter		A Drill Point Length		B Drill Point Diameter	
			Max	Min	Max	Min	Max	Min	Max	Min
5/16	.3125	12	.315	.307	.272	.263	.421	.361	.270	.265
3/8	.3750	12	.380	.370	.308	.298	.354	.314	.338	.330

Neo-EPDM Washers used with Self Piercing & Self Drilling Screws

For Use with Screw of this Nominal Diameter	S Outside Diameter of Steel Section		N Inside Diameter of Steel Section		G Thickness of Steel Section		E Total Thickness (EPDM & Steel)	
	Max	Min	Max	Min	Max	Min	Max	Min
8	.507	.491	.212	.196	.039	.023	.125	.093
10	.507	.491	.212	.196	.039	.023	.125	.093
12	.558	.542	.243	.227	.039	.023	.125	.093
14 or 1/4	.617	.601	.275	.259	.039	.023	.125	.093
5/16	.750	.720	.345	.315	.040	.032	.116	.086
3/8	.750	.720	.449	.419	.040	.032	.110	.080

Description	A hex washer head tapping screw with spaced threads and a drill point which drills its own hole. Beneath the head is a thin conically-shaped circular steel washer, bonded to a similarly shaped rubber-like piece which as a slightly smaller outside and inside diameter. When these washers are assembled (rubber side down) to self-piercing or self-drilling screws, those fasteners become "sealing screws".
Applications/ Advantages	When properly assembled, this washer: (a) offers protection against leakage; (b) provides load bearing qualities superior to that of a regular flat washer; (c) reduces the chance of the fastening becoming loose due to vibration; (d) minimizes damage to the mating surface caused by contact with a steel washer. Sealing screws may be used to attach roofing or metal walls to steel frames. Consult a self-drilling screw selection chart for the correct size.
Material	***Screw:*** AISI 1016-1024 or equivalent steel; ***Steel Section of washer***: 20 gauge steel; ***Elastic Section of washer:*** Style 40 EPDM sheet
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 625°F minimum.
Case Hardness	***Screw.*** Rockwell C52 -58 ***Washer.*** EPDM ***Material:*** Shore A 65 - 75 (Durometer scale)
Case Depth of Screw	***No. 4 and 6 diameter:*** .002 - .007 ***No. 8 thru 12 diameter:*** .004 - .009 ***1/4 diameter and larger:*** .005 - .011
Core Hardness of Screw	Rockwell C32 - 40 (after tempering)
Plating	See Appendix-A for plating information.

Slotted Hex Washer SELF-PIERCING



Head dimensions of self-piercing screws differ from those of standard tapping screws.

HEX WASHER HEAD SLOTTED SELF-PIERCING SCREWS

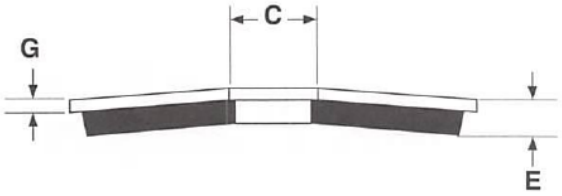
Size	A		H		F		U		J		T		D		d	
	Width Across Flats		Head Height		Washer Diameter		Washer Thickness		Slot Width		Slot Depth		Major Diameter		Minor Diameter	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
6-18	.250	.244	.093	.080	.328	.302	.025	.015	.048	.039	.053	.033	.141	.136	.102	.096
7-16	.250	.244	.093	.080	.328	.302	.029	.017	.048	.039	.062	.040	.158	.152	.114	.108
8-15	.250	.244	.110	.096	.348	.322	.031	.019	.054	.045	.074	.052	.168	.162	.123	.116
10-12	.250	.244	.110	.096	.414	.384	.031	.019	.054	.045	.074	.052	.194	.188	.133	.126
12-11	.312	.305	.150	.133	.432	.398	.039	.022	.067	.056	.093	.077	.221	.215	.162	.155
14-10	.375	.366	.190	.171	.520	.479	.050	.029	.075	.064	.111	.082	.254	.247	.200	.178

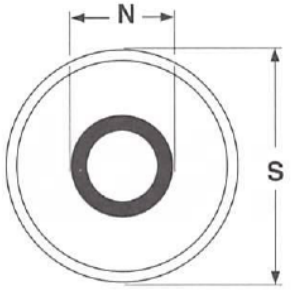
Tolerance on Length	±0.05

NOTE: There is no single standard for self-piercing screw dimensions. These values are offered as a guide; deviations from these specifications may occur.

Description	A slotted hex washer head thread forming tapping screw with a single lead thread rolled to the tip of an extra sharp point, and a second thread spaced 180° apart.
Applications/ Advantages	May be used in thin metal (less than .050 thick). Eliminates need for pre-drilled or pre-punched holes. Undercut area beneath the head allows greater length of thread engagement. Twin lead threads help to reduce driving torque.
Material	AISI 1018 - 1022 or equivalent steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.
Surface Hardness	Rockwell C45 minimum
Case Depth	*No. 6 diameter:* .002 - .007 *No. 7 thru 12 diameter:* .004 - .009 *1/4 diameter:* .005 - .011
Core Hardness (after tempering)	Rockwell C28 - 38
Plating	See Appendix-A for plating information.

SELF-PIERCING With Neo-EPDM Sealing Washers





Neo-EPDM Washers used with Self Piercing & Self Drilling Screws

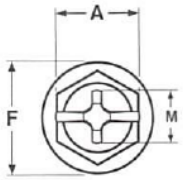
For Use with Screw of this Nominal Diameter	S		N		G	C		E	
	Outside Diameter of Steel Section		Inside Diameter of Steel Section		Thickness of Steel Section	Inside Diameter of EPDM Section		Thickness of EPDM Section	
	Max	Min	Max	Min	Ref	Max	Min	Max	Min
8	.507	.491	.212	.196	.031	.149	.126	.087	.070
10	.507	.491	.212	.196	.031	.149	.023	.087	.070
12	.558	.542	.243	.227	.031	.197	.172	.087	.070
14	.617	.601	.275	.259	.031	.232	.208	.087	.070

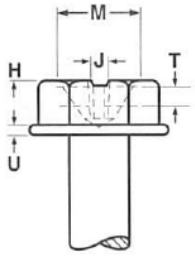
NOTE: There is no single standard for Neo-EPDM dimensions. These values are offered as a guide; deviations from these specifications may occur.

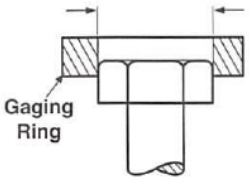
Description	A thin conically-shaped circular steel stamping with a centrally located hole, bonded to a similarly shaped rubber-like piece which as a slightly smaller outside and inside diameter. When these washers are assembled (rubber side down) to self-piercing or self-drilling screws, those fasteners become "sealing screws".
Applications / Advantages	When properly assembled, this washer: (a) offers protection against leakage; (b) provides load bearing qualities superior to that of a regular flat washer; (c) reduces the chance of the fastening becoming loose due to vibration; (d) minimizes damage to the mating surface caused by contact with a steel washer. Self-piercing sealing screws are used in thin metals (less than .050" thick). Self-drilling sealing screws may be used in thicker metals, depending on the diameter of the screw and length of the drill point (consult a self-drilling screw selection chart).
Material	***Steel Section of washer:*** 20 gauge steel ***Elastic Section of washer:*** Style 40 EPDM sheet
Hardness	***EPDM material:*** Shore A 65 - 75 (Durometer scale)
Plating	***Steel Section of washer:*** Galvanized

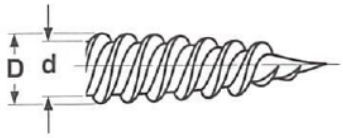
Combo Phillips/Slotted Hex Washer

SELF-PIERCING









Hex Washer Head Combo Phillips-Slotted Self-Piercing Screws

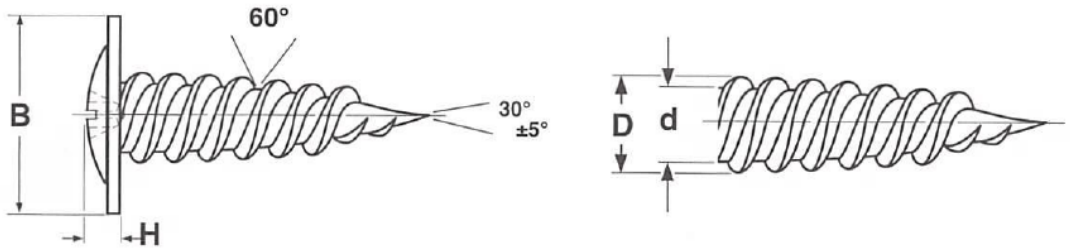
Size	A		H		F		U		M	J		T	D		d		Phillips Driver Size
	Width Across Flats		Head Height		Washer Diameter		Washer Thickness		Recess Diam.	Slot Width		Recess Depth	Major Diameter		Minor Diameter		
	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Max	Min	Min	Max	Min	Max	Min	
10-12	.250	.244	.110	.096	.414	.384	.031	.018	.178	.060	.050	.126	.194	.188	.133	.126	2

Tolerance on Length	±0.05

Description	A hex washer head thread forming tapping screw with a single lead thread rolled to the tip of an extra sharp point, and a second thread spaced 180° apart. The head can accomodate either a slotted or a cross-recessed driver.
Applications/ Advantages	May be used in thin metal (less than .050 thick). Eliminates need for pre-drilled or pre-punched holes. Undercut area beneath the head allows greater length of thread engagement. Twin lead threads help to reduce driving torque.
Material	AISI 1018 - 1022 or equivalent steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.
Surface Hardness	Rockwell C45 minimum
Case Depth	***No. 7 thru 12 diameter:*** .004 - .009
Core Hardness (after tempering)	Rockwell C28 - 38
Plating	See Appendix-A for plating information.

SELF-PIERCING

Modified Truss Phillips



Modified Truss Phillips Self-Piercing Screws										
Size	B		H		D		d		Minimum Torque (Kg/cm)	Phillips Driver Size
	Overall Head Diameter		Total Head Height		Major Diameter		Minor Diameter			
	Max	Min	Max	Min	Max	Min	Max	Min		
6-18	.401	.385	.099	.070	.141	.136	.102	.096	27.7	2
8-15	.446	.426	.098	.082	.168	.162	.123	.116	45	2
10-12	.441	.425	.098	.079	.194	.188	.133	.126	55.3	2
Tolerance on Length					± 0.05					

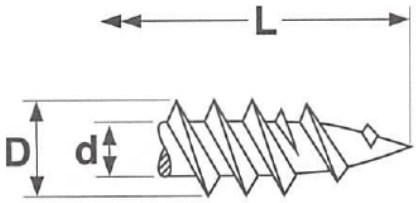
NOTE: There is no single standard for self-piercing screw dimensions. These values are offered as a guide; deviations from these specifications may occur.

Description	A fastener with an extra wide head, a single lead thread rolled to the tip of an extra sharp point, and a second thread spaced 180° apart. The head is an integrally formed round washer with a low rounded top that is approximately 75% the diameter of the washer.	
Applications/ Advantages	May be used in thin metal (less than .050 thick). Eliminates need for pre-drilled or pre-punched holes. The head design offers low clearance and an extra large bearing surface.	May be used in thin stainless sheet. The head design offers low clearance and an extra large bearing surface. Offers resistance to corrosion caused by moisture.
Material	AISI 1018 - 1022 or equivalent steel	18-8 Stainless Steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.	-
Surface Hardness	Rockwell C45 minimum	-
Core Hardness (after tempering)	Rockwell C28 - 38	-
Plating	See Appendix-A for plating information.	Stainless Self Pierce screws are usually supplied without an additional finish.

Bugle Head DRYWALL SCREWS



Fine Thread Drill Point Drywall Screw



Fine Thread Sharp Point Drywall Screw

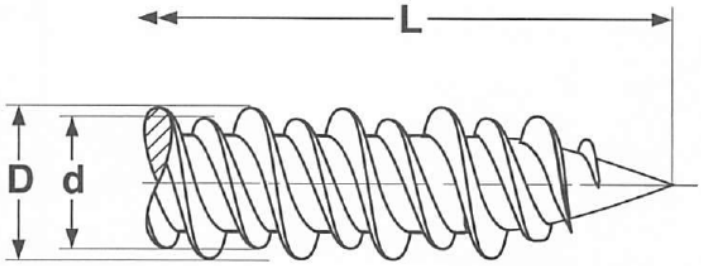
Threads for Fine Thread Drywall Screws					
Screw Size	Threads per inch	D		d	
		Major Diameter		Minor Diameter	
		Max.	Min.	Max.	Min.
6	18	.144	.135	.102	.096
7	16	.156	.147	.113	.106
8	15	.170	.161	.123	.116
10	14	.201	.193	.158	.152
Tolerance on Length		Up to 1 in. incl.: -0, +0.060		Over 1 in.: -0, +0.100	

NOTE: There is no single standard for drywall screw dimensions. These values are offered as a guide; deviations from these specifications may occur.

Description	*Fine thread Drywall--Sharp point*: A bugle head screw with twinfast thread, extra sharp point and black phosphate finish. *Fine thread Drywall--Drill point*: A bugle head screw with twin lead spaced thread, self drilling point and black phosphate finish.
Applications/ Advantages	*Fine thread Drywall--Sharp point*: For attaching drywall to metal studs from 25 gage through 20 gage thick. Longer sizes are ideal for multiple layers or insulation. *Fine thread Drywall--Drill point*: Will drive easily through drywall, drill a hole in a steel stud up to 14 gage thick, and form its own mating thread. Can also be used for attaching plywood or insulation board to 14 gage metal.
Material	AISI 1018 or equivalent steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.
Case Hardness	Rockwell C44 minimum
Plating	See Appendix-A for information about the coating of drywall screws.

DRYWALL SCREWS, HIGH-LOW

Bugle Head



High-Low Pattern
Drywall Screw Thread

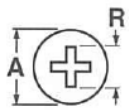
THREADS FOR HIGH-LOW DRYWALL SCREWS					
Screw Size	Threads per inch	D		d	
		High Thread Diameter		Low Thread Diameter	
		Max.	Min.	Max.	Min.
6	18	.154	.141	.124	.118
7	16	.166	.153	.130	.122
8	15	.181	.165	.138	.131
Tolerance on Length		Up to 1 in. incl.: -0, +0.060		Over 1 in.: -0, +0.100	

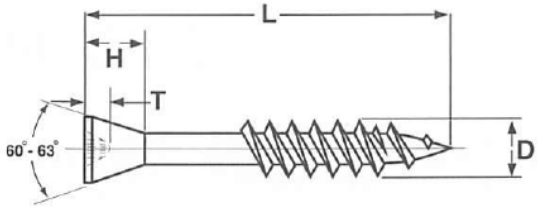
NOTE: There is no single standard for drywall screw dimensions. These values are offered as a guide; deviations from these specifications may occur.

Description	A bugle head screw with a double-lead, consisting of a high and low thread with an extra sharp point and black phosphate finish. The lower thread varies in height from 1/3 to 1/2 that of the higher thread, which is sharper and flatter than a standard thread.
Applications/ Advantages	Requires less torque to drive than a standard twinfast drywall screw. The high-low thread is more resistant to vibration and reduces the chance of heads popping.
Material	AISI 1018 or equivalent steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.
Surface Hardness	Vickers HV 550-800 (Rockwell C 52.3 - 64)
Core Hardness	Vickers HV 270-450 (Rockwell C 25.6 - 45.3)
Plating	See Appendix-A for information about the coating of drywall screws.

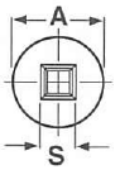
Phillips & Square Drive DRYWALL SCREWS, TRIM HEAD

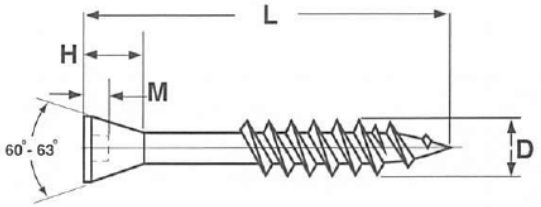
Phillips Drive Trim Head





Square Drive Trim Head





TRIM HEAD DRYWALL SCREWS																	
Nominal Size & Threads per Inch	A		R		T		S		M		C		D		H		Drive Size
	Head Diameter		Phillips Recess Diameter		Phillips Recess Depth		Recess Square		Square Recess Depth		Head Thickness		Thread Diameter		Head Height		
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
6 - 18	.236	.216	.154	.141	.075	.051	.106	.091	.071	.055	.031	.023	.142	.133	.150	.133	#1
8 - 15	.276	.256	.185	.169	.104	.080	.113	.110	.075	.065	.031	.023	.169	.161	.150	.133	#2
Tolerance on Length							± 0.06										

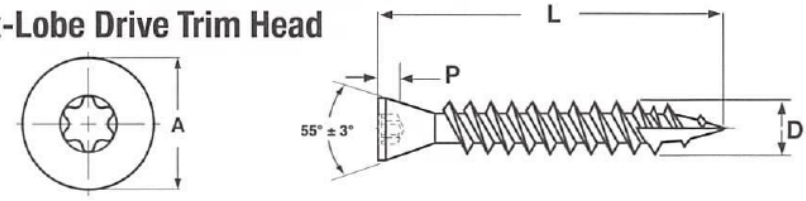
NOTE: There is no single standard for trim head dry-wall screw dimensions. These values are offered as a guide; deviations from these specifications may occur.

Description	A screw with twinfast thread, extra sharp point and countersunk flat head of a width 1/3 less than a standard bugle drywall screws.
Applications/ Advantages	For attaching wood trim to wood framing of up to 20 gage thick. The square drive variety is preferred when greater torque is required during installation.
Material	AISI 1018 or equivalent steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.
Case Depth	.004 in. minimum
Surface Hardness	Vickers HV 550 - 800 (Rockwell C 52.3 - 64)
Core Hardness	HV 270 - 450 (Rockwell C 25.6 - 45.3)
Plating	Black phosphate finish

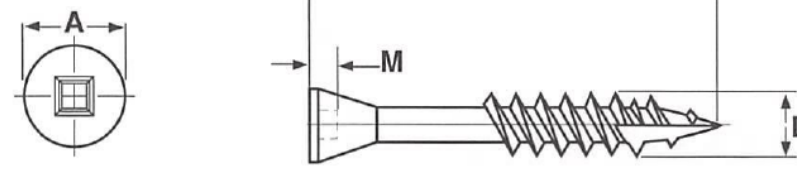
DRYWALL SCREWS, TRIM HEAD

Six-Lobe Recess
Square Recess

Six-Lobe Drive Trim Head



Square Recess Trim Head



Trim Head Six-Lobe Recess Drywall Screws with Type-17 Point

Nominal Size & Threads per Inch	A Head Diameter		P Six-Lobe Recess Depth		D Thread Diameter		Drive Size
	Max	Min	Max	Min	Max	Min	
7-10	0.236	0.223	0.067	0.058	0.168	0.161	T-15
Tolerance on Length			1 5/8" length		+0, -0.06"		
			2 1/4" length		+0, -0.07"		

Description	A screw with a coarse thread, extra sharp point with a chip cavity, a six-lobe recess and countersunk flat head of a width 1/3 less than a standard bugle drywall screws.
Applications/ Advantages	For attaching wood trim or railing to fences. Type-17 point minimizes the chances of splitting wood. Stainless material offers superior resistance to corrossion.
Material	Class 305 or equivalent Stainless Steel
Finish	Screws are typically commercially passivated.

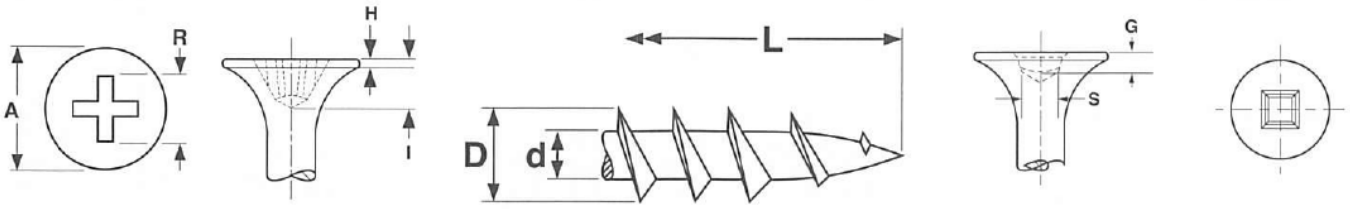
Trim Head Square Recess Drywall Screws with Type-17 Point

Nominal Size & Threads per Inch	A Head Diameter		M Square Recess Depth		D Thread Diameter		Drive Size
	Max	Min	Max	Min	Max	Min	
7-10	0.236	0.223	0.067	0.058	0.168	0.161	#1
Tolerance on Length			All lengths		±0.03		

Description	A screw with a coarse thread, extra sharp point with a chip cavity, square socket recess and countersunk flat head of a width 1/3 less than a standard bugle drywall screws.
Applications/ Advantages	For attaching wood trim or railing to fences. Type-17 point minimizes the chances of splitting wood. Stainless material offers superior resistance to corrossion. The square drive variety is preferred when greater torque is required during installation.
Material	Class 305 or equivalent Stainless Steel
Finish	Screws are typically commercially passivated.

Coarse Thread, Phillips & Square Recess

DRYWALL & DECK SCREWS



Square Recess Coarse Thread Deck Screws

Screw Size	Threads per inch	D		S		G		Drive Size
		Major Diameter		Recess Square		Penetration Gaging Depth		
		Max.	Min.	Max	Min	Max	Min	
6	10	.154	.142	.091	.089	.065	.056	1
8	8	.180	.163	.113	.110	.075	.064	2
10	8	.210	.180	.113	.110	.075	.064	2
Tolerance on Length		Up to 1 in. incl.: -0, +0.060				Over 1 in.: -0, +0.100		
In the abscence of a single industry standard for Deck Screws, these dimensions are offered as a guide; slight deviations are acceptable.								

Phillips Recess Coarse Thread Deck Screws

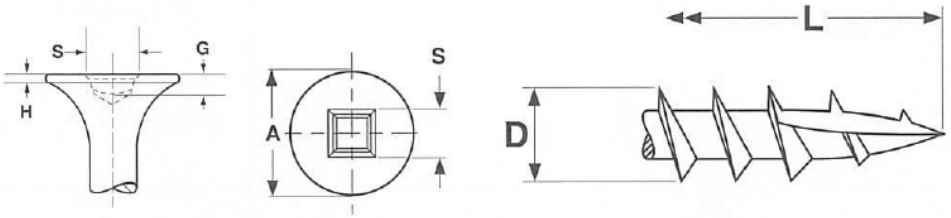
Screw Size	Threads per inch	D		R		I	Phillips Recess Depth
		Major Diameter		Phillips Recess Diameter		Phillips Recess Depth	
		Max.	Min.	Max.	Min.	Ref	
6	8 to 10	.158	.142	.201	.176	.106	2
7	8 to 10	.169	.153	.201	.176	.118	2
8	8 to 10	.187	.170	.201	.176	.124	2
9	8	.195	.180	.201	.176	.124	2
10	8	.211	.192	.204	.190	.124	2
12	8	.239	.212	.265	.250	.144	3
1/4	8	.270	.240	.277	.260	.160	3
Tolerance on Length		Up to 1 in. incl.: -0, +0.060				Over 1 in.: -0, +0.100	
In the abscence of a single industry standard for Deck Screws, these dimensions are offered as a guide; slight deviations are acceptable.							

NOTE: There is no single standard for deck screw dimensions. These values are offered as a guide; deviations from these specifications may occur.

	Steel	*Stainless*
Description	A bugle head screw with spaced threads, extra sharp point and dacrotized finish.	A bugle head screw with spaced threads and extra sharp point, manufactured of corrosion-resistant stainless steel.
Applications/ Advantages	Designed specifically for joining pieces of pressure treated lumber. Provides corrosion resistance superior to phosphate-coated drywall screws without discoloring the wood. The square drive recess is preferred by some for its excellent torque transmission and resistance to cam-out problems.	Designed specifically for joining pieces of pressure treated lumber. Remains resistant to corrosion for approximately twice as long as do dacrotized steel deck screws.
Material	AISI 1018 or equivalent steel	18-8 passivated stainless steel
Hardness	HV 550 - 800	Rockwell B 85 - 95
Plating	Steel deck screws have a dacrotized finish.	Stainless deck screws require no additional coating.

DECK SCREWS W/TYPE-17 POINT

Bugle Head Square Recess



Bugle Head Type-17 Deck Screws

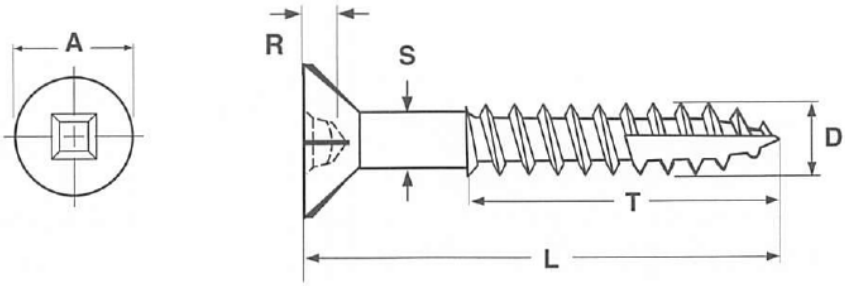
Nominal Size	Threads per Inch	D		A		H		S		G		Square Recess Driver Size
		Major Diameter		Head Diameter		Head Thickness		Square Recess Drive				
								Recess Square		Depth		
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
6	8 to 10	.158	.142	.347	.315	.031	.020	106	.090	.071	.055	1
8	8 to 10	.187	.170	.363	.315	.039	.020	.113	.110	.075	.064	2
10	8	.211	.192	.363	.334	.039	.020	.113	.110	.075	.064	2
12	8	.239	.212	.435	.390	.055	.042	.135	.131	.115	.105	3
1/4	8	.270	.240	.472	.450	.058	.047	.135	.131	.115	.105	3

Tolerance on Length	Up to 1" Incl.	Over 1"
	-0, +0.60	-0, +0.100

In the absence of a single industry standard for Bugle Head Deck Screws, these dimensions are offered as a guide; slight deviations are acceptable.

Description	A countersunk head screw with a flat top surface, a concave underhead bearing surface with spaced threads. The final 2 to 3 threads taper to an extra sharp point with a chip cavity cut out of approximately 25% of that tapered section.
Applications/ Advantages	Designed specifically for joining pieces of pressure treated lumber. Remains resistant to corrosion for approximately twice as long as do dacrotized steel deck screws. The chip cavity assists in the driving process
Material	18-8 stainless steel
Hardness	Rockwell B 85 - 95
Plating	Stainless deck screws require no additional coating.

Flat Hd w/Nibs, Square Recess DECK SCREWS W/TYPE-17 POINT

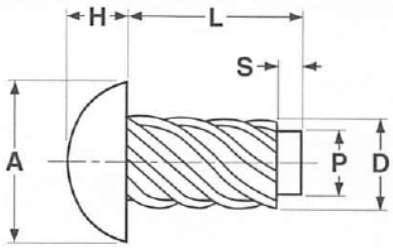


FLAT HD W/NIBS, SQUARE RECESS DECK SCREW WITH TYPE-17 POINT								
Nominal Diameter	A		R		D		S	Recess Size
	Head Diameter		Recess Depth		Major Thread Diameter		Shoulder Diameter	
	Max	Min	Max	Min	Max	Min	Ref	
8	0.311	0.286	0.075	0.064	0.177	0.157	0.124	2
9	0.336	0.308	0.075	0.064	0.177	0.169	0.126	2
10	0.378	0.341	0.075	0.064	0.199	0.186	0.137	2

Tolerance on Length	Up to 1.25"	+0 / -0.05
	Over 1.25 to 2.5"	+0 / -0.07
	Over 2.5 to 4"	+0 / -0.10

Description	An externally threaded fastener with a countersunk head, square socket recess and a single lead thread. The bearing surface of the countersink has several equidistant nibs running down the underside of the head from the top, outer edge. The shank has a full body diameter and a chip cavity cut out where the final several threads end at the tip.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The chip cavity (or auger point) enables the fastener to drive—especially in denser woods—without pre-drilling a pilot hole.
Material	18-8 Stainless steel
Plating	Stainless Deck screws have a commercial passivation.

DRIVE SCREWS — Type U



Drive Screws - Round Head Type U

ASME B18.6.3-2013

Nominal Screw Size	Number of Thread Starts	D Outside Diameter Max	D Outside Diameter Min	A Head Diameter Max	A Head Diameter Min	H Head Height Max	H Head Height Min	P Pilot Diameter Max	P Pilot Diameter Min	Recommended Hole Size: Drill Size No.	Recommended Hole Size: Hole Diameter
00	6	.060	.057	.099	.090	.034	.026	.049	.046	55	.052
0	6	.075	.072	.127	.118	.049	.041	.063	.060	51	.067
2	8	.100	.097	.162	.146	.069	.059	.083	.080	44	.086
3 •	8	.108	.104	.187	.169	.078	.067	.090	.086	41	.096
4	7	.116	.112	.211	.193	.086	.075	.096	.092	37	.104
5 •	7	.128	.124	.236	.217	.095	.083	.106	.102	35	.110
6	7	.140	.136	.260	.240	.103	.091	.116	.112	31	.120
7	8	.154	.150	.285	.264	.111	.099	.126	.122	29	.136
8	8	.167	.162	.309	.287	.120	.107	.136	.132	27	.144
10	8	.182	.177	.359	.334	.137	.123	.150	.146	20	.161
12	8	.212	.206	.408	.382	.153	.139	.177	.173	11	.191
14	9	.242	.236	.457	.429	.170	.155	.202	.198	2	.221

L	Nominal Screw Length	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1" and over
Tolerance on Length		±0.02	±0.02	±0.02	±0.02	±0.02	±0.03	±0.03	±0.03	±0.03
S	Pilot Length	.047	.047	.047	.047	.062	.062	.078	.078	.125

NOTE: Dimensions for #3 & #5 Drive screws are independent of the ASME B18.6.3 standard.

Description	Round head metallic drive screw having multiple start threads of large helix angle, with a pivot.		
Applications/ Advantages	For making permanent fastenings in metals and plastics, when forced into the work under pressure.		
Material	*Steel*	*Stainless*	
	AISI 1016 - 1024 or equivalent steel	18-8 Stainless Steel	316 Stainless Steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.	-	-
Case Hardness	Rockwell C 45 minimum	Hardness: Rockwell B 85 - 95 (approximate)	Hardness: Rockwell B 85 - 95 (approximate)
Core Hardness	Rockwell C 28-38		
Case Depth	No. 2 through 6 diameter: .002 - .007 No. 7 through 12 diameter: .004 - .009 No. 14 diameter: .006 - .011	-	-
For Use In	Drive screws shall produce mating threads without shearing of threads or fracture of the screw when driven into properly sized holes in test plates having a Rockwell hardness of B70 to B85.	Not recommended for use in materials of a hardness greater than Rockwell B 65.	Not recommended for use in materials of a hardness greater than Rockwell B 65.
Plating	See Appendix-A for plating information.	Parts are typically supplied without secondary finishes.	Parts are typically supplied without secondary finishes.

MACHINE SCREWS

Head Style Reference Chart 76

Drive Type Reference Chart 77

Head & Drive Dimensions

Flat 82°, Phillips & Slotted 78
Flat Undercut, Phillips & Slotted 79
Six-Lobe Flat 80
Six-Lobe Flat Undercut 80
Flat 100°, Phillips & Slotted 81
Combination Truss 81
Pan, Phillips & Slotted 82
Combination Pan 82
Combination Round 83
Combination Hex Washer 83
Round, Phillips & Slotted 84
Phillips Binding 84
Slotted Binding Undercut 85
Truss, Phillips & Slotted 85
Oval, Phillips & Slotted 86
Oval Undercut, Phillips & Slotted 87
Hex, Slotted and Unslotted 88
Hex Washer, Slotted and Unslotted 88
Hex Washer, Phillips 89
Serrated Hex Washer, Slotted & Unslotted 89
Fillister, Phillips & Slotted 90
Six-Lobe Pan 90
Pozidriv® Flat 91
Pozidriv® Pan 91
Square Flat 92
Square Pan 92
Six-Lobe Flat 100° 93
Phillips Round Washer 93
Flat 100° Undercut Phillips 94
Six-Lobe Truss 94
Combination Binding 95
Combination Flat 95
Serrated Truss, Phillips & Slotted 96

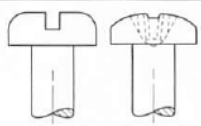
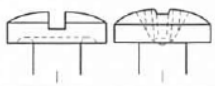
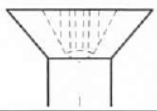
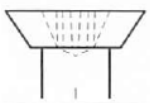
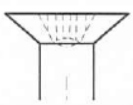
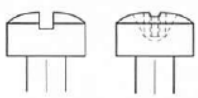
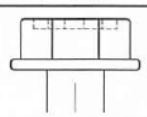
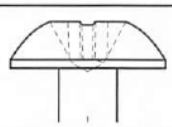
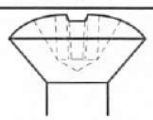
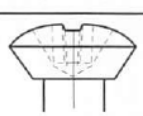
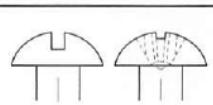
Thread & Hole Dimensions;
Mechanical & Performance Requirements

Double Washer SEMS 97
Machine Screws 98
SEMS 100
SEMS Washer Dimensions 101
Machine Screws with Dog Point, H/W Head 103

Thread Gaging Notes 104

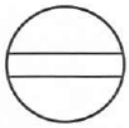
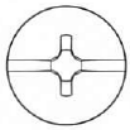
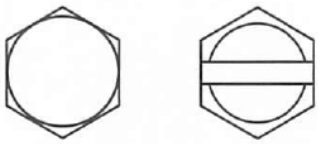
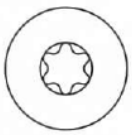
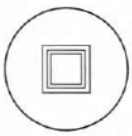
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HEAD STYLES

Schematic	Head Style	Description	Applications / Advantages
	Pan	Slotted pan heads have a flat or gently rounded top surface, cylindrical sides and a flat bearing surface. Phillips and Six-Lobe pan heads have a rounded top, cylindrical sides and a flat bearing surface.	Has a general purpose bearing area. Can be substituted in most applications for round, truss or binding heads.
	Binding	Has a round top surface and slightly tapered sides. The bearing surface is flat with the slotted variety having an annular undercut adjacent to the shank.	Preferred design for making a firm electrical connection.
	Flat 82	A countersunk head with a flat top surface and a cone-shaped bearing surface with a head angle of approximately 82°.	Used in applications where protrusion of the fastener above the mating surface is unacceptable. Use a protrusion gage when measuring head height.
	Flat Undercut	Similar to an 82° flat head except that the head is undercut to 70% of its normal side height.	Standard for short lengths because it allows greater length of threads. Also avoids transition fillet and assembly interference.
	Flat 100°	A countersunk head with a flat top sufrace and a cone-shaped bearing surface with a head angle of approximately 100°.	Preferred over an 82° flat head when fastening in soft materials--the 100° countersunk head distributes pressure over a larger surface area.
	Fillister	Has a rounded top surface, cylindrical sides, and a flat bearing surface. The greater side height is what distinguishes a fillister head from a pan head.	Preferred style for use in counterbored holes.
	Indented Hex	Has an indented top surface, six flat sides, and a flat bearing surface.	Preferred in high volume assembly where pneumatic equipment is used to drive the screw. Can transmit significantly higher tightening torque levels than other head styles.
	Indented Hex Washer	Has an indented top surface, six flat sides and a flat washer which projects beyond the sides and provides a flat bearing surface. The washer and hex head are formed together as one piece.	Offers greater protection to the mating surface than a standard indented hex head. Increased bearing area reduces the likelihood of crushing mating surfaces.
	Truss	Has a low rounded top surface with a flat bearing surface greater in area than a round-head screw of the same nominal size.	Weaker than pan or round heads but preferred in applications where minimal clearance exists above the head. Truss profile provides a trim, finished assembly appearance.
	Oval	A countersunk head with a rounded top surface and a cone-shaped bearing surface of approximately 82°	Preferred over a flat head in conical applications, or when a more decorative finished look is desired. The countersunk surface nests into mating countersunk application sites.
	Oval Undercut	Similar to an 82° oval head except that the head is undercut to 70% of its normal side height.	Standard for short lengths because it allows greater length of threads.
	Round	Has a semi-elliptical top surface and a flat bearing surface.	Sometimes preferred over pan head for its smooth surface and appearance.

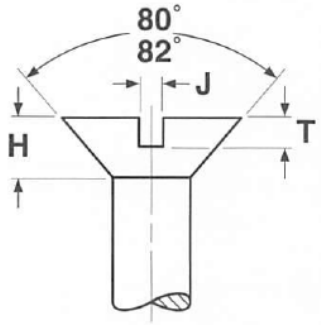
DRIVE TYPES

Drive Types for Machine Screws

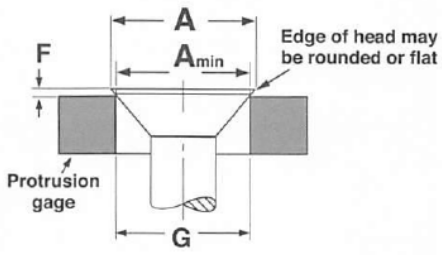
Schematic	Drive Type	Uses
	Phillips	Most recommended drive type. Provides good control in driving. Always use a driver bit in good condition.
	Slotted	Accepts standard blade screwdrivers. Requires less downward pressure to drive slotted parts than it does those with cross-recessed openings. Use proper fitting blade to minimize slippage.
	Combination: Phillips/Slotted	Accepts phillips and standard blade screwdrivers. Often used when fastener is expected to be driven and backed-out several times.
	Hex / Slotted-Hex	Accepts hex wrench. Slotted drive is added to make it easier to remove the fastener.
	Six-Lobe	Positive-engaging, fast-locating method of transmitting torque and optimizing worker efficiency.
	Pozidriv -Alternative (Type 1A)	Design offers even greater control in driving than Phillips drive. Used in automotive and appliance manufacturing.
	Square Recess	Increases productivity with excellent torque transmission and resists cam-out. Distinctive appearance which discourages tinkering.

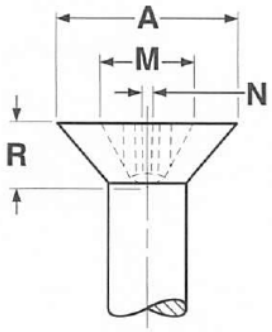
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HEAD DIMENSIONS — 82° Flat



Slotted





Phillips

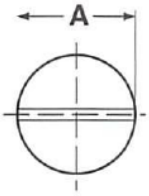
FLAT HEADS FOR MACHINE SCREWS

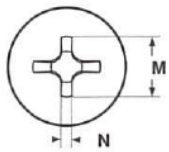
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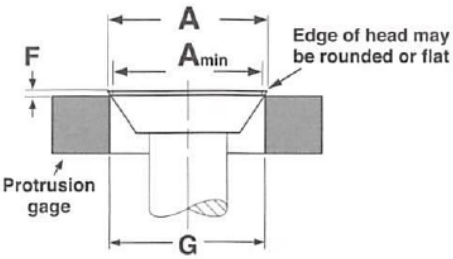
Nominal Size	A		H		J		T		M	R	N	F		G	Phillips Driver Size
	Head Dimensions				Slot Dimensions				Recess Dimensions			Protrusion Above Gaging Diameter		Gaging Diameter	
	Diameter		Height		Width		Depth		Diam.	Depth	Width				
	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Ref	Ref	Max	Min		
0	.112	.096	.035	.026	.023	.016	.015	.010	.062	.035	.014	.026	.016	.078	0
1	.137	.120	.043	.033	.026	.019	.019	.012	.070	.043	.015	.028	.016	.101	0
2	.162	.144	.051	.040	.031	.023	.023	.015	.096	.055	.017	.029	.017	.124	1
3	.187	.167	.059	.047	.035	.027	.027	.017	.100	.060	.018	.031	.018	.148	1
4	.212	.191	.067	.055	.039	.031	.030	.020	.122	.081	.018	.032	.019	.172	1
5	.237	.215	.075	.062	.043	.035	.034	.022	.148	.074	.027	.034	.020	.196	2
6	.262	.238	.083	.069	.048	.039	.038	.024	.168	.094	.029	.036	.021	.220	2
8	.312	.285	.100	.084	.054	.045	.045	.029	.182	.110	.030	.039	.023	.267	2
10	.362	.333	.116	.098	.060	.050	.053	.034	.198	.124	.032	.042	.025	.313	2
12	.412	.380	.132	.112	.067	.056	.060	.039	.262	.144	.035	.045	.027	.362	3
1/4	.477	.442	.153	.131	.075	.064	.070	.046	.276	.160	.036	.050	.029	.424	3
5/16	.597	.556	.191	.165	.084	.072	.088	.058	.358	.205	.061	.057	.034	.539	4
3/8	.717	.670	.230	.200	.094	.081	.106	.070	.386	.234	.065	.065	.039	.653	4
1/2	.815	.765	.223	.186	.106	.091	.103	.065	.418	.265	.069	.081	.049	.739	4

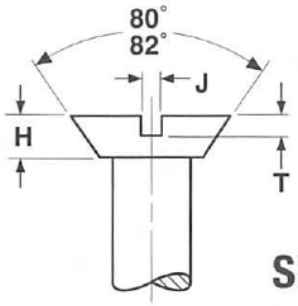
Flat Undercut

HEAD DIMENSIONS

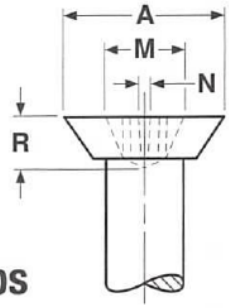








Slotted



Phillips

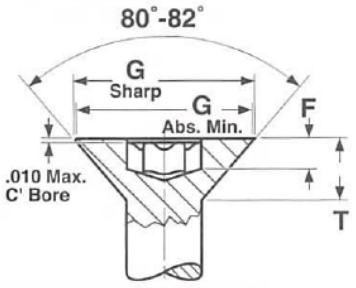
UNDERCUT FLAT HEADS FOR MACHINE SCREWS

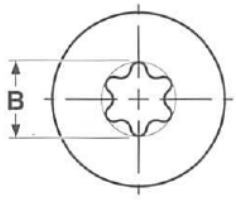
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Nominal Size	L	A		H		J		T		M	R	N	F		G	Phillips Driver Size
	These Lengths or Shorter are Undercut	Head Dimensions				Slot Dimensions				Recess Dimensions			Protrusion Above Gaging Diameter		Gaging Diameter	
		Diameter		Height		Width		Depth		Diam.	Depth	Width				
		Max	Min	Max	Min	Max	Min	Max	Min	Ref	Ref	Ref	Max	Min		
0	1/8	.112	.096	.025	.018	.023	.016	.011	.007	.062	.035	.014	-	-	-	0
1	1/8	.137	.120	.031	.023	.026	.019	.014	.009	.070	.043	.015	-	-	-	0
2	1/8	.162	.144	.036	.028	.031	.023	.016	.011	.088	.048	.017	.029	.017	.124	1
4	3/16	.212	.191	.047	.038	.039	.031	.022	.014	.110	.070	.018	.032	.019	.172	1
5	3/16	.237	.215	.053	.043	.043	.035	.024	.016	.122	.081	.018	.034	.020	.196	1
6	3/16	.262	.238	.059	.048	.048	.039	.027	.017	.140	.066	.025	.036	.021	.220	2
8	1/4	.312	.285	.070	.058	.054	.045	.032	.021	.168	.094	.029	.039	.023	.267	2
10	5/16	.362	.333	.081	.068	.060	.050	.037	.024	.182	.110	.030	.042	.025	.313	2
12	3/8	.412	.380	.092	.078	.067	.056	.043	.028	.226	.110	.030	.045	.027	.362	3
1/4	7/16	.477	.442	.107	.092	.075	.064	.050	.032	.244	.124	.032	.050	.029	.424	3
5/16	1/2	.597	.556	.134	.116	.084	.072	.062	.041	.310	.157	.053	.057	.034	.539	4
3/8	9/16	.717	.670	.161	.140	.094	.081	.075	.049	.358	.205	.061	.065	.039	.653	4
1/2	3/4	.815	.765	.156	.130	.106	.091	.072	.046	.402	.252	.068	.081	.049	.739	4

HEAD DIMENSIONS

Six-Lobe Flat
Six-Lobe Flat Undercut

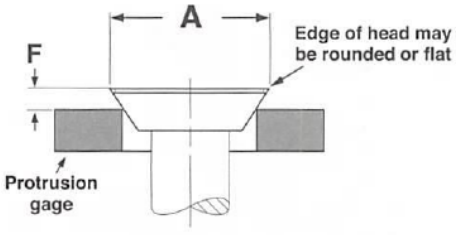


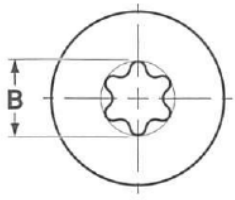


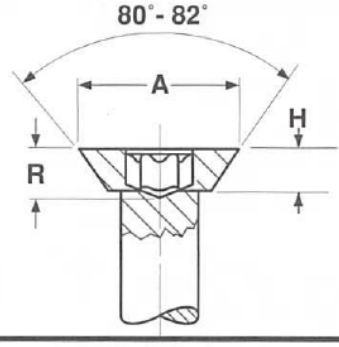
SIX-LOBE DRIVE FLAT HEADS

ASME B18.6.3-2013

Nominal Size	G		T	B	F	Fallaway	Driver Size
	Head Diameter		Head Height	Recess Diameter	Gauge Penetration		
	Max	Min	Ref	Ref	Min	Max	
2	.162	.144	.051	.069	.017	.014	T6
4	.212	.191	.067	.094	.028	.019	T8
5	.237	.215	.075	.111	.035	.022	T10
6	.262	.238	.083	.111	.035	.022	T10
8	.312	.285	.100	.132	.040	.026	T15
10	.362	.333	.116	.155	.050	.031	T20
12	.412	.380	.132	.178	.055	.036	T25
1/4	.477	.442	.153	.200	.075	.040	T27
5/16	.597	.556	.191	.266	.087	.047	T40
3/8	.717	.670	.230	.266	.115	.047	T40





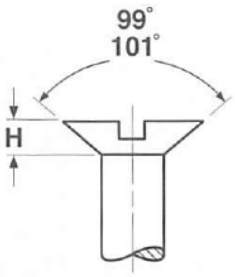


SIX-LOBE DRIVE FLAT UNDERCUT HEADS

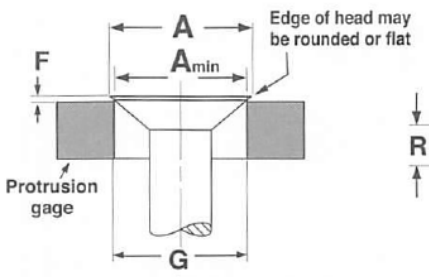
Camcar

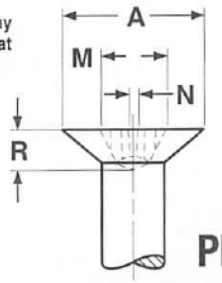
Nominal Size	A		H		B	F		R	Six-Lobe Driver Size
	Head Diameter		Head Height		Recess Diameter	Protrusion Above Gauging Diameter		Recess Penetration Gaging Depth	
	Max	Min	Max	Min	Ref	Max	Min	Min	
2	.172	.146	.036	.028	.069	.029	.017	.019	T6
4	.225	.195	.047	.038	.094	.032	.019	.020	T8
6	.279	.244	.059	.048	.111	.036	.021	.024	T10
8	.332	.292	.070	.058	.132	.039	.023	.035	T15
10	.385	.340	.081	.068	.155	.042	.025	.045	T20
12	.438	.389	.092	.078	.178	.045	.027	.050	T25
1/4	.507	.452	.107	.092	.200	.050	.029	.055	T27

100° Flat Combo Truss HEAD DIMENSIONS



Slotted



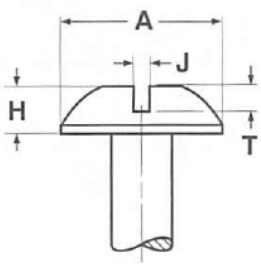


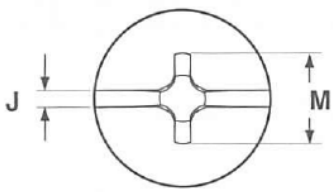
Phillips

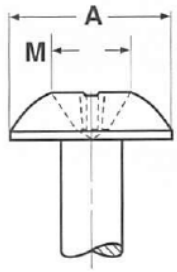
FLAT HEAD 100° FOR MACHINE SCREWS

ASME B18.6.3-2013

Nominal Size	A		H		J		T		M	R	N	F		G	Phillips Driver Size
	Head Dimensions				Slot Dimensions				Recess Dimensions			Protrusion Above Gaging Diameter		Gaging Diameter	
	Diameter		Height		Width		Depth		Diam.	Depth	Width				
	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Ref	Ref	Max	Min		
0	.112	.095	.026	.019	.023	.016	.013	.008	.054	.027	.013	.020	.012	.074	0
2	.162	.142	.037	.029	.031	.023	.019	.012	.088	.048	.012	.022	.014	.121	1
4	.212	.188	.049	.039	.039	.031	.024	.017	.110	.070	.018	.025	.016	.167	1
6	.262	.235	.060	.049	.048	.039	.030	.022	.148	.074	.027	.028	.017	.214	2
8	.312	.282	.072	.060	.054	.045	.036	.027	.162	.090	.028	.031	.019	.261	2
10	.362	.329	.083	.070	.060	.050	.042	.031	.178	.104	.030	.034	.021	.307	2
12	.438	.375	.095	.080	-	-	.050	.039	-	-	-	.037	.023	-	3
1/4	.477	.437	.110	.094	.075	.064	.055	.042	.240	.124	.033	.040	.025	.415	3
5/16	.597	.550	.138	.118	.084	.072	.069	.053	.310	.157	.053	.047	.030	.526	4







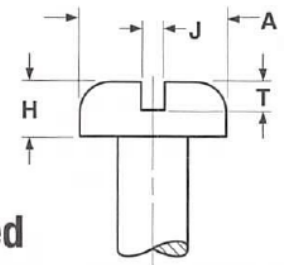
COMBINATION DRIVE TRUSS HEADS FOR MACHINE SCREWS

ASME B 18.6.3-2013

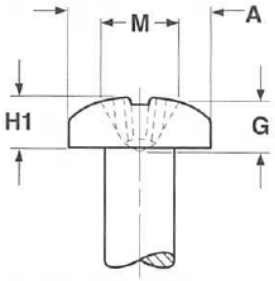
Nominal Size	A		H		J		T		M	Recess Penetration Gaging Depth		Phillips Driver Size
	Head Diameter		Height of Head		Width of Slot		Depth of Slot		Recess Diameter			
	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Max	Min	
4	.257	.241	.069	.059	.039	.031	.040	.027	.105	.062	.044	1
6	.321	.303	.086	.074	.048	.039	.050	.033	.151	.073	.048	2
8	.384	.364	.102	.088	.054	.045	.058	.040	.166	.088	.063	2
10	.448	.425	.118	.103	.060	.050	.068	.048	.181	.104	.079	2
12	.511	.487	.134	.118	.067	.056	.077	.055	.241	.111	.086	3
1/4	.573	.546	.150	.133	.075	.064	.087	.063	.256	.126	.101	3

HEAD DIMENSIONS

Pan
Combo Pan



Slotted

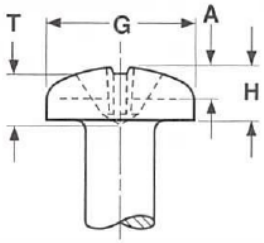


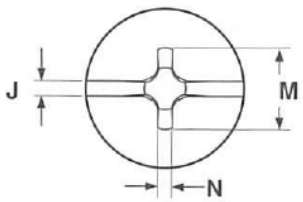
Phillips

PAN HEADS FOR MACHINE SCREWS AND SEMS

ASME B18.6.3-2013

Nominal Size	A		H		H1		J		T		M	G		Phillips Driver Size
	Head Diameter		Height of Head				Width of Slot		Depth of Slot		Dimensions of Recess			
			Slotted		Recessed						Diameter	Recess Penetration Gaging Depth		
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Max	Min	
0	.116	.104	.039	.031	.044	.036	.023	.016	.022	.014	.060	.032	.014	0
2	.167	.155	.053	.045	.062	.053	.031	.023	.031	.022	.097	.052	.034	1
3	.193	.180	.060	.051	.071	.062	.035	.027	.036	.026	.105	.061	.043	1
4	.219	.205	.068	.058	.080	.070	.039	.031	.040	.030	.115	.071	.053	1
5	.245	.231	.075	.065	.089	.079	.043	.035	.045	.034	.152	.072	.046	2
6	.270	.256	.082	.072	.097	.087	.048	.039	.050	.037	.159	.080	.055	2
8	.322	.306	.096	.085	.115	.105	.054	.045	.058	.045	.175	.097	.071	2
10	.373	.357	.110	.099	.133	.122	.060	.050	.068	.053	.192	.113	.089	2
12	.425	.407	.125	.112	.151	.139	.067	.056	.077	.061	.252	.124	.098	3
1/4	.492	.473	.144	.130	.175	.162	.075	.064	.087	.070	.274	.144	.118	3
5/16	.615	.594	.178	.162	.218	.203	.084	.072	.106	.085	.343	.173	.149	4
3/8	.740	.716	.212	.195	.261	.244	.094	.081	.124	.100	.382	.213	.190	4
1/2	.987	.958	.281	.260	.348	.325	.106	.091	.161	.131	.428	.260	.235	4



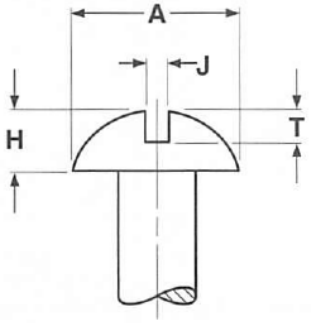


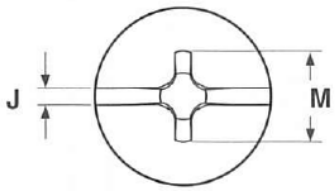
COMBINATION DRIVE PAN HEADS FOR MACHINE SCREWS

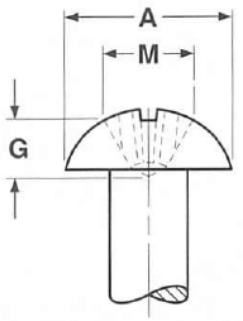
ASME B18.6.3-2013

Nominal Screw Size	G		H		J		A		M		T		N			Driver Size
	Head Dimensions				Slot Dimensions				Recess Dimensions					Recess Penetration		
	Head Diameter		Head Height		Width		Depth		Diameter		Depth		Recess Width			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Min	Max	Min	
4	.219	.205	.080	.070	.039	.031	.040	.027	.122	.109	.078	.060	.019	.071	.053	1
6	.270	.256	.097	.087	.048	.039	.050	.033	.166	.153	.091	.066	.028	.080	.055	2
8	.322	.306	.115	.105	.054	.045	.058	.041	.182	.169	.108	.082	.030	.097	.071	2
10	.373	.357	.133	.122	.060	.050	.068	.048	.199	.186	.124	.100	.031	.113	.089	2
12	.425	.407	.151	.112	.067	.056	.077	.055	.259	.246	.141	.115	.034	.124	.098	3
1/4	.492	.473	.175	.162	.075	.064	.087	.063	.281	.268	.161	.135	.036	.144	.118	3
5/16	.615	.594	.218	.203	.084	.072	.106	.076	.350	.337	.193	.169	.059	.173	.149	4

Combo Round & Combo Hex Washer HEAD DIMENSIONS



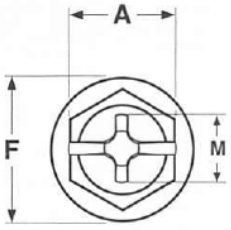


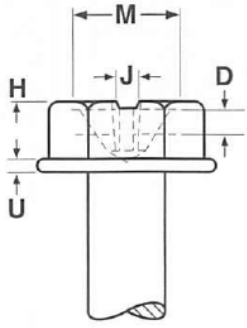


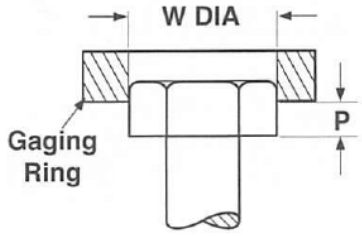
Combination Round Heads

ASME B18.6.3- 2013

Nominal Size	A Head Diameter		H Head Height		J Slot Width		T Slot Depth		M Recess Diameter	Recess Penetration Gaging Depth		Phillips Driver Size
	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Max	Min	
6	.260	.240	.103	.091	.048	.039	.068	.051	.155	.073	.045	2
8	.309	.287	.120	.107	.054	.045	.077	.058	.171	.090	.064	2
10	.359	.334	.137	.123	.060	.050	.087	.065	.188	.108	.082	2
1/4	.472	.443	.175	.160	.075	.064	.109	.082	.261	.130	.104	3
5/16	.590	.557	.216	.198	.084	.072	.132	.099	.301	.170	.144	3
3/8	.708	.670	.256	.237	.094	.081	.155	.117	.380	.208	.182	4







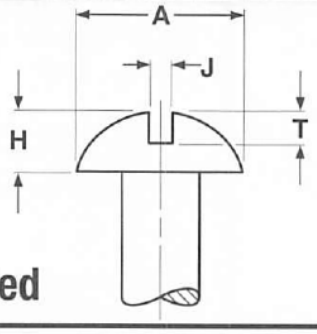
Combination Hex Washer Heads

ASME B18.6.3- 2013

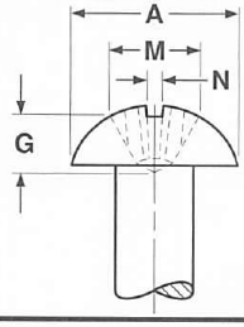
Nom Size	A Width Across Flats		H Head Height		F Washer Diameter		U Washer Thickness		J Slot Width		D Slot Depth		P Protrusion Beyond Gaging Ring	M Recess Diameter	Recess Penetrating Gaging Depth		Phillips Driver Size
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Min	Ref	Max	Min	
6	.250	.244	.093	.080	.328	.302	.025	.015	.048	.039	.053	.033	.048	.148	.089	.064	2
8	.250	.244	.110	.096	.348	.322	.031	.019	.054	.045	.074	.052	.058	.168	.115	.090	2
10	.312	.305	.120	.105	.414	.384	.031	.019	.060	.050	.080	.057	.063	.178	.127	.102	2
12	.312	.305	.155	.139	.432	.398	.039	.022	.067	.056	.103	.077	.083	.247	.152	.127	3
1/4	.375	.367	.190	.172	.520	.480	.050	.030	.075	.064	.111	.083	.103	.277	.186	.161	3

HEAD DIMENSIONS

Round Phillips Binding



Slotted

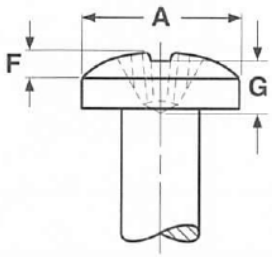


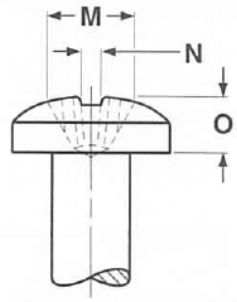
Phillips

Round Heads for Machine Screws

ASME B18.6.3 2013

Nominal Size	A		H		J		T		M		G	N	Phillips Driver Size
	Head Diameter		Height of Head		Width of Slot		Depth of Slot		Dimensions of Recess				
									Diameter		Depth	Width	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
2	.162	.146	.069	.059	.031	.023	.048	.037	.100	.087	.053	.017	1
3	.187	.169	.078	.067	.035	.027	.053	.040	.109	.096	.062	.018	1
4	.211	.193	.086	.075	.039	.031	.058	.044	.118	.105	.072	.019	1
5	.236	.217	.095	.083	.043	.035	.063	.047	.154	.141	.074	.027	2
6	.260	.240	.103	.091	.048	.039	.068	.051	.162	.149	.084	.027	2
8	.309	.287	.120	.107	.054	.045	.077	.058	.178	.165	.101	.030	2
10	.359	.334	.137	.123	.060	.050	.087	.065	.195	.182	.119	.031	2
12	.408	.382	.153	.139	.067	.056	.096	.073	.249	.236	.125	.032	3
1/4	.472	.443	.175	.160	.075	.064	.109	.082	.268	.255	.147	.034	3
5/16	.590	.557	.216	.198	.084	.072	.132	.099	.308	.295	.187	.040	3
3/8	.708	.670	.256	.237	.094	.081	.155	.117	.387	.374	.228	.064	4
1/2	.813	.766	.355	.332	.106	.091	.211	.159	.416	.403	.256	.068	4



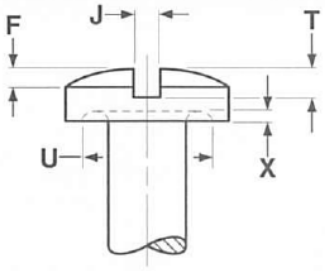


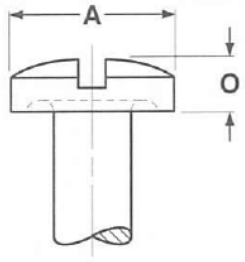
Phillips Binding Heads for Machine Screws

ASME B18.6.3-2013

Nominal Size	A		O		F		M		G		N	Phillips Driver Size
	Head Diameter		Total Head Height		Head Oval Height		Recess Diameter		Recess Depth		Recess Width	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Min	
2	.181	.171	.050	.043	.018	.013	.100	.087	.058	.041	.017	1
4	.235	.223	.068	.061	.025	.018	.118	.105	.077	.059	.017	1
6	.290	.275	.087	.078	.032	.024	.160	.147	.088	.064	.026	2
8	.344	.326	.105	.095	.039	.029	.186	.173	.114	.090	.028	2
10	.399	.378	.123	.112	.045	.034	.205	.192	.134	.109	.029	2
1/4	.525	.498	.165	.152	.061	.046	.281	.268	.164	.140	.046	3

Slotted Binding Truss HEAD DIMENSIONS

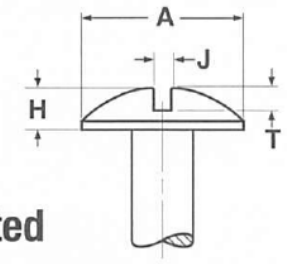




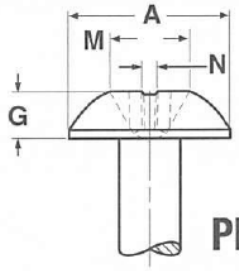
SLOTTED BINDING HEADS UNDERCUT FOR MACHINE SCREWS

ASME B18.6.3 2013

Nominal Size	A		F		O		J		T		U		X	
	Head Diameter		Height of Head				Width of Slot		Depth of Slot		Dimensions of Undercut			
			Height of Oval		Total Height						Diameter		Depth	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
2	.181	.171	.018	.013	.050	.043	.031	.023	.030	.020	.141	.124	.010	.005
3	.208	.197	.022	.016	.059	.052	.035	.027	.036	.025	.162	.143	.011	.006
4	.235	.223	.025	.018	.068	.061	.039	.031	.042	.030	.184	.161	.012	.007
5	.263	.249	.029	.021	.078	.069	.043	.035	.048	.035	.205	.180	.014	.009
6	.290	.275	.032	.024	.087	.078	.048	.039	.053	.040	.226	.199	.015	.010
8	.344	.326	.039	.029	.105	.095	.054	.045	.065	.050	.269	.236	.017	.012
10	.399	.378	.045	.034	.123	.112	.060	.050	.077	.060	.312	.274	.020	.015
12	.454	.430	.052	.039	.141	.130	.067	.056	.089	.070	.354	.311	.023	.018
1/4	.525	.498	.061	.046	.165	.152	.075	.064	.105	.084	.410	.360	.026	.021



Slotted



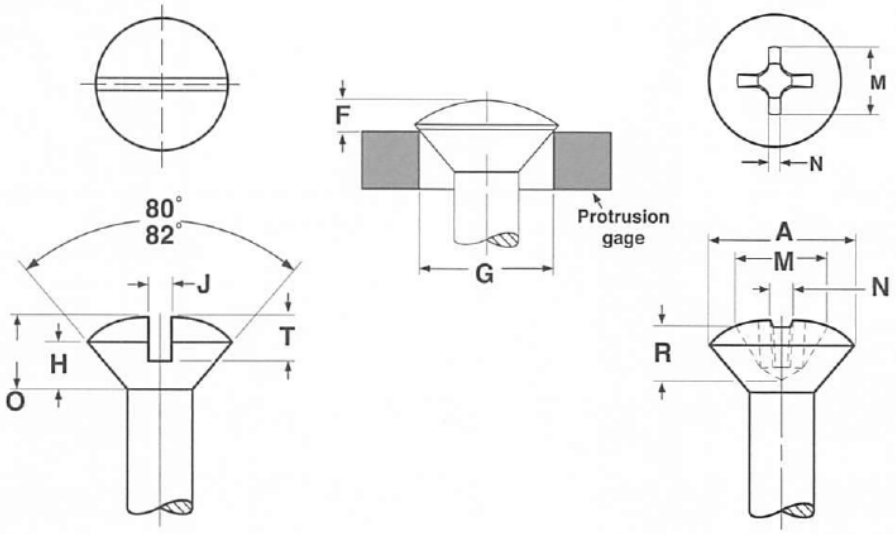
Phillips

TRUSS HEADS FOR MACHINE SCREWS

ASME B18.6.3-2013

Nominal Size	A		H		J		T		M	G		Phillips Driver Size
	Head Diameter		Height of Head		Width of Slot		Depth of Slot		Recess Diameter	Recess Penetration Gaging Depth		
	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Max	Min	
2	.194	.180	.053	.044	.031	.023	.031	.022	.097	.052	.034	1
3	.226	.211	.061	.051	.035	.027	.036	.026	.103	.059	.042	1
4	.257	.241	.069	.059	.039	.031	.040	.030	.105	.062	.044	1
5	.289	.272	.078	.066	.043	.035	.045	.034	.121	.078	.060	1
6	.321	.303	.086	.074	.048	.039	.050	.037	.151	.073	.048	2
8	.384	.364	.102	.088	.054	.045	.058	.045	.166	.088	.063	2
10	.448	.425	.118	.103	.060	.050	.068	.053	.181	.104	.079	2
12	.511	.487	.134	.118	.067	.056	.077	.061	.241	.111	.086	3
1/4	.573	.546	.150	.133	.075	.064	.087	.070	.256	.126	.101	3
5/16	.698	.666	.183	.162	.084	.072	.106	.085	.345	.173	.148	4
3/8	.823	.787	.215	.191	.094	.081	.124	.100	.376	.206	.182	4
1/2	1.073	1.028	.280	.250	.106	.091	.161	.131	.437	.268	.243	4

HEAD DIMENSIONS — Oval



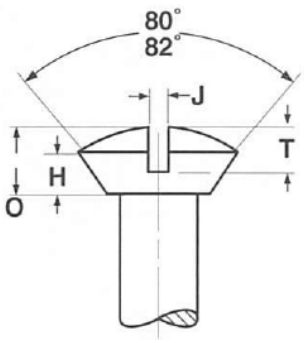
Slotted **Phillips**

OVAL HEADS FOR MACHINE SCREWS

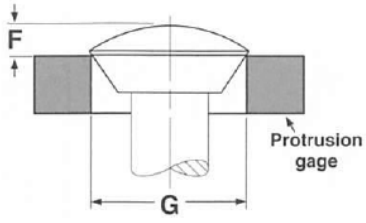
ASME B18.6.3-2013

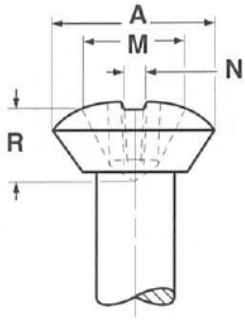
Nominal Size	A		H	O	J		T		M	R	N	F		G	Phillips Driver Size
	Head Diameter		Height of Head		Slot Dimensions				Recess Dimensions			Protrusion Above Gaging Diameter		Gaging Diameter	
			Side	Total	Width		Depth		Diam.	Depth	Width				
	Max	Min	Max	Max	Max	Min	Max	Max	Ref	Ref	Ref	Max	Min		
0	.112	.096	.035	.056	.023	.016	.030	.025	.068	.036	.014	.047	.031	.078	0
1	.137	.120	.043	.068	.026	.019	.038	.031	.070	.039	.015	.053	.035	.101	0
2	.162	.144	.051	.080	.031	.023	.045	.037	.106	.060	.018	.058	.039	.124	1
3	.187	.167	.059	.092	.035	.027	.052	.043	.118	.072	.019	.064	.044	.148	1
4	.212	.191	.067	.104	.039	.031	.059	.049	.130	.086	.019	.069	.048	.172	1
5	.237	.215	.075	.116	.043	.035	.067	.055	.152	.073	.028	.075	.053	.196	2
6	.262	.238	.083	.128	.048	.039	.074	.060	.172	.092	.030	.080	.057	.220	2
8	.312	.285	.100	.152	.054	.045	.088	.072	.186	.107	.031	.091	.066	.267	2
10	.362	.333	.116	.176	.060	.050	.103	.084	.202	.125	.033	.102	.075	.313	2
12	.412	.380	.132	.200	.067	.056	.117	.096	.264	.140	.038	.113	.084	.362	3
1/4	.477	.442	.153	.232	.075	.064	.136	.112	.284	.160	.040	.129	.095	.424	3
5/16	.597	.556	.191	.290	.084	.072	.171	.141	.384	.226	.065	.155	.117	.539	4
3/8	.717	.670	.230	.347	.094	.081	.206	.170	.404	.245	.068	.182	.139	.653	4
7/16	.760	.715	.223	.345	.094	.081	.210	.174	.416	.257	.070	.195	.150	.690	4
1/2	.815	.765	.223	.354	.106	.091	.216	.176	.430	.271	.071	.212	.163	.739	4

Oval Undercut HEAD DIMENSIONS



Slotted





Phillips

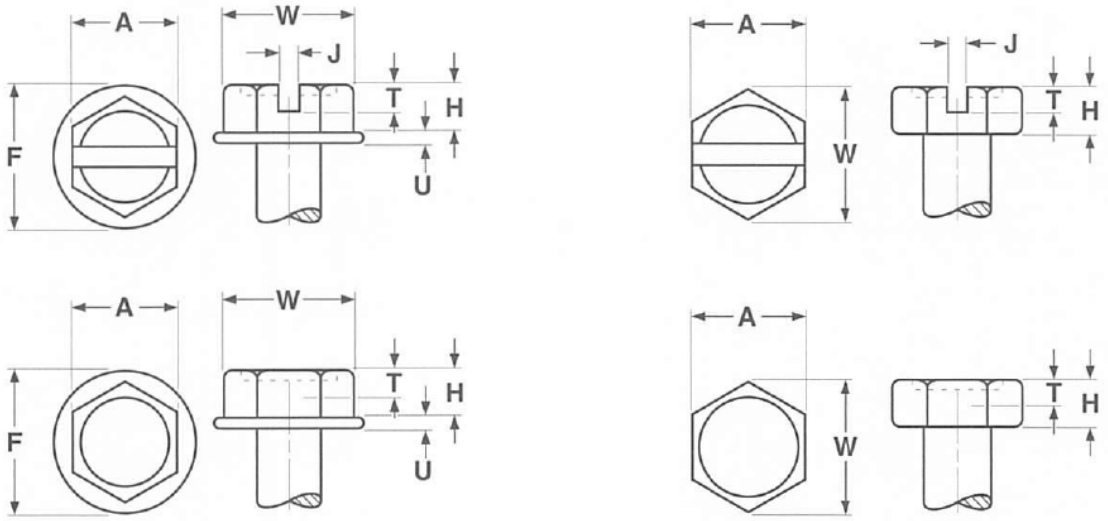
UNDERCUT OVAL HEADS FOR MACHINE SCREWS

ASME B18.6.3-2013

Nominal Size	These Lengths or Shorter are Undercut	A		H	O		J		T		M	R	N	F		G	Phillips Driver Size
		Head Dimensions					Slot Dimensions				Recess Dimensions			Protrusion Above Gaging Diameter		Gaging Diam.	
		Diameter		Side Height	Total Height		Width		Depth		Diam.	Depth	Width				
		Max	Min	Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Max	Min		
0	1/8	0.112	0.096	0.025	0.046	0.033	0.023	0.016	0.028	0.022	0.068	0.036	0.014	0.047	0.031	0.078	0
1	1/8	0.137	0.120	0.031	0.056	0.042	0.026	0.019	0.034	0.027	0.070	0.039	0.015	0.053	0.035	0.101	0
2	1/8	0.162	0.144	0.036	0.065	0.050	0.031	0.023	0.040	0.033	0.106	0.060	0.018	0.058	0.039	0.124	1
3	1/8	0.187	0.167	0.042	0.075	0.059	0.035	0.027	0.047	0.038	0.118	0.072	0.019	0.064	0.044	0.148	1
4	3/16	0.212	0.191	0.047	0.084	0.067	0.039	0.031	0.053	0.043	0.130	0.086	0.019	0.069	0.048	0.172	1
5	3/16	0.237	0.215	0.053	0.094	0.076	0.043	0.035	0.059	0.048	0.152	0.073	0.028	0.075	0.053	0.196	2
6	3/16	0.262	0.238	0.059	0.104	0.084	0.048	0.039	0.065	0.053	0.172	0.092	0.030	0.080	0.057	0.220	2
8	1/4	0.312	0.285	0.070	0.123	0.101	0.054	0.045	0.078	0.064	0.186	0.107	0.031	0.091	0.066	0.267	2
10	5/16	0.362	0.333	0.081	0.142	0.118	0.060	0.050	0.090	0.074	0.202	0.125	0.033	0.102	0.075	0.313	2
12	3/8	0.412	0.380	0.092	0.161	0.135	0.067	0.056	0.103	0.085	0.264	0.140	0.038	0.113	0.084	0.362	3
1/4	7/16	0.477	0.442	0.107	0.186	0.158	0.075	0.064	0.119	0.098	0.284	0.160	0.040	0.129	0.095	0.424	3
5/16	1/2	0.597	0.556	0.134	0.232	0.198	0.084	0.072	0.149	0.124	0.374	0.214	0.064	0.155	0.117	0.539	4
3/8	9/16	0.717	0.670	0.161	0.278	0.239	0.094	0.081	0.179	0.149	0.394	0.233	0.066	0.182	0.139	0.653	4
7/16	5/8	0.760	0.715	0.156	0.279	0.239	0.094	0.081	0.184	0.154	0.404	0.245	0.068	0.195	0.150	0.690	4
1/2	3/4	0.815	0.765	0.156	0.288	0.244	0.106	0.091	0.204	0.169	0.416	0.257	0.070	0.212	0.163	0.739	4

HEAD DIMENSIONS

Hex & Hex Washer Slotted & Unslotted

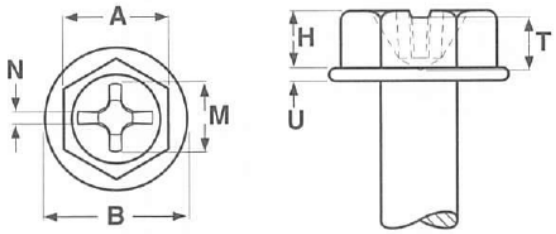


HEX HEADS AND HEX WASHER HEADS FOR MACHINE SCREWS

ASME B18.6.3-2013

Nominal Size	A		W	H		F		U		J		T	
	Width Across Flats		Width Across Corners	Height of Head		Diameter of Washer		Thickness of Washer		Width of Slot		Depth of Slot	
	Max	Min	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
2	.125	.120	.134	.050	.040	.166	.154	.016	.010	-	-	-	-
4	.188	.181	.202	.060	.049	.243	.225	.019	.011	.039	.031	.042	.025
5	.188	.181	.202	.070	.058	.260	.240	.025	.015	.043	.035	.049	.030
6	.250	.244	.272	.093	.080	.328	.302	.025	.015	.048	.039	.053	.033
8	.250	.244	.272	.110	.096	.348	.322	.031	.019	.054	.045	.074	.052
10	.312	.305	.340	.120	.105	.414	.384	.031	.019	.060	.050	.080	.057
12	.312	.305	.340	.155	.139	.432	.398	.039	.022	.067	.056	.103	.077
1/4	.375	.367	.409	.190	.172	.520	.480	.050	.030	.075	.064	.111	.083
5/16	.500	.489	.545	.230	.208	.676	.624	.055	.035	.084	.072	.134	.100
3/8	.562	.551	.614	.295	.270	.780	.720	.063	.037	.094	.081	.168	.131
1/2	.750	.735	.820	.400	.367	1.040	.960	.085	.050	.106	.091	.195	.155

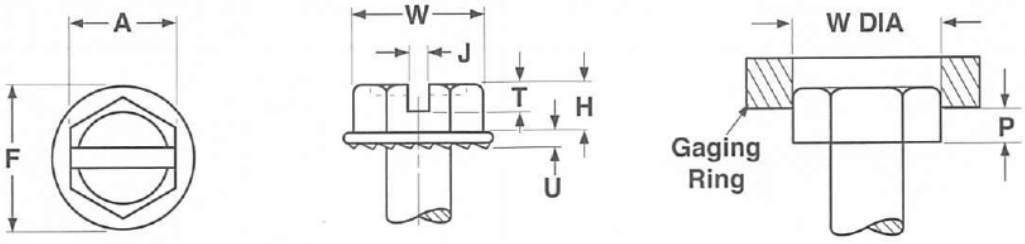
Hex Washer Phillips & Slotted w/ Serrations — HEAD DIMENSIONS



Phillips Hex Washer Heads for Machine Screws

ASME B18.6.3 2013

Nominal Size	A		H		B		U		M	T	N	Protrusion Beyond Gaging Ring	Recess Penetration Gaging Depth		Phillips Driver Size
	Width Across Flats		Head Height		Washer Diameter		Washer Thickness		Recess Diameter	Recess Depth	Recess Width				
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Min		Max	Min	
4	.188	.181	.060	.049	.243	.225	.019	.011	.097	.065	.017	.029	.067	.049	1
6	.250	.244	.093	.080	.328	.302	.025	.015	.148	.088	.026	.048	.089	.064	2
8	.250	.244	.110	.096	.348	.322	.031	.019	.168	.114	.029	.058	.115	.090	2
10	.312	.305	.120	.105	.414	.384	.031	.019	.178	.126	.029	.063	.127	.102	2
12	.312	.305	.155	.139	.432	.398	.039	.022	.247	.157	.033	.083	.152	.127	3
1/4	.375	.367	.190	.172	.520	.480	.050	.030	.277	.191	.034	.103	.186	.161	3

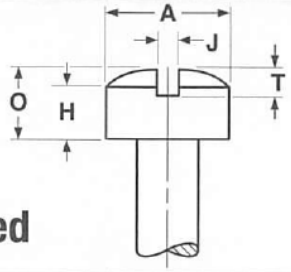


Slotted Hex Washer Heads with Serrations for Machine Screws

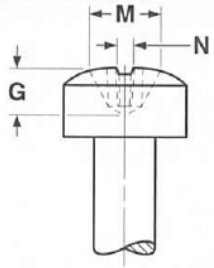
Nominal Size	A		W	H		F		U		J		T		P
	Width Across Flats		Width Across Corners	Head Height		Washer Diameter		Washer Thickness		Slot Width		Slot Depth		Protrusion Beyond Gaging Ring
	Max	Min	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Min
4	.188	.181	.202	.060	.049	.243	.225	.019	.011	.039	.031	.042	.025	.029
6	.250	.244	.272	.093	.080	.328	.302	.025	.015	.048	.039	.053	.033	.048
8	.250	.244	.272	.110	.096	.348	.322	.031	.019	.054	.045	.074	.052	.058
10	.312	.305	.340	.120	.105	.414	.384	.031	.019	.060	.050	.080	.057	.063
1/4	.375	.367	.409	.190	.172	.520	.480	.050	.030	.075	.064	.111	.083	.103
5/16	.500	.489	.545	.230	.208	.676	.624	.055	.035	.084	.072	.134	.100	.125
3/8	.562	.551	.614	.295	.270	.780	.720	.063	.037	.094	.081	.168	.131	.162

HEAD DIMENSIONS

Fillister & Six-Lobe Pan



Slotted

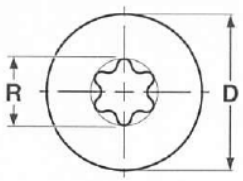


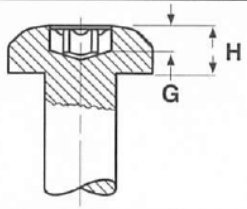
Phillips

Fillister Heads for Machine Screws

ASME B18.6.3-2013

Nominal Size	A		H		O		J		T		M		G	N	Phillips Driver Size
	Head Diameter		Height of Head				Width of Slot		Depth of Slot		Dimensions of Recess				
			Side Height		Total Height						Diameter		Depth	Width	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
0	.096	.083	.043	.038	.055	.047	.023	.016	.025	.015	.067	.054	.039	.013	0
2	.140	.124	.062	.053	.083	.066	.031	.023	.037	.025	.104	.091	.059	.017	1
3	.161	.145	.070	.061	.095	.077	.035	.027	.043	.030	.112	.099	.068	.019	1
4	.183	.166	.079	.069	.107	.088	.039	.031	.048	.035	.122	.109	.078	.019	1
5	.205	.187	.088	.078	.120	.100	.043	.035	.054	.040	.143	.130	.067	.027	2
6	.226	.208	.096	.086	.132	.111	.048	.039	.060	.045	.166	.153	.091	.028	2
8	.270	.250	.113	.102	.156	.133	.054	.045	.071	.054	.182	.169	.108	.030	2
10	.313	.292	.130	.118	.180	.156	.060	.050	.083	.064	.199	.186	.124	.031	2
12	.357	.334	.148	.134	.205	.178	.067	.056	.094	.074	.259	.246	.141	.034	3
1/4	.414	.389	.170	.155	.237	.207	.075	.064	.109	.087	.281	.268	.161	.036	3
5/16	.518	.490	.211	.194	.295	.262	.084	.072	.137	.110	.322	.309	.203	.042	3
3/8	.622	.590	.253	.233	.355	.315	.094	.081	.164	.133	.389	.376	.233	.065	4



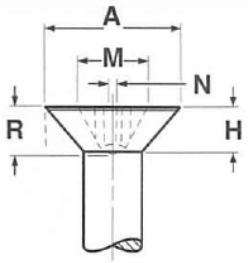


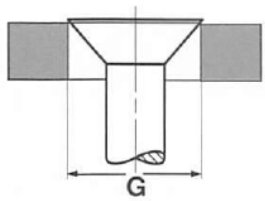
Six-Lobe Pan Heads

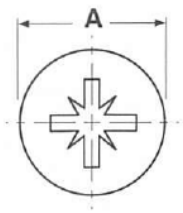
ASME B18.6.3-2013

Screw Size	D		H		R	G		Driver Size
	Head Dimensions				Recess Dimensions			
	Head Diameter		Head Height		Ref	Gauge Penetration Min	(Fallaway) Max Penetration	
	Max	Min	Max	Min				
2	.167	.155	.062	.053	.094	.030	.019	T8
3	.193	.180	.071	.062	.094	.033	.019	T8
4	.219	.205	.080	.070	.111	.035	.022	T10
5	.245	.231	.089	.079	.111	.045	.022	T10
6	.270	.256	.097	.087	.132	.045	.026	T15
8	.322	.306	.115	.105	.155	.055	.031	T20
10	.373	.357	.133	.122	.178	.070	.036	T25
12	.425	.407	.151	.139	.200	.070	.040	T27
1/4	.492	.473	.175	.162	.221	.085	.044	T30
5/16	.615	.594	.218	.203	.266	.105	.047	T40
3/8	.740	.716	.261	.244	.312	.130	.055	T45

Flat Pozidriv® Pan Pozidriv® HEAD DIMENSIONS



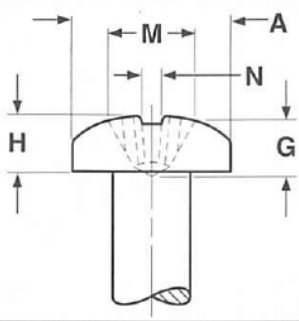


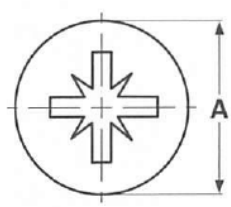


POZIDRIV® (TYPE 1A) FLAT HEADS FOR MACHINE SCREWS

ASME B18.6.3-2013

Nominal Size	A		H		M	R	N	Recess Penetration Gaging Depth		F		G	Driver Size
	Head Dimensions				Recess Dimensions					Protrusion Above Gaging Diameter		Gaging Diameter	
	Diameter		Height		Diam.	Depth	Width						
	Max	Min	Max	Min	Ref	Ref	Ref	Max	Min	Max	Min		
2	.162	.144	.051	.040	.096	.055	.029	.053	.037	.029	.017	.124	1
4	.212	.191	.067	.055	.122	.081	.030	.079	.063	.032	.019	.172	1
6	.262	.238	.083	.069	.168	.098	.041	.091	.073	.036	.021	.220	2
8	.312	.285	.100	.084	.182	.112	.041	.107	.089	.039	.023	.267	2
10	.362	.333	.116	.098	.198	.127	.041	.122	.104	.042	.025	.313	2
12	.412	.380	.132	.112	.262	.149	.056	.136	.118	.045	.027	.362	3
1/4	.477	.442	.153	.131	.276	.164	.057	.151	.133	.050	.029	.424	3
5/16	.597	.556	.191	.165	.358	.211	.086	.193	.175	.057	.034	.539	4
3/8	.717	.670	.230	.200	.386	.239	.086	.222	.204	.065	.039	.653	4





POZIDRIV® (TYPE 1A) PAN HEADS FOR MACHINE SCREWS

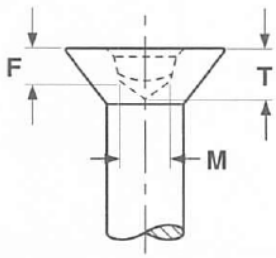
ASME B18.6.3-2013

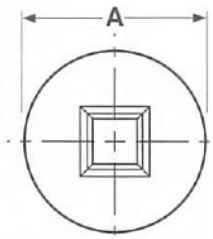
Nominal Size	A		H		M		G		N	Recess Penetration Gaging Depth		Driver Size
	Head Diameter		Height of Head		Dimensions of Recess							
					Diameter		Depth		Width			
	Max	Min	Max	Min	Max	Min	Max	Min	Min	Max	Min	
2	.167	.155	.062	.053	.104	.091	.064	.048	.028	.053	.037	1
4	.219	.205	.080	.070	.122	.109	.083	.067	.029	.072	.056	1
6	.270	.256	.097	.087	.162	.149	.092	.074	.040	.076	.058	2
8	.322	.306	.115	.105	.177	.164	.108	.090	.041	.092	.074	2
10	.373	.357	.133	.122	.193	.180	.124	.106	.041	.108	.090	2
12	.425	.407	.151	.139	.254	.241	.139	.121	.056	.117	.099	3
1/4	.492	.473	.175	.162	.273	.260	.159	.141	.057	.137	.119	3

Pozidriv® is a registered trademark of the Phillips Screw Company. Our Type-1A drive fasteners are not manufactured by or connected with the producer of Pozidriv® screws.

HEAD DIMENSIONS

Flat Square Recess
Pan Square Recess



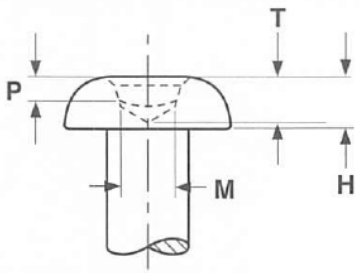


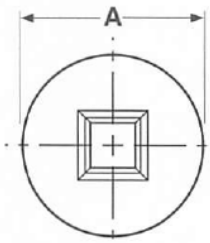
Square Recess Flat Heads

ASME B 18.6.3 2013

Nominal Size or Basic Screw Diameter		A Head Diameter		H Head Height	M Recess Square	T Recess Depth	F Recess Penetration Gaging Depth		Driver Size
		Max	Min	Ref	Ref	Ref	Max	Min	
4	.1120	.212	.191	.067	.0696	.066	.038	.028	0
6	.1380	.262	.238	.083	.090	.096	.055	.040	1
8	.1640	.312	.285	.100	.111	.115	.063	.048	2
10	.1900	.362	.333	.116	.111	.127	.075	.060	2
12	.2160	.412	.380	.132	.1315	.158	.095	.080	3
1/4	.2500	.477	.442	.153	.1315	.158	.095	.080	3
5/16	.3125	.597	.556	.191	.1895	.194	.100	.085	4

This type of recess has a square center opening, slightly tapered side walls and a conical bottom.





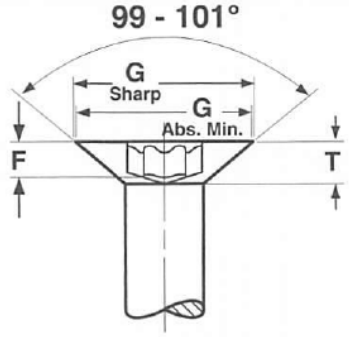
Square Recess Pan Heads

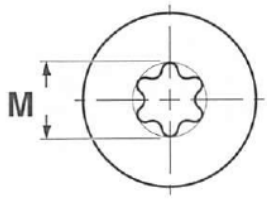
ASME B18.6.3 2013

Nominal Size or Basic Screw Diameter		A Head Diameter		H Head Height		M Recess Square	T Recess Depth	P Penetration Gaging Depth		Driver Size
		Max	Min	Max	Min	Ref	Ref	Max	Min	
4	.1120	.219	.205	.086	.076	.070	.066	.038	.028	0
6	.1380	.270	.256	.103	.093	.091	.106	.065	.050	1
8	.1640	.322	.306	.120	.110	.112	.127	.075	.060	2
10	.1900	.373	.357	.137	.126	.112	.127	.075	.060	2
12	.2160	.425	.407	.153	.141	.133	.158	.095	.080	3
1/4	.2500	.492	.473	.175	.162	.133	.158	.095	.080	3
5/16	.3125	.615	.594	.218	.203	.191	.194	.100	.085	4

This type of recess has a square center opening, slightly tapered side walls and a conical bottom.

Six-Lobe 100° Flat Phillips Round Washer HEAD DIMENSIONS

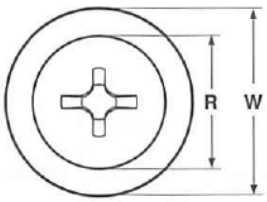


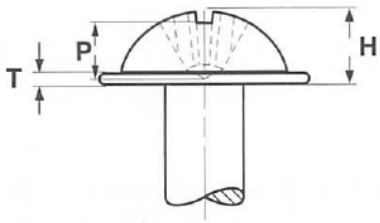


Six-Lobe 100° Flat Head for Machine Screws

Camcar Textron

Nominal Size	T	G		M	F	Fallaway Maximum Penetration of No-Go Gauge	Driver Size
	Head Height	Head Diameter		Recess Diam.	Gauge Penetration		
	Ref	Max Sharp	Abs. Min	Ref	Ref	Max	
2	.0216	.171	.143	-	.020	-	T6
4	.049	.212	.188	.094	.028	.019	T8
6	.060	.279	.238	.111	.035	.022	T10
8	.072	.332	.285	.132	.046	.026	T15
10	.083	.385	.333	.155	.056	.031	T20
1/4	.110	.507	.442	.221	.085	.044	T30
5/16	.138	.635	.556	.266	.092	.047	T40
3/8	.165	.762	.670	.312	.110	.055	T45





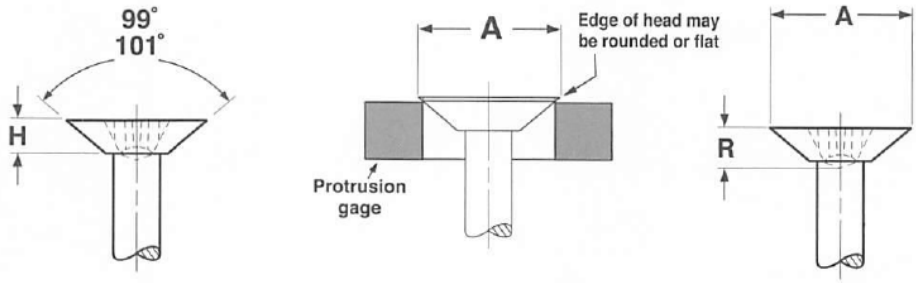
Phillips Round Washer Heads For Machine Screws

ASME B18.6.3 2013

Nominal Size	R	H		W		T	D	Recess Penetrating Gaging Depth		Driver Size
	Crown Diameter	Head Height		Washer Diameter		Washer Thickness	Recess Diameter			
	Ref	Max	Min	Max	Min	Ref	Ref	Max	Min	
4	.177	.079	.067	.261	.243	.030	.116	.065	.044	1
6	.218	.096	.084	.321	.301	.040	.147	.061	.033	2
8	.259	.113	.101	.380	.358	.040	.161	.076	.048	2
10	.300	.130	.118	.439	.416	.050	.177	.093	.066	2
12	.341	.148	.134	.498	.473	.050	.228	.094	.066	3
1/4	.396	.170	.157	.576	.548	.050	.244	.107	.080	3
5/16	.494	.211	.197	.719	.687	.060	.292	.156	.129	3

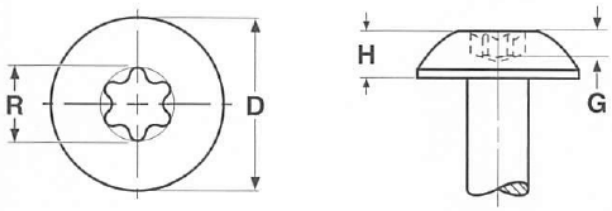
HEAD DIMENSIONS

100° Flat Undercut Truss Six-Lobe



PHILLIPS UNDERCUT 100° FLAT HEADS FOR MACHINE SCREWS

Nominal Size	A		H		R		Phillips Driver Size
	Head Diameter		Head Height		Recess Depth		
	Max	Min	Max	Min	Max	Min	
4	.212	.188	.047	.038	.071	.055	1
6	.262	.235	.059	.048	.067	.044	2
8	.312	.282	.070	.058	.095	.072	2
10	.362	.329	.081	.068	.110	.087	2
12	.412	.375	.092	.077	.104	.081	3



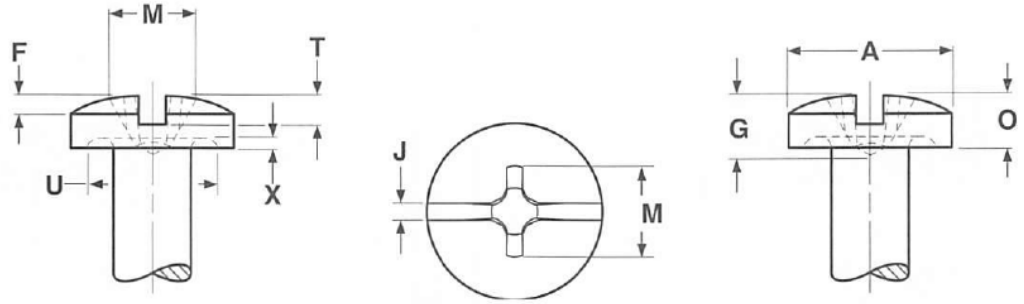
SIX-LOBE TRUSS HEADS

ASME B18.6.3-2013

Screw Size	D		H		R	G		Driver Size
	Head Dimensions				Recess Dimensions			
	Head Diameter		Head Height		Ref	Gauge Penetration Min	(Fallaway) Max Penetration	
	Max	Min	Max	Min				
4*	.257	.241	.069	.059	-	-	-	T9
6	.321	.303	.086	.074	.111	.045	.022	T10
8	.384	.364	.102	.088	.132	.045	.026	T15
10	.448	.425	.118	.103	.155	.055	.031	T20
12	.511	.487	.134	.118	.178	.070	.036	T25
1/4	.573	.546	.150	.133	.200	.070	.040	T27
5/16	.698	.666	.183	.162	.266	.080	.047	T40
3/8	.823	.787	.215	.191	.312	.110	.055	T45

*Dimensions for the #4 diameter Six-Lobe Truss head are independent of ASME B18.6.3

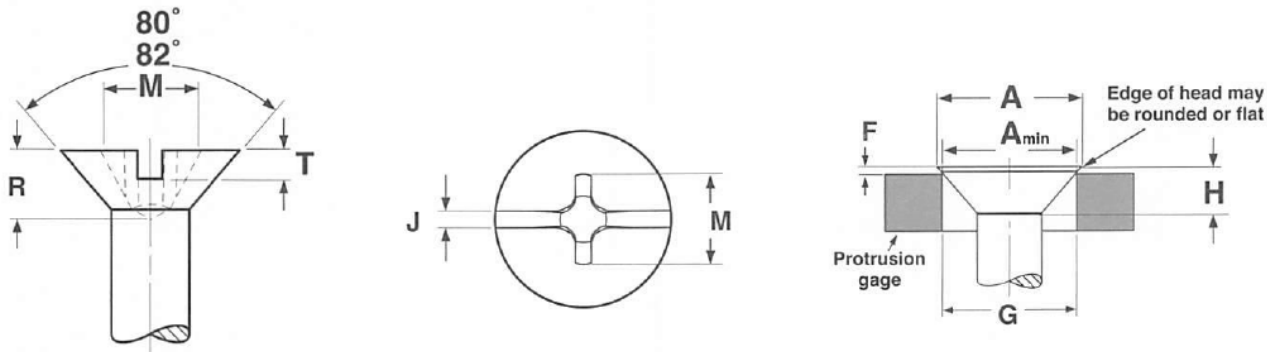
Combo Binding Undercut
Combo 82° Flat
HEAD DIMENSIONS



Combination Binding Undercut Heads for Machine Screws

ASME B18.6.3 2013

Nominal Size	A		F		O		J		T		M	G		Driver Size	U		X	
	Head Diameter		Height of Head				Width of Slot		Depth of Slot		Phillips Recess				Dimensions of Undercut			
			Height of Oval		Total Height						Diam	Penetration Gaging Depth			Diameter		Depth	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Max	Min		Max	Min	Max	Min
4	.235	.223	.025	.018	.068	.061	.039	.031	.042	.030	.111	.070	.052	1	.184	.161	.012	.007
6	.290	.275	.032	.024	.087	.078	.048	.039	.053	.040	.153	.077	.053	2	.226	.199	.015	.010
8	.344	.326	.039	.029	.105	.095	.054	.045	.065	.050	.179	.103	.079	2	.269	.236	.017	.012
10	.399	.378	.045	.034	.123	.112	.060	.050	.077	.060	.198	.123	.098	2	.312	.274	.020	.015



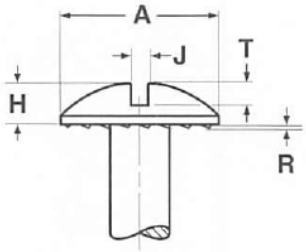
Combination Flat Heads for Machine Screws

ASME B18.6.3-2013

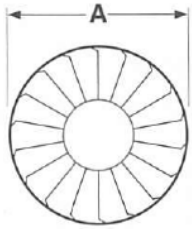
Nominal Size	A		H		J		T		M	R		F		G	Phillips Driver Size
	Head Dimensions				Slot Dimensions				Recess Dimensions			Protrusion Above Gaging Diameter		Gaging Diameter	
	Diameter		Height		Width		Depth		Diam.	Penetration Gaging Depth					
	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Max	Min	Max	Min		
4	.212	.191	.067	.055	.039	.031	.030	.020	.122	.082	.066	.032	.019	.172	1
6	.262	.238	.083	.069	.048	.039	.038	.024	.168	.095	.072	.036	.021	.220	2
8	.312	.285	.100	.084	.054	.045	.045	.029	.182	.110	.087	.039	.023	.267	2
10	.362	.333	.116	.098	.060	.050	.053	.034	.198	.125	.102	.042	.025	.313	2

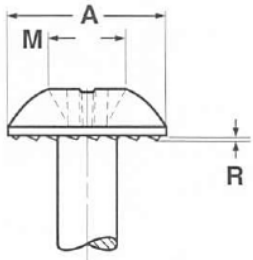
HEAD DIMENSIONS

Serrated Truss



Slotted



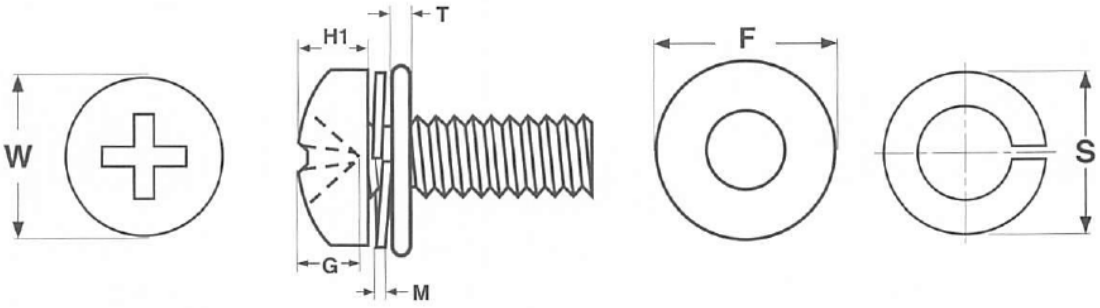


Phillips

SERRATED TRUSS HEADS FOR MACHINE SCREWS

Nominal Size	A		H		J		T		M	R		Phillips Driver Size
	Head Diameter		Height of Head		Width of Slot		Depth of Slot		Phillips Recess Diameter	Locking Serration Depth		
	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Max	Min	
1/4	.573	.546	.150	.133	.075	.064	.087	.070	.256	.0015	.0010	3
5/16	.698	.666	.183	.162	.084	.072	.106	.085	.345	.0015	.0010	4

Double Washer Pan Phillips SEMS Screws



Pan Phillips Double Washer Sems (Split-Lock & Regular Flat Washers)

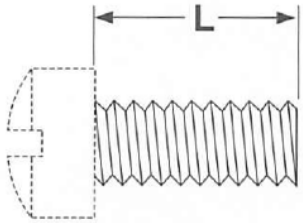
Nominal Size	W		H1		G		F		T		R		M	Phillips Driver Size
	Head Diameter		Height of Head		Recess Depth		Flat Washer Diameter		Flat Washer Thickness		Split Lock Washer Diameter		Split Lock Washer Material Thickness	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Ref	
4	.219	.204	.080	.070	.071	.053	.382	.369	.045	.036	.208	.194	.031	1
6	.270	.255	.097	.086	.080	.055	.445	.432	.045	.036	.261	.247	.034	2
8	.321	.305	.115	.104	.097	.071	.507	.494	.045	.036	.319	.304	.031	2
10	.373	.356	.133	.121	.113	.089	.569	.556	.045	.036	.373	.358	.047	2

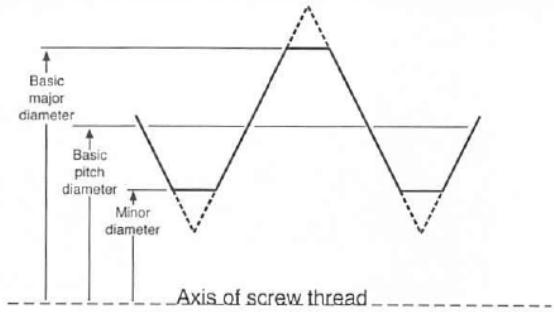
Pan Phillips Double Washer Sems (Split-Lock & Narrow Flat Washers)

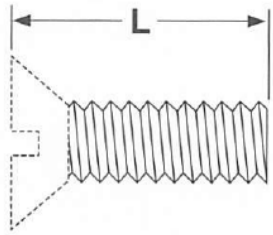
Nominal Size	W		H1		G		F		T		R		M	Phillips Driver Size
	Head Diameter		Height of Head		Recess Depth		Flat Washer Diameter		Flat Washer Thickness		Split Lock Washer Diameter		Split Lock Washer Material Thickness	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Ref	
4	.219	.204	.080	.070	.071	.053	.250	.244	.036	.028	.208	.194	.031	1
6	.270	.255	.097	.086	.080	.055	.312	.306	.037	.028	.261	.247	.034	2
8	.321	.305	.115	.104	.097	.071	.382	.369	.036	.028	.319	.304	.031	2
10	.373	.356	.133	.121	.113	.089	.445	.432	.045	.036	.373	.358	.047	2

Description	A pan head machine screw with a free-spinning lock-washer and flat washer manufactured as one assembly.	
Applications/ Advantages	The washer/screw assembly makes this a locking screw with the helical washer providing the locking action and flat washer distributing the load over a wider area.	
Material	***Steel***	***Stainless***
	Steel Screws-- AISI 1006 - 1022 or equivalent steel. ***Steel Washers***-- Split-lock: SAE 1060 carbon steel; Flat washer: SAE 1008 carbon steel.	***Stainless Screws***-- Class 304 stainless. ***Stainless Washers***-- Class 304 stainless
Hardness	***Steel Screws***-- Rockwell B70 - B100 (Unhardened). ***Steel Washers***-- Split-lock: Rockwell C38 - 46; Flat washer: Unhardened	-
Tensile Strength	***Steel***: 60,000 psi. minimum. No. 4 SEMS screws shorter than 1/2" are not subject totensile 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.	-
Plating	See Appendix-A for information on the plating of steel SEMS.	Stainless sems are usually supplied with plain finish

DIMENSIONS







2A External Threads for Machine Screws and SEMS

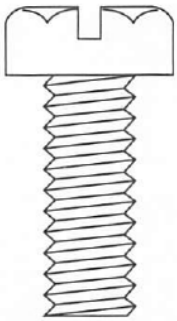
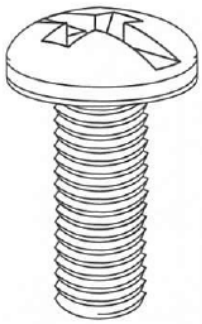
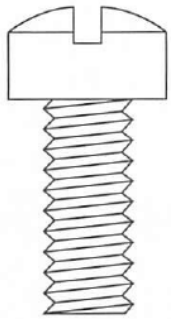
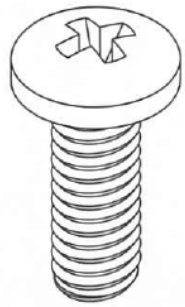
ASME B 1.1 (2008)

Nominal Size & Threads per Inch	Series Designation	Allowance	Major Diameter		Pitch Diameter			Stress Area, in²	Tensile Strength,[a] lb., min. (STEEL screws only)
			Max	Min	Max	Min	Tolerance		
0-80 0.060	UNF	.0005	.0595	.0563	.0514	.0496	.001762	0.00180	-
1-64 0.073	UNC	.0006	.0724	.0686	.0623	.0603	.001970	0.00263	-
1-72 0.073	UNF	.0006	.0724	.0689	.0634	.0615	.001899	0.00278	-
2-56 0.086	UNC	.0006	.0854	.0813	.0738	.0717	.002127	0.00370	-
2-64 0.086	UNF	.0006	.0854	.0816	.0753	.0733	.002040	0.00394	-
3-48 0.099	UNC	.0007	.0983	.0938	.0848	.0825	.002302	0.00487	-
3-56 0.099	UNF	.0007	.0983	.0942	.0867	.0845	.002191	0.00523	-
4-40 0.112	UNC	.0008	.1112	.1061	.0950	.0925	.002507	0.00604	360
4-48 0.112	UNF	.0007	.1113	.1068	.0978	.0954	.002361	0.00661	396
5-40 0.125	UNC	.0008	.1242	.1191	.1080	.1054	.002562	0.00796	470
5-44 0.125	UNF	.0007	.1243	.1195	.1095	.1070	.002484	0.00830	498
6-32 0.138	UNC	.0008	.1372	.1312	.1169	.1141	.002820	0.00909	550
6-40 0.138	UNF	.0008	.1372	.1321	.1210	.1184	.002614	0.01015	609
8-32 0.164	UNC	.0009	.1631	.1571	.1428	.1399	.002916	0.0140	850
8-36 0.164	UNF	.0008	.1632	.1577	.1452	.1424	.002804	0.01474	884
10-24 0.190	UNC	.0010	.1890	.1818	.1619	.1586	.003319	0.0175	1050
10-32 0.190	UNF	.0009	.1891	.1831	.1688	.1658	.003004	0.0200	1200
12-24 0.216	UNC	.0010	.2150	.2078	.1879	.1845	.003400	0.0242	1450
12-28 0.216	UNF	.0010	.2150	.2085	.1918	.1886	.003224	0.0258	1548
1/4-20 0.250	UNC	.0011	.2489	.2408	.2164	.2127	.003731	0.0318	1900
1/4-28 0.250	UNF	.0010	.2490	.2425	.2258	.2225	.003322	0.0364	2200
5/16-18 0.3125	UNC	.0012	.3113	.3026	.2752	.2712	.004041	0.0524	3150
5/16-24 0.3125	UNF	.0011	.3114	.3042	.2843	.2806	.003660	0.0580	3480
3/8-16 0.375	UNC	.0013	.3737	.3643	.3331	.3287	.004363	0.0775	4650
3/8-24 0.375	UNF	.0011	.3739	.3667	.3468	.3430	.003804	0.0878	5268
1/2-13 0.500	UNC	.0015	.4985	.4876	.4485	.4435	.004965	0.1419	8500
1/2-20 0.500	UNF	.0013	.4987	.4906	.4662	.4619	.004288	0.1599	9594

Tolerance on Length L	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.
	0 thru 12	-0.02	-0.03	-0.06	-0.09
	1/4 thru 3/4	-0.03	-0.03	-0.06	-0.09

[a]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.

Steel & Stainless — Mechanical & Performance Requirements

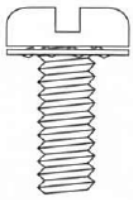





Description	A straight shank fastener with external threads designed to go through a hole or nut that is pre-tapped to form a mating thread for the screw.				
Applications/ Advantages	Machine screws form a fastening superior in strength to spaced thread screws.				
	Steel	***Stainless***			***Aluminum***
	Steel Zinc is the most common and most popular variety of steel machine screws ***Steel Zinc yellow*** screws are popular in electronics applications. ***Steel Zinc Black*** and Black Oxide screws are used to blend in with black-colored components.	***18-8 Stainless steel*** machine screws are used in applications which require general atmospheric corrosion resistance, in food processing machinery and refrigeration equipment. Stainless is also superior to steel in withstanding some elevation in application operating temperature while maintaining its strength. ***316 Stainless steel*** offers superior corrosion resistance to 18-8 and is superior at maintaining its strength at high temperatures. ***410 Stainless steel*** is recommended in applications where greater tensile strength is needed such as control mechanisms or valves under high stress. 410 is not as corrosion resistant as are 18-8 or 316 stainless			In some applications, aluminum machine screws can be a less expensive alternative to stainless screws because of their resistance to corrosion and high rate of conductivity. Aluminum machine screws should be fastened with aluminum nuts to minimize the chance of galvanic corrosion.
Material	AISI 1006 - 1022 or equivalent steel.	SAE 18-8 stainless steel	316 stainless steel	410 stainless steel	2024-T4 alloy
Hardness	Rockwell B70 - B100.	Rockwell B85 - B95 (approximate)*	Rockwell B85 - B95 (approximate)*	Rockwell C34 (approximate)	-
Tensile Strength	60,000 psi. minimum.	80,000 psi. minimum (100,000 psi after cold working)*	85,000 - 140,000 psi.	180,000 psi.	62,000 psi. minimum
	Steel machine screws which have a nominal diameter smaller than #4 are not subject to tensile testing. No. 4 and No. 5 machine screws which are shorter than 1/2" are not subject to tensile testing. Steel machine screws of diameters No. 6 to 1/2" inclusive, which are shorter than either 1/2" or 3D (where D is the nominal screw size in inches) are not subject to tensile testing. Such steel machine screws of a size to be tested shall meet the tensile load requirements listed above. Tensile strength values for stainless screws are offered as approximations only; there is no single standard for the performance requirements of stainless machine screws.				
Plating	See Appendix-A for information on the plating of steel machine screws	Stainless machine screws are usually supplied plain or with a black oxide finish.			Aluminum machine screws are usually supplied without any additional finish.

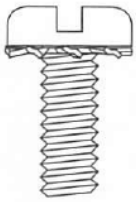
*Hardness and tensile strength standards are offered as guides only for stainless machine screws. There is currently no national standard for these performance requirements for stainless machine screws.

Mechanical & Performance Requirements — Sems

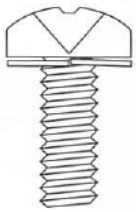
MACHINE SCREWS WITH FREE-SPINNING LOCKWASHERS



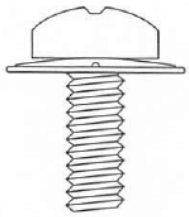
Internal Tooth



External Tooth



Split-Lock



Conical

Description	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 conical. Stainless SEMS are offered with external tooth lock washers.
Applications/ Advantages	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. ***Internal Tooth SEMS***: Recommended when it it desirable to hide the teeth for appearance or to prevent snagging. ***External Tooth SEMS***: Preferred over the internal tooth style as the teeth provide greater torsional resistance being on the larger radius. ***Split-Lock SEMS***: Preferred over tooth lockwasher SEMS for use with hardened bearing surfaces. ***Conical SEMS***: 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.
Material	***Steel Screws***-- AISI 1022 or equivalent steel. ***Steel Washers***-- Split-lock: SAE 1055-1065 carbon steel; Tooth-lock: SAE 1050-1065; Conical: SAE 1050. ***Stainless Screws***-- SAE 18-8 stainless steel or 410 martensitic stainless steel ***Stainless Washers***-- Split-lock: SAE J405 302-305; Tooth-lock: SAE 410 stainless steel; Conical: 410 stainless steel
Hardness	***Steel Screws***-- Rockwell B70 - B100. ***Steel Washers***-- Split-lock: Rockwell C38 - 46; Tooth-lock: Rockwell C40 - 50; Conical: Rockwell C42 - 46. ***Stainless Washers***-- Split-lock: Rockwell C35 - 43; Tooth-lock: Rockwell C40 - 50; Conical: Rockwell B88 minimum.
Tensile Strength	***Steel***: 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 84. ***18-8 Stainless***: No. 4: 99,000 psi. minimum; No. 6 & No. 8: 96,000 psi. minimum. Note: No. 4, No. 6 and No. 8 SEMS screws which are shorter than 1/2" are not subject to tensile testing. ***410 Stainless***: No. 4, No. 6 and No. 8 SEMS screws which are shorter than 1/2" are not subject to tensile testing.
Plating	See Appendix-A for information on the plating of steel SEMS.

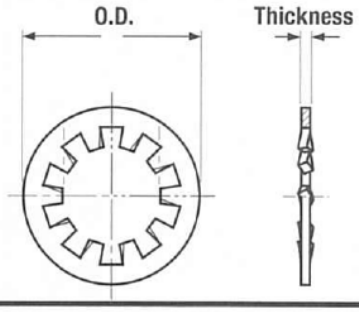
HOW SEMS SPECIFICATIONS VARY FROM MACHINE SCREWS

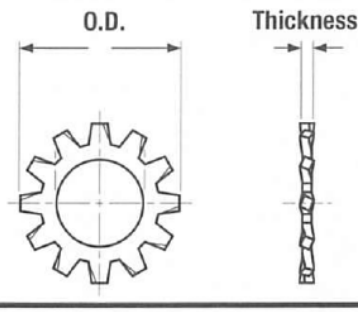
- The maximum diameter of the unthreaded shank shall be less than the maximum major diameter of the thread by an amount sufficient to prevent disassembly of the washer from the screw.

- The unthreaded length on full 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 for Pan Head Screws

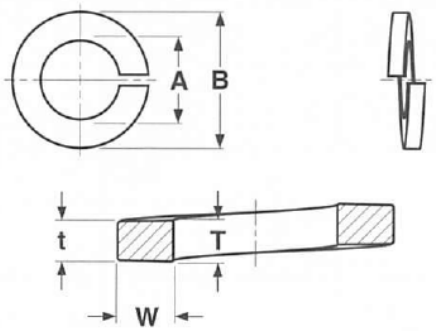


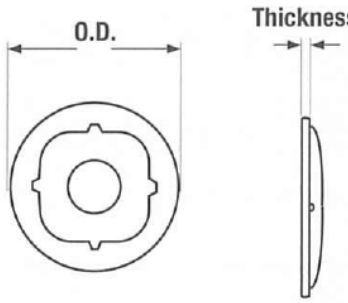


Tooth-Lock Washers for Pan Head SEMS

ASME B18.13-2011

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	.018	.012	.268	.258	.018	.012	.230	.220
6	.1380	.022	.016	.288	.278	.022	.016	.285	.270
8	.1640	.023	.018	.338	.327	.023	.018	.320	.305
10	.1900	.024	.018	.383	.372	.024	.018	.381	.365
12	.2160	.027	.020	.408	.396	.027	.020	.410	.395
1/4	.2500	.028	.023	.478	.466	.028	.023	.510	.494
5/16	.3125	.034	.028	.610	.597	.034	.028	.610	.588





Washers for Split-Lock & Conical Pan Head SEMS

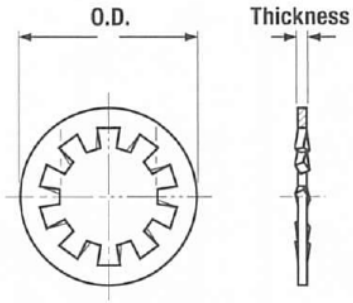
ASME B18.13,-2011 & Shakeproof*

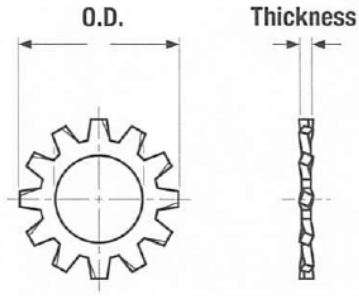
Nominal Size or Basic Screw Diameter		Split-Lock						Conical*		
		Washer Outside Diameter A		Washer Section Min		Washer Outside Diameter B		Washer Thickness	Washer Outside Diameter	
		Max	Min	Width W	Thickness $\frac{T+t}{2}$	Max	Min	Ref	Max	Min
2*	.0860	.080	.075	.035	.020	.156	.145	.015	.210	.200
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	.035	.383	.370
10	.1900	.179	.173	.093	.047	.373	.359	.035	.446	.433
1/4	.2500	.238	.230	.125	.062	.496	.480	.045	.515	.495

*Dimensions of Square-Cone® washers are to Shakeproof specifications. Square-Cone® is a registered trademark of Shakeproof division of Illinois Tool Works.

SEMS Washer Specs for Hex Washer Head Screws

Tooth-Lock





Tooth Lock Washers for Hex Head SEMS

ASME B18.13-2011

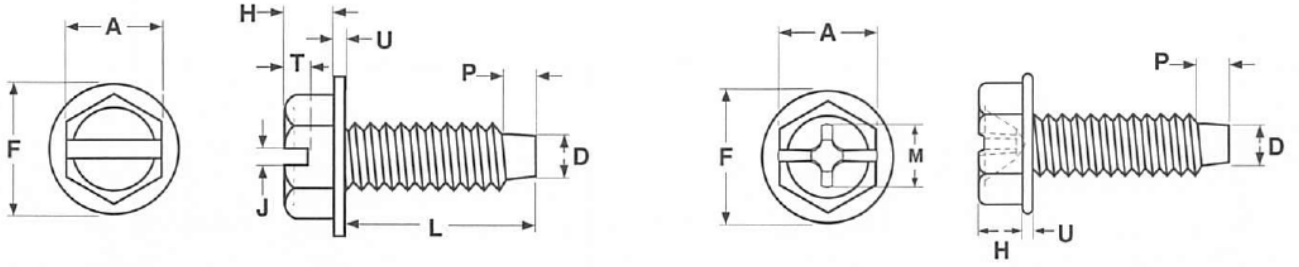
Nominal Size or Basic Screw Diameter		Internal Tooth				External Tooth			
		Washer Thickness		Washer Outside Diameter		Washer Thickness		Washer Outside Diameter	
		Max	Min	Max	Min	Max	Min	Max	Min
4	.1120	.018	.012	.268	.258	.018	.012	.230	.220
6	.1380	.022	.016	.288	.278	.022	.016	.285	.270
8	.1640	.023	.018	.338	.327	.023	.018	.320	.305
10	.1900	.024	.018	.383	.372	.024	.018	.381	.365
12	.2160	.027	.020	.408	.396	.027	.020	.410	.395
1/4	.2500	.028	.023	.478	.466	.028	.023	.475	.460
5/16	.3125	.034	.028	.610	.597	.034	.028	.580	.567
3/8	.3750	.040	.032	.692	.678	.040	.032	.660	.640

Tooth Lock Washers for Hex Washer Head SEMS

ASME B18.13-2011

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
4	.1120	.018	.012	.268	.258	.018	.012	.230	.220
6	.1380	.022	.016	.288	.278	.022	.016	.317	.306
8	.1640	.023	.018	.338	.327	.023	.018	.317	.306
10	.1900	.024	.018	.383	.372	.024	.018	.406	.395
12	.2160	.027	.020	.408	.396	.027	.020	.406	.395
1/4	.2500	.028	.023	.478	.466	.028	.023	.580	.567
5/16	.3125	.034	.028	.610	.597	.034	.028	.654	.640
3/8	.3750	.040	.032	.692	.678	.040	.032	.760	.740

Slotted Hex Washer with Dog Point DIMENSIONS & PERFORMANCE



Hex Washer Head Machine Screw with Dog Point

ASME B18.6.3-2013*

Nominal Size	A		H		F		U		J		T		M	D	P
	Width Across Flats		Height of Head		Diameter of Washer		Thickness of Washer		Width of Slot		Depth of Slot		Recess Diam-eter	Diameter of Dog Point	Length of Dog Point
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Ref	Ref
10	.312	.305	.120	.105	.414	.384	.031	.019	.060	.050	.080	.057	.178	.124	.060
5/16	.500	.489	.230	.208	.676	.624	.055	.035	.084	.072	.134	.100	.358	.208	.187
3/8	.562	.551	.295	.270	.780	.720	.063	.037	.094	.081	.168	.131	.386	.250	.225

Tolerance on Length	Over 1/2" to 1"	Over 1" to 2"	Over 2"
	-0.03	-0.06	-0.09

* Dog point dimensions are independent of ASME B18.6.3 standard.

Description	A straight shank fastener with hexagonally shaped head, integrally formed washer face and external threads designed to go through a hole or nut that is pre-tapped to form a mating thread for the screw. The tip of the screw has an unthreaded, straight pointed section that is slightly less than the screw's root diameter
Applications/ Advantages	The dog point is intended to make it easier for the screw to engage with the nut or threaded hole, increasing efficiency--especially when used on production lines.
Material	AISI 1006 - 1022 or equivalent steel.
Hardness	Rockwell B70 - B100.
Tensile Strength	60,000 psi. minimum.
	Steel machine screws of diameters No. 6 to 1/2" inclusive, which are shorter than either 1/2" or 3D (where D is the nominal screw size in inches) are not subject to tensile testing. Such steel machine screws of a size to be tested shall meet the tensile load requirements listed above. Tensile strength values for stainless screws are offered as approximations only; there is no single standard for the performance requirements of stainless machine screws.
Plating	Screws are usually supplied with a zinc finish.

THREAD GAGING

Notes on Thread Gaging

• Thread gaging is one method of testing the acceptability of machine screws, SEMS and nuts. It is possible that parts which are near a limit may be accepted by one type of gaging yet rejected by another. A product screw thread is considered acceptable when it passes any of the permissible gages in ASME B1.3, provided that those gages are within the tolerances specified in this standard.

• Many commercial applications will accept a screw that, although may not pass a gage test, will accept a mating nut. It is important to know the customer's requirements concerning thread quality when testing machine screw threads.

• Go gages check either the maximum-material limit or size to assure interchangeable assembly of maximum-material mating parts.

• NO GO gages inspect the functional diameter limit of product internal thread. In applying the NO GO gage, the functional diameter is acceptable when gaging elements do not pass the product thread. The NO GO gage can also indicate out-of-roundness of the pitch cylinder.

• The gages are normally set to master gages with a range of calibration precision such as Class X (looser tolerance) or Class W (tighter tolerance). They are also set by technicians with slight variations in hand pressure. For these reasons, gage setting variability should be considered during thread inspection. Also, the NO GO gage can be confounded by undersized, error laden threads which in fact are undersized on pitch diameter but with helix, flank or similar out of tolerance conditions large enough to not enter the required number of turns.

• FOR THESE REASONS, THREAD INSPECTION SHOULD CONSIDER GAGE AND OPERATOR VARIABILITY WHEN PASSING QUALITY JUDGEMENTS ON MACHINE SCREW THREAD QUALITY.

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CAP SCREWS & BOLTS

Bent Anchor Bolts 108

Carriage Bolts
- Flat Head, Low Carbon & Grade 5 109
- Round Hd, Square Neck, Low Carbon 110
- Round Hd, Square Neck, Galvanized 110
- Round Hd, Square Neck, Grade 5 & Grade 8 110-111
- Round Hd, Square Neck, 18-8 Stainless 110-111
- Round Hd, Short Neck, Low Carbon 112
- Round Hd, Ribbed Neck, Low Carbon, Gr-5 & Stainless 113
- Round Hd, Fin Neck, Low Carbon 114

Dowel Screws 115

Elevator Bolts 116

Eye Bolts, Open-End 117

Eye Bolts, Forged
- Plain Pattern 118-119
- Shoulder Pattern 119

Eye Screws, Closed-End 120

Flange Screws, 12 point 121

Flange Screws, Serrated
- Case-Hardened Steel 122-123
- Grade-5 Steel 122-123
- Grade-8 Steel 122-123
- 18-8 Stainless Steel 122-123

Frame Bolts, Grade 8 & 18-8 SS 124-125

Flat Slotted Cap Screws 126

Hanger Bolts 127

Heavy Hex Bolts
- A193 (includes B7 Bolts) 128
- A307 128

Heavy Hex Cap Screws 129

CAP SCREWS & BOLTS

Hex Cap Screws
- Head & Thread Dimensions (all grades) 130
- Grade 2 130-131
- 18-8 Stainless Steel 130-131
- 316 Stainless Steel 130-131
- Grade 5 132-133
- Grade 8 132-133
- Grade 9 134-135

Hex Machine Bolts 136-137

Hex Tap Bolts
- Low Carbon 138-139
- Grade 5 138-139
- Grade 8 138-139
- 18-8 Stainless Steel 138-139

Lag Screws
- Full Body-Steel, Stainless & Galvanized 140
- Fully Threaded Hex Washer 141
- Hex Flange 142

Plow Bolts
- Clipped Head 143
- No. 3 Head 144
- Grade 5 & 8 144-145

Square Bolts 146

Step Bolts 147

Structural Bolts, A325 & A490 148-149

Studs, Continuous Thread, B7 150

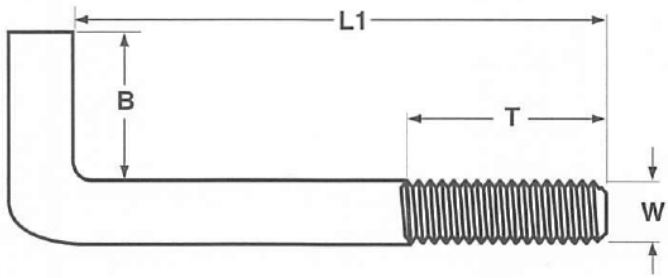
T-Head Bolts 151

Tension Control Bolts 152-153

Track Bolts, Ribbed Neck 154

Thread Dimensions, External, Class 2A 155

BENT ANCHOR BOLTS

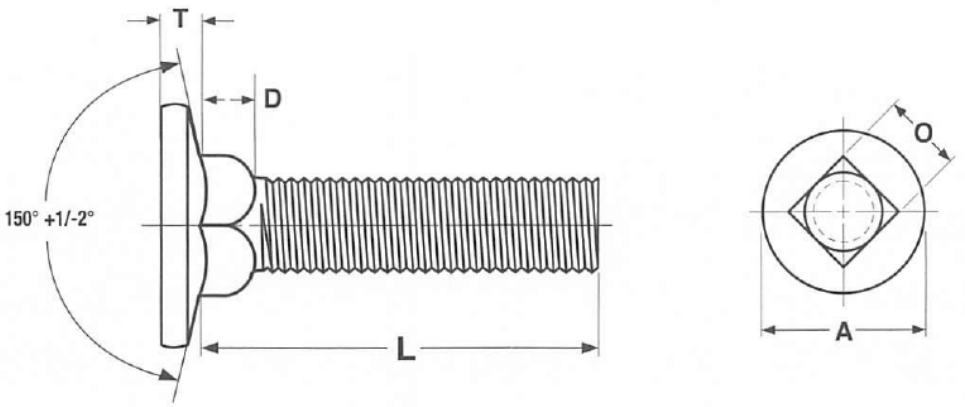


BENT ANCHOR BOLTS, 90°						ASME B18.31.5 (2011)
Nominal Size x Length	L1		B		T	
	Inside Length (below the bend)		Inside Width		Threaded Length	
	Max	Min	Max	Min	Max	Min
3/8-16 x 8	8.125	7.875	1.125	0.875	1.625	1.375
3/8-16 x 10	10.125	9.875	1.125	0.875	1.625	1.375
1/2-13 x 8	8.125	7.875	1.125	0.875	2.125	1.875
1/2-13 x 10	10.125	9.875	1.125	0.875	2.125	1.875
1/2-13 x 18	18.125	17.875	1.125	0.875	2.125	1.875
3/4-10 x 12	12.188	11.812	3.188	2.812	4.250	3.750
3/4-10 x 18	18.188	17.812	3.188	2.812	4.250	3.750

Description	A headless fastener with a partially threaded shank. A portion of he top unthreaded section of the bolt is bent at a 90-degree angle. It is recommended that bolts be supplied with (a) nuts that conform to ASTM A194 or A563 Grade-A (hex or heavy hex); and (b) washers that conform to ASTM F436 Type 1.
Applications/ Advantages	Designed to anchor structural supports to concrete foundations. The bent portion (or leg) of the bolt is that which is embedded into concrete to create greater resistance to forces pulling away from the concrete foundation.
Material	Grade-36: Low carbon steel shall conform as follows: *Carbon:* 0.29% max; *Manganese:* (optional); *Phosphorus:* 0.05% max; *Sulfur:* 0.06% max; *Copper (when specified):* 0.18% min.
Tensile Strength	36,000 psi., minimum
Plating	Anchor bolts are usually supplied plain.

Low Carbon & Grade 5

CARRIAGE BOLTS, FLAT HEAD



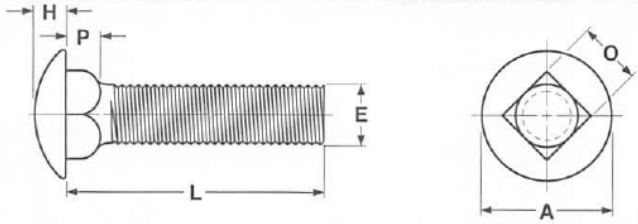
Flat Head Carriage Bolts, Square Neck

Bolt Diameter & Thread Pitch	Head Diameter		Head Height		Square Width		Square Depth	
	A		T		O		D	
	Max	Min	Max	Min	Max	Min	Max	Min
1/4-20	.640	.590	.098	.078	.260	.245	.156	.125
Tolerance on Length	+ 0.02, -0.04							

Description	A flat head bolt with a bearing surface that is countersunk to a 150° angle. Although flat, the head has a measurable side height causing it to protrude above its mating surface when it is completely tightened. Directly below the head is a square neck and a threaded section that has a unified thread pitch.
Applications/ Advantages	The square neck design keeps the bolt from turning as a nut is tightened. The flat head feature gives a lower profile on the front or top side of the fastening than a round head carriage bolt. Designed specifically, but not exclusively, for the garage door industry.
Material	*Grade-2:* AISI 1006 - 1025 steel *Grade-5:* AISI 1030 - 1055 steel
Core Hardness	*Grade-2:* Rockwell B80 - B100 *Grade-5:* Rockwell C25 - C34
Tensile Strength	*Grade-2:* 74,000 psi. min. *Grade-5:* 120,000 psi. min.
Plating	Flat head carriage bolts are usually supplied with a clear zinc finish.

CARRIAGE BOLTS
Round Head, Square Neck

Low Carbon & Hot-Dip Galvanized



CARRIAGE BOLTS - ROUND HEAD, SQUARE NECK

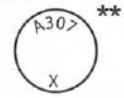
ASME B18.5-2012

Basic Bolt Diameter		E Body Diameter		A Head Diameter		H Head Height		O Square Width		P Square Depth	
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
•6	0.1380	0.122	0.108	0.313	0.278	0.086	0.071	0.160	0.135	0.094	0.062
•8	0.1640	0.173	0.157	0.328	0.298	0.102	0.083	0.169	0.155	0.108	0.078
10	0.1900	0.199	0.159	0.469	0.436	0.114	0.094	0.199	0.185	0.125	0.094
•12	0.2160	0.225	0.206	0.500	0.468	0.149	0.125	0.215	0.197	0.135	0.105
1/4	0.2500	0.260	0.213	0.594	0.563	0.145	0.125	0.260	0.245	0.156	0.125
5/16	0.3125	0.324	0.272	0.719	0.688	0.176	0.156	0.324	0.307	0.187	0.156
3/8	0.3750	0.388	0.329	0.844	0.782	0.208	0.188	0.388	0.368	0.219	0.188
7/16	0.4375	0.452	0.385	0.969	0.907	0.239	0.219	0.452	0.431	0.250	0.219
1/2	0.5000	0.515	0.444	1.094	1.032	0.270	0.250	0.515	0.492	0.281	0.250
5/8	0.6250	0.642	0.559	1.344	1.219	0.344	0.313	0.642	0.616	0.344	0.313
3/4	0.7500	0.768	0.678	1.594	1.469	0.406	0.375	0.768	0.741	0.406	0.375

Tolerance on Length	Nominal Bolt Size	Nominal Bolt Length				
		Up to 1 in., incl.	Over 1 in. to 2-1/2 in., incl.	Over 2-1/2 in. to 4 in., incl.	Over 4 in. to 6 in., incl.	Over 6 in.
	No. 6 thru 3/8	+0.02 -0.03	+0.02 -0.04	+0.04 -0.06	+0.06 -0.10	+0.10 -0.18
	7/16 and 1/2	+0.02 -0.03	+0.04 -0.05	+0.06 -0.08	+0.08 -0.10	+0.12 -0.18
	9/16 thru 3/4	+0.02 -0.03	+0.06 -0.08	+0.08 -0.10	+0.10 -0.10	+0.14 -0.18

‡Length of a cap screw is measured from the underhead bearing surface to the extreme end of the screw.
ASME B18.5-2008 does not specify dimensions for the #6, #8 or #12 diameters. Data listed for these sizes is independent of the ASME specification.

LOW CARBON & HOT-DIP GALVANIZED CARRIAGE BOLT



**

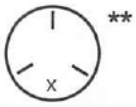
Description	***Low Carbon Steel Carriage:*** Round head bolt with a square neck under the head, and a unified thread pitch. Made from low or medium carbon steel. ***Hot-Dip Galvanized Steel Carriage:*** Carriage bolt made from low or medium carbon steel with a galvanic zinc finish applied.
Applications/ Advantages	***Low Carbon Steel Carriage:*** The square neck is designed to keep the bolt from turning as a nut is tightened. *Hot-Dip Galvanized Steel Carriage:* Same design advantages as a low carbon carriage bolt but with a thicker protective coating for outdoor use. Often used in outdoor furniture.
Material	***Low Carbon Steel & Hot-Dip Galvanized Steel Carriage:*** AISI 1006 - 1050 or equivalent steel.
Core Hardness	***Low Carbon Steel & Hot-Dip Galvanized Steel Carriage:*** Rockwell B70 - B100
Proof Load	***Low Carbon Steel Carriage:*** 33,000 psi.
Yield Strength*	***Low Carbon Steel Carriage:*** 36,000 psi. minimum
Tensile Strength	***Low Carbon Steel Carriage:*** 60,000 psi. minimum
Elongation*	***Low Carbon Steel Carriage:*** 18% minimum
Reduction of Area*	***Low Carbon Steel Carriage:*** 35% minimum (all sizes)
Minimum Thread Length	The minimum length of thread shall be equal to twice the basic bolt diameter plus 0.25 in. for bolts 6 in. or shorter, and twice the diameter plus 0.50 in. for bolts longer than 6 in..
Plating	See Appendix-A for information on the plating of steel carriage bolts.

* These properties are tested only on machined specimens when the testing machine cannot provide for full testing of the parts.
**Product standards require the manufacturer's head marking to appear on the top of all bolts 1/4" diameter and larger. "X" represents one location such a marking may appear.

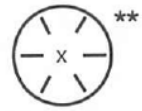
Grades 5 & 8; 18-8 Stainless

CARRIAGE BOLTS
Round Head, Square Neck

NOTE: Dimensions for Grade-5, Grade-8 &18-8 Stainless Steel Carriage Bolts are listed on previous page.

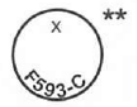


GRADE-5 & 8 CARRIAGE BOLTS



Description	*Grade-5*	*Grade-8*
	Carriage bolt made from medium carbon alloy steel and heat-treated.	Carriage bolt made from medium carbon steel and heat-treated.
Applications/ Advantages	Same design advantages as a low carbon carriage bolt but with significantly greater load carrying capacity.	Same design advantages as a Grade-5 carriage bolt but with greater load carrying capacity.
Material	AISI 1030 - 1050 or equivalent steel.	Medium carbon alloy steel
Heat Treatment	Bolts shall be heat-treated, oil or water-quenched, at the option of the manufacturer, and tempered at a minimum temperature of 800°F.	Grade 8 carriage bolts shall be heat-treated, oil-quenched and tempered at a minimum temperature of 800° F.
Core Hardness	***1/4 through 1 in. diameters:*** Rockwell C25 - C34	***1/4 through 1 in. diameters:*** Rockwell C33 - C39
Surface Hardness	***1/4 through 1 in. diameters:*** Rockwell 30N54 maximum	***1/4 through 1 in. diameters:*** Rockwell 30N 58.6 maximum
Proof Load	***1/4 through 1 in. diameters:*** 85,000 psi.	***1/4 through 1 in. diameters:*** 120,000 psi.
Yield Strength*	***1/4 through 1 in. diameters:*** 92,000 psi. minimum	***1/4 through 1 in. diameters:*** 130,000 psi. minimum
Tensile Strength	***1/4 through 1 in. diameters:*** 120,000 psi. minimum	***1/4 through 1 in. diameters:*** 150,000 psi. minimum
Elongation*	14% minimum	12% minimum (all diameters)
Reduction of Area*	35% minimum (all sizes)	35% minimum (all sizes)
Minimum Thread Length	The minimum length of thread shall be equal to twice the basic bolt diameter plus 0.25 in. for bolts 6 in. or shorter, and twice the diameter plus 0.50 in. for bolts longer than 6 in..	
Plating	See Appendix-A for information on the plating of steel carriage bolts.	Grade-8 carriage bolts are typically provided with a zinc yellow finish.

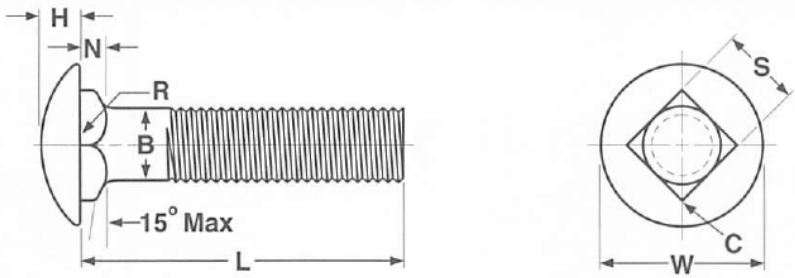
CARRIAGE BOLTS—STAINLESS STEEL, 18-8



Description	Round head bolt with a square neck under the head, and a unified thread pitch, made from austenitic alloy stainless steel.
Applications/ Advantages	Same design advantages as a low carbon carriage bolt but for use in environments which require general atmospheric corrosion resistance.
Material	18-8 stainless steel carriage bolts are made from one of the following austenitic alloys: 302 HQ, 303, 303Se, 304, XM7, all of which are characterized as having a chromium content of 17-19% and nickel content of 8-10%.
Heat Treatment	The austenitic alloys develop their strength through work hardening during the fastener manufacturing process, as seen from the hardness properties below. The only heat treatment normally available on austenitic stainless alloys is annealing, which is done at approximately 1900°F to a dead soft condition and is not normally thermally reversible.
Hardness	***1/4 through 1/2 in. diameter:*** Rockwell B95 - C32.
Yield Strength	***1/4 through 1/2 in. diameter, 2.25D and longer:*** 65,000 psi. minimum
Tensile Strength	***1/4 through 1/2 in. diameter, 2.25D and longer:*** 100,000 - 150,000 psi. minimum
Elongation in 4D	***1/4 through 1/2 in. diameter:*** 20% minimum
Minimum Thread Length	The minimum length of thread shall be equal to twice the basic bolt diameter plus 0.25 in. for bolts 6 in. or shorter.

* These properties are tested only on machined specimens when the testing machine cannot provide for full testing of the parts.
**Product standards require the manufacturer's head marking to appear on the top of all bolts 1/4" diameter and larger. "X" represents one location such a marking may appear.

CARRIAGE BOLTS — Round Head, Short Neck



Carriage Bolts, Short Neck

ASME B18.5--2012

Nominal Size or Basic Bolt Diameter		B		W		H		S		N		C	R
		Body Diameter		Head Diameter		Head Height		Square Width		Square Depth		Corner Radius on Square	Fillet Radius
		Max	Min	Max	Mln	Max	Min	Max	Min	Max	Min	Max	Max
1/4	0.2500	0.260	0.213	0.594	0.563	0.145	0.125	0.260	0.245	0.124	0.093	0.031	0.031
5/16	0.3125	0.324	0.272	0.719	0.688	0.176	0.156	0.324	0.307	0.124	0.093	0.031	0.031
3/8	0.3750	0.388	0.329	0.844	0.782	0.208	0.188	0.388	0.368	0.156	0.125	0.047	0.031
7/16	0.4375	0.452	0.385	0.969	0.907	0.239	0.219	0.452	0.431	0.156	0.125	0.047	0.031
1/2	0.5000	0.515	0.444	1.094	1.032	0.270	0.250	0.515	0.492	0.156	0.125	0.047	0.031
5/8	0.6250	0.642	0.559	1.344	1.219	0.344	0.313	0.642	0.616	0.218	0.187	0.078	0.062
3/4	0.7500	0.768	0.678	1.594	1.469	0.406	0.375	0.768	0.741	0.218	0.187	0.078	0.062

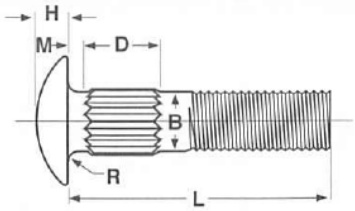
Tolerance on Length	Nominal Bolt Size	Nominal Screw Length									
		Up to 1 in., incl.		Over 1 in. to 2 1/2 in., incl.		Over 2 1/2 in. to 4 in., incl.		Over 4 in. to 6 in., incl.		Over 6 in.	
	No. 10 thru 3/8	+0.02	-0.03	+0.02	-0.04	+0.04	-0.06	+0.06	-0.10	+0.10	-0.18
	7/16 and 1/2	+0.02	-0.03	+0.04	-0.05	+0.06	-0.08	+0.08	-0.10	+0.12	-0.18
	9/16 thru 3/4	+0.02	-0.03	+0.06	-0.08	+0.08	-0.10	+0.10	-0.10	+0.14	-0.18
	7/8 and 1	....	....	+0.08	-0.10	+0.10	-0.14	+0.12	-0.16	+0.16	-0.20
	1-1/8 thru 1-1/2	....	....	+0.12	-0.12	+0.16	-0.16	+0.18	-0.18	+0.22	-0.22

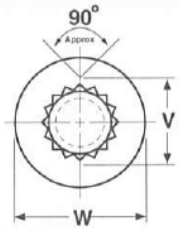
‡Length of a carriage bolt is measured from the underhead bearing surface to the extreme end of the bolt.

Description	A round head bolt with a short, square shoulder under the head, and a unified thread pitch. The bolt is made from low or medium carbon steel.
Applications/ Advantages	Carriage bolts are designed to keep the bolt from turning when a nut is being tightened. The short neck variety is used in sheet metal where a standard sized neck would create an obstruction.
Material	AISI 1006 - 1050 or equivalent steel
Hardness	Rockwell B70 - 100
Proof Load	33,000 psi.
Tensile Strength	60,000 psi. minimum
Yield Strength	36,000 psi. minimum
Elongation	18% minimum
Reduction of Area	35% minimum
Minimum Thread Length	The minimum length of thread shall be equal to twice the basic bolt diameter plus 0.25 in. for bolts 6 in. or shorter, and twice the diameter plus 0.50 in. for bolts longer than 6 in..
Plating	See Appendix-A for plating information.

Round Head, Ribbed Neck
Low Carbon & Gr-5 & Stainless Steel

CARRIAGE BOLTS





CARRIAGE BOLTS, RIBBED NECK

ASME B18.5-2012

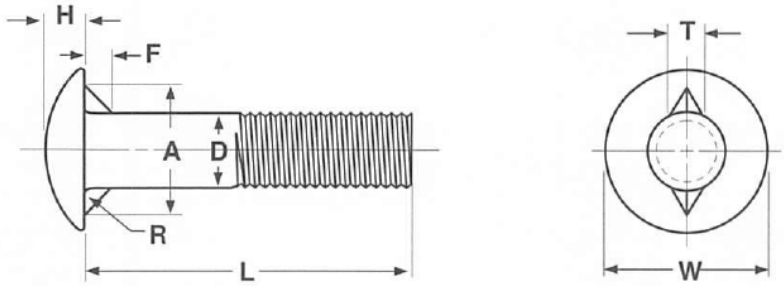
Nominal Size or Basic Bolt Diameter		B		W		H		M		Number of Ribs Approx	V	D			R
		Body Diameter		Head Diameter		Head Height		Head to Ribs For Lengths of			Diameter Over Ribs	Depth Over Ribs For Lengths of			Fillet Radius
								7/8 and Shorter	1 in. and Longer			7/8 and Shorter	1 in. and 1-1/8	1-1/4 and Longer	
		Max	Min	Max	Min	Max	Min	Max			Min	± 0.031			Max
No. 10	0.1900	0.199	0.182	0.469	0.438	0.114	0.094	0.062	0.094	9	0.210	0.250	0.407	0.594	0.031
1/4	0.2500	0.260	0.237	0.594	0.563	0.145	0.125	0.062	0.094	10	0.274	0.250	0.407	0.594	0.031
5/16	0.3125	0.324	0.298	0.719	0.688	0.176	0.156	0.062	0.094	12	0.340	0.250	0.407	0.594	0.031
3/8	0.3750	0.388	0.360	0.844	0.782	0.208	0.188	0.062	0.094	12	0.405	0.250	0.407	0.594	0.031
7/16	0.4375	0.452	0.421	0.969	0.907	0.239	0.219	0.062	0.094	14	0.470	0.250	0.407	0.594	0.031
1/2	0.5000	0.515	0.483	1.094	1.032	0.270	0.250	0.062	0.094	16	0.534	0.250	0.407	0.594	0.031
5/8	0.6250	0.642	0.605	1.344	1.219	0.344	0.313	0.125	0.125	19	0.660	0.313	0.438	0.625	0.062
3/4	0.7500	0.768	0.729	1.594	1.469	0.406	0.375	0.125	0.125	22	0.785	0.313	0.438	0.625	0.062

Tolerance on Length	Nominal Screw Size	Nominal Screw Length									
		Up to 1 in., incl.		Over 1 in. to 2 1/2 in., incl.		Over 2 1/2 in. to 4 in., incl.		Over 4 in. to 6 in., incl.		Over 6 in.	
	No. 10 thru 3/8	+0.02	-0.03	+0.02	-0.04	+0.04	-0.06	+0.06	-0.10	+0.10	-0.18
	7/16 and 1/2	+0.02	-0.03	+0.04	-0.05	+0.06	-0.08	+0.08	-0.10	+0.12	-0.18
	9/16 thru 3/4	+0.02	-0.03	+0.06	-0.08	+0.08	-0.10	+0.10	-0.10	+0.14	-0.18
	7/8 and 1	....	....	+0.08	-0.10	+0.10	-0.14	+0.12	-0.16	+0.16	-0.20
	1-1/8 thru 1-1/2	....	....	+0.12	-0.12	+0.16	-0.16	+0.18	-0.18	+0.22	-0.22

†Length of a cap screw is measured from the underhead bearing surface to the extreme end of the screw.
*Tolerance on #10 through 1/2" sizes for nominal lengths of 7/8" and shorter shall be +0.031 and -0.000.

Description	A round head bolt with a flat bearing surface which intersects with the shank at a 90° angle. Where the bearing surface and shank meet are two fins, 180° opposite each other.		
Applications/ Advantages	Primarily used in thin plywood to keep the bolt from turning when nut is being tightened.	Widely used in the truck and trailer industries	
Material	***Low Carbon***	***Grade-5***	***Stainless***
	Bolts shall be made from a carbon steel which conforms to the following chemical composition requirements-- *Carbon*: 0.55% maximum; *Phosphorus*: 0.060% max; *Sulfur*: 0.150% max.	AISI 1030 - 1050 or equivalent steel	18-8 Stainless Steel
Hardness	Rockwell B69 - 100	Core: (1/4 thru 1" diams): Rockwell C25 - C34 Surface: (1/4 thru 1" diams): Rockwell 30N54 max	Approximately B80 - C32
Tensile Strength	60,000 psi. minimum	(1/4 thru 1" diams): 120,000 psi. min.	80,000 psi. minimum
Yield Strength	36,000 psi. minimum	(1/4 thru 1" diams): 92,000 psi. min.	40,000 psi. minimum
Elongation	18% minimum	14% minimum	-
Reduction of Area	35% minimum	35% minimum	-
Plating	See Appendix-A for plating information.		

CARRIAGE BOLTS — Fin Neck



Carriage Bolts, Fin Neck

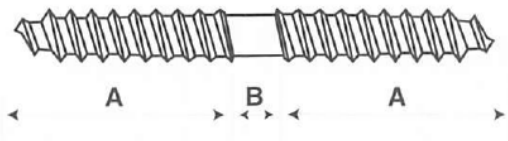
ASME B18.5-2012

Nominal Size or Basic Bolt Diameter		D		W		H		T		A		F		R	
		Body Diameter		Head Diameter		Head Height		Fin Thickness		Distance Across Fins		Fin Depth		Fillet Radius	
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
10	0.1900	0.199	0.182	0.469	0.438	0.114	0.094	0.098	0.078	0.395	0.375	0.088	0.076	0.031	0.015
1/4	0.2500	0.260	0.237	0.594	0.563	0.145	0.125	0.114	0.094	0.458	0.438	0.104	0.094	0.031	0.015
5/16	0.3125	0.324	0.298	0.719	0.688	0.176	0.156	0.145	0.125	0.551	0.531	0.135	0.125	0.031	0.015
3/8	0.3750	0.388	0.360	0.844	0.782	0.208	0.188	0.161	0.141	0.645	0.625	0.151	0.141	0.031	0.015
7/16	0.4375	0.452	0.421	0.969	0.907	0.239	0.219	0.192	0.172	0.739	0.719	0.182	0.172	0.031	0.015
1/2	0.5000	0.515	0.483	1.094	1.032	0.270	0.250	0.208	0.188	0.833	0.813	0.198	0.188	0.031	0.015

Tolerance on Length	Nominal Bolt Size	Nominal Screw Length									
		Up to 1 in., incl.		Over 1 in. to 2 1/2 in., incl.		Over 2 1/2 in. to 4 in., incl.		Over 4 in. to 6 in., incl.		Over 6 in.	
	#10 thru 3/8	+0.02	-0.03	+0.02	-0.04	+0.04	-0.06	+0.06	-0.10	+0.10	-0.18
	7/16 and 1/2	+0.02	-0.03	+0.04	-0.05	+0.06	-0.08	+0.08	-0.10	+0.12	-0.18

Description	A round head bolt with a flat bearing surface which intersects with the shank at a 90° angle. Where the bearing surface and shank meet are two fins, 180° opposite each othe. The bolt is made from low carbon steel.
Applications/ Advantages	Primarily used in thin plywood to keep the bolt from turning when nut is being tightened.
Material	Bolts shall be made from a carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.55% maximum; ***Phosphorus***: 0.060% maximum; ***Sulfur***: 0.150% maximum
Hardness	Rockwell B69 - 100
Tensile Strength	60,000 psi. minimum
Yield Strength	36,000 psi. minimum
Elongation	18% minimum
Reduction of Area	35% minimum
Plating	See Appendix-A for plating information.

DOWEL SCREWS



DOWEL SCREWS

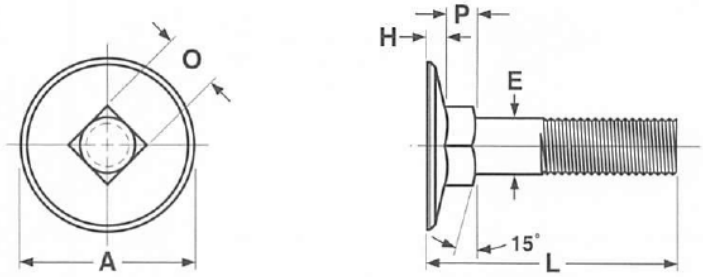
Hanger Bolt & Stud

Diameter & Thread Pitch	Overall Length	A Thread Lengths	B Collar Length
#6-18	3/4	3/8	-
	1	3/8	1/4
#8-15	1	1/2	-
	1-1/4	5/8	-
	1-1/2	5/8	1/4
3/16-11	1	1/2	-
	1-1/4	1/2	1/4
	1-1/2	3/4	-
	1-3/4	3/4	1/4
	2	7/8	1/4
	2-1/4	7/8	1/2
	2-1/2	1-1/8	1/4
	3	1-3/8	1/4
1/4-10	1-1/2	3/4	-
1/4-10	1-3/4	3/4	1/4
	2	7/8	1/4
	2-1/2	1-1/8	1/4
	3	1-3/8	1/4
	3-1/2	1-5/8	1/4
5/16-9	1-1/2	3/4	-
	1-3/4	3/4	1/4
	2	7/8	1/4
	2-1/2	1-1/8	1/4
	3	1-3/8	1/4
	3-1/2	1-5/8	1/4
	4	1-5/8	3/4
	4-1/2	2-1/4	-
	5	2-1/4	1/2
	6	2-1/4	1-1/2
5/16-9	6	2-1/4	1-1/2
3/8-7	2	7/8	1/4
	2-1/2	1-1/8	1/4
	3	1-3/8	1/4
	3-1/2	1-5/8	1/4
1/2-6	4	1-5/8	3/4
	4-1/2	2-1/4	-
	5	2-1/4	1/2
	6	2-1/4	1-1/2
	8	3	2
	4	2	-
	5	2	1
	6	3	-
	8	3	2

Tolerance on Length	Up to 6": ± 1/16"	Over 6": ± 1/8"

Description	A headless fastener with a lag thread at both ends. They are designed to be inserted into a predrilled pilot hole. The end of the wood thread is designed as a taper that is threaded all the way to its blunt tip.
Applications / Advantages	Used for fastening two pieces of wood so as to keep them permanently in their proper relative position, usually set apart from each other.
Material	AISI 1008 & 1010 steel
Core Hardness	***3/16 through 3/8 in. diameter, all lengths:*** Rockwell B70 - B100
Tensile Strength	***3/16 through 3/8 in. diameter, all lengths:*** 60,000 psi. minimum
Plating	See Appendix-A for plating information.

ELEVATOR BOLTS



‡Length of an elevator bolt is measured from the top of the head to the extreme end of the bolt.

ELEVATOR BOLTS

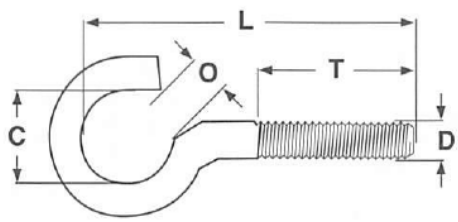
ASME B18.5-2012

Nominal Size	E		A			H		O		P	
	Body Diameter		Head Diameter			Head Height		Square Width		Square Depth	
	Max.	Min.	Max. Edge Sharp	Min. Edge Sharp	Min. Edge Flat	Max.	Min.	Max.	Min.	Max.	Min.
1/4	0.260	0.237	1.008	0.969	0.938	0.098	0.078	0.280	0.245	0.219	0.188
5/16	0.324	0.298	1.227	1.188	1.157	0.114	0.094	0.342	0.307	0.250	0.219
3/8	0.388	0.360	1.352	1.312	1.272	0.145	0.125	0.405	0.368	0.250	0.219
7/16	0.452	0.421	1.477	1.438	1.397	0.176	0.156	0.468	0.431	0.281	0.250
1/2	0.515	0.483	1.602	1.562	1.522	0.176	0.156	0.530	0.492	0.281	0.250

Tolerance on Length	Nominal Bolt Size	Nominal Bolt Length		
		Up to 1 in., incl.	Over 1 in. to 2-1/2 in., incl.	Over 2-1/2 in. to 4 in., incl.
	1/4 thru 3/8	+0.02, -0.03	+0.02, -0.04	+0.04, -0.06
	7/16 and 1/2	+0.02, -0.03	+0.04, -0.05	+0.06, -0.08

Description	Bolt with a wide, countersunk flat head, a shallow conical bearing surface, an integrally-formed square neck under the head, and a unified thread pitch.
Applications/ Advantages	Popular use is in conveyor systems.
Material	AISI 1006 - 1050 or equivalent steel.
Core Hardness	***1/4 through 3/8 in. diameter, all lengths:*** Rockwell B70 - B100
Proof Load	***1/4 through 3/8 in. diameter, all lengths:*** 33,000 psi.
Yield Strength	***1/4 through 3/8 in. diameter, all lengths:*** 36,000 psi. minimum
Tensile Strength	***1/4 through 3/8 in. diameter, all lengths:*** 54,000 psi. minimum
Elongation	18% minimum (all sizes)
Reduction of Area	35% minimum (all sizes)
Minimum Thread Length	The minimum length of thread shall be equal to twice the basic bolt diameter plus 0.25 in..
Plating	See Appendix-A for plating information.

EYE BOLTS, OPEN-END

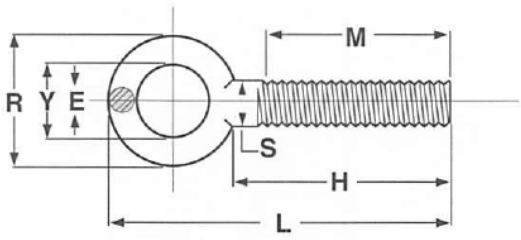


OPEN END EYE BOLTS									
Standard Sizes	C		O		T	D		L	
	Inner Curve Diameter		Diameter of Opening		Threaded Portion	Major Diameter		Nominal Length	
	Max	Min	Max	Min	Min	Max	Min	Max	Min
1/4-20 x 3"	.650	.550	.410	.310	1.75	.2489	.2408	3.06	2.94
5/16-18 x 3-3/4"	.750	.650	.410	.310	2	.3113	.3026	3.84	3.69

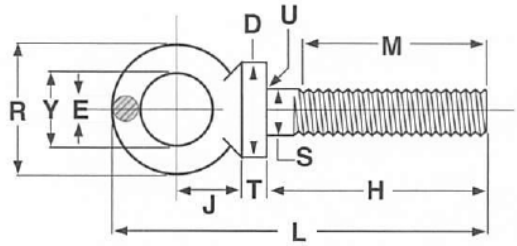
Description	An externaly threaded fastener with a unified thread pitch and a blunt point. At the end opposite the gimlet point the unthreaded section of the shank is turned into an incomplete circle leaving an opening of a specified distance through which a closed-end eye bolt or screw may pass.
Applications / Advantages	A convenient part that may be used as a temporary fastening in overhead applications for suspending light weights for a short period of time. One example of an end use is when a garage door assembly is installed by a single person; an open end eye bolt, s-hook and screw eye can be used, under proper conditions, to temporarily suspend a garage door opener mechanism while the permanent suspension device is being set in place.
Material	Low carbon cold drawn steel
Plating	Eye-bolts are typically supplied with a zinc finish.

EYE BOLTS, FORGED

Plain & Shoulder Patterns



PLAIN PATTERN



SHOULDER PATTERN

FORGED EYEBOLTS, PLAIN PATTERN

ANSI/ASME B18.15

Nominal Size		S	H		Y	R	E	L	M		Thread Size UNC-2A
		Shank Dia.	Shank Length		Eye ID	Nominal Eye OD	Eye Sect. Diameter	Overall Length	Min Length Full Thread		
			Long Length	Short Length					Long Length	Short Length	
1/4	0.25	0.25 0.28	1.00 1.06	1.00 1.06	0.69 0.81	1.19	0.19 0.25	2.06 2.38	0.75	0.75	1/4-20 or .250-20
5/16	0.31	0.31 0.34	1.12 1.19	1.06 1.13	0.81 0.94	1.44	0.25 0.31	2.44 2.75	0.81	0.75	5/16-18 or .3125-18
3/8	0.38	0.38 0.41	1.25 1.38	1.12 1.25	0.94 1.06	1.69	0.31 0.38	2.81 3.19	0.88	0.75	3/8-16 or .375-16
7/16	0.44	0.44 0.47	1.38 1.50	1.13 1.25	1.00 1.12	1.81	0.34 0.41	3.06 3.44	1.00	0.75	7/16-14 or .4375-14
1/2	0.50	0.50 0.53	1.50 1.62	1.13 1.25	1.12 1.25	2.12	0.44 0.50	3.50 3.88	1.12	0.75	1/2-13 or .500-13
9/16	0.56	0.56 0.59	1.62 1.75	1.21 1.34	1.19 1.31	2.25	0.47 0.53	3.75 4.12	1.25	0.84	9/16-12 or .5625-12
5/8	0.62	0.62 0.66	1.75 1.88	1.31 1.44	1.31 1.44	2.56	0.56 0.62	4.19 4.56	1.38	0.94	5/8-11 or .625-11
3/4	0.75	0.75 0.78	2.00 2.12	1.50 1.62	1.44 1.56	2.81	0.62 0.69	4.69 5.06	1.62	1.13	3/4-10 or .750-10
7/8	0.88	0.88 0.91	2.25 2.38	1.75 1.88	1.56 1.69	3.19	0.75 0.81	5.31 5.69	1.81	1.31	7/8-9 or .875-9
1	1.00	1.00 1.06	2.50 2.62	1.94 2.06	1.69 1.81	3.56	0.88 0.94	5.94 6.31	2.06	1.50	1-8 or 1.000-8
1-1/8	1.12	1.12 1.19	2.75 2.88	2.13 2.26	1.94 2.06	4.06	1.00 1.06	6.69 7.06	2.31	1.69	1-1/8-7 or 1.125-7
1-1/4	1.25	1.25 1.34	3.00 3.12	2.38 2.50	2.12 2.25	4.44	1.09 1.16	7.31 7.69	2.50	1.88	1-1/4-7 or 1.250-7
1-1/2	1.50	1.50 1.59	3.50 3.62	2.75 2.87	2.44 2.56	5.19	1.31 1.38	8.56 8.94	3.00	2.25	1-1/2-6 or 1.500-6
1-3/4	1.75	1.75 1.84	3.75 3.88	3.18 3.31	2.75 3.00	6.00	1.50 1.62	9.50 10.12	3.19	2.62	1-3/4-5 or 1.750-5
2	2.00	2.00 2.09	4.00 4.25	3.62 3.87	3.06 3.44	6.88	1.75 1.88	10.56 11.44	3.38	3.00	2-4-1/2 or 2.000-4.50
2-1/2	2.50	2.50 2.62	5.00 5.25	4.50 4.75	3.81 4.19	8.50	2.19 2.31	13.19 14.06	4.25	3.75	2-1/2-4 or 2.500-4

Plain & Shoulder Patterns

EYE BOLTS, FORGED

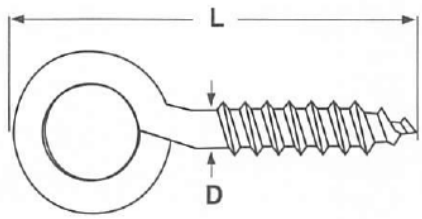
FORGED EYEBOLTS, SHOULDER PATTERN

ANSI/ASME B18.15

Nominal Size		S	H		Y	R	E	L	M		Thread Size UNC-2A	J	D	T	U
		Shank Diam.	Shank Length		Eye ID	Nominal Eye OD	Eye Sect. Diam.	Overall Length	Min Length Full Thread			Center line Eye To Shoulder	Shoulder Diam.	Shoulder Height	Radius Under Shoulder
			Long Length	Short Length					Long Length	Short Length					
1/4	0.25	0.25 0.28	1.00 1.06	1.00 1.06	0.69 0.81	1.19	0.19 0.25	2.22 2.53	0.75	0.75	1/4-20 or .250-20	0.69 0.81	0.50 0.56	0.12 0.19	0.015 0.025
5/16	0.31	0.31 0.34	1.12 1.19	1.06 1.13	0.81 0.94	1.44	0.25 0.31	2.66 2.97	0.81	0.75	5/16-18 or .3125-18	0.88 1.00	0.56 0.62	0.12 0.19	0.015 0.025
3/8	0.38	0.38 0.41	1.25 1.38	1.12 1.25	0.94 1.06	1.69	0.31 0.38	3.09 3.47	0.88	0.75	3/8-16 or .375-16	1.06 1.19	0.62 0.69	0.12 0.19	0.015 0.025
7/16	0.44	0.44 0.47	1.38 1.50	1.13 1.25	1.00 1.12	1.81	0.34 0.41	3.41 3.78	1.00	0.75	7/16-14 or .4375-14	1.19 1.31	0.75 0.81	0.19 0.25	0.015 0.025
1/2	0.50	0.50 0.53	1.50 1.62	1.13 1.25	1.12 1.25	2.12	0.44 0.50	3.81 4.19	1.12	0.75	1/2-13 or .500-13	1.31 1.44	0.88 0.94	0.19 0.25	0.015 0.025
9/16	0.56	0.56 0.59	1.62 1.75	1.21 1.34	1.19 1.31	2.25	0.47 0.53	4.19 4.56	1.25	0.84	9/16-12 or .5625-12	1.50 1.62	0.94 1.00	0.22 0.28	0.020 0.045
5/8	0.62	0.62 0.66	1.75 1.88	1.31 1.44	1.31 1.44	2.56	0.56 0.62	4.56 4.94	1.38	0.94	5/8-11 or .625-11	1.59 1.72	1.00 1.06	0.25 0.31	0.020 0.045
3/4	0.75	0.75 0.78	2.00 2.12	1.50 1.62	1.44 1.56	2.81	0.62 0.69	5.06 5.50	1.62	1.12	3/4-10 or .750-10	1.72 1.91	1.12 1.25	0.25 0.31	0.020 0.045
7/8	0.88	0.88 0.91	2.25 2.38	1.75 1.88	1.56 1.69	3.19	0.75 0.81	5.75 6.19	1.81	1.31	7/8-9 or .875-9	2.03 2.22	1.31 1.44	0.31 0.38	0.040 0.065
1	1.00	1.00 1.06	2.50 2.62	1.94 2.06	1.69 1.81	3.56	0.88 0.94	6.44 6.88	2.06	1.50	1-8 or 1.000-8	2.22 2.41	1.50 1.62	0.38 0.44	0.060 0.095
1-1/8	1.12	1.12 1.19	2.75 2.88	2.13 2.26	1.94 2.06	4.06	1.00 1.06	7.31 7.75	2.31	1.69	1-1/8-7 or 1.125-7	2.59 2.78	1.69 1.81	0.44 0.50	0.060 0.095
1-1/4	1.25	1.25 1.34	3.00 3.12	2.38 2.50	2.12 2.25	4.44	1.09 1.16	8.00 8.44	2.50	1.88	1-1/4-7 or 1.250-7	2.84 3.03	1.88 2.00	0.50 0.56	0.060 0.095
1-1/2	1.50	1.50 1.59	3.50 3.62	2.75 2.87	2.44 2.56	5.19	1.31 1.38	9.22 9.72	3.00	2.25	1-1/2-6 or 1.500-6	3.19 3.44	2.12 2.25	0.50 0.62	0.060 0.095
1-3/4	1.75	1.75 1.84	3.75 3.88	3.18 3.31	2.75 3.00	6.00	1.50 1.62	10.50 11.12	3.19	2.62	1-3/4-5 or 1.750-5	3.88 4.12	2.50 2.62	0.50 0.62	0.060 0.095
2	2.00	2.00 2.09	4.00 4.12	3.62 3.79	3.06 3.44	6.88	1.75 1.88	11.53 12.22	3.38	3.00	2-4-1/2 or 2.000-4.50	4.25 4.50	2.88 3.00	0.62 0.75	0.060 0.095

Description	A forged bolt without welds, with a head in the form of an open or closed anchor ring. Bolt shall have a unified thread pitch. Shoulder pattern eyebolts shall have an unthreaded shoulder below the anchor ring which is greater in diameter than the threaded shank.
Applications/ Advantages	Used in applications where a forged shank is required, ie. in a rigging when mounted atop a uniformly distributed weight.
Material	Eyebolts shall be made from a carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.48% maximum; ***Manganese***: 1.00% maximum; ***Phosphorus***: 0.040% maximum; ***Sulfur***: 0.050 maximum; ***Silicon***: 0.15-0.35%
Heat Treatment	Bolts shall be liquid quenched and tempered before machining the threaded end.
Grain Size	ASTM No. 5 or finer
Tensile Strength	65,000 - 85,000 psi.
Yield Strength	30,000 psi. minimum
Elongation in 2 in.	30% minimum
Reduction of Area	60% minimum
Plating	See Appendix-A for plating information.

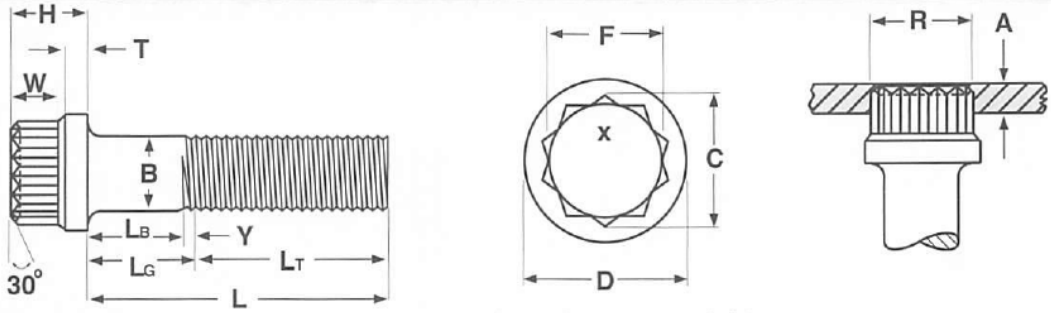
CLOSED-END EYE SCREWS



Closed-End Eye Screws		
Nominal Size	L	D
	Overall Length	Major Diameter
1/4	2	.250

Description	An externaly threaded fastener with spaced threads and a gimlet point. At the end opposite the gimlet point, the unthreaded section of the shank is turned into itself in a circular shape. This top end is considered "closed" if there is insufficient clearance area for a like-sized screw eye to pass through.
Applications / Advantages	A handy, economical part for use as a temporary fastening in wood. Can be used in overhead applications to suspend light weights for a short period of time. Can be used as part of a permanent fastening in side-to-side applications with hooks.
Material	Low carbon steel
Plating	Screw-eyes are typically supplied with a zinc finish.

Alloy Steel FLANGE SCREWS, 12-POINT



‡Length of a flange screw is measured from the underhead bearing surface to the extreme end of the screw.

12-Point Flange Screws

IFI 115

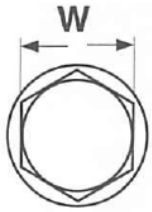
Nominal Size	B	D		F		C	H	W	T	A		R		LT	Y
	Body Diam.	Flange Diameter		Width Across Flats		Width Across Coners	Head Height	Wrench-ing Height	Flange Thick-ness	Gaging Ring Thickness		Gaging Ring Diameter		Thread Length	Transi-tion Thread Length
	Min	Max	Min	Max	Min	Min	Max	Min	Min	Max	Min	Max	Min	Basic	Max
1/4	0.2435	0.375	0.365	0.252	0.244	0.278	0.260	0.15	0.058	0.0525	0.0522	0.2783	0.2780	1.000	0.25
5/16	0.3053	0.469	0.457	0.315	0.306	0.348	0.312	0.18	0.074	0.0600	0.0597	0.3483	0.3480	1.125	0.28
3/8	0.3678	0.562	0.550	0.377	0.368	0.420	0.375	0.21	0.095	0.0711	0.0708	0.4203	0.4200	1.250	0.31
7/16	0.4294	0.656	0.642	0.438	0.429	0.489	0.438	0.26	0.109	0.0840	0.0837	0.4893	0.4890	1.375	0.36
1/2	0.4919	0.750	0.735	0.502	0.493	0.562	0.500	0.29	0.129	0.0948	0.0945	0.5623	0.5620	1.500	0.38
9/16	0.5538	0.844	0.828	0.564	0.555	0.633	0.563	0.33	0.145	0.1071	0.1068	0.6333	0.6330	1.625	0.42
5/8	0.6163	0.938	0.921	0.627	0.618	0.705	0.625	0.36	0.166	0.1179	0.1176	0.7053	0.7050	1.750	0.46
3/4	0.7406	1.125	1.107	0.752	0.743	0.847	0.750	0.44	0.200	0.1416	0.1413	0.8473	0.8470	2.000	0.50
7/8	0.8647	1.312	1.293	0.877	0.866	0.987	0.875	0.51	0.234	0.1656	0.1653	0.9873	0.9870	2.250	0.56
1	0.9886	1.500	1.479	1.003	0.991	1.130	1.000	0.60	0.268	0.1893	0.1890	1.1303	1.1300	2.500	0.62
1-1/8	1.1086	1.688	1.665	1.128	1.115	1.271	1.125	0.66	0.310	0.2109	0.2106	1.2713	1.2710	2.750	0.71
1-1/4	1.2336	1.875	1.852	1.253	1.240	1.414	1.250	0.73	0.350	0.2331	0.2328	1.4143	1.4140	3.000	0.71
1-3/8	1.3568	2.062	2.038	1.378	1.365	1.556	1.375	0.80	0.392	0.2544	0.2541	1.5563	1.5560	3.250	0.83
1-1/2	1.4818	2.250	2.224	1.503	1.489	1.697	1.500	0.87	0.433	0.2763	0.2760	1.6973	1.6970	3.500	0.83

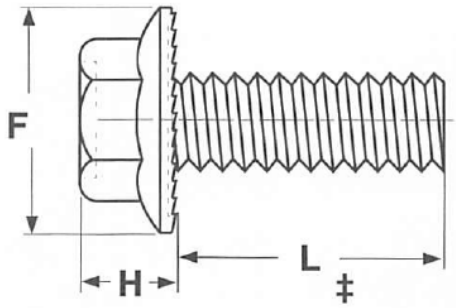
Tolerance on Length	Nominal Screw Lengths			
	Up to 1 in., incl.	Over 1 to 2 in., incl.	over 2 to 6 in., incl.	over 6 in.
	-0.031	-0.047	-0.062	-0.125

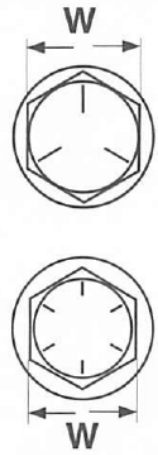
Description	A one-piece bolt with a 24-sided head and a flanged bearing surface, made of alloy steel.
Applications/ Advantages	Popular in aircraft manufacturing and aftermarket because of its ease of installation with pneumatic wrenches.
Material	Alloy Steel
Heat Treatment	Grade-8 flange screws shall be heat treated, oil quenched and tempered at a minimum tempering temperature of 800°F.
Hardness	Rockwell C33 - 39
Tensile Strength	150,000 psi. minimum
Yield Strength	130,000 psi. minimum
Proof Load	120,000 psi.
Plating	See Appendix-A for plating information.

**Product standards require the manufacturer's head marking to appear on the top of all bolts 1/4" diameter and larger. "X" represents one location such a marking may appear.

FLANGE SCREWS, SERRATED HEX WASHER







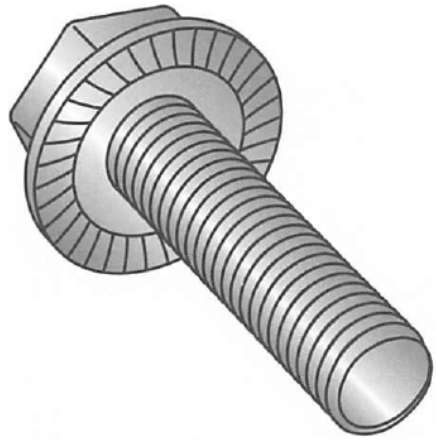
‡Length of a serrated flange screw is measured from the bottom of the serration to the extreme end of the screw.

Serrated Hex Washer Head Flange Screws

Size (Diameter & Thread Pitch)	W		H		F	
	Width Across Flats		Thickness		Flange Diameter	
	Max	Min	Max	Min	Max	Min
4-40	.188	.181	.079	.060	.243	.225
6-32	.187	.181	.157	.132	.266	.254
8-32	.250	.244	.186	.161	.355	.341
10-24 & 10-32	.312	.305	.210	.185	.441	.425
12-24	.312	.305	.240	.161	.520	.398
1/4-20 & 1/4-28	.375	.367	.240	.216	.531	.513
5/16-18 & 5/16-24	.500	.491	.298	.274	.706	.686
3/8-16 & 3/8-24	.562	.552	.331	.307	.793	.771
7/16-14	.625	.612	.460	.365	.930	.856
1/2-13 & 1/2-20	.750	.736	.510	.470	1.070	1.020
5/8-11	.9375	.922	.620	.580	1.330	1.260
3/4-10	1.1250	1.100	.730	.680	1.590	1.490

Tolerance on Length (ASME B18.2.1 & ASME B18.6.3)	Nominal Screw Size	Nominal Screw Length				
		Up to 1/2 in., incl.	Over 1/2 in. to 1 in., incl.	Over 1 in. to 2 in., incl.	Over 2 in. to 4 in., incl.	Over 4 in. to 6 in., incl.
	No. 4 thru 12	-0.02	-0.03	-0.06	-0.09	-0.09
	1/4 thru 3/8	-0.03	-0.03	-0.06	-0.09	-0.10
	7/16 thru 1/2	-0.03	-0.03	-0.06	-0.09	-0.10
	9/16 thru 3/4	....	-0.03	-0.08	-0.10	-0.10

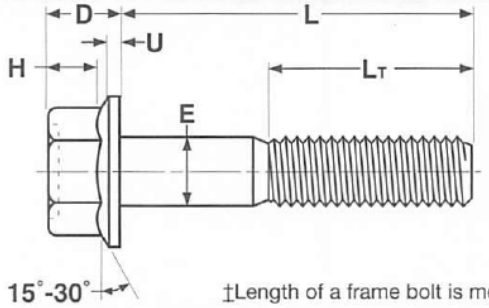
FLANGE SCREWS, SERRATED HEX WASHER

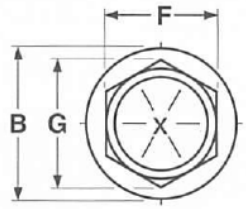


Description	An unslotted hex head screw with unified thread pitch and a flange that has serrations on the bearing surface side.			
Applications/ Advantages	Designed for use in applications where loosening forces are present,such as vibration. The serrations grip to the bearing surface so that significantly more torque is needed to loosen than to tighten the screw. Flange provides more strength than a standard machine screw. Eliminates need for a lockwasher or locknut in certain applications.			
Material	***Low Carbon Steel***	***Grade 5***	***Grade 8***	***Stainless Steel***
	AISI C1022 steel.	Medium carbon steel	Medium carbon alloy steel	18-8 Stainless
Heat Treatment	Serrated flange screws shall be quenched and tempered at a minimum temperature of 650°F.	Screws shall be heat treated, oil or water quenched, at the option of the manufacturer, and tempered at a minimum tempering temperature of 800°F.	Grade-8 serrated flange screws shall be heat-treated, oil-quenched and tempered at a minimum temperature of 800°F.	-
Case Hardness	Rockwell C 40 minimum	Rockwell 30N54 maximum	Rockwell 30N58.6 maximum	Base metal hardness: Rockwell B85 - B95 (approximate)
Core Hardness	Rockwell C26 - C34	Rockwell C25 - C34	Rockwell C33 - C39	
Proof Load	-	1/4 through 3/4 in. diameter, all lengths: 85,000 psi.	120,000 psi.	-
Tensile Strength	-	1/4 through 3/4 in. diameter, all lengths: 120,000 psi. minimum	150,000 psi. minimum	80,000 psi. minimum
Plating	See Appendix-A for plating information.	See Appendix-A for plating information.	See Appendix-A for plating information.	Stainless serrated flange screws are usually supplied without an additional finish.

FRAME BOLTS, HEX WASHER

Grade 8 & Stainless Steel





‡Length of a frame bolt is measured from the underhead bearing surface to the extreme end of the screw.

FRAME BOLTS / FLANGE BOLTS

IFI-111 (2014) & SAE J429

Nominal Size	E		F			G		B	U	D	H	L_T	Gr-8 Alloy Bolts Only	
	Body Diameter		Width Across Flats			Width Across Corners		Flange Diam.	Flange Thick-ness	Head Height	Hex Height	Thread Length	Tensile Strength, Lbs.	Proof Load, Lbs.
	Max	Min	Basic	Max	Min	Max	Min	Max	Min	Max	Min	Basic		
1/4	0.2500	0.2450	3/8	0.3750	0.367	0.433	0.409	0.56	0.04	0.28	0.17	0.750	4,750	3,800
5/16	0.3125	0.3065	1/2	0.5000	0.489	0.577	0.548	0.68	0.05	0.32	0.21	0.875	7,850	6,300
3/8	0.3750	0.3690	9/16	0.5625	0.551	0.650	0.618	0.81	0.06	0.39	0.25	1.000	11,600	9,300
7/16	0.4375	0.4305	5/8	0.6250	0.612	0.722	0.685	0.93	0.07	0.46	0.30	1.125	15,900	12,800
1/2	0.5000	0.4930	3/4	0.7500	0.736	0.866	0.825	1.07	0.08	0.51	0.34	1.250	21,300	17,000
5/8	0.6250	0.6170	15/16	0.9375	0.922	1.083	1.034	1.33	0.10	0.62	0.42	1.500	33,900	27,100
3/4	0.7500	0.7410	1-1/8	1.1250	1.100	1.299	1.234	1.59	0.11	0.73	0.51	1.750	50,100	40,100

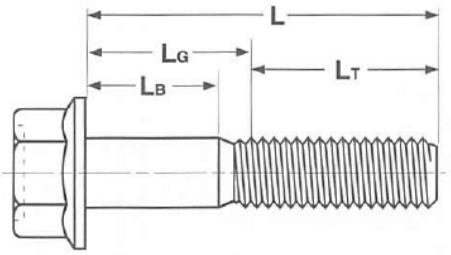
Tolerance on Length	Nominal Bolt Size	Nominal Bolt Length		
		Up to 1 in., incl.	Over 1 in. to 2-1/2 in., incl.	Over 2-1/2 in. to 4 in., incl.
	1/4 to 3/8	-0.03	-0.04	-0.06
	7/16 and 1/2	-0.03	-0.06	-0.08
	5/8 and 3/4	-0.03	-0.08	-0.10

Description	A one-piece hex-washer head bolt with a flat bearing surface, made of high-alloy steel. Indented top of the head is optional	A one-piece hex-washer head bolt with a flat bearing surface, made of stainless steel. Indented top of the head is optional.
Applications/ Advantages	For use on truck frames. The flange eliminates washers and helps compensate for a misaligned hole. Used with a Grade-GT lock nut, the bolt system resists bolt slippage by distributing the clamp load over a wide area.	Used in applications where greater resistance to corrosion is required and increased bearing area is desired.
Material	AISI 4037 - 5135 or equivalent alloy steel	18-8 Stainless Steel
Heat Treatment	Grade-8 frame bolts shall be heat-treated, oil-quenched and tempered at a minimum temperature of 800°F.	-
Core Hardness	Rockwell C33 - C39	Overall Hardness: **1/4 thru 5/8" diameters:** Rockwell B95 - C32 **3/4 thru 1 1/2" diameters:** Rockwell B80 - C32
Surface Hardness	Rockwell 30N58.6 maximum	
Proof Load	120,000 psi.	-
Yield Strength	130,000 psi. minimum	**1/4 thru 5/8" diameters:** 65,000 psi. **3/4 thru 1 1/2" diameters:** 45,000 psi.
Tensile Strength	150,000 psi. minimum	**1/4 thru 5/8" diameters:** 100,000 - 150,000 psi. **3/4 thru 1 1/2" diameters:** 85,000 - 140,000 psi.
Coating	See Appendix-A for information on the plating of frame bolts.	Stainless flange bolts are usually supplied with no additional finish.

**Product standards require the manufacturer's head marking to appear on the top of all bolts 1/4" diameter and larger. "X" represents one location such a marking may appear.

Thread Length Specifications

FRAME BOLTS, HEX WASHER



HEX WASHER FRAME BOLTS

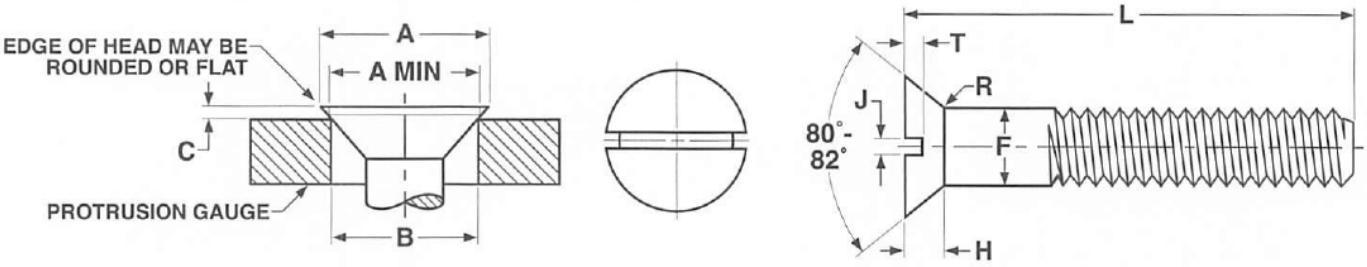
IFI-111 (2014) & SAE J429

Maximum Grip Gaging Lengths, L_G, and Minimum Body Lengths, L_B

Nominal Diameter	1/4		5/16		3/8		7/16		1/2		5/8		3/4	
Nominal Lengths	LB Min	LG Max	LB Min	LG Max	LB Min	LG Max	LB Min	LG Max	LB Min	LG Max	LB Min	LG Max	LB Min	LG Max
1-1/4														
1-3/8	0.225	0.625												
1-1/2	0.350	0.750	0.208	0.625										
1-5/8	0.475	0.875	0.333	0.750	0.187	0.625								
1-3/4	0.600	1.000	0.458	0.875	0.312	0.750								
1-7/8	0.725	1.125	0.583	1.000	0.437	0.875	0.286	0.750						
2	0.850	1.250	0.708	1.125	0.562	1.000	0.411	0.875	0.269	0.750				
2-1/8	0.975	1.375	0.833	1.250	0.687	1.125	0.536	1.000	0.394	0.875				
2-1/4	1.100	1.500	0.958	1.375	0.812	1.250	0.661	1.125	0.519	1.000				
2-3/8	1.225	1.625	1.083	1.500	0.937	1.375	0.786	1.250	0.644	1.125				
2-1/2	1.350	1.750	1.208	1.625	1.062	1.500	0.911	1.375	0.769	1.250				
2-5/8	1.475	1.875	1.333	1.750	1.187	1.625	1.036	1.500	0.894	1.375	0.352	1.125		
2-3/4	1.600	2.000	1.458	1.875	1.312	1.750	1.161	1.625	1.019	1.500	0.477	1.250		
2-7/8	1.725	2.125	1.583	2.000	1.437	1.875	1.286	1.750	1.144	1.625	0.602	1.375	0.325	1.125
3	1.850	2.250	1.708	2.125	1.562	2.000	1.411	1.875	1.269	1.750	0.727	1.500	0.450	1.250
3-1/4	2.100	2.500	1.958	2.375	1.812	2.250	1.661	2.125	1.519	2.000	0.977	1.750	0.700	1.500
3-1/2	2.350	2.750	2.208	2.625	2.062	2.500	1.911	2.375	1.769	2.250	1.227	2.000	0.950	1.750
3-3/4	2.600	3.000	2.458	2.875	2.312	2.750	2.161	2.625	2.019	2.500	1.477	2.250	1.200	2.000
4	2.850	3.250	2.708	3.125	2.562	3.000	2.411	2.875	2.269	2.750	1.727	2.500	1.450	2.250
4-1/4	3.100	3.500	2.958	3.375	2.812	3.250	2.661	3.125	2.519	3.000	1.977	2.750	1.700	2.500
4-1/2	3.350	3.750	3.208	3.625	3.062	3.500	2.911	3.375	2.769	3.250	2.227	3.000	1.950	2.750
4-3/4	3.60	4.000	3.458	3.875	3.312	3.750	3.161	3.625	3.019	3.500	2.477	3.250	2.200	3.000
5	3.850	4.250	3.708	4.125	3.562	4.000	3.411	3.875	3.269	3.750	2.727	3.500	2.450	3.250

Frame Bolt lengths above heavy black line are fully threaded (for parts made after 2002)

FLAT SLOTTED CAP SCREWS



‡Length of a slotted flatcap screw is measured from the top of the head to the extreme end of the screw.

SLOTTED FLAT COUNTERSUNK HEAD CAP SCREWS

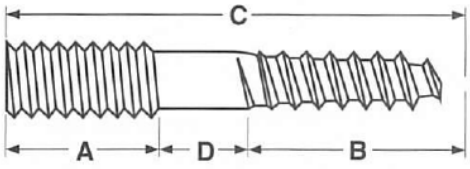
ASME B18.6.2--2010

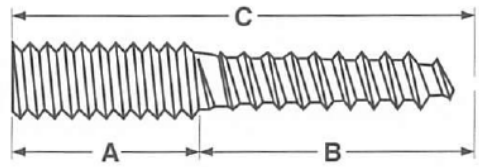
Nominal Size or Basic Screw Diameter		F		A		H	J		T		R	C		B
		Body Diameter		Head Diameter		Head Height	Slot Width		Slot Depth		Fillet Radius	Protrusion Above Gaging Diameter		Gaging Diameter
		Max	Min	Max, Edge Sharp	Min,Edge Rounded or Flat	Ref	Max	Min	Max	Min	Max	Max	Min	
1/2	0.5000	0.5000	0.4930	0.875	0.791	0.210	0.106	0.091	0.103	0.068	0.200	0.071	0.049	0.756
5/8	0.6250	0.6250	0.6170	1.125	1.020	0.281	0.133	0.116	0.137	0.091	0.250	0.085	0.058	0.982
3/4	0.7500	0.7500	0.7420	1.375	1.251	0.352	0.149	0.131	0.171	0.115	0.300	0.099	0.068	1.208

Tolerance on Length	Nominal Screw Size	Nominal Screw Length		
		Up to 1 in., incl.	Over 1 to 2-1/2 in., incl.	Over 2-1/2 to 6 in., incl.
	1/2 thru 3/4	-0.03	-0.06	-0.08

Description	Flat, countersunk screw with a flat top surface, milled slot, and a conical bearing surface with a head angle of 82°.
Applications/ Advantages	For assembling close tolerance machinery where head clearance is critical.
Material	AISI 1006 - 1050 or equivalent steel.
Core Hardness	***1/2 through 3/4 in. diameter, all lengths:*** Rockwell B80 - B100
Proof Load	***1/2 through 3/4 in. diameter, all lengths:*** 55,000 psi.
Tensile Strength	***1/2 through 3/4 in. diameter, all lengths:*** 74,000 psi. minimum
Thread Length	The length of full-form thread shall be equal to twice the basic screw diameter plus 0.250 in. with a tolerance of +0.188 in. or (2.5xThread Pitch), whichever is greater.
Plating	See Appendix-A for plating information.

HANGER BOLTS





HANGER BOLTS

Hanger Bolt & Stud

Diameter & Thread Pitch	C Standard Length	A Machine Thread Length	B Lag Thread Length	D Center Space
6-32	5/8	1/4	3/8	-
	3/4	3/8	3/8	-
	7/8	1/4	5/8	-
	1	3/8	5/8	-
8-32	5/8	1/4	3/8	-
	3/4	3/8	3/8	-
	7/8	1/4	5/8	-
	1	3/8	5/8	-
	1-1/4	5/8	5/8	-
	1-1/2	5/8	7/8	-
	1-3/4	3/4	1	-
	2	1	1	-
10-24	1	3/8	5/8	-
	1-1/4	5/8	5/8	-
	1-1/2	5/8	7/8	-
	1-3/4	3/4	1	-
	2	1	1	-
	2-1/2	1	1-1/2	-
	3	1-1/2	1-1/2	-
	3-1/2	1-1/2	2	-
1/4-20	1	3/8	5/8	-
	1-1/4	5/8	5/8	-
	1-1/2	5/8	7/8	-
	1-3/4	3/4	1	-

Diameter & Thread Pitch	C Standard Length	A Machine Thread Length	B Lag Thread Length	D Center Space
1/4-20	2	1	1	-
	2-1/4	1	1-1/4	
	2-1/2	1	1-1/2	-
	2-3/4	1-1/4	1-1/2	-
	3	1-1/2	1-1/2	-
	3-1/2	1-1/2	2	-
	4	2	2	-
	4-1/2	1-1/8	3	3/8
	5	1-3/8	3	5/8
	6	1-1/2	3	1-1/2
5/16-18	1-1/2	5/8	7/8	-
	1-3/4	3/4	1	-
	2	1	1	-
	2-1/4	1	1-1/4	-
	2-1/2	1	1-1/2	-
	2-3/4	1-1/4	1-1/2	-
	3	1-1/2	1-1/2	-
	3-1/2	1-1/2	2	-
	3-3/4	1-3/4	2	-
	4	2	2	-
	4-1/2	1-1/8	3	3/8
	5	1-3/8	3	5/8
	5-1/2	1-1/2	3	1
	6	1-1/2	3	1-1/2

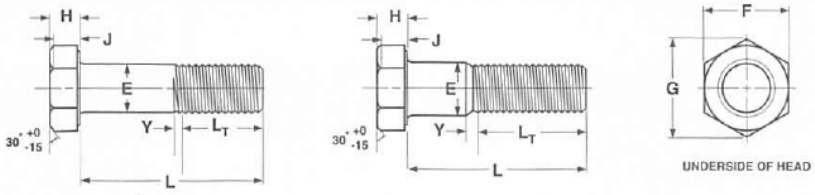
Diameter & Thread Pitch	C Standard Length	A Machine Thread Length	B Lag Thread Length	D Center Space
3/8-16	1-1/2	1/2	1	-
	2	1	1	-
	2-1/2	1	1-1/2	-
	3	1-1/2	1-1/2	-
	3-1/2	1-1/2	2	-
	4	2	2	-
	4-1/2	1-1/8	3	3/8
	5	1-3/8	3	5/8
	5-1/2	1-1/2	3	1
	6	1-1/4	3	1-3/4
	8	2-1/2	3	2-1/2
	10	2-1/2	3	4-1/2
	12	2-1/2	3	6-1/2
	14	2-1/2	3	8-1/2
1/2-13	3	1	2	-
	3-1/2	1-1/2	2	-
	4	2	2	-
	5	2	3	-
	6	2-1/2	3	1/2
	8	2-1/2	3	2-1/2
	10	2-1/2	3	4-1/2
	12	2-1/2	3	6-1/2

Tolerance on Length	Up to 6": ± 1/16"	Over 6": ± 1/8"

Description	Bolt with threaded areas at both ends--lag screw thread at one end and unified thread at the other. Standard hanger bolts are designed for insertion into a predrilled pilot hole. The end of the wood thread is designed as a taper which is threaded all the way to its blunt tip.
Applications / Advantages	Designed to hang material from wooden structures. The lag is wrenched into the wood and the assembly is completed after applying a nut. Used for suspending electrical wiring and sheet metal. Also common in the furniture industry.
Material	***Steel:*** AISI 1008 & 1010 steel ***Stainless:*** Type 303 or 304 stainless steel
Core Hardness (Steel only)	***No. 10 through 1/2 in. diameter, all lengths:*** Rockwell B80 - B100
Tensile Strength (Steel only)	***No. 10 through 1/2 in. diameter, all lengths:*** 74,000 psi. minimum (applies only to stresses applied to the Unified thread-side of the fastening)
Plating	See Appendix-A for plating information.

HEAVY HEX BOLTS

ASTM A193 Grade B7
ASTM A307 Grades A & B



HEAVY HEX BOLTS

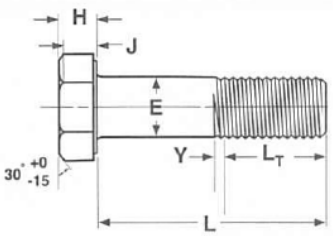
ASME B18.2.1-2012

Nominal Size or Basic Product Diameter		E		F			G		H			R		L_T	
		Body Diameter		Width Across Flats			Width Across Corners		Head Height			Radius of Fillet		Thread Length for Bolt Lengths	
														6 in. and shorter	Over 6 in.
		Max	Min	Basic	Max	Min	Max	Min	Basic	Max	Min	Max	Min	Basic	Basic
1/2	0.5000	0.515	0.482	7/8	0.875	0.850	1.010	0.969	11/32	0.364	0.302	0.03	0.01	1.250	1.500
5/8	0.6250	0.642	0.605	1-1/16	1.062	1.031	1.227	1.175	27/64	0.444	0.378	0.06	0.02	1.500	1.750
3/4	0.7500	0.768	0.729	1-1/4	1.250	1.212	1.443	1.383	1/2	0.524	0.455	0.06	0.02	1.750	2.000
7/8	0.8750	0.895	0.852	1-7/16	1.438	1.394	1.660	1.589	37/64	0.604	0.531	0.06	0.02	2.000	2.250
1	1.0000	1.022	0.976	1-5/8	1.625	1.575	1.876	1.796	43/64	0.700	0.591	0.09	0.03	2.250	2.500
1 1/8	1.1250	1.149	1.098	1-13/16	1.812	1.756	2.093	2.002	3/4	0.780	0.658	0.09	0.03	2.500	2.750
1 1/4	1.2500	1.277	1.223	2	2.000	1.938	2.309	2.209	27/32	0.876	0.749	0.09	0.03	2.750	3.000
1 3/8	1.3750	1.404	1.345	2-3/16	2.188	2.119	2.526	2.416	29/32	0.940	0.810	0.09	0.03	3.000	3.250
1 1/2	1.5000	1.531	1.470	2-3/8	2.375	2.300	2.742	2.622	1	1.036	0.902	0.09	0.03	3.250	3.500
1 3/4	1.7500	1.785	1.716	2-3/4	2.750	2.662	3.175	3.035	1-5/32	1.196	1.054	0.12	0.04	3.750	4.000
2	2.0000	2.039	1.964	3-1/8	3.125	3.025	3.608	3.449	1-11/32	1.388	1.175	0.12	0.04	4.250	4.500

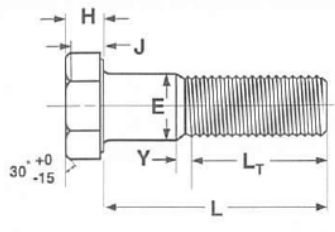
Tolerance on Length	Nominal Screw Size	Nominal Screw Length									
		Up to 1 in., incl.		Over 1 in. to 2 1/2 in., incl.		Over 2 1/2 in. to 4 in., incl.		Over 4 in. to 6 in., incl.		Longer than 6 in.	
	1/4 to 3/8	+0.02	-0.03	+0.02	-0.04	+0.04	-0.06	+0.06	-0.10	+0.10	-0.18
	7/16 and 1/2	+0.02	-0.03	+0.04	-0.06	+0.06	-0.08	+0.08	-0.10	+0.12	-0.18
	9/16 to 3/4	+0.02	-0.03	+0.06	-0.08	+0.08	-0.10	+0.10	-0.10	+0.14	-0.18
	7/8 and 1	....	....	+0.08	-0.10	+0.10	-0.14	+0.12	-0.16	+0.16	-0.20
	1 1/8 to 1 1/2	....	....	+0.12	-0.12	+0.16	-0.16	+0.18	-0.18	+0.22	-0.22
	Over 1-1/2	....	....	+0.18	-0.18	+0.20	-0.20	+0.22	-0.22	+0.24	-0.24

Description	An externally threaded fastener with a six-sided head that is wider than that of a standard hex bolt.
Applications/ Advantages	Offers greater wrenching area than standard hex machine bolts for use in heavy duty industrial work.
Material	Bolts shall be made from a carbon steel which conforms to the following chemical composition requirements-- Grade A-- *Phosphorus*: 0.06% maximum; *Sulfur*: 0.15% maximum; Grade B-- *Phosphorus*: 0.04% maximum; *Sulfur*: 0.05% maximum Grade B7-- *Carbon*: 0.37-0.49%; *Manganese*: 0.65-1.10%; *Phosphorus*: 0.035% max; *Sulfur*: 0.040% max; *Silicon*: 0.15-0.35%; *Chromium*: 0.75-1.20%; *Molybdenum*: 0.15-0.25%
Hardness*	*Bolts less than 3 times diameter in length*: Grade A-- Rockwell B69 - 100; Grade B-- Rockwell B69 - 95; Bolts 3 times diameter and longer: Grade A-- Rockwell B100 maximum; Grade B-- Rockwell B69 - 95; Grade B7-- Rockwell C 35 max
Tensile Strength	*Grade A*: 60,000 psi. minimum; *Grade B*: 60,000 - 100,000 psi.; *Grade B7*: 125,000 psi. min. (all diams thru 2 1/2 ")
Elongation in 4D	*Grades A & B:* 18% minimum; *Grade B7:* 16% minimum (all diams thru 4")
Plating	See Appendix-A for plating information.

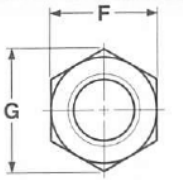
HEAVY HEX CAP SCREWS



Cut Thread



Rolled Thread



UNDERSIDE OF HEAD

HEAVY HEX CAP SCREWS

ASME B18.2.1-2012

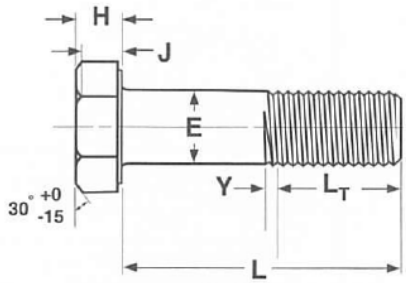
Nominal Size or Basic Product Diameter		E		F		G		H		W	L_T		S
		Body Diameter		Width Across Flats		Width Across Corners		Head Height		Wrenching Height	Thread Length for Screw Lengths		Transition Thread Length
											6 in. and shorter	Over 6 in.	
		Max	Min	Max	Min	Max	Min	Max	Min	Min	Basic	Basic	Max
1/2	0.5000	0.5000	0.482	0.875	0.850	1.010	0.969	0.323	0.302	0.215	1.250	1.500	0.385
5/8	0.6250	0.6250	0.605	1.062	1.031	1.227	1.175	0.403	0.378	0.269	1.500	1.750	0.455
3/4	0.7500	0.7500	0.729	1.250	1.212	1.443	1.383	0.483	0.455	0.324	1.750	2.000	0.500
7/8	0.8750	0.8750	0.852	1.438	1.394	1.660	1.589	0.563	0.531	0.378	2.000	2.250	0.556
1	1.0000	1.0000	0.976	1.625	1.575	1.876	1.796	0.627	0.591	0.416	2.250	2.500	0.625
1 1/8	1.1250	1.1250	1.098	1.812	1.756	2.093	2.002	0.718	0.658	0.461	2.500	2.750	0.714
1 1/4	1.2500	1.2500	1.223	2.000	1.938	2.309	2.209	0.813	0.749	0.530	2.750	3.000	0.714
1 3/8	1.3750	1.3750	1.345	2.188	2.119	2.526	2.416	0.878	0.810	0.569	3.000	3.250	0.833
1 1/2	1.5000	1.5000	1.470	2.375	2.300	2.742	2.622	0.974	0.902	0.640	3.250	3.500	0.833
1 3/4	1.7500	1.7500	1.716	2.750	2.662	3.175	3.035	1.134	1.054	0.748	3.750	4.000	1.000
2	2.0000	2.0000	1.964	3.125	3.025	3.608	3.449	1.263	1.175	0.825	4.250	4.500	1.111
2 1/4	2.2500	2.2500	2.214	3.500	3.388	4.041	3.862	1.423	1.327	0.933	...	5.000	1.111
2 1/2	2.5000	2.5000	2.461	3.875	3.750	4.474	4.275	1.583	1.479	1.042	...	5.500	1.250
2 3/4	2.7500	2.7500	2.711	4.250	4.112	4.907	4.688	1.744	1.632	1.151	...	6.000	1.250
3	3.0000	3.0000	2.961	4.625	4.475	5.340	5.102	1.935	1.815	1.290	...	6.500	1.250

Tolerance on Length	Nominal Screw Size	Nominal Screw Length									
		Up to 1 in., incl.		Over 1 in. to 2 1/2 in., incl.		Over 2 1/2 in. to 4 in., incl.		Over 4 in. to 6 in., incl.		Longer than 6 in.	
	1/4 to 3/8	+0.02	-0.03	+0.02	-0.04	+0.04	-0.06	+0.06	-0.10	+0.10	-0.18
	7/16 and 1/2	+0.02	-0.03	+0.04	-0.06	+0.06	-0.08	+0.08	-0.10	+0.12	-0.18
	9/16 to 3/4	+0.02	-0.03	+0.06	-0.08	+0.08	-0.10	+0.10	-0.10	+0.14	-0.18
	7/8 and 1	....	....	+0.08	-0.10	+0.10	-0.14	+0.12	-0.16	+0.16	-0.20
	1 1/8 to 1 1/2	....	....	+0.12	-0.12	+0.16	-0.16	+0.18	-0.18	+0.22	-0.22

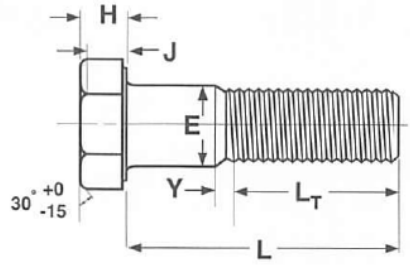
Description	A low carbon steel hex cap screw with a wider head than that of a standard hex cap screw.
Applications/ Advantages	Offers greater wrenching area than standard hex cap screws and more consistent body diameter dimensions than heavy hex bolts (the following specifications pertain to Grade-2 heavy hex cap screws; performance requirements for grades 5 & 8 are on page 131).
Material	Grade-2 heavy hex cap screws shall be made from a carbon steel which conforms to the following chemical composition requirements-- ***Carbon:*** 0.55% maximum; ***Phosphorus:*** 0.048% maximum; ***Sulfur:*** 0.058% maximum
Hardness*	Rockwell B80 - 100
Tensile Strength	74,000 psi. minimum
Proof Load	55,000 psi.
Elongation in 2 in.	18% minimum
Plating	See Appendix-A for plating information.

HEX CAP SCREWS

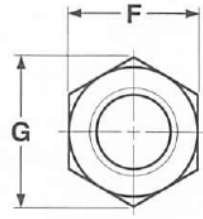
Head & Thread Dimensions



Cut Thread



Rolled Thread



UNDERSIDE OF HEAD

‡Length of a cap screw is measured from the underhead bearing surface to the extreme end of the screw.

HEX CAP SCREWS

ASME B18.2.1-2012

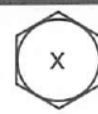
Nominal or Basic Product Diameter		E		F			G		H			J	L_T		Y
		Body Diameter		Width Across Flats			Width Across Corners		Head Height			Wrenching Height	Thread Length		Transition Thread Length
													For Screw Lengths ≤ 6 in.	For Screw Lengths > 6 in.	
		Max	Min	Basic	Max	Min	Max	Min	Basic	Max	Min	Min	Ref	Ref	Max
1/4	0.2500	0.2500	0.2450	7/16	0.438	0.428	0.505	0.488	5/32	0.163	0.150	0.106	0.750	1.000	0.250
5/16	0.3125	0.3125	0.3065	1/2	0.500	0.489	0.577	0.557	13/64	0.211	0.195	0.140	0.875	1.125	0.278
3/8	0.3750	0.3750	0.3690	9/16	0.562	0.551	0.650	0.628	15/64	0.243	0.226	0.160	1.000	1.250	0.312
7/16	0.4375	0.4375	0.4305	5/8	0.625	0.612	0.722	0.698	9/32	0.291	0.272	0.195	1.125	1.375	0.357
1/2	0.5000	0.5000	0.4930	3/4	0.750	0.736	0.866	0.840	5/16	0.323	0.302	0.215	1.250	1.500	0.385
9/16	0.5625	0.5625	0.5545	13/16	0.812	0.798	0.938	0.910	23/64	0.371	0.348	0.250	1.375	1.625	0.417
5/8	0.6250	0.6250	0.6170	15/16	0.938	0.922	1.083	1.051	25/64	0.403	0.378	0.269	1.500	1.750	0.455
3/4	0.7500	0.7500	0.7410	1-1/8	1.125	1.100	1.299	1.254	15/32	0.483	0.455	0.324	1.750	2.000	0.500
7/8	0.8750	0.8750	0.8660	1-5/16	1.312	1.285	1.516	1.465	35/64	0.563	0.531	0.378	2.000	2.250	0.556
1	1.0000	1.0000	0.9900	1-1/2	1.500	1.469	1.732	1.675	39/64	0.627	0.591	0.416	2.250	2.500	0.625
1-1/8	1.1250	1.1250	1.1140	1-11/16	1.688	1.631	1.949	1.859	11/16	0.718	0.658	0.461	2.500	2.750	0.714
1-1/4	1.2500	1.2500	1.2390	1-7/8	1.875	1.812	2.165	2.066	25/32	0.813	0.749	0.530	2.750	3.000	0.714
1-1/2	1.5000	1.5000	1.4880	2-1/4	2.250	2.175	2.598	2.480	15/16	0.974	0.902	0.640	3.250	3.500	0.833

Tolerance on Length	Nominal Screw Size	Nominal Screw Length				
		Up to 1 in., incl.	Over 1 in. to 2-1/2 in., incl.	Over 2-1/2 in. to 4 in., incl.	Over 4 in. to 6 in., incl.	Longer than 6 in.
	1/4 to 3/8	-0.03	-0.04	-0.06	-0.10	-0.18
	7/16 and 1/2	-0.03	-0.06	-0.08	-0.10	-0.18
	9/16 to 3/4	-0.03	-0.08	-0.10	-0.10	-0.18
	7/8 and 1	....	-0.10	-0.14	-0.16	-0.20
	1-1/8 to 1-1/2	....	-0.12	-0.16	-0.18	-0.22

Gr.2, 18-8 & 316 SS

HEX CAP SCREWS

GRADE-2 HEX CAP SCREW



Description	A low or medium carbon steel, externally threaded mechanical device 1/4" diameter or larger, with a trimmed hex head and a washer face on the bearing surface.
Applications/ Advantages	Economical for use in non-critical applications where the fastener is not subject to extreme temperatures or stress beyond the limits listed herein.
Material	AISI 1006 - 1050 or equivalent steel.
Hardness	***1/4 through 3/4 in. diameter, 6 in. and shorter in length:*** Rockwell B80 - B100. *1/4 through 3/4 in. diameter, over 6 in. in length:* Rockwell B70 - B100. *7/8 through 1-1/2 in. diameter, all lengths:* Rockwell B70 - B100.
Proof Load	***1/4 through 3/4 in. diameter, 6 in. and shorter in length:*** 55,000 psi. *1/4 through 3/4 in. diameter, over 6 in. in length:* 33,000 psi. *7/8 through 1-1/2 in. diameter, all lengths:* 33,000 psi.
Yield Strength*	***1/4 through 3/4 in. diameter, 6 in. and shorter in length:*** 57,000 psi. minimum. *1/4 through 3/4 in. diameter, over 6 in. in length:* 36,000 psi. minimum. *7/8 through 1-1/2 in. diameter, all lengths:* 36,000 psi. minimum.
Tensile Strength	***1/4 through 3/4 in. diameter, 6 in. and shorter in length:*** 74,000 psi. minimum. *1/4 through 3/4 in. diameter, over 6 in. in length:* 60,000 p si. minimum. *7/8 through 1-1/2 in. diameter, all lengths:* 60,000 psi. minimum.
Elongation*	18% minimum (all diameters)
Reduction of Area*	35% minimum (all sizes)
Plating	See Appendix-A for plating information



HEX CAP SCREW--STAINLESS STEEL, 18-8 & 316

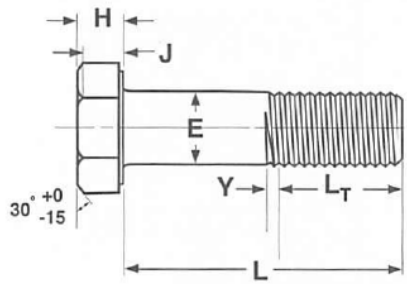


Description	18-8 and 316 stainless steel cap screws are both made from austenitic alloys as described below.
Applications/ Advantages	***18-8***: Used in products that require general atmospheric corrosion resistance, such as chemical and food-processing equipment. Some chemical environments may require special corrosion resistant materials and precautions. ***316***: The molybdenum content gives this type of stainless even greater corrosion resistance than 18-8 as well as superior strength at high temperatures.
Material	***18-8***: A cap screw made from one of the following austenitic alloys: 303, 303Se, 304, XM7, all of which are characterized as having a chromium content of 17-19% and nickel content of 8-10%. ***316***: A cap screw made from 316 stainless steel, an austenitic alloy which differs from 18-8 by its molybdenum content (2-3%) and a higher nickel content (10-14%).
Heat Treatment	The austenitic alloys develop their strength through work hardening during the fastener manufacturing process, as seen from the hardness properties below. The only heat treatment normally available on austenitic stainless alloys is annealing, which is done at approximately 1900°F to a dead soft condition and is not normally thermally reversible.
Hardness	***1/4 through 5/8 in. diameter:*** Rockwell B95 - C32 *3/4 through 1 in. diameter:* Rockwell B80 - C32
Yield Strength*	***1/4 through 5/8 in. diameter, 2.25D and longer:*** 65,000 psi. minimum *3/4" (2.25D & longer) & 7/8 through 1 in. diameter (3D & longer):* 45,000 psi. minimum
Tensile Strength	***1/4 through 5/8 in. diameter, 2.25D and longer:*** 100,000 - 150,000 psi. *3/4" (2.25D & longer) & 7/8 through 1 in. diameter (3D & longer):* 85,000 - 140,000 psi.
Elongation in 4D*	***1/4 through 5/8 in. diameter:*** 20% minimum; ***3/4 through 1 in. diameter:*** 25% minimum.

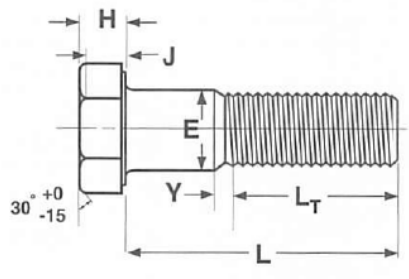
D = Nominal diameter of the screw in inches.
•These properties are tested only on machined specimens when the testing machine cannot provide for full testing of the parts.
••Product standards require the manufacturer's head marking to appear on the top of all cap screws 1/4" diameter and larger. "X" represents one location such a marking may appear.

HEX CAP SCREWS

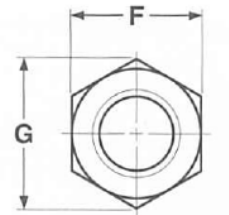
Grades 5 & 8 Cap Screws



Cut Thread



Rolled Thread



UNDERSIDE OF HEAD

‡Length of a cap screw is measured from the underhead bearing surface to the extreme end of the screw.

HEX CAP SCREWS

ASME B18.2.1-2012

Nominal or Basic Product Diameter		E		F			G		H			J	L_T		Y
		Body Diameter		Width Across Flats			Width Across Corners		Head Height			Wrenching Height	Thread Length		Transition Thread Length
													For Screw Lengths ≤ 6 in.	For Screw Lengths > 6 in.	
		Max	Min	Basic	Max	Min	Max	Min	Basic	Max	Min	Min	Ref	Ref	Max
1/4	0.2500	0.2500	0.2450	7/16	0.438	0.428	0.505	0.488	5/32	0.163	0.150	0.106	0.750	1.000	0.250
5/16	0.3125	0.3125	0.3065	1/2	0.500	0.489	0.577	0.557	13/64	0.211	0.195	0.140	0.875	1.125	0.278
3/8	0.3750	0.3750	0.3690	9/16	0.562	0.551	0.650	0.628	15/64	0.243	0.226	0.160	1.000	1.250	0.312
7/16	0.4375	0.4375	0.4305	5/8	0.625	0.612	0.722	0.698	9/32	0.291	0.272	0.195	1.125	1.375	0.357
1/2	0.5000	0.5000	0.4930	3/4	0.750	0.736	0.866	0.840	5/16	0.323	0.302	0.215	1.250	1.500	0.385
9/16	0.5625	0.5625	0.5545	13/16	0.812	0.798	0.938	0.910	23/64	0.371	0.348	0.250	1.375	1.625	0.417
5/8	0.6250	0.6250	0.6170	15/16	0.938	0.922	1.083	1.051	25/64	0.403	0.378	0.269	1.500	1.750	0.455
3/4	0.7500	0.7500	0.7410	1-1/8	1.125	1.100	1.299	1.254	15/32	0.483	0.455	0.324	1.750	2.000	0.500
7/8	0.8750	0.8750	0.8660	1-5/16	1.312	1.285	1.516	1.465	35/64	0.563	0.531	0.378	2.000	2.250	0.556
1	1.0000	1.0000	0.9900	1-1/2	1.500	1.469	1.732	1.675	39/64	0.627	0.591	0.416	2.250	2.500	0.625
1-1/8	1.1250	1.1250	1.1140	1-11/16	1.688	1.631	1.949	1.859	11/16	0.718	0.658	0.461	2.500	2.750	0.714
1-1/4	1.2500	1.2500	1.2390	1-7/8	1.875	1.812	2.165	2.066	25/32	0.813	0.749	0.530	2.750	3.000	0.714
1-1/2	1.5000	1.5000	1.4880	2-1/4	2.250	2.175	2.598	2.480	15/16	0.974	0.902	0.640	3.250	3.500	0.833

Tolerance on Length	Nominal Screw Size	Nominal Screw Length				
		Up to 1 in., incl.	Over 1 in. to 2-1/2 in., incl.	Over 2-1/2 in. to 4 in., incl.	Over 4 in. to 6 in., incl.	Longer than 6 in.
	1/4 to 3/8	-0.03	-0.04	-0.06	-0.10	-0.18
	7/16 and 1/2	-0.03	-0.06	-0.08	-0.10	-0.18
	9/16 to 3/4	-0.03	-0.08	-0.10	-0.10	-0.18
	7/8 and 1	....	-0.10	-0.14	-0.16	-0.20
	1-1/8 to 1-1/2	....	-0.12	-0.16	-0.18	-0.22

Grades 5 & 8
Cap Screws

HEX CAP SCREWS



**

GRADE-5 HEX CAP SCREW

Description	A cap screw made from medium carbon steel and heat-treated.
Applications/ Advantages	Has greater tensile strength than a Grade-2. Yield-to-tensile ratio is the lowest of all heat treated steels.
Heat Treatment	Grade-5 cap screws shall be heat treated, oil or water quenched, at the option of the manufacturer, and tempered at a minimum tempering temperature of 800°F.
Material	Medium carbon steel. Use of an alloy steel is also acceptable.
Core Hardness	***1/4 through 1 in. diameter, all lengths:*** Rockwell C25 - C34. *1-1/8 through 1-1/2 in. diameter, all lengths:* Rockwell C19 - C30.
Surface Hardness	***1/4 through 1 in. diameter, all lengths:*** Rockwell 30N54 maximum. *1-1/8 through 1-1/2 in. diameter, all lengths:* Rockwell 30N50 maximum.
Proof Load	***1/4 through 1 in. diameter, all lengths:*** 85,000 psi. *1-1/8 through 1-1/2 in. diameter, all lengths:* 74,000 psi.
Yield Strength*	***1/4 through 1 in. diameter, all lengths:*** 92,000 psi. minimum *1-1/8 through 1-1/2 in. diameter, all lengths:* 81,000 psi. minimum
Tensile Strength	***1/4 through 1 in. diameter, all lengths:*** 120,000 psi. minimum *1-1/8 through 1-1/2 in. diameter, all lengths:* 105,000 psi. minimum
Elongation*	14% minimum (all diameters)
Reduction of Area*	35% minimum (all sizes)
Plating	See Appendix-A for plating information.



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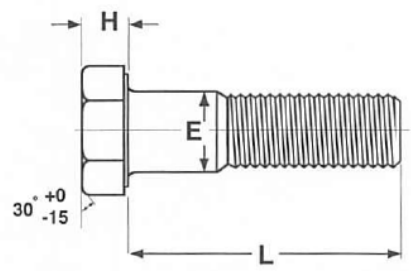
GRADE-8 HEX CAP SCREW

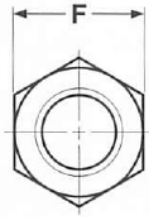
Description	A cap screw made from medium carbon alloy steel and heat-treated.
Applications/ Advantages	Has greater tensile strength than a Grade-5. Designed for use in high stress applications. See specifications below for more information on how the Grade-8 exceeds the strength of a Grade-5.
Heat Treatment	Grade-8 cap screws shall be heat-treated, oil-quenched and tempered at a minimum temperature of 800°F.
Material	Medium carbon alloy steel. Note: For diameters 1/4 through 7/16 inch, it is permissible to use AISI 1541 steel.
Core Hardness	***1/4 through 1-1/2 in. diameter, all lengths:*** Rockwell C33 - C39.
Surface Hardness	***1/4 through 1-1/2 in. diameter, all lengths:*** Rockwell 30N58.6 maximum.
Proof Load	***1/4 through 1-1/2 in. diameter, all lengths:*** 120,000 psi.
Yield Strength*	***1/4 through 1-1/2 in. diameter, all lengths:*** 130,000 psi. minimum
Tensile Strength	***1/4 through 1-1/2 in. diameter, all lengths:*** 150,000 psi. minimum
Elongation*	12% minimum (all diameters)
Reduction of Area*	35% minimum (all sizes)
Plating	See Appendix-A for plating information.

*These properties are tested only on machined specimens when the testing machine cannot provide for full testing of the parts.
**Product standards require the manufacturer's head marking to appear on the top of all cap screws 1/4" diameter and larger. "X" represents one location such a marking may appear.

HEX CAP SCREWS

Grade 9 Cap Screws





UNDERSIDE OF HEAD

GRADE-9 HEX CAP SCREWS										Holo-Krome
Nominal or Basic Product Diameter		E		F			H			
		Body Diameter		Width Across Flats			Head Height			
		Max	Min	Basic	Max	Min	Basic	Max	Min	
1/4	0.2500	0.2500	0.2450	7/16	0.438	0.428	3/16	0.194	0.181	
5/16	0.3125	0.3125	0.3065	1/2	0.500	0.489	15/64	0.242	0.227	
3/8	0.3750	0.3750	0.3690	9/16	0.562	0.551	9/32	0.289	0.273	
7/16	0.4375	0.4375	0.4305	5/8	0.625	0.612	21/64	0.338	0.318	
1/2	0.5000	0.5000	0.4930	3/4	0.750	0.736	3/8	0.386	0.364	
9/16	0.5625	0.5625	0.5545	13/16	0.812	0.798	27/64	0.433	0.410	
5/8	0.6250	0.6250	0.6170	15/16	0.938	0.922	15/32	0.481	0.456	
3/4	0.7500	0.7500	0.7410	1-1/8	1.125	1.100	9/16	0.577	0.548	
7/8	0.8750	0.8750	0.8660	1-5/16	1.312	1.285	21/32	0.672	0.640	
1	1.0000	1.0000	0.9900	1-1/2	1.500	1.469	3/4	0.768	0.732	

Tolerance on Length	Nominal Screw Size	Nominal Screw Length				
		Up to 1 in., incl.	Over 1 in. to 2-1/2 in., incl.	Over 2-1/2 in. to 4 in., incl.	Over 4 in. to 6 in., incl.	Longer than 6 in.
	1/4 to 3/8	-0.03	-0.04	-0.06	-0.10	-0.18
	7/16 and 1/2	-0.03	-0.06	-0.08	-0.10	-0.18
	9/16 to 3/4	-0.03	-0.08	-0.10	-0.10	-0.18
	7/8 and 1	....	-0.10	-0.14	-0.16	-0.20

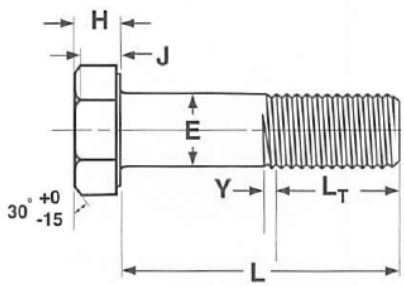
Grade 9
Cap Screws

HEX CAP SCREWS

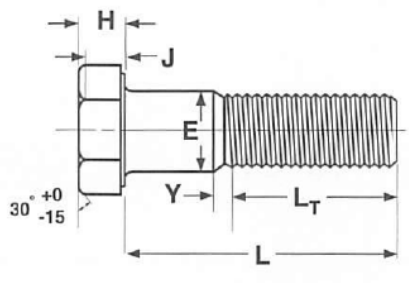
GRADE-9 HEX CAP SCREW

Description	A cap screw made from medium carbon or alloy steel with head height approximately 25% higher than a standard cap screw.
Applications/ Advantages	Has greater tensile strength than a Grade-8. Designed for use in heavy machinery and equipment subject to harsh environmental and fatigue conditions.
Material	AISI 8637 / 8640 / 8740 Medium Carbon Alloy Steel wire or 4340 Alloy Steel bar stock
Hardness	Rockwell C38 - C42
Proof Load	140,650 psi.
Yield Strength*	159,500 psi. minimum
Tensile Strength	180,000 psi. minimum
Elongation*	10% minimum (all diameters)
Reduction of Area*	35% minimum (all sizes)
Plating	Steel EcoGuard™ 1000-hour Gray/Silver finish

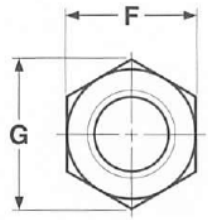
HEX MACHINE BOLTS



Cut Thread



Rolled Thread



UNDERSIDE OF HEAD

‡Length of a machine bolt is measured from the underhead bearing surface to the extreme end of the bolt.

HEX MACHINE BOLTS

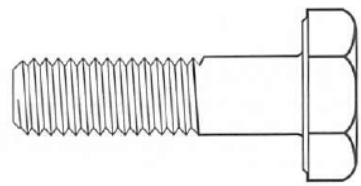
ASME B18.2.1-2012

Nominal Size Or Basic Diameter	E		F			G		H			R		L_T	
	Body Diameter		Width Across Flats			Width Across Corners		Head Height			Radius of Fillet		Thread Length For Bolt Lengths	
													6 in. and shorter	over 6 in.
	Max.	Min.	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	Max.	Min.	Basic	Basic
1/4 0.2500	0.260	0.237	7/16	0.438	0.425	0.505	0.484	11/64	0.188	0.150	0.03	0.01	0.750	1.000
5/16 0.3125	0.324	0.298	1/2	0.500	0.484	0.577	0.552	7/32	0.235	0.195	0.03	0.01	0.875	1.125
3/8 0.3750	0.388	0.360	9/16	0.562	0.544	0.650	0.620	1/4	0.268	0.226	0.03	0.01	1.000	1.250
1/2 0.5000	0.515	0.482	3/4	0.750	0.725	0.866	0.826	11/32	0.364	0.302	0.03	0.01	1.250	1.500
5/8 0.6250	0.642	0.605	15/16	0.938	0.906	1.083	1.033	27/64	0.444	0.378	0.06	0.02	1.500	1.750
3/4 0.7500	0.768	0.729	1-1/8	1.125	1.088	1.299	1.240	1/2	0.524	0.455	0.06	0.02	1.750	2.000
7/8 0.8750	0.895	0.852	1-5/16	1.312	1.269	1.516	1.447	37/64	0.604	0.531	0.06	0.02	2.000	2.250
1 1.0000	1.022	0.976	1-1/2	1.500	1.450	1.732	1.653	43/64	0.700	0.591	0.09	0.03	2.250	2.500

	Nominal Screw Size	Nominal Screw Length				
		Up to1 in., incl.	Over 1 in. to 2-1/2 in., incl.	Over 2-1/2 in. to 4 in., incl.	Over 4 in. to 6 in., incl.	Longer than 6 in.
Tolerance on Length	1/4 to 3/8	+0.02, -0.03	+0.02, -0.04	+0.04, -0.06	+0.06, -0.10	+0.10, -0.18
	7/16 and 1/2	+0.02, -0.03	+0.04, -0.06	+0.06, -0.08	+0.08, -0.10	+0.12, -0.18
	9/16 to 3/4	+0.02, -0.03	+0.06, -0.08	+0.08, -0.10	+0.10, -0.10	+0.14, -0.18
	7/8 and 1	...	+0.08, -0.10	+0.10, -0.14	+0.12, -0.16	+0.16, -0.20

Hot Dip Galvanized HEX MACHINE BOLTS



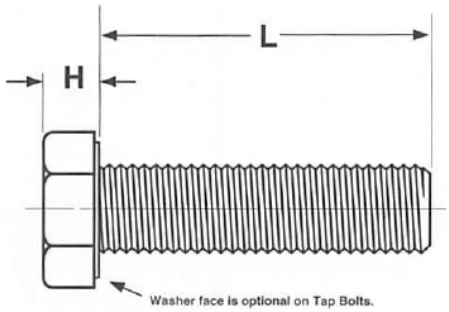


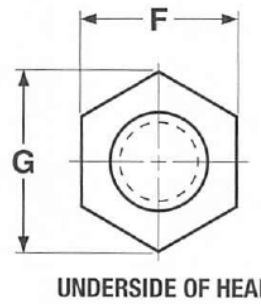
Description	A low or medium carbon steel, externally threaded mechanical device, 1/4 inch in diameter or larger, with a trimmed hex head and a hot-dip galvanized coating. A hex bolt does not have a washer face on its bearing surface as does a hex cap screw, nor does it have a machined point. Its body tolerances are not as close as those of a cap screw.
Applications/ Advantages	Designed to be used in highly corrosive environments (ie. coastal locales and heavily polluted atmospheres). May be inserted into an oversized hole and should be assembled with a nut.
Material	Machine bolts shall be manufactured from steel which conforms to the following chemical composition requirements: ***Phosphorus***: 0.06% maximum; ***Sulfur***: 0.15% maximum.
Hardness	Bolts of a length < 3X nominal diameter: Rockwell B69 - B100. Bolts of a length ≥ 3X nominal diameter: Rockwell B100 maximum.
Tensile Strength	60,000 psi. minimum.
Elongation*	18% minimum (all diameters)
Plating	See Appendix-A for plating information.

* These properties are tested only on machined specimens when the testing machine cannot provide for full testing of the parts.
**Product standards require the manufacturer's head marking to appear on the top of all bolts 1/4" diameter and larger. "X" represents one location such a marking may appear.

HEX TAP BOLTS

A307, Grades 5 & 8





UNDERSIDE OF HEAD

‡Length of a tap bolt is measured from the underhead bearing surface to the extreme end of the bolt.

FULLY THREADED HEX TAP BOLTS

IFI-199 (2014)

Nominal or Basic Product Diameter	F			G		H		
	Width Across Flats			Width Across Corners		Head Height		
	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.
1/4	7/16	0.438	0.425	0.505	0.484	11/64	0.188	0.150
5/16	1/2	0.500	0.484	0.577	0.552	7/32	0.235	0.195
3/8	9/16	0.562	0.544	0.650	0.620	1/4	0.268	0.226
7/16	5/8	0.625	0.603	0.722	0.687	19/64	0.316	0.272
1/2	3/4	0.750	0.725	0.866	0.826	11/32	0.364	0.302
* 9/16	13/16	0.812	0.798	0.938	0.910	23/64	0.371	0.348
5/8	15/16	0.938	0.906	1.083	1.033	27/64	0.444	0.378
3/4	1 1/8	1.125	1.088	1.299	1.240	1/2	0.524	0.455
7/8	1 5/16	1.312	1.269	1.516	1.447	37/64	0.604	0.531
1	1 1/2	1.500	1.450	1.732	1.653	43/64	0.700	0.591
1 1/4	1 7/8	1.875	1.812	2.165	2.066	27/32	0.876	0.749

	Nominal Screw Size	Nominal Size				
		Up to 1 in., incl.	Over 1 in. to 2-1/2 in., incl.	Over 2-1/2 in. to 4 in., incl.	Over 4 in. to 6 in., incl.	Over 6 in.
Tolerance on Length	1/4 to 3/8	+0.02 -0.03	+0.02 -0.04	+0.04 -0.06	+0.06 -0.10	+0.10 -0.18
	7/16 and 1/2	+0.02 -0.03	+0.04 -0.06	+0.06 -0.08	+0.08 -0.10	+0.12 -0.18
	9/16 to 3/4	+0.02 -0.03	+0.06 -0.08	+0.08 -0.10	+0.10 -0.10	+0.14 -0.18
	7/8 and 1	...	+0.08 -0.10	+0.10 -0.14	+0.12 -0.16	+0.16 -0.20
	1 1/4	...	+0.12 -0.12	+0.16 -0.16	+0.18 -0.18	+0.22 -0.22

* Dimensions for 9/16" nominal diameter are independent of the IFI-199 standard.

A307, Grades 5, 8 & 18-8 SS HEX TAP BOLTS

A307 Headmark



Grade-5 Headmark



Grade-8 Headmark

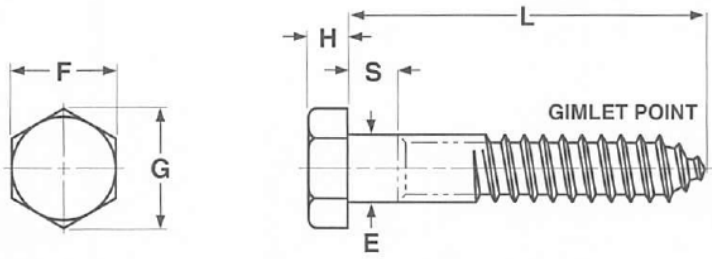


Description	***ASTM A307 Tap Bolt:*** A low carbon, hex head bolt with a machined point which is threaded to the head. ***Grade-5 Tap Bolt:*** A tap bolt made from medium carbon steel. ***Grade-8 Tap Bolt:*** A tap bolt made from medium carbon alloy steel and heat-treated. ***Stainless Tap Bolt:*** A tap bolt made from 18-8 stainless steel.
Applications/ Advantages	***ASTM A307 Tap Bolt:*** To be used in drilled and tapped holes which are threaded full length. Used instead of a stud and a nut. ***Grade-5 Tap Bolt:*** Used to mount motors to machinery; also popular in automotive and truck repair. ***Grade-8 Tap Bolt:*** Used in automotive and fleet industries where greater tensile strength is required than can be met by a grade-5. ***Stainless Tap Bolt:*** Used in in environments corrosive to carbon steel, in tapped holes that are threaded full length.
Material	***ASTM A307 Tap Bolt:*** Bolts shall be made from a carbon steel which conforms to the following chemical composition requirements-- *Carbon*: 0.33 maximum; *Manganese*: 0.93; *Phosphorous*: 0.041 ***Grade-5 Tap Bolt:*** AISI 1030 - 1541 or equivalent medium carbon steel. Use of an alloy such as 4037 modified steel is also acceptable. ***Grade-8 Tap Bolt:*** Medium carbon alloy steel. Note: For diameters 1/4 thru 7/16 inch, it is permissible to use AISI 1541 steel. ***Stainless Tap Bolt:*** 18-8 Stainless steel
Heat Treatment	***Grade-5 Tap Bolt:*** Bolts shall be heat treated, oil or water quenched, at the option of the manufacturer, and tempered at a minimum tempering temperature of 800°F. ***Grade-8 Tap Bolt:*** Bolts shall be heat treated, oil quenched and tempered at a minimum tempering temperature of 800°F.
Core Hardness	***ASTM A307 Tap Bolt:*** Rockwell B69 - B100 ***Grade-5 Tap Bolt:*** Rockwell C25 - C34 ***Grade-8 Tap Bolt:*** Rockwell C33 - C39 ***Stainless Tap Bolt:*** 1/4 thru 5/8"" diam: Rockwell B95 - C32
Surface Hardness	***Grade-5 Tap Bolt:*** Rockwell 30N54 maximum ***Grade-8 Tap Bolt:*** Rockwell 30N58.6 maximum
Proof Load	***Grade-5 Tap Bolt:*** 85,000 psi. ***Grade-8 Tap Bolt:*** 120,000 psi.
Yield Strength*	***Grade-5 Tap Bolt:*** 92,000 psi. minimum ***Grade-8 Tap Bolt:*** 130,000 psi. minimum ***Stainless Tap Bolt:*** 1/4 thru 5/8"" diam: 60,000 psi. minimum
Tensile Strength	***ASTM A307 Tap Bolt:*** 60,000 psi. minimum ***Grade-5 Tap Bolt:*** 120,000 psi. minimum ***Grade-8 Tap Bolt:*** 150,000 psi. minimum ***Stainless Tap Bolt:*** 1/4 thru 5/8"" diam: 95,000 psi. minimum
Elongation*	***ASTM A307 Tap Bolt:*** 18% minimum ***Grade-5 Tap Bolt:*** 14% minimum ***Grade-8 Tap Bolt:*** 12% minimum
Reduction of Area*	**Grades *5 & 8 Tap Bolts:*** 35% minimum (all sizes)
Plating	See Appendix-A for plating information.

* These properties are tested only on machined specimens when the testing machine cannot provide for full testing of the parts.
**Product standards require the manufacturer's head marking to appear on the top of all bolts 1/4" diameter and larger. "X" represents one location such a marking may appear.

LAG SCREWS

Steel, Stainless & Hot-Dip Galvanized



HEX LAG SCREWS

ASME B18.2.1-2012

Basic Product Diameter		Threads Per Inch	E		F			G		H			S
			Body or Shoulder Diameter		Width Across Flats			Width Across Corners		Head Height			Shoulder Length
			Max	Min	Basic	Max	Min	Max	Min	Basic	Max	Min	Min
No. 10	0.1900	11	0.199	0.178	9/32	0.281	0.271	0.323	0.309	1/8	0.140	0.110	0.094
1/4	0.2500	10	0.260	0.237	7/16	0.438	0.425	0.505	0.484	11/64	0.188	0.150	0.094
5/16	0.3125	9	0.324	0.298	1/2	0.500	0.484	0.577	0.552	7/32	0.235	0.195	0.125
3/8	0.3750	7	0.388	0.360	9/16	0.562	0.544	0.650	0.620	1/4	0.268	0.226	0.125
7/16	0.4375	7	0.452	0.421	5/8	0.625	0.603	0.722	0.687	19/64	0.316	0.272	0.156
1/2	0.5000	6	0.515	0.482	3/4	0.750	0.725	0.866	0.826	11/32	0.364	0.302	0.156
5/8	0.6250	5	0.642	0.605	15/16	0.938	0.906	1.083	1.033	27/64	0.444	0.378	0.312
3/4	0.7500	4-1/2	0.768	0.729	1-1/8	1.125	1.088	1.299	1.240	1/2	0.524	0.455	0.375
7/8	0.8750	4	0.895	0.852	1-5/16	1.312	1.269	1.516	1.447	37/64	0.604	0.531	0.375

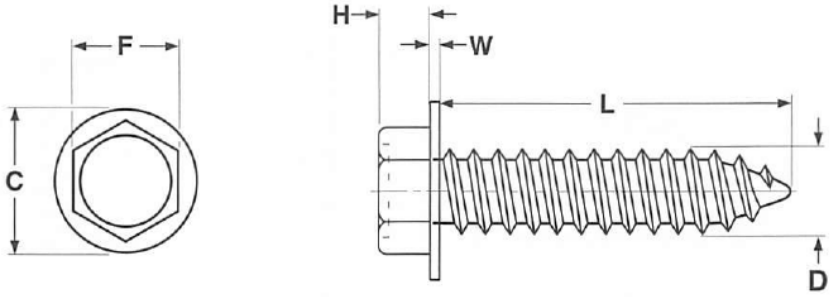
Tolerance on Length	Nominal Screw Size	Nominal Screw Length	
		Thru 6 in.	Over 6 in.
	1/2 and smaller	±0.12	±0.25
	Over 1/2	±0.25	±0.25

±Length of a lag screw is measured from the underhead bearing surface to the extreme end of the screw.

Description	A full-bodied bolt with hex head, spaced threads and a gimlet point.
Applications/ Advantages	***Steel, Electro-plated Zinc***: For use in wood in non-corrosive environments. ***Steel, Hot-Dip Galvanized***: For use in corrosive environments. ***Stainless***: Has superior corrosion resistance to galvanized steel bolts.
Material	***Steel***: AISI 1006 - 1022 or equivalent steel. ***Stainless***: 18-8 stainless.
Heat Treatment	***Stainless***: The austenitic alloys develop their strength through work hardening during the fastener manufacturing process, as seen from the hardness properties below. The only heat treatment normally available on austenitic stainless alloys is annealing, which is done at approximately 1900°F to a dead soft condition and is not normally thermally reversible.
Hardness	***Steel***: Rockwell B70 - B100. ***Stainless***: 1/4 through 1/2 in. diameter-- Rockwell B95 - C32.
Tensile Strength	***Steel***: 60,000 psi. minimum ***Stainless***: 100,000 - 125,000 psi. (approximate)
Minimum Thread Length	The minimum length of thread shall be equal to 1/2 the nominal screw length plus 0.50 in., or 5.00 in., whichever is shorter. Screws too short for this formula shall be threaded as close to the head as practicable.
Plating	See Appendix-A for information on the plating of steel lag bolts.

Low Carbon

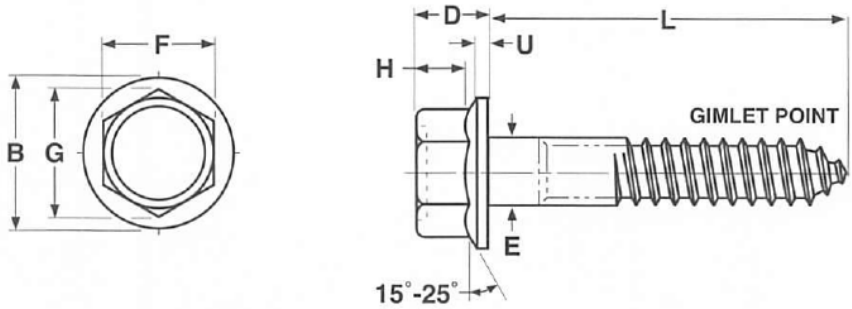
LAG SCREWS, FULLY THREADED



FULLY THREADED HEX WASHER LAG SCREWS											
Screw Diameter	Threads per Inch	H		F		C		W		D	
		Head Height		Width Across the Flats		Washer Diameter		Washer Thickness		Major Diameter	
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1/4	10	.190	.172	.437	.429	.625	.610	.060	.050	.260	.237
5/16	9	.230	.200	.437	.429	.625	.610	.060	.050	.324	.298
5/16 High Head	9	.312	.300	.437	.429	.625	.610	.060	.050	.324	.298
Tolerance on Length		+/- .012									

Description	A fully threaded fastener with a spaced thread pitch, tapered point, an an integrally formed hex washer head with an indented top surface.
Applications/ Advantages	Designed specifically for attaching track brackets and flag brackets of garage door assemblies to wooden door jambs.
Material	AISI 1018 or equivalent steel
Plating	Full thread lags are typically supplied in zinc finish.

LAG SCREWS, HEX FLANGE — Steel, Hot-Dip Galvanized



Length of a hex flange lag screw (L) is measured from the underhead bearing surface to the extreme end of the screw. Minimum thread length is 1/2 length of the screw plus 0.50 inch or 6 inches, whichever is shorter.

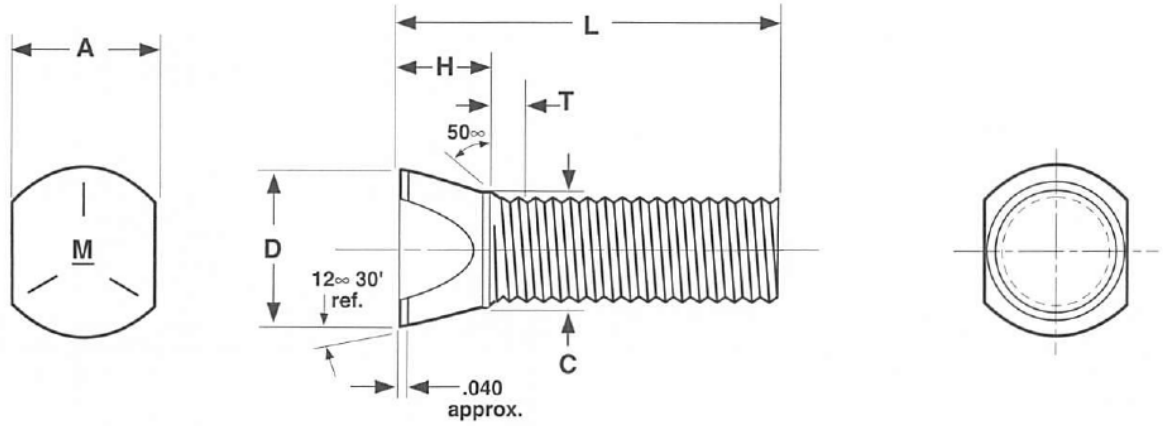
Hex Flange Lag Screws

Nominal Size	Threads per Inch	E		F		G		B	U	D	H
		Body Diameter		Width Across Flats		Width Across Corners		Flange Diam.	Flange Thick-ness	Head Height	Wrench Height
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1/4	10	0.260	0.237	0.375	0.367	0.433	0.409	0.56	0.04	0.28	0.17
5/16	9	0.324	0.298	0.500	0.489	0.577	0.548	0.68	0.05	0.32	0.21
3/8	7	0.388	0.360	0.562	0.551	0.650	0.618	0.81	0.06	0.39	0.25
1/2	6	0.515	0.482	0.750	0.736	0.866	0.825	1.07	0.08	0.51	0.34

Tolerance on Length	Nominal Bolt Size	Nominal Bolt Length	
		Up to 6 inches, incl.	Over 6 inches
	1/4 thru 1/2	-0.03	-0.08

Description	A one-piece hex-washer head screw with a flat bearing surface, spaced threads and a gimlet point.
Applications/ Advantages	Useful in constructing decks and also popular in timber assembly. Preferred by some over traditional lag screws because flat washers are not required. Galvanized finish offers resistance to corrosion.
Material	AISI 1006 - 1022 or equivalent steel
Hardness	Rockwell B70 - B100
Tensile Strength	60,000 psi. minimum
Coating	Hex Flange Lag Screws are typically supplied with a hot-dipped galvanized finish. See Appendix-A for more information..

Clipped Head PLOW BOLTS



Plow Bolts, Clipped Head

ASME B18.9 (2012)

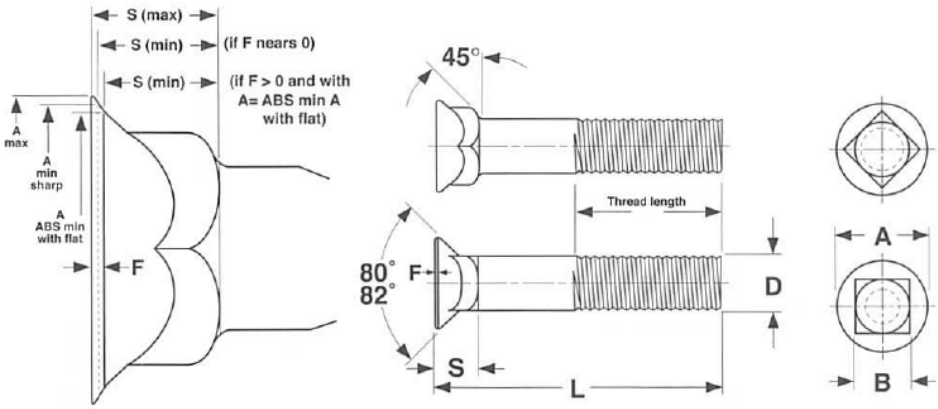
Nominal Size or Basic Bolt Diameter		A		D		H	C		T
		Width Across Flats		Full Head Diameter		Head Height	Diameter at Base of Head		Imperfect Thread Length
		Max	Min	Max	Min	Max	Max	Min	Max
3/8-16	0.3750	.470	.445	.565	.535	.350	.455	.440	.156
7/16-14	0.4375	.510	.495	.620	.590	.350	.510	.495	.178
1/2-13	0.5000	.570	.555	.680	.650	.350	.570	.555	.192

Tolerance on Length	Nominal Bolt Size	
	3/8	± 0.03
	7/16 & 1/2	± 0.06

Description	Bolt with a countersunk, flat head, round neck and unified thread pitch, made from medium-carbon steel. The distinguishing characteristic of this part is the way the head diameter is reduced at opposite sides with equal sized sections removed, leaving two flat sides.
Applications/ Advantages	Used primarily in agricultural equipment.
Material	Grade-5 Clipped head Plow Bolts shall be made from a medium carbon steel which conforms to the following chemical composition requirements: ***Carbon***: 0.25% to 0.58%; ***Manganese***: 0.060% minimum; ***Phosphorus***: 0.048% maximum; ***Sulphur***: 0.058% maximum.
Heat Treatment	Grade-5 Clipped head Plow Bolts shall be heat treated by quenching in a liquid medium from above the transformation temperature and tempered at a minimum tempering temperature of 800°F.
Hardness	Rockwell C25 - C34
Yield Strength	92,000 psi.
Tensile Strength	120,000 psi. minimum
Reduction of Area	35% minimum
Plating	See Appendix-A for plating information.

PLOW BOLTS

#3 Head



‡Length of a plow bolt is measured from the top of the head to the extreme end of the bolt.

No. 3 Head Plow Bolts

ASME B18.9-2012

D	E		A			F	S		B	
Nominal Diameter	Diameter of Full Size Body		Diameter of Head			Feed Thickness	Depth of Square and Head		Width of Square	
	Max	Min	Max	Min Sharp	Abs. Min with Flat	Max	Max	Min	Max	Min (Basic)
5/16	0.312	0.299	0.605	0.578	0.538	0.040	0.269	0.228	0.325	0.313
3/8	0.375	0.360	0.708	0.671	0.624	0.050	0.312	0.262	0.387	0.375
7/16	0.438	0.421	0.826	0.781	0.729	0.058	0.364	0.306	0.450	0.438
1/2	0.500	0.483	0.945	0.890	0.831	0.068	0.417	0.349	0.515	0.500
5/8	0.657	0.606	1.147	1.094	1.013	0.080	0.506	0.426	0.640	0.625
3/4	0.782	0.729	1.303	1.250	1.169	0.080	0.541	0.461	0.765	0.750
7/8	0.938	0.853	1.512	1.469	1.469	0.100	0.626	0.526	0.906	0.875
1	1.062	0.976	1.700	1.656	1.656	0.100	0.690	0.590	1.031	1.000

Tolerance on Length	Nominal Bolt Size	All Lengths
	1/4 through 3/8	±0.03
	7/16 and 1/2	±0.06
	5/8 through 1	±0.12

Minimum Thread Length of Plow Bolts (2D + 0.25)

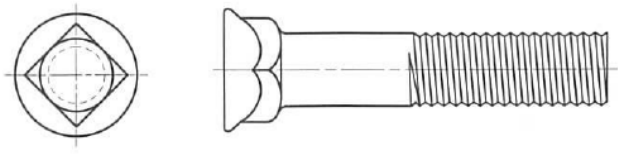
ASME B18.9-2012

Recommended Bolt Length	Nominal Bolt Diameter, D							
	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1
1	T to H	T to H	-	-	-	-	-	-
1-1/4	0.875	T to H	T to H	T to H	T to H	-	-	-
1-1/2	0.875	1.000	T to H	T to H	T to H	T to H	T to H	-
1-3/4	0.875	1.000	1.125	1.250	T to H	T to H	T to H	T to H
2	0.875	1.000	1.125	1.250	T to H	T to H	T to H	T to H
2-1/4	0.875	1.000	1.125	1.250	1.500	T to H	T to H	T to H
2-1/2	0.875	1.000	1.125	1.250	1.500	1.750	T to H	T to H
3	0.875	1.000	1.125	1.250	1.500	1.750	2.000	2.250
3-1/2	0.875	1.000	1.125	1.250	1.500	1.750	2.000	2.250
4	0.875	1.000	1.125	1.250	1.500	1.750	2.000	2.250

"T to H" = Threaded to Head or square within 2.5 full threads.

Grades 5 & 8

PLOW BOLTS



GRADE-5 PLOW BOLT

Description	Bolt with a countersunk, flat head, square neck and unified thread pitch, made from medium-carbon steel.
Applications/ Advantages	Used in road graders, scoop shovels and other heavy-duty equipment where a smooth surface is required at the spot of head protrusion.
Material	Grade-5 Plow Bolts shall be made from a medium carbon steel which conforms to the following chemical composition requirements: ***Carbon***: 0.28% to 0.55%; ***Phosphorus***: 0.048% maximum; ***Sulphur***: 0.058% maximum.
Heat Treatment	Grade-5 Plow Bolts shall be heat treated, oil or water quenched, and tempered at a minimum tempering temperature of 800°F.
Core Hardness	Rockwell C25 - C34
Surface Hardness	Rockwell 30N 54 maximum
Proof Load	85,000 psi.
Yield Strength	92,000 psi. minimum
Tensile Strength	120,000 psi. minimum
Plating	See Appendix-A for plating information.

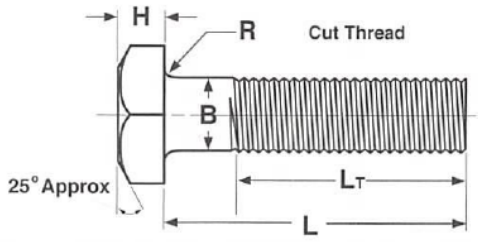
GRADE-8 PLOW BOLT

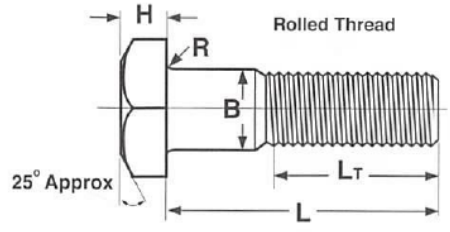


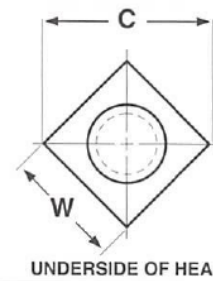
Description	A plow bolt made from alloy steel.
Applications/ Advantages	Greater tensile and proof load strength than a grade-5. Popular use is with bulldozer and snowplow blades.
Material	AISI 4037 and 4042 steel
Heat Treatment	Grade-8 Plow Bolts shall be heat treated, oil quenched and tempered at a minimum tempering temperature of 800°F.
Core Hardness	Rockwell C33 - C39
Surface Hardness	Rockwell 30N58.6 maximum
Proof Load	120,000 psi.
Yield Strength	130,000 psi. minimum
Tensile Strength	150,000 psi. minimum
Plating	Bolts are supplied unplated.

**Product standards require the manufacturer's head marking to appear on the top of all bolts 1/4" diameter and larger.
"X" represents one location such a marking may appear.

SQUARE BOLTS







SQUARE BOLTS

ASME B18.2.1-2012

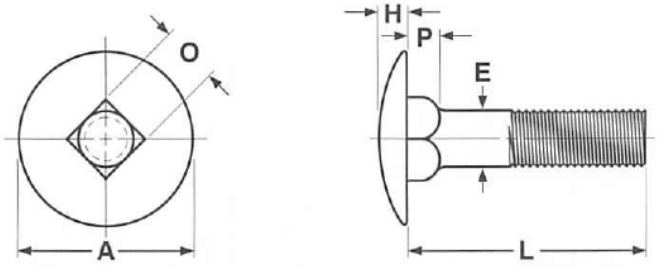
Nominal Size or Base Product Diameter		B		W		C		H		R		L_T	
		Full Size Body Diameter		Width Across Flats		Width Across Corners		Head Height		Radius of Fillet		Thread Length for Bolt Lengths	
												6 in. & shorter	Over 6 in.
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Nom.	Nom.
1/4	0.2500	0.260	0.237	0.375	0.362	0.530	0.498	0.188	0.156	0.03	0.01	0.750	1.000
5/16	0.3125	0.324	0.298	0.500	0.484	0.707	0.665	0.220	0.186	0.03	0.01	0.875	1.125
3/8	0.3750	0.388	0.360	0.562	0.544	0.795	0.747	0.268	0.232	0.03	0.01	1.000	1.250
7/16	0.4375	0.452	0.421	0.625	0.603	0.884	0.828	0.316	0.278	0.03	0.01	1.125	1.375
1/2	0.5000	0.515	0.482	0.750	0.725	1.061	0.995	0.348	0.308	0.03	0.01	1.250	1.500
5/8	0.6250	0.642	0.605	0.938	0.906	1.326	1.244	0.444	0.400	0.06	0.02	1.500	1.750
3/4	0.7500	0.768	0.729	1.125	1.088	1.591	1.494	0.524	0.476	0.06	0.02	1.750	2.000
7/8	0.8750	0.895	0.852	1.312	1.269	1.856	1.742	0.620	0.568	0.06	0.02	2.000	2.250
1	1.0000	1.022	0.976	1.500	1.450	2.121	1.991	0.684	0.628	0.09	0.03	2.250	2.500
1 1/8	1.1250	1.149	1.098	1.688	1.631	2.386	2.239	0.780	0.720	0.09	0.03	2.500	2.750
1 1/4	1.2500	1.277	1.223	1.875	1.812	2.652	2.489	0.876	0.812	0.09	0.03	2.750	3.000
1 3/8	1.3750	1.404	1.345	2.062	1.994	2.917	2.738	0.940	0.872	0.09	0.03	3.000	3.250
1 1/2	1.5000	1.531	1.470	2.250	2.175	3.182	2.986	1.036	0.964	0.09	0.03	3.250	3.500

Tolerance on Length	Nominal Screw Size	Nominal Screw Length									
		Up to 1 in., incl.		Over 1 in. to 2 1/2 in., incl.		Over 2 1/2 in. to 4 in., incl.		Over 4 in. to 6 in., incl.		Longer than 6 in.	
	1/4 to 3/8	+0.02	-0.03	+0.02	-0.04	+0.04	-0.06	+0.06	-0.10	+0.10	-0.18
	7/16 and 1/2	+0.02	-0.03	+0.04	-0.06	+0.06	-0.08	+0.08	-0.10	+0.12	-0.18
	9/16 to 3/4	+0.02	-0.03	+0.06	-0.08	+0.08	-0.10	+0.10	-0.10	+0.14	-0.18
	7/8 and 1	....	....	+0.08	-0.10	+0.10	-0.14	+0.12	-0.16	+0.16	-0.20
	1 1/8 to 1 1/2	....	....	+0.12	-0.12	+0.16	-0.16	+0.18	-0.18	+0.22	-0.22

‡Length of a square bolt is measured from the underhead bearing surface to the extreme end of the bolt.

Description	A low or medium carbon steel, externally threaded mechanical device 1/4" diameter or larger, with a trimmed square shaped external wrenching head.
Applications/ Advantages	Offers greater bearing surface for wrenching than hex head bolts.
Material	Bolts shall be made from a carbon steel which conforms to the following chemical composition requirements-- ***Phosphorus***: 0.06% maximum; ***Sulfur***: 0.15% maximum
Hardness	***Bolts of a length less than 3 times diameter:*** Rockwell B69-100 *Bolts of a length 3 times diameter and longer:* Rockwell B100 maximum
Tensile Strength	60,000 psi. minimum
Elongation in 2 in.	18% minimum
Plating	See Appendix-A for plating information.

STEP BOLTS



‡Length of a step bolt is measured from the underhead bearing surface to the extreme end of the bolt.

STEP BOLTS

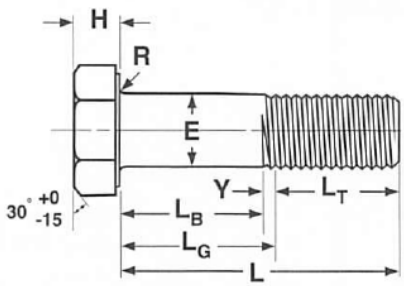
ASME B18.5-2012

Nominal Size	E		A		H		O		P	
	Body Diameter		Head Diameter		Head Height		Square Width		Square Depth	
	Max.	Min.	Max.	Min,	Max.	Min.	Max.	Min.	Max.	Min.
10	0.199	0.182	0.656	0.625	0.114	0.094	0.199	0.185	0.125	0.094
1/4	0.260	0.237	0.844	0.813	0.145	0.125	0.260	0.245	0.156	0.125
5/16	0.324	0.298	1.031	1.000	0.176	0.156	0.324	0.307	0.187	0.156
3/8	0.388	0.360	1.219	1.188	0.208	0.188	0.388	0.368	0.219	0.188
7/16	0.452	0.421	1.406	1.375	0.239	0.219	0.452	0.431	0.250	0.219
1/2	0.515	0.483	1.594	1.563	0.270	0.250	0.515	0.492	0.281	0.250

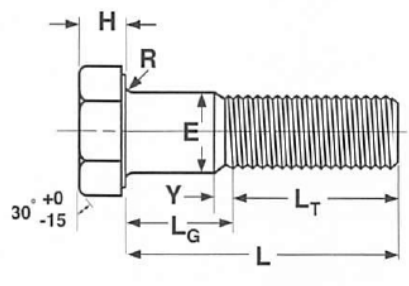
Tolerance on Length	Nominal Bolt Size	Nominal Bolt Length		
		Up to 1 in., incl.	Over 1 in. to 2-1/2 in., incl.	Over 2-1/2 in. to 4 in., incl.
	No. 10 thru 3/8	+0.02, -0.03	+0.02, -0.04	+0.04, -0.06

Description	Similar to a carriage bolt in bearing surface and square-neck design, but with a wider, lower-profile, round head.
Applications/ Advantages	Preferred for use where wood is bolted down as decking--the larger diameter head of the step bolt will not pull through the soft wood. Smooth, low, rounded head permits unrestricted movement over the surface.
Material	AISI 1006 - 1050 or equivalent steel.
Hardness	***No. 10 through 3/8 in. diameter, all lengths:*** Rockwell B70 - B100
Proof Load	***No. 10 through 3/8 in. diameter, all lengths:*** 33,000 psi.
Yield Strength	***No. 10 through 3/8 in. diameter, all lengths:*** 36,000 psi. minimum
Tensile Strength	***No. 10 through 3/8 in. diameter, all lengths:*** 54,000 psi. minimum
Elongation	18% minimum (all sizes)
Reduction of Area	35% minimum (all sizes)
Minimum Thread Length	The minimum length of thread shall be equal to twice the basic bolt diameter plus 0.25 in..
Plating	See Appendix-A for plating information.

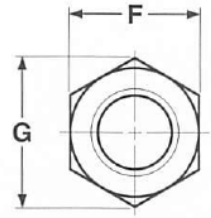
STRUCTURAL BOLTS A325 & A490



Cut Thread



Rolled Thread



‡Length of a structural bolt is measured from the underhead bearing surface to the extreme end of the bolt.

STRUCTURAL BOLTS, A325 & A490

ASME B18.2.6-2010

Nominal size or Basic Product Diameter		E		F			G		H			R		L_T	Y
		Body Diameter		Width Across Flats			Width Across Corners		Head Height			Radius of Fillet		Thread Length	Transition Thread Length
		Max	Min	Basic	Max	Min	Max	Min	Basic	Max	Min	Max	Min	Ref	Max, Ref
1/2	0.5000	0.515	0.482	7/8	0.875	0.850	1.010	0.969	5/16	0.323	0.302	0.031	0.009	1.00	0.19
5/8	0.6250	0.642	0.605	1-1/16	1.062	1.031	1.227	1.175	25/64	0.403	0.378	0.062	0.021	1.25	0.22
3/4	0.7500	0.768	0.729	1-1/4	1.250	1.212	1.443	1.383	15/32	0.483	0.455	0.062	0.021	1.38	0.25
7/8	0.8750	0.895	0.852	1-7/16	1.438	1.394	1.660	1.589	35/64	0.563	0.531	0.062	0.031	1.50	0.28
1	1.0000	1.022	0.976	1-5/8	1.625	1.575	1.876	1.796	39/64	0.627	0.591	0.093	0.062	1.75	0.31
1 1/8	1.1250	1.149	1.098	1-13/16	1.812	1.756	2.093	2.002	11/16	0.718	0.658	0.093	0.062	2.00	0.34
1 1/4	1.2500	1.277	1.223	2	2.000	1.938	2.309	2.209	25/32	0.813	0.749	0.093	0.062	2.00	0.38
1 3/8	1.3750	1.404	1.345	2-3/16	2.188	2.119	2.526	2.416	27/32	0.878	0.810	0.093	0.062	2.25	0.44
1 1/2	1.5000	1.531	1.470	2-3/8	2.375	2.300	2.742	2.622	15/16	0.974	0.902	0.093	0.062	2.25	0.44

Tolerance on Length	Nominal Screw Size	Nominal Screw Length	
		Through 6 in.	Over 6 in.
	1/2	-0.12	-0.19
	5/8	-0.12	-0.25
	3/4 through 1	-0.19	-0.25
	1 1/8 through 1 1/2	-0.25	-0.25

ASTM A325 & A490 STRUCTURAL BOLTS



ASTM A325 Bolts, Type 1



Description	A heavy hex bolt made of medium carbon steel. The bearing surface shall be flat and washer faced, and the point is chamfered.
Applications/ Advantages	Commonly used in structural steel joints in heavy construction.
Material	Type 1 bolts shall be made from a carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.25-0.58%; ***Manganese***: 0.57% minimum; ***Phosphorus***: 0.048% maximum; ***Sulfur***: 0.058% maximum
Heat Treatment	Type 1 bolts shall be heat treated by quenching in a liquid medium from above the austenitizing temperature and then tempering by reheating to a temperature of at least 800°F.
Hardness	***1/2" through 1" diameter, inclusive***: Rockwell C24 - 35 ***1-1/8" through 1-1/2 diameter, inclusive***: Rockwell C19 - 31
Proof Load	***1/2" through 1" diameter, inclusive***: 85,000 psi. ***1-1/8" through 1-1/2" diameter, inclusive***: 74,000 psi.
Yield Strength	***1/2" through 1" diameter, inclusive***: 92,000 psi. minimum ***1-1/8" through 1-1/2" diameter, inclusive***: 81,000 psi. minimum
Tensile Strength	***1/2" through 1" diameter, inclusive***: 120,000 psi. minimum ***1-1/8" through 1-1/2" diameter, inclusive***: 105,000 psi. minimum
Plating	See Appendix-A for plating information.



Type 1

ASTM A490 BOLTS, Types 1 & 3

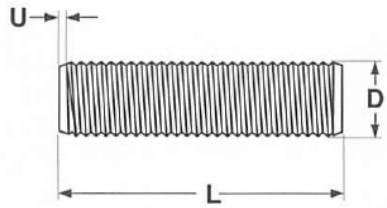


Type 3

Description	A heavy hex bolt made of alloy steel. The bearing surface shall be flat and washer faced, and the point is chamfered.
Applications/ Advantages	Used in structural steel joints in heavy construction when greater yield and tensile strengths than those of an A325 bolt are required. A Type 3 bolt is approximately twice as resistant to corrosion as a Type 1 bolt.
Material	Type 1 bolts shall be made from an alloy steel which conforms to the following chemical composition requirements-- ***Carbon:*** 0.28-0.50% (for 1-1/2" diameter: 0.33-0.55%); ***Phosphorus***: 0.045% maximum; ***Sulfur***: 0.045% maximum. Type 3 bolts shall be made from a corrosion resistant steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.19-0.55%; ***Manganese***: 0.37% minimum; ***Phosphorus***: 0.045% maximum; ***Sulfur***: 0.055% maximum; ***Copper***: 0.63% maximum; ***Chromium***: 0.42% minimum; ***Nickel***: 0.17% minimum; ***Molybdenum***: 0.14% minimum.
Heat Treatment	Type 1 bolts shall be heat treated by quenching in oil from above the transformation temperature. Type 3 bolts shall be quenched in a suitable liquid from above the transformation temperature. Type 1 and Type 3 bolts shall be tempered by reheating to a temperature of at least 800°F.
Hardness	Rockwell C33 - 38
Proof Load	120,000 psi.
Yield Strength	130,000 psi. minimum
Tensile Strength	150,000 - 170,000 psi.
Plating	See Appendix-A for plating information.

**Product standards require the manufacturer's head marking to appear on the top of all bolts 1/4" diameter and larger. "X" represents one location such a marking may appear.

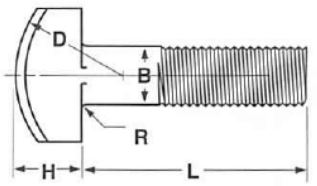
STUDS, CONTINUOUS THREAD B-7

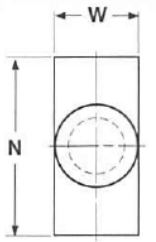


B-7 Continuous Thread Studs					ASME B18.31.2
Nominal Size	Diameter D	Threads Per Inch		U_{max} = 2 Thread Pitches	
		UNC	UNF	UNC Threads	UNF Threads
1/2	0.5000	13	20	0.154	0.100
5/8	0.6250	11	18	0.182	0.111
3/4	0.7500	10	16	0.200	0.125
7/8	0.8750	9	14	0.222	0.143
1	1.0000	8	12	0.250	0.167
Tolerance on Length		Nominal Length			
		Over 1/2 thru 2.5": ±0.04	Over 2.5 thru 4": ±0.08	Over 4 thru 8": ±0.10	Over 8 thru 16": ±0.12

Description	An externally threaded fastener without a head that is threaded over its entire length.
Applications/ Advantages	B7 studs are best suited for use in temperatures between 300° - 400° C.
Material	Bolts shall be made from a grade B7 alloy which conforms to the following chemical composition requirements-- ***Carbon***: 0.37-0.49%; ***Manganese***: 0.65-1.10%; ***Phosphorus***: 0.035% maximum; ***Sulfur***: 0.040% maximum; ***Silicon***: 0.15-0.35%; ***Chromium***: 0.75-1.20% ; ***Molybdenum***: 0.15-0.25%
Heat Treatment	Immediately after rolling or forging, the studs are cooled to a temperature below the cooling transformation stage. Parts are then reheated to a minimum tempering temperature of 1100° F and quenched in a liquid medium.
Hardness	***Studs 2.5" in diameter and smaller:*** Rockwell C35 maximum
Yield Strength	105,000 psi. minimum
Tensile Strength	125,000 psi. minimum
Elongation in 4D	16% minimum
Plating	Studs are typically provided plain without a secondary finish.

T-HEAD BOLTS





‡Length of a T-Head bolt is measured from the underhead bearing surface to the extreme end of the bolt.

T-HEAD BOLTS

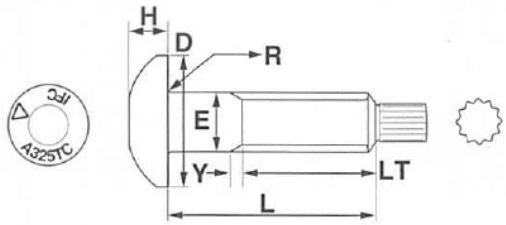
ASME B18.5--2012

Nominal Size or Basic Bolt Diameter		B		N		W		H		D	R
		Body Diameter		Head Length		Head Width		Head Height		Head Radius	Fillet Radius
		Max	Min	Max	Min	Max	Mln	Max	Mln	Basic	Max
1/4	0.2500	0.260	0.237	0.500	0.488	0.280	0.245	0.204	0.172	0.438	0.031
5/16	0.3125	0.324	0.298	0.625	0.609	0.342	0.307	0.267	0.233	0.500	0.031
3/8	0.3750	0.388	0.360	0.750	0.731	0.405	0.368	0.331	0.295	0.625	0.031
7/16	0.4375	0.452	0.421	0.875	0.853	0.468	0.431	0.394	0.356	0.875	0.031
1/2	0.5000	0.515	0.483	1.000	0.975	0.530	0.492	0.458	0.418	0.875	0.031
5/8	0.6250	0.642	0.605	1.250	1.218	0.675	0.616	0.585	0.541	1.062	0.062
3/4	0.7500	0.768	0.729	1.500	1.462	0.800	0.741	0.649	0.601	1.250	0.062
7/8	0.8750	0.895	0.852	1.750	1.706	0.938	0.865	0.776	0.724	1.375	0.062
1	1.0000	1.022	0.976	2.000	1.950	1.063	0.990	0.903	0.847	1.500	0.062

	Nominal Bolt Size	Nominal Screw Length									
		Up to 1 in., incl.		Over 1 2 1/2 in., incl. in. to		Over 2 1/2 in. to 4 in., incl.		Over 4 in. to 6 in., incl.		Over 6 in.	
Tolerance on Length	No. 10 thru 3/8	+0.02	-0.03	+0.02	-0.04	+0.04	-0.06	+0.06	-0.10	+0.10	-0.18
	7/16 and 1/2	+0.02	-0.03	+0.04	-0.05	+0.06	-0.08	+0.08	-0.10	+0.12	-0.18
	9/16 thru 3/4	+0.02	-0.03	+0.06	-0.08	+0.08	-0.10	+0.10	-0.10	+0.14	-0.18
	7/8 and 1	....	....	+0.08	-0.10	+0.10	-0.14	+0.12	-0.16	+0.16	-0.20
	1-1/8 thru 1-1/2	....	....	+0.12	-0.12	+0.16	-0.16	+0.18	-0.18	+0.22	-0.22

Description	A low or medium carbon steel, externally threaded mechanical device 1/4" diameter or larger, with a rectangular head with a rounded top surface and a flat bearing surface."
Applications/ Advantages	Used in the machine tool and water works industries
Material	Bolts shall be made from a carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.55% maximum; ***Phosphorus***: 0.048% maximum; ***Sulfur***: 0.058% maximum
Hardness	Rockwell B70 - 100
Tensile Strength	60,000 psi. minimum
Yield Strength	36,000 psi. minimum
Elongation	18% minimum
Reduction of Area	35% minimum
Plating	See Appendix-A for plating information.

TENSION CONTROL BOLTS A325

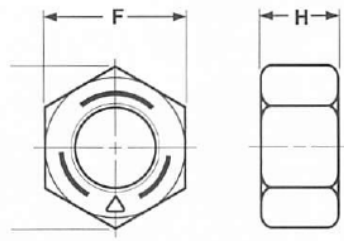


Dimensions Of High Strength Tension Control Bolts

Nominal Bolt Size	E		D		H			R		LT	Y
	Body Diameter		Diameter of Bearing Surface		Height			Radius of Fillet		Thread Length (Ref)	Trans. Thread Length (Ref)
	Max.	Min	Max.	Min.	Basic	Max.	Min.	Max.	Min	Basic	Max.
5/8	0.642	0.605	1.181	1.102	25/64	0.403	0.378	0.062	0.021	1.25	0.22
3/4	0.768	0.729	1.417	1.338	15/32	0.483	0.455	0.062	0.021	1.38	0.25
7/8	0.895	0.852	1.654	1.535	35/64	0.563	0.531	0.062	0.031	1.50	0.28
1	1.022	0.976	1.900	1.771	39/64	0.627	0.591	0.093	0.062	1.75	0.31

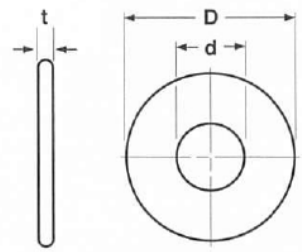
Heavy Hex Nuts Used With Tension Control Bolts

Nominal Nut Size	F			G		H		
	Width Across Flats			Width Across Corners		Height		
	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.
5/8	1-1/16	1.062	1.031	1.227	1.175	39/64	0.631	0.587
3/4	1-1/41	1.250	1.212	1.443	1.382	47/64	0.758	0.710
7/8	1-7/16	1.438	1.394	1.660	1.589	55/64	0.885	0.833
1	1-5/8	1.625	1.575	1.876	1.796	63/64	1.012	0.956



Washers Used With Tension Control Bolts

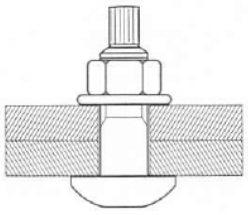
Nominal Bolt Size	D		d		t	
	Outside Diameter		Diameter of Hole		Thickness	
	Nom.	Tolerances	Nom.	Tolerances	Max.	Min.
5/8	1-5/16	- 1/32: + 1/4	11/16	- 0: + 1/32	0.177	0.122
3/4	1-15/32	- 1/32: + 1/4	13/16	- 0: + 1/32	0.177	0.122
7/8	1-3/4	- 1/32: + 1/4	15/16	- 0: + 1/32	0.177	0.136
1	2	- 1/32: + 1/4	1-1/8	- 0: + 1/32	0.177	0.136



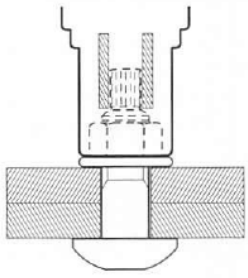
A325 TENSION CONTROL BOLTS

Description	A three piece fastening system consisting of: 1) a round-head bolt with a truncated, flat surface area at the top of the bolt, and a 24-sided tip which protrudes from the opposite end. The tip is calibrated to shear off when the proper tension is achieved; 2) a 2H heavy hex nut; and 3) a structural flat washer.		
Applications/ Advantages	Commonly used in structural steel joints in heavy construction. Has several advantages over traditional structural bolts, including: A) no operator or tool can over torque the fastening, B) the fastening can be visually inspected—when the tip is gone, the tension is correct; C) installation is faster, easier and can be done by one person; D) installation process is quieter.		
Component	***Bolt***	***Nut***	***Washer***
Material	Type 1 bolts shall be made from a carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.25-0.58%; ***Manganese***: 0.60% minimum; ***Phosphorus***: 0.048% maximum; ***Sulfur***: 0.058% maximum	2H nuts shall be made from a carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.40% minimum; ***Manganese***: 1.00% maximum; ***Phosphorus***: 0.040% maximum; ***Sulfur***: 0.050% maximum; ***Silicon***: 0.040% maximum	Type 1 washers shall be made from a steel which conforms to the following chemical composition requirements-- ***Phosphorus***: 0.050% maximum; ***Sulfur***: 0.060% maximum
Heat Treatment	Type 1 bolts shall be heat treated by quenching in a liquid medium from above the austenitizing temperature and then tempering by reheating to a temperature of at least 800°F.	2H nuts shall be heat treated to meet the required mechanical properties.	Washers shall be through hardened.
Hardness	***5/8" through 1" diameter, inclusive***: Rockwell C24 - 35	Rockwell C24 - 38	Rockwell C38 - 45
Proof Load	***5/8" through 1" diameter, inclusive***: 85,000 psi.	175,000 psi.	-
Yield Strength	***5/8" through 1" diameter, inclusive***: 92,000 psi. minimum	-	-
Tensile Strength	***5/8" through 1" diameter, inclusive***: 120,000 psi. minimum	-	-
Plating	All components are most commonly used plain, without any secondary finish other than oil.		

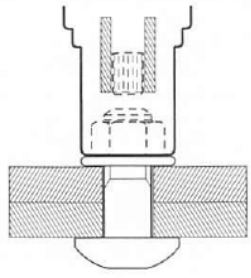
INSTALLATION PROCEDURE



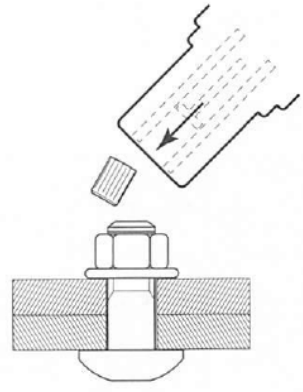
Place the bolt into the connection with the washer under the nut.



Slide the inner socket over the bolt tip and the outer socket over the nut. Press the trigger switch. The outer socket will rotate and tighten the nut until the bolt reaches the required tension.



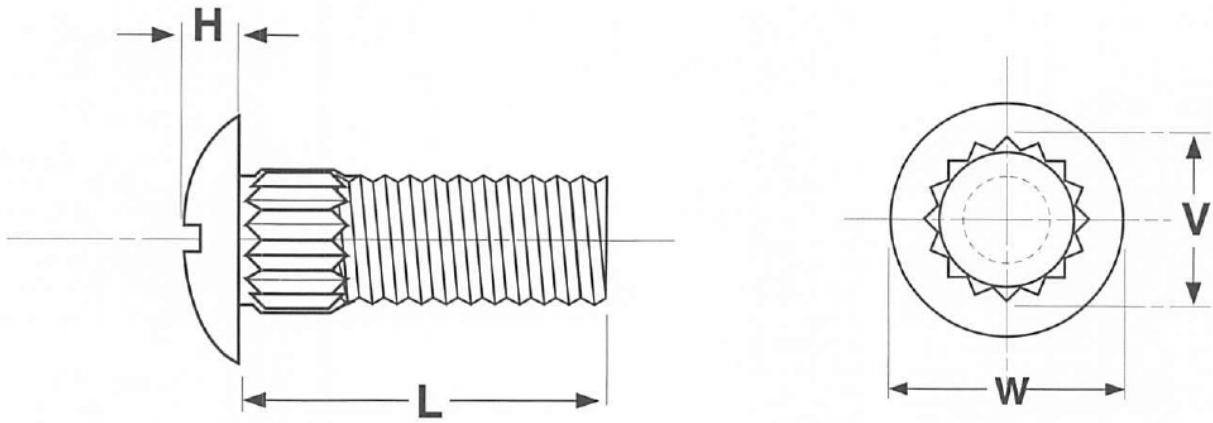
When the proper bolt tension is reached, the tip of the bolt will shear. When the tip of the bolt shears, pull back on the wrench until the outer socket is no longer engaging the nut.



Push the ejector lever to discharge the severed bolt tip.

TRACK BOLTS

Low Carbon & Grade 5



SLOTTED ROUND TRACK BOLTS						
Bolt Diameter & Thread Pitch	Head Diameter		Head Height		Neck Diameter	
	W		H		V	
	Max	Min	Max	Min	Max	Min
1/4-20	.448	.425	.103	.083	.290	.275
Tolerance on Length			+.009, -.013			

Description	A round head bolt with slot that extends across the center of the top of the head for driving. Directly below the head, the shoulder has vertical ribs that protrude out from the screw's shank, giving that section a greater diameter than the threaded portion of the fastener.
Applications/ Advantages	Designed specifically for use in installation of garage doors. The track bolt is used to (a) attach track brackets to the vertical sections of track; (b) attach the flag bracket to the top of the vertical tracks; (c) fasten the horizontal angle bracket to the horizontal track. The round head has a low profile to not interfere with the rollers as they pass along the track. The preferred mating part is a serrated flange nut.
Material	Grade-2: AISI 1006 - 1025 steel Grade-5: AISI 1030 - 1055 steel
Core Hardness	Grade-2: Rockwell B80 - B100 Grade-5: Rockwell C25 - C34
Tensile Strength	Grade-2: 74,000 psi. min. Grade-5: 120,000 psi. min.
Plating	Track bolts are usually supplied with a clear zinc finish.

EXTERNAL THREAD DIMENSIONS

External Threads - Class 2A

ASME B1.1

Nominal Size	Series Designation	Allowance	Major Diameter		Pitch Diameter		
			Max	Min	Max	Min	Tolerance
4-40	UNC	0.0008	0.1112	0.1061	0.0950	0.0925	0.0025
6-32	UNC	0.0008	0.1372	0.1312	0.1169	0.1141	0.0028
8-32	UNC	0.0009	0.1631	0.1571	0.1428	0.1399	0.0029
10-24	UNC	0.0010	0.1890	0.1818	0.1619	0.1586	0.0033
10-32	UNF	0.0009	0.1891	0.1831	0.1688	0.1658	0.0030
1/4-20	UNC	0.0011	0.2489	0.2408	0.2164	0.2127	0.0037
1/4-28	UNF	0.0010	0.2490	0.2425	0.2258	0.2225	0.0033
5/16-18	UNC	0.0012	0.3113	0.3026	0.2752	0.2712	0.0040
5/16-24	UNF	0.0011	0.3114	0.3042	0.2843	0.2806	0.0037
3/8-16	UNC	0.0013	0.3737	0.3643	0.3331	0.3287	0.0044
3/8-24	UNF	0.0011	0.3739	0.3667	0.3468	0.3430	0.0038
7/16-14	UNC	0.0014	0.4361	0.4258	0.3897	0.3850	0.0047
7/16-20	UNF	0.0013	0.4362	0.4281	0.4037	0.3995	0.0042
1/2-13	UNC	0.0015	0.4985	0.4876	0.4485	0.4435	0.0050
1/2-20	UNF	0.0013	0.4987	0.4906	0.4662	0.4619	0.0043
9/16-12	UNC	0.0016	0.5609	0.5495	0.5068	0.5016	0.0052
9/16-18	UNF	0.0014	0.5611	0.5524	0.5250	0.5205	0.0045
5/8-11	UNC	0.0016	0.6234	0.6113	0.5644	0.5589	0.0055
5/8-18	UNF	0.0014	0.6236	0.6149	0.5875	0.5828	0.0047
3/4-10	UNC	0.0018	0.7482	0.7353	0.6832	0.6773	0.0059
3/4-16	UNF	0.0015	0.7485	0.7391	0.7079	0.7029	0.0050
7/8-9	UNC	0.0019	0.8731	0.8592	0.8009	0.7946	0.0063
7/8-14	UNF	0.0016	0.8734	0.8631	0.8270	0.8216	0.0054
1-8	UNC	0.0020	0.9980	0.9830	0.9168	0.9100	0.0068
1-14	UNS	0.0017	0.9983	0.9880	0.9519	0.9463	0.0056
1 1/8-7	UNC	0.0022	1.1228	1.1064	1.0300	1.0228	0.0072
1 1/8-12	UNF	0.0018	1.1232	1.1118	1.0691	1.0631	0.0060
1 1/4-7	UNC	0.0022	1.2478	1.2314	1.1550	1.1476	0.0074
1 1/4-12	UNF	0.0018	1.2482	1.2368	1.1941	1.1879	0.0062
1 3/8-6	UNC	0.0024	1.3726	1.3544	1.2643	1.2563	0.0080
1 1/2-6	UNC	0.0024	1.4976	1.4794	1.3893	1.3812	0.0081
1 3/4-5	UNC	0.0027	1.7473	1.7268	1.6174	1.6085	0.0089
2-4.5	UNC	0.0029	1.9971	1.9751	1.8528	1.8433	0.0095
2 1/2-4	UNC	0.0031	2.4969	2.4731	2.3345	2.3241	0.0104
2 3/4-4	UNC	0.0032	2.7468	2.7230	2.5844	2.5739	0.0105
3-4	UNC	0.0032	2.9968	2.9730	2.8344	2.8237	0.0107

NUTS, SPEED CLIPS & HOOKS

Dimensions, Mechanical & Performance Requirements

Automotive Light Hex 158

Cap Nuts, Hex
- Closed End, One Piece & Two Piece 159
- Open Ended 160
- Closed End Washer-Based 161
- Open Ended Washer-Based 162

Castle Nuts, Hex 163

Clinching 164

Conduit Lock 166

Coupling, Hex
- Reducer Couplings 167
- Standard Couplings 168

Finished Hex Nuts
- Grade 2 170-171
- Hot Dip Galvanized 170-171
- Stainless, 18-8 & 316 170-171
- Grade 5 172-173
- Grade 8 172-173

Flange, Hex
- No Serrations, Standard Width 174
- No Serrations, Large Flange Grade F 175
- Serrated, Case-hardened & 18-8 176
- Serrated, Grades 5 & 8 177
- Serrated, Large Flange 178

FLEXLOC® Style
- Light Hex, Full Height 179
- Light Hex, Thin Height 180
- Heavy Hex, Full Height 181
- Heavy Hex, Thin Height 182

High Hex, Grade-8 183

Heavy Hex, Steel (Incl. A194 2H & A563 DH) & Stainless 184-185

Jam, Hex, Steel & Stainless 186

Jam, Heavy Hex, Steel 187

K-Lock
- Conical Lockwasher 188
- External Tooth Lockwasher 189

Machine Screw Style
- Regular Pattern, Hex 190-191
- Regular Pattern, Square 190-191
- Small Pattern Hex 191

FLEXLOC® is a registered trademark of SPS Technologies, Inc. Kanebridge's lock nuts are not manufactured by or connected with the producers of FLEXLOC® nuts.

NUTS, SPEED CLIPS & HOOKS

Nylon Insert Stop
- Light Hex, Full Height, Steel & Stainless 192
- Light Hex, Thin Height, Steel & Stainless 193
- Heavy Hex, Full Height, Steel 194
- Heavy Hex, Thin Height, Steel 195
- Light Hex, Full Height, Grade-8 196
- Flange, Low Carbon & Grade 8 197

Panel, Hex 198

Reversible Center Lock Flange, Grade F 199

Reversible (Two-way) Center Lock 200-201

Slotted Hex Nuts 202

Slotted Heavy Hex Nuts 203

S Hooks 204

Speed Clips, "U" Type 205

Spring Nuts
- Cage Type 206
- Flat Type 207
- "J" Type 208
- "U" Type 209

Square Nuts
- Heavy 210
- Regular 211

Stover®-Equivalent Lock
- Grade G 212
- Grade C 212-213
- Grade B 214

Tee Nuts
- 3-Prong 215
- 4-Prong 216
- 6-Prong 217

Thick Hex, Grade 9 218

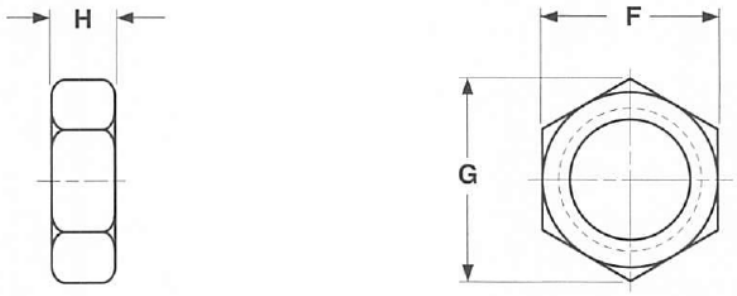
Top Lock, Grade 9 219

Wheel Nuts, Right-hand 220

Wing Nuts
- Cold Forged, Steel & Stainless 221
- Stamped 222
- Washer Based, Zinc Alloy 223

Internal Thread Dimensions 224-225

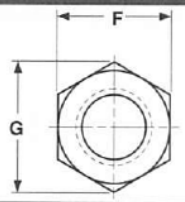
AUTOMOTIVE — Light Hex

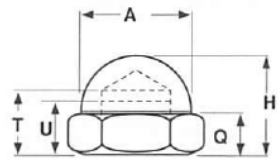


AUTOMOTIVE, LIGHT HEX NUTS							
Nominal Size or Basic Major Diameter of Thread		F		G		H	
		Width Across Flats		Width Across Corners		Thickness	
		Max	Min	Max	Min	Max	Min
7/16-14	0.4375	0.625	0.607	0.722	0.692	0.385	0.365
7/16-20	0.4375	0.625	0.607	0.722	0.692	0.385	0.365

Description	A six-sided, internally threaded fastener that is approximately 50% thicker than a same-sized jam nut.
Applications / Advantages	Used in automotive applications that require light tension and have limited clearance area.
Material	Low carbon steel
Plating	Nuts are usually supplied with a plain finish.

One-Piece & Two-Piece; Steel & Stainless — CAP (ACORN), CLOSED-END





One Piece Closed-End Hex Cap Nuts, Low Crown

SAE J483

Nominal Size or Basic Major Diameter of Thread		F Width Across Flats		G Width Across Corners		A Body Diameter	H Overall Height	Q Hexagon Height	T Drill Depth	U Full Thread
		Max	Min	Max	Min				Max	Min
6	0.1380	0.3125	0.302	0.361	0.344	0.30	0.34	0.16	0.25	0.16
8	0.1640	0.3125	0.302	0.361	0.344	0.30	0.34	0.16	0.25	0.16
10	0.1900	0.3750	0.362	0.433	0.413	0.36	0.41	0.19	0.28	0.19
1/4	0.2500	0.4375	0.428	0.505	0.488	0.41	0.47	0.22	0.34	0.25
5/16	0.3125	0.5000	0.489	0.577	0.557	0.47	0.53	0.25	0.41	0.31
3/8	0.3750	0.5625	0.551	0.650	0.628	0.53	0.62	0.28	0.45	0.38
1/2	0.5000	0.7500	0.736	0.866	0.840	0.72	0.81	0.38	0.59	0.50
5/8	0.6250	0.9375	0.922	1.083	1.051	0.91	1.00	0.47	0.75	0.62
3/4	0.7500	1.0625	1.045	1.227	1.191	1.03	1.16	0.53	0.88	0.75

Two Piece Closed-End Hex Cap Nuts

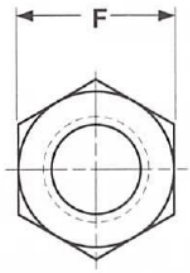
Nominal Size or Basic Major Diameter of Thread		F Width Across Flats		G Width Across Corners		H Overall Height	
		Max	Min	Max	Min	Max	Min
4	0.1120	0.248	0.225	-	-	0.200	0.177
5	0.1250	0.3125	0.302	0.361	0.344	0.260	0.240
6	0.1380	0.3125	0.302	0.361	0.344	0.260	0.240
8	0.1640	0.3125	0.302	0.361	0.344	0.260	0.240
10	0.1900	0.3750	0.362	0.433	0.413	0.291	0.271
1/4	0.2500	0.4375	0.423	0.505	0.482	0.338	0.318
5/16	0.3125	0.562	0.545	0.650	0.621	0.385	0.365
3/8	0.3750	0.625	0.607	0.722	0.692	0.432	0.412
7/16	0.4375	0.673	0.659	0.775	0.750	0.680	0.660
1/2	0.5000	0.750	0.736	0.866	0.840	0.572	0.552
9/16	0.5625	0.875	0.861	1.010	0.982	0.482	0.462
5/8	0.6250	0.938	0.909	1.083	1.037	0.807	0.787
3/4	0.7500	1.12	1.08	-	-	1.12	1.08
7/8	0.8750	1.250	1.212	1.443	1.382	1.420	1.380
1	1.0000	1.497	1.447	1.728	1.650	1.572	1.414

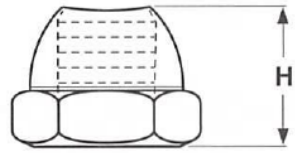
NOTE: There is no single standard for cap nut dimensions. These values are offered as a guide; deviations from these specifications may occur.

Description	***Steel:*** The low-crown cap nut is usually manufactured in two pieces, a hex nut and an acorn-shaped top, zinc die cast to form the finished part. ***Stainless:*** Similar in design to the steel nut but made from an austenitic stainless alloy. Nuts may be one or two-piece style.
Applications/ Advantages	Cap nuts serve two main purposes: (1) as decorative pieces, and (2) as covers for projecting threads.
Material	***Steel:*** Nuts shall be made from a low-carbon steel which conforms to the following chemical composition requirements-- *Carbon*: 0.47% max.; *Phosphorus*: 0.12% max.; *Sulfur*: 0.23% max.. ***Stainless:*** 304L or equivalent stainless.
Plating	See Appendix-A for information about the plating of steel cap nuts.

CAP, OPEN-END

Steel

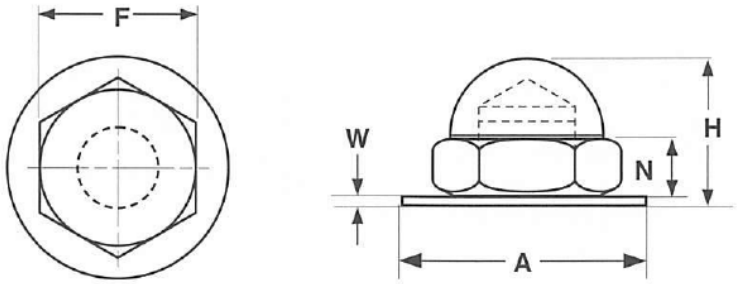




Open-Ended Hex Cap Nuts			
Nominal Size or Basic Major Diameter of Thread		F	H
		Width Across Flats	Overall Height
		Ref	Ref
1/4-20	0.2500	7/16	21/64
5/16-18	0.3125	9/16	3/8

Description	A low-crown cap nut with the top portion of its dome removed, allowing the male-threaded part to protrude through the opening.
Applications/ Advantages	The open-ended cap nut still offers much of the attractiveness and protection of a regular closed-end cap nut but can be used with bolts or screws of any length.
Material	Nuts shall be made from a low-carbon steel which conforms to the following chemical composition requirements-- *Carbon*: 0.47% max.; *Phosphorus*: 0.12% max.; *Sulfur*: 0.23% max.
Plating	Steel open-ended cap nuts are usually supplied with a nickel plate finish. See Appendix-A for more information.

Steel CAP, WASHER-BASED, CLOSED-END

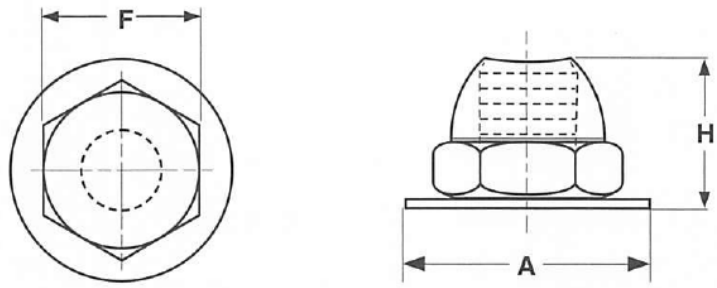


Washer-Based Closed-End Cap Nuts

Nominal Size or Basic Thread Diameter		F		N		H	W		A
		Width Across the Flats		Wrenching Height		Overall Height	Washer Thickness		Washer Base Diameter
		Max	Min	Max	Min	Nom	Max	Min	Nom
10	0.1900	0.382	0.372	0.165	0.155	3/8	0.040	0.030	19/32
1/4	0.2500	0.444	0.434	0.169	0.159	13/32	0.045	0.035	11/16
5/16	0.3125	0.569	0.589	0.193	0.183	15/32	0.050	0.040	27/32
3/8	0.3750	0.632	0.622	0.218	0.208	17/32	0.055	0.045	15/16

Description	A zinc alloy internally threaded fastener that features a wide-diameter, integral washer base and a low-crown cap with a dome-shaped top.
Applications / Advantages	This design is preferred by some as a more attractive alternative to a basic hex nut. Washer-base design enables the nut to be used in oversized or offset holes, and with soft materials such as wood or plastic.
Material	Nuts are made from the zinc die cast alloy Zamak #3 which conforms to the following chemical composition requirements-- ***Aluminum***: 3.5-4.3%; ***Magnesium***: 0.02-0.05%; ***Copper***: 0.25%* max.; Iron: 0.10% max.; ***Lead***: 0.005% max.; ***Cadmium***: 0.004% max.; ***Tin***: 0.003% max.; ***Zinc***: balance (*Note: Most commercial applications will accept copper content within the range of 0.25-0.75% without rejecting the product).

Steel CAP, WASHER-BASED, OPEN-END

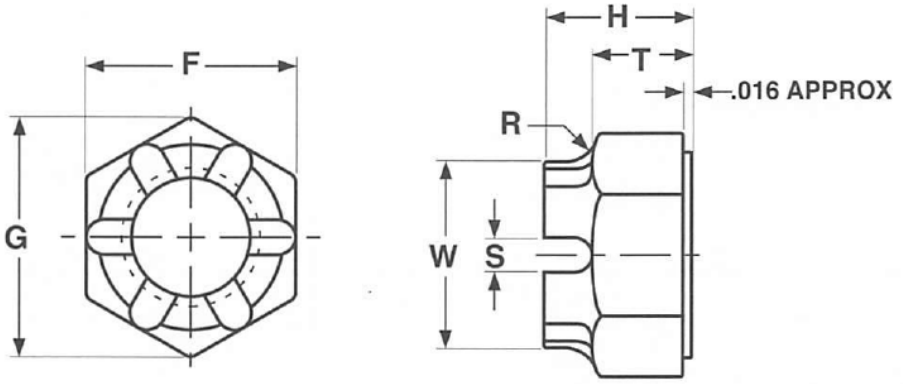


WASHER-BASED OPEN-END CAP NUTS							
Nominal Size or Basic Thread Diameter		F		N		R	
		Width Across the Flats		Overall Height		Washer Base Diameter	
		Max	Min	Max	Min	Max	Min
10	0.1900	0.375	0.362	0.291	0.271	0.450	0.430
1/4	0.2500	0.438	0.423	0.338	0.318	0.522	0.502
5/16	0.3125	0.562	0.545	0.385	0.365	0.667	0.647
3/8	0.3750	0.625	0.607	0.431	0.411	0.739	0.719

Description	A zinc alloy internally threaded fastener that features a wide-diameter, integral washer base and a low-crown cap with the top portion of its dome removed.
Applications / Advantages	This design is preferred by some as a more attractive alternative to a basic hex nut. It is a useful alternative to a washer-based closed-end cap nut because it can be used with bolts of any length. Washer-base design enables the nut to be used in oversized or offset holes, and with soft materials such as wood or plastic.
Material	Nuts are made from the zinc die cast alloy Zamak #3 which conforms to the following chemical composition requirements-- ***Aluminum***: 3.5-4.3%; ***Magnesium***: 0.02-0.05%; ***Copper***: 0.25%* max.; Iron: 0.10% max.; ***Lead***: 0.005% max.; ***Cadmium***: 0.004% max.; ***Tin***: 0.003% max.; ***Zinc***: balance (*Note: Most commercial applications will accept copper content within the range of 0.25-0.75% without rejecting the product).

HEX CASTLE

Low Carbon Steel



HEX CASTLE NUTS

ANSI B18.2.2 1970

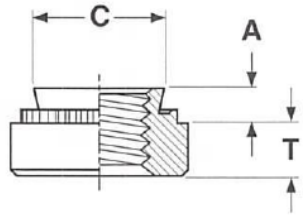
Nominal Size or Basic Major Diameter of Thread		F			G		H			T			S		R	W	
		Width Across Flats			Width Across Corners		Thickness			Unslotted Thickness and Height of Flat			Width of Slot		Radius of Filet	Diam. of Cylindrical Part	Runout of Bearing Surface FIR
		Basic	Max	Min	Max	Min	Basic	Max	Min	Nom	Max	Min	Max	Min	+.010	Min	Max
1/4	0.2500	7/16	0.438	0.428	0.505	0.488	9/32	0.288	0.274	3/16	0.20	0.18	0.10	0.07	0.094	0.371	0.015
5/16	0.3125	1/2	0.500	0.489	0.577	0.557	21/64	0.336	0.320	15/64	0.24	0.22	0.12	0.09	0.094	0.425	0.016
3/8	0.3750	9/16	0.562	0.551	0.650	0.628	13/32	0.415	0.398	9/32	0.29	0.27	0.15	0.12	0.094	0.478	0.017
7/16	0.4375	11/16	0.688	0.675	0.794	0.768	29/64	0.463	0.444	19/64	0.31	0.29	0.15	0.12	0.094	0.582	0.018
1/2	0.5000	3/4	0.750	0.736	0.866	0.840	9/16	0.573	0.552	13/32	0.42	0.40	0.18	0.15	0.125	0.637	0.019
9/16	0.5625	7/8	0.875	0.861	1.010	0.982	39/64	0.621	0.598	27/64	0.43	0.41	0.18	0.15	0.156	0.744	0.020
5/8	0.6250	15/16	0.938	0.922	1.083	1.051	23/32	0.731	0.706	1/2	0.51	0.49	0.24	0.18	0.156	0.797	0.021
3/4	0.7500	1-1/8	1.125	1.088	1.299	1.240	13/16	0.827	0.798	9/16	0.57	0.55	0.24	0.18	0.188	0.941	0.023
7/8	0.8750	1-5/16	1.312	1.269	1.516	1.447	29/32	0.922	0.890	21/32	0.67	0.64	0.24	0.18	0.188	1.097	0.025
1	1.0000	1-1/2	1.500	1.450	1.732	1.653	1	1.018	0.982	23/32	0.73	0.70	0.30	0.24	0.188	1.254	0.027
1-1/4	1.250	1-7/8	1.875	1.812	2.165	2.066	1-1/4	1.272	1.228	7/8	0.89	0.86	0.40	0.31	0.250	1.570	0.033

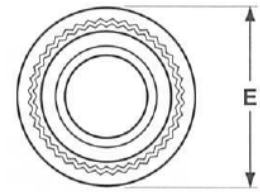
Description	Similar to a slotted nut with the following exception: the slots are cut into a cylindrical portion that is equal in length to the slot depth and slightly smaller in diameter than the hex width.
Applications/ Advantages	The slots are for the insertion of a cotter pin to secure the nut when used with a drilled shank fastener. The slotted and castle styles are both interchangeable with the slotted design now the preferred style.
Material	***Low Carbon Steel***
	Nuts shall be made from a low-carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.47% max.; ***Phosphorus***: 0.12% max.; ***Sulfur***: 0.23% max..
Hardness	Rockwell C32 maximum
Proof Load	-
Plating	See Appendix-A for plating information.

NOTE: There is no industry standard for Grade-5 Castle nut performance. These values are offered as a recommendation. Parts should be tested in actual applications before making final evaluations for suitability.

SELF-CLINCHING

Steel & Stainless





SELF-CLINCHING NUTS

*PEM®

Size	Catalog Part Number (Steel nuts)	PEM® Part Number (Steel nuts)	A Shank Height Max	Sheet Thickness Min	Hole Size in Sheet +.003, -.000	C Shank Diameter Max	E Nut Diameter ±.01	T Nut Height ±.01	Performance Data in Cold-Rolled Steel: Installation (lbs.)	Pushout (lbs.)	Torque Out (in.-lbs.)
4-40-0	04-0NCL	S-440-0-ZI	.030	.030	.166	.165	.25	.07	2500-3500	105	13
4-40-1	04-1NCL	S-440-1-ZI	.038	.040	.166	.165	.25	.07		125	15
4-40-2	04-2NCL	S-440-2-ZI	.054	.056	.166	.165	.25	.07		230	18
4-40-3	-	S-440-3-ZI	.087	.091	.166	.165	.25	.07		230	18
6-32-0	06-0NCL	S-632-0-ZI	.030	.030	.1875	.187	.28	.07	3000-6000	110	16
6-32-1	06-1NCL	S-632-1-ZI	.038	.040	.1875	.187	.28	.07		130	20
6-32-2	06-2NCL	S-632-2-ZI	.054	.056	.1875	.187	.28	.07		275	28
6-32-3	-	S-632-3-ZI	.087	.091	.1875	.187	.28	.07		275	28
8-32-0	08-0NCL	S-832-0-ZI	.030	.030	.213	.212	.31	.09	4000-6000	110	26
8-32-1	08-1NCL	S-832-1-ZI	.038	.040	.213	.212	.31	.09		145	35
8-32-2	08-2NCL	S-832-2-ZI	.054	.056	.213	.212	.31	.09		285	45
8-32-3	08-3NCL	S-832-3-ZI	.087	.091	.213	.212	.31	.09		285	45
10-24-0	10-0NCL	SS-024-0-ZI	.030	.030	.250	.249	.34	.09	4000-9000	120	32
10-24-1	10-1NCL	SS-024-1-ZI	.038	.040	.250	.249	.34	.09		180	40
10-24-2	10-2NCL	SS-024-2-ZI	.054	.056	.250	.249	.34	.09		250	60
10-24-3	10-3NCL	SS-024-3-ZI	.087	.091	.250	.249	.34	.09		320	60
10-32-0	11-0NCL	SS-032-0-ZI	.030	.030	.250	.249	.34	.09		120	32
10-32-1	11-1NCL	SS-032-1-ZI	.038	.040	.250	.249	.34	.09		180	40
10-32-2	11-2NCL	SS-032-2-ZI	.054	.056	.250	.249	.34	.09		250	60
10-32-3	11-3NCL	SS-032-3-ZI	.087	.091	.250	.249	.34	.09		320	60
12-24-1	12-1NCL	S-1224-1-ZI	.038	.040	.277	.276	.38	.13	5000-6500	195	73
12-24-2	12-2NCL	S-1224-2-ZI	.054	.056	.277	.276	.38	.13		345	79
12-24-3	12-3NCL	S-1224-3-ZI	.087	.091	.277	.276	.38	.13		345	79
1/4-20-0	14-0NCL	S-0420-0-ZI	.045	.047	.344	.343	.44	.17	6000-8000	315	115
1/4-20-1	14-1NCL	S-0420-1-ZI	.054	.056	.344	.343	.44	.17		400	150
1/4-20-2	14-2NCL	S-0420-2-ZI	.087	.091	.344	.343	.44	.17			
1/4-20-3	14-3NCL	S-0420-3-ZI	.120	.125	.344	.343	.44	.17			
1/4-28-0	15-0NCL	-	.045	.047	.344	.343	.44	.17	6000-8000	315	115
1/4-28-1	15-1NCL	S-0428-1-ZI	.054	.056	.344	.343	.44	.17			
1/4-28-2	15-2NCL	S-0428-2-ZI	.087	.091	.344	.343	.44	.17		400	150
5/16-18-1	31-1NCL	S-0518-1-ZI	.054	.056	.413	.411	.50	.23	6000-8000	420	165
5/16-18-2	31-2NCL	S-0518-2-ZI	.087	.091	.413	.411	.50	.23			180
5/16-18-3	31-3NCL	S-0518-3-ZI	.120	.125	.413	.411	.50	.23			180
5/16-24-1	32-1NCL	S-0524-1-ZI	.054	.056	.413	.411	.50	.23			165
5/16-24-2	32-2NCL	S-0524-2-ZI	.087	.091	.413	.411	.50	.23			180
3/8-16-1	37-1NCL	S-0616-2-ZI	.087	.091	.500	.499	.56	.27	7000-11,000	460	320
3/8-16-2	37-2NCL	S-0616-3-ZI	.120	.125	.500	.499	.56	.27			320

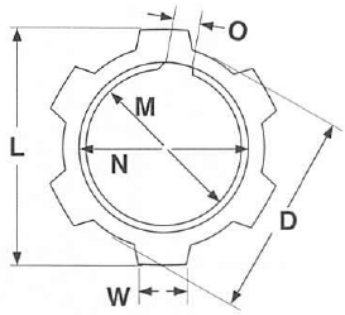
PEM® is a registered trademark of Penn Engineering. Our clinch nuts are not manufactured by or connected with the producers of PEM® nuts.

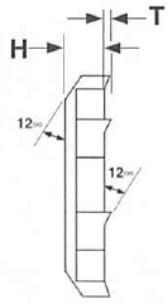
Steel & Stainless SELF-CLINCHING

Description	A round, internally threaded, one-piece fastener with a shank protruding from the internal circumference, and a knurled clinching ring surrounding the shank. Both the shank and the clinching ring are integrally formed into the bottom side of the nut.	
Applications/ Advantages	Designed for use in thin sheet metal when load bearing threads are necessary. The nut is pressed into a pre-drilled or punched hole, then force is applied to the top of the nut until the bearing surface at the outside diameter of the bottom of the nut is flush with the sheet metal to which it is attached.	
Material	*Steel*	*Stainless Steel*
	Carbon steel	Type 303 stainless passivated to ASTM A 380
Heat Treatment	Nuts are case-hardened.	-
Plating	See Appendix-A for information on zinc plating.	None
For Use In	Can be installed into metals of Rockwell hardness of B80 max.	Can be installed into stainless sheets of Rockwell hardness of B70 max.

CONDUIT

Zinc Alloy





Conduit Nuts

Nominal Size	N		D		L		M		W		H		T
	Inside Diameter		Outside Diameter		Lobe-to-Lobe Diameter		Minor Thread Diameter		Lobe Width		Nut Height		Tooth Depth
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Ref
1/2-14	0.870	0.860	1.005	0.995	1.130	1.120	0.759	0.747	0.176	0.156	0.140	0.125	.025
3/4-14	1.058	1.048	1.260	1.250	1.380	1.370	0.970	0.958	0.255	0.245	0.167	0.157	.028
1-11.5	1.349	1.339	1.567	1.557	1.718	1.708	1.211	1.201	0.286	0.276	0.185	0.170	.048
1 1/4-11.5	1.723	1.713	2.037	2.027	2.224	2.214	1.555	1.546	0.296	0.286	0.185	0.170	.055
1 1/2-11.5	1.981	1.974	2.255	2.245	2.442	2.432	1.794	1.785	0.317	0.307	0.185	0.170	.055

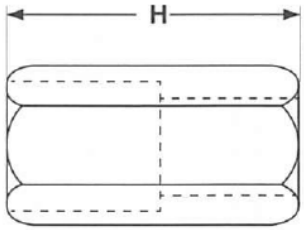
Part Number Comparison

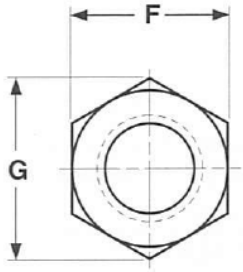
Size	Kanebridge Number	Dynacast Number	Size	Kanebridge Number	Dynacast Number
1/2-14	50NLC	112303	1 1/4-11.5	125NLC	112306
3/4-14	75NLC	112304	1 1/2-11.5	150NLC	112307
1-11.5	100NLC	112305			

Description	A zinc alloy nut with a single thread design and minimal surface area. The nut has integrally formed lobes protruding from its circuference at 60° intervals which enable it to be turned.
Applications/ Advantages	Used in the electrical industry as a component in cable connectors in order to make a connection into various electrical boxes.
Material	Nuts are made from the zinc die cast alloy Zamak #3 which conforms to the following chemical composition requirements-- ***Aluminum***: 3.5-4.3%; ***Magnesium***: 0.02-0.05%; ***Copper***: 0.25%* max.; ***Iron***: 0.10% max.; ***Lead***: 0.005% max.; ***Cadmium***: 0.004% max.; ***Tin***: 0.003% max.; ***Zinc***: balance (*Note: Most commercial applications will accept copper content within the range of 0.25-0.75% without rejecting the product).

NOTE: There is no single standard for conduit nut dimensions. These values are offered as a guide; deviations from these specifications may occur.

Steel HEX REDUCER COUPLINGS



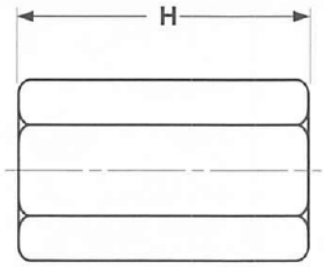


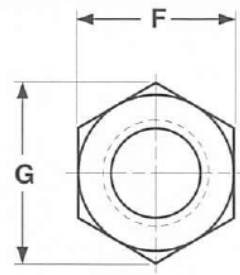
HEX REDUCER COUPLING NUTS												Coupling Nut Supply
Nominal Size and Threads per Inch	Basic Major Diameter of Thread	Opposite Nominal Size and Threads per Inch	Opposite Basic Major Diameter of Thread	F			G		H			
				Width Across Flats			Width Across Corners		Length			
				Basic	Max	Min	Max	Min	Basic	Max	Min	
3/8-16	0.3750	1/4-20	0.2500	1/2	0.500	0.489	0.577	0.557	1	1.01	0.98	
1/2-13	0.5000	3/8-16	0.3750	5/8	0.625	0.607	0.722	0.692	1-1/4	1.26	1.19	
5/8-11	0.6250	1/2-13	0.5000	13/16	0.813	0.782	0.939	0.891	1-1/4	1.26	1.19	
3/4-10	0.7500	5/8-11	0.6250	1	1.000	0.963	1.155	1.097	1-1/2	1.51	1.44	

LOW CARBON

Description	A double chamfered hex nut with two different internal thread sizes at opposite ends of the nut. The length of the nut is greater than 2.5D where D equals the basic major thread diameter. Also referred to as rod couplings.
Applications/ Advantages	Used to join a larger diameter threaded rod to a smaller diameter threaded rod.
Material	1010 - 1018 or equivalent steel. 12L14 steel is commonly used in domestically manufactured coupling nuts.
Hardness	Rockwell B68 - C32
Proof Load	75,000 psi. minimum
Plating	See Appendix-A for plating information.

HEX COUPLING — Dimensional Information





Hex Coupling Nuts

Nominal Size and Threads per Inch	Basic Major Diameter of Thread	F Width Across Flats			G Width Across Corners		H Length			Coupling Nut Supply
		Basic	Max	Min	Max	Min	Basic	Max	Min	
4-40	0.1120	5/16	0.312	0.302	0.361	0.344	7/16	0.448	0.408	
6-32	0.1380	5/16	0.312	0.302	0.361	0.344	1/2	0.510	0.470	
8-32	0.1640	5/16	0.312	0.302	0.361	0.344	5/8	0.64	0.61	
8-32	0.1640	3/8	0.375	0.365	0.433	0.416	5/8	0.64	0.61	
10-24	0.1900	5/16	0.312	0.302	0.361	0.344	3/4	0.76	0.74	
10-24	0.1900	3/8	0.375	0.365	0.433	0.416	3/4	0.76	0.74	
10-32	0.1900	5/16	0.312	0.302	0.361	0.344	3/4	0.76	0.74	
10-32	0.1900	3/8	0.375	0.365	0.433	0.416	3/4	0.76	0.74	
1/4-20	0.2500	3/8	0.375	0.365	0.433	0.416	7/8	0.89	0.86	
1/4-20	0.2500	7/16	0.438	0.428	0.505	0.488	7/8	0.89	0.86	
1/4-20	0.2500	7/16	0.438	0.428	0.505	0.488	1-1/2	1.51	1.48	
1/4-20	0.2500	7/16	0.438	0.428	0.505	0.488	1-3/4	1.76	1.73	
1/4-28	0.2500	3/8	0.375	0.365	0.433	0.416	7/8	0.89	0.86	
5/16-18	0.3125	7/16	0.438	0.428	0.505	0.488	7/8	0.89	0.86	
5/16-18	0.3125	1/2	0.500	0.489	0.577	0.557	7/8	0.89	0.86	
5/16-18	0.3125	1/2	0.500	0.489	0.577	0.557	1-1/8	1.13	1.11	
5/16-18	0.3125	1/2	0.500	0.489	0.577	0.557	1-3/4	1.76	1.69	
5/16-24	0.3125	7/16	0.438	0.428	0.505	0.488	7/8	0.89	0.86	
3/8-16	0.3750	1/2	0.500	0.489	0.577	0.557	1-1/8	1.13	1.11	
3/8-16	0.3750	1/2	0.500	0.489	0.577	0.557	1-3/8	1.39	1.34	
3/8-16	0.3750	9/16	0.562	0.551	0.650	0.628	1-3/4	1.76	1.69	
3/8-16	0.3750	5/8	0.625	0.613	0.722	0.698	1-3/4	1.76	1.73	
3/8-24	0.3750	1/2	0.500	0.489	0.577	0.557	1-1/8	1.13	1.11	
1/2-13	0.5000	5/8	0.625	0.613	0.722	0.698	1-1/4	1.26	1.24	
1/2-13	0.5000	11/16	0.688	0.663	0.794	0.756	1-3/4	1.76	1.73	
1/2-13	0.5000	3/4	0.750	0.728	0.866	0.830	1-3/4	1.76	1.73	
1/2-20	0.5000	5/8	0.625	0.613	0.722	0.698	1-1/4	1.26	1.24	
5/8-11	0.6250	13/16	0.813	0.782	0.939	0.891	1-7/8	1.89	1.86	
5/8-11	0.6250	13/16	0.813	0.782	0.939	0.891	2-1/8	2.14	2.10	
5/8-11	0.6250	13/16	0.813	0.782	0.939	0.891	3	3.03	2.97	
5/8-18	0.6250	13/16	0.813	0.782	0.939	0.891	2-1/8	2.14	2.10	
3/4-10	0.7500	1	1.000	0.963	1.155	1.097	2-1/4	2.27	2.22	
3/4-10	0.7500	1	1.000	0.963	1.155	1.097	3	3.03	2.97	
3/4-16	0.7500	1	1.000	0.963	1.155	1.097	2-1/4	2.26	2.19	
7/8-9	0.8750	1-1/4	1.250	1.212	1.443	1.382	2-1/2	2.53	2.47	
1-8	1.0000	1-1/4	1.250	1.212	1.443	1.382	2-1/2	2.53	2.47	
1-8	1.0000	1-3/8	1.375	1.325	1.588	1.511	2-3/4	2.78	2.72	

Steel & Stainless Steel

HEX COUPLING

LOW CARBON

Description	A double chamfered hex nut available in various widths and lengths. The length of the nut is greater than 2.5D where D equals the basic major thread diameter. Also referred to as rod couplings.
Applications/ Advantages	Used to join two externally threaded parts of equal thread diameter and pitch, often two pieces of threaded rod.
Material	1010 - 1018 or equivalent steel. 12L14 steel is commonly used in domestically manufactured coupling nuts.
Hardness	Rockwell B68 - C32
Proof Load	75,000 psi. minimum
Plating	See Appendix-A for plating information.

GRADE-5

Description	A double chamfered hex nut available in various widths and lengths. The length of the nut is greater than 2.5D where D equals the basic major thread diameter. Also referred to as rod couplings.
Applications/ Advantages	Used to join two externally threaded parts of equal thread diameter and pitch, often two pieces of grade-5 threaded rod.
Material	AISI 1008 - 1026 or equivalent steel
Hardness	Rockwell C32 maximum
Proof Load	*1/4 through 1 in. Coarse thread:* 120,000 psi.; *Fine thread*: 109,000 psi.
Plating	See Appendix-A for plating information.

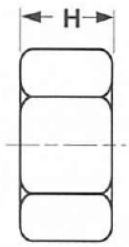
STAINLESS STEEL, 18-8

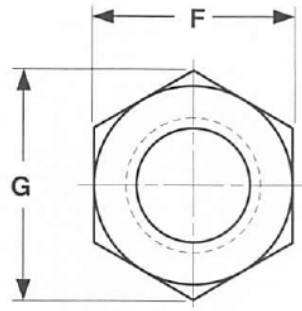
Description	A double chamfered hex nut available in various widths and lengths. The length of the nut is greater than 2.5D where D equals the basic major thread diameter. Also referred to as rod couplings.
Applications/ Advantages	Used to join two externally threaded parts of equal thread diameter and pitch, often two pieces of stainless steel threaded rod.
Material	*18-8:* Nuts shall be made from one of the following austenitic alloys: 303, 303Se, 304, XM7, all of which are characterized as having a chromium content of 18% and nickel content of 8-10%.
Hardness	-
Proof Load	*1/4 through 5/8* : 100,000 psi.; *Fine thread*: 85,000 psi.

NOTE: There is no single standard for coupling nut dimensions. Those listed on these two pages are offered as a guide; deviations from these specifications may occur.

FINISHED HEX

Dimensional Information





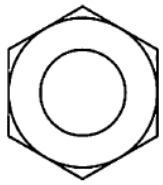
Finished Hex Nuts

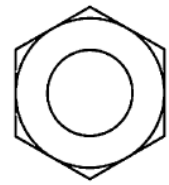
ASME B18.2.2--2010

Nominal or Basic Major Diameter of Thread		F			G		H		
		Width Across Flats			Width Across Corners		Thickness of Hex Nuts		
		Basic	Max	Min	Max	Min	Basic	Max	Min
1/4	0.2500	7/16	0.438	0.428	0.505	0.488	7/32	0.226	0.212
5/16	0.3125	1/2	0.500	0.489	0.577	0.557	17/64	0.273	0.258
3/8	0.3750	9/16	0.562	0.551	0.650	0.628	21/64	0.337	0.320
7/16	0.4375	11/16	0.688	0.675	0.794	0.768	3/8	0.385	0.365
1/2	0.5000	3/4	0.750	0.736	0.866	0.840	7/16	0.448	0.427
9/16	0.5625	7/8	0.875	0.861	1.010	0.982	31/64	0.496	0.473
5/8	0.6250	15/16	0.938	0.922	1.083	1.051	35/64	0.559	0.535
3/4	0.7500	1-1/8	1.125	1.088	1.299	1.240	41/64	0.665	0.617
7/8	0.8750	1-5/16	1.312	1.269	1.516	1.447	3/4	0.776	0.724
1	1.0000	1-1/2	1.500	1.450	1.732	1.653	55/64	0.887	0.831
1-1/8	1.1250	1-11/16	1.688	1.631	1.949	1.859	31/32	0.999	0.939
1-1/4	1.2500	1-7/8	1.875	1.812	2.165	2.066	1-1/16	1.094	1.030
1-3/8	1.3750	2-1/16	2.062	1.994	2.382	2.273	1-11/64	1.206	1.138
1-1/2	1.5000	2-1/4	2.250	2.175	2.598	2.480	1-9/32	1.317	1.245
1-5/8	1.6250	2-7/16	2.438	2.356	2.815	2.686	1-25/64	1.429	1.353
1-3/4	1.7500	2-5/8	2.625	2.538	3.031	2.893	1-1/2	1.540	1.460
2	2.0000	3	3.000	2.900	3.464	3.306	1-23/32	1.763	1.675
2-1/4	2.2500	3-3/8	3.375	3.263	3.897	3.719	1-15/16	1.986	1.890
2-1/2	2.5000	3-3/4	3.750	3.625	4.330	4.133	2-5/32	2.209	2.105
2-3/4	2.7500	4-1/8	4.125	3.988	4.763	4.546	2-3/8	2.431	2.319
3	3.0000	4-1/2	4.500	4.350	5.196	4.959	2-19/32	2.654	2.534

Grade 2, Hot-Dip Galvanized & Stainless

FINISHED HEX





GRADE-2

Description	A six-sided internally threaded fastener whose thickness is .875 D where D is the nominal nut size and 1.5D is their width across the flats, made from low carbon steel.
Applications/ Advantages	The most versatile and widely used nut design. Grade-2 nuts are for use with any low carbon bolt or screw that is not heat-treated, with a specified minimum tensile strength of 74,000 psi or less.
Material	Grade-2 nuts shall be made from a low carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.47% maximum; ***Phosphorus***: 0.12% maximum; ***Sulfur***: 0.23% maximum.
Hardness	Rockwell B68 - C32
Proof Load	***Coarse thread***: 90,000 psi.; ***Fine thread***: 80,000 psi.
Plating	See Appendix-A for information on the plating of steel finished hex nuts.

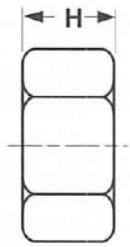
STEEL HOT-DIP GALVANIZED

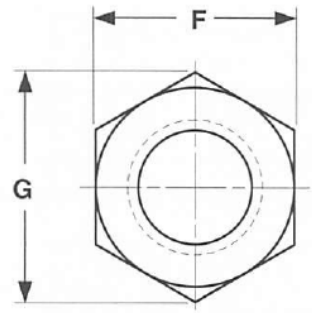
Description	A six-sided internally threaded fastener whose thickness is .875 D where D is the nominal nut size and 1.5D is their width across the flats, made from low carbon steel with a galvanic zinc coating.
Applications/ Advantages	Designed for use with low carbon bolts and screws with a specified minimum tensile strength of 74,000 psi or less, which are subjected to moisture, salt and other such corrosive conditions.
Material	Nuts shall be made from a low carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.47% maximum; ***Phosphorus***: 0.12% maximum; ***Sulfur***: 0.23% maximum.
Hardness	Rockwell B68 - C32
Proof Load	***Coarse thread***: 68,000 psi.; ***Fine thread***: 60,000 psi.
Plating	See Appendix-A for information on the plating of steel finished hex nuts.

STAINLESS STEEL, 18-8 & 316

Description	Six-sided internally threaded fasteners whose thickness is .875 D where D is the nominal nut size and 1.5D is their width across the flats, made from austenitic alloys as described below.
Applications/ Advantages	Designed for use with stainless steel bolts and screws with a specified minimum tensile strength equal to or less than the specified proof stress of the mating nut. Both types of stainless are corrosion resistant with 316 stainless having greater such resistance as well as superior strength at raised temperatures.
Material	***18-8:*** Nuts shall be made from one of the following austenitic alloys: 303, 303Se, 304, XM7, all of which are characterized as having a chromium content of 18% and nickel content of 8-10%. ***316:*** Nuts shall be made from 316 stainless steel, an austenitic alloy which differs from 18-8 by its molybdenum content (2-3%) and a higher nickel content (10-14%).
Heat Treatment	The austenitic alloys develop their strength through work hardening during the fastener manufacturing process, as seen from the hardness properties below. The only heat treatment normally available on austenitic stainless alloys is annealing, which is done at approximately 1900°F to a dead soft condition and is not normally thermally reversible.
Hardness	***1/4 through 5/8*** : Rockwell B95 - C32; ***3/4 through 1*** : Rockwell B80 - C32
Proof Load	***1/4 through 5/8*** : 100,000 psi.; ***Fine thread***: 85,000 psi.

FINISHED HEX — Dimensional Information



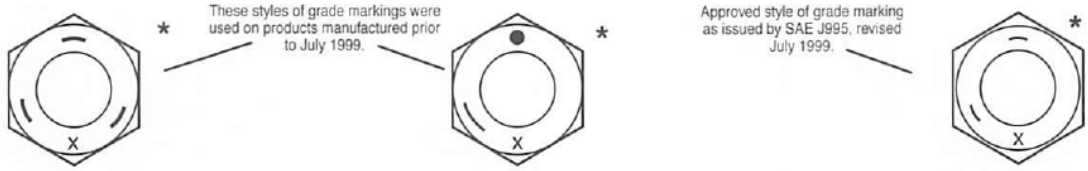


GRADE-5 & GRADE-8 FINISHED HEX NUTS

ASME B18.2.2--2010

Nominal or Basic Major Diameter of Thread		F			G		H		
		Width Across Flats			Width Across Corners		Thickness of Hex Nuts		
		Basic	Max	Min	Max	Min	Basic	Max	Min
1/4	0.2500	7/16	0.438	0.428	0.505	0.488	7/32	0.226	0.212
5/16	0.3125	1/2	0.500	0.489	0.577	0.557	17/64	0.273	0.258
3/8	0.3750	9/16	0.562	0.551	0.650	0.628	21/64	0.337	0.320
7/16	0.4375	11/16	0.688	0.675	0.794	0.768	3/8	0.385	0.365
1/2	0.5000	3/4	0.750	0.736	0.866	0.840	7/16	0.448	0.427
9/16	0.5625	7/8	0.875	0.861	1.010	0.982	31/64	0.496	0.473
5/8	0.6250	15/16	0.938	0.922	1.083	1.051	35/64	0.559	0.535
3/4	0.7500	1-1/8	1.125	1.088	1.299	1.240	41/64	0.665	0.617
7/8	0.8750	1-5/16	1.312	1.269	1.516	1.447	3/4	0.776	0.724
1	1.0000	1-1/2	1.500	1.450	1.732	1.653	55/64	0.887	0.831
1 1/8	1.1250	1-11/16	1.688	1.631	1.949	1.859	31/32	0.999	0.939
1 1/4	1.2500	1-7/8	1.875	1.812	2.165	2.066	1 1/16	1.094	1.030
1 3/8	1.375	2-1/16	2.062	1.994	2.382	2.273	1 11/64	1.206	1.138
1 1/2	1.5000	2-1/4	2.250	2.175	2.598	2.480	1 9/32	1.317	1.245

Grades 5 & 8 FINISHED HEX



GRADE-5

Description	A finished hex nut made from steel with a maximum carbon content of 0.55%, a minimum manganese content of 0.30%, and a maximum sulfur content of 0.15%.
Applications/ Advantages	For use with bolts with a minimum tensile strength equal to or less than the specified proof stress of the nut.
Material	AISI 1008 - 1026 or equivalent steel
Core Hardness	Rockwell C32 maximum
Proof Load	***1/4 through 1 in.*** *Coarse thread:* 120,000 psi.; *Fine thread:* 109,000 psi. ***1-1/8 through 1-1/2 in.*** *Coarse thread:* 105,000 psi.; *Fine thread:* 94,000 psi.
Plating	See Appendix-A for plating information.

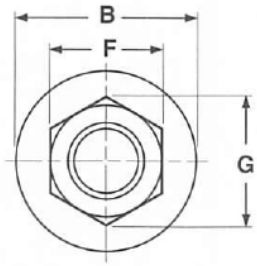


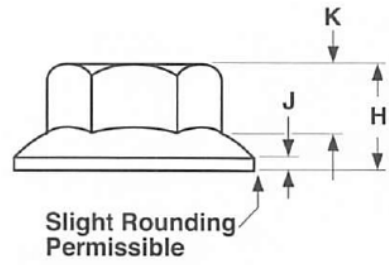
GRADE-8

Description	A finished hex nut made from steel with a maximum carbon content of 0.55%, a minimum manganese content of 0.30% and a maximum sulfur content of 0.05%. The purchaser and producer of the nuts may agree to allow a sulfur content of 0.33% maximum provided that the manganese content is at least 1.35%.
Applications/ Advantages	For use with bolts with a minimum tensile strength equal to or less than 150,000 psi..
Material	AISI 1021 - 1045 or equivalent steel
Core Hardness	***1/4 through 5/8 in.:*** Rockwell C24 - C32 ***3/4 through 1 in.:*** Rockwell C26 - C34 ***Over 1 in. through 1-1/2 in.:*** Rockwell C26 - C36
Proof Load	***1/4 through 1-1/2 in.:*** 150,000 psi.
Plating	See Appendix-A for plating information.

*Product standards require all grade-marked nuts 1/4" diameter and larger to have a raised or depressed insignia identifying its manufacturer. "X" represents one location such a marking may appear.

HEX FLANGE — No Serrations





HEX FLANGE NUTS

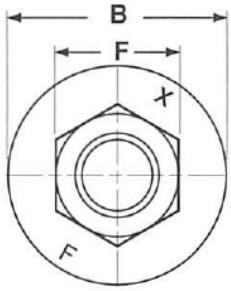
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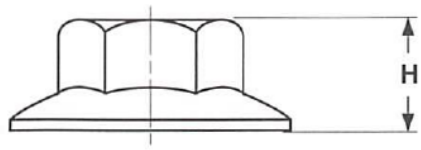
Nominal Size or Basic Major Diameter of Thread		F		G		B		H		K	J
		Width Across Flats		Width Across Corners		Flange Diameter		Nut Thickness		Wrenching Height	Flange Thickness
		Max	Min	Max	Min	Max	Min	Max	Min	Min	Min
8	0.1640	0.344	0.334	0.397	0.381	0.469	0.452	0.203	0.187	0.13	0.02
10	0.1900	0.375	0.365	0.433	0.416	0.500	0.480	0.219	0.203	0.13	0.03
1/4	0.2500	0.438	0.428	0.505	0.488	0.594	0.574	0.236	0.222	0.14	0.04
5/16	0.3125	0.500	0.489	0.577	0.557	0.680	0.660	0.283	0.268	0.17	0.04
3/8	0.3750	0.562	0.551	0.650	0.628	0.750	0.728	0.347	0.330	0.23	0.04
7/16	0.4375	0.688	0.675	0.794	0.768	0.937	0.910	0.395	0.375	0.26	0.04
1/2	0.5000	0.750	0.736	0.866	0.840	1.031	1.000	0.458	0.437	0.31	0.05
9/16	0.5625	0.875	0.861	1.010	0.982	1.188	1.155	0.506	0.483	0.35	0.05
5/8	0.6250	0.938	0.922	1.083	1.051	1.281	1.248	0.569	0.545	0.40	0.05
3/4	0.7500	1.125	1.088	1.299	1.240	1.500	1.460	0.675	0.627	0.46	0.06

Description	Hex nut with an enlarged circular base flaring out from the bottom of the nut. The bearing surface of the flange is smooth, with no serrations.
Applications/ Advantages	Will span oversized or poorly aligned holes. Flange provides a more uniform bearing-stress to clamp-force ratio than other low carbon nuts. Does not gall screw threads.
Material	*Steel*
	Nuts shall be made from a carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.47% max.; ***Phosphorus***: 0.12% max.; ***Sulfur***: 0.23% max.
Hardness	Rockwell B68 - C32
Plating	See Appendix-A for plating information.

Grade F, No Serrations

LARGE FLANGE





LARGE FLANGE NUT, GRADE F							MacLean-Fogg**
Nominal Size or Basic Major Diameter of Thread		F		B		H	
		Width Across Flats		Flange Diameter		Nut Thickness	
		Max	Min	Max	Min	Max	Min
1/4	0.2500	0.437	0.428	0.728	0.700	0.312	0.281
5/16	0.3125	0.500	0.489	0.820	0.790	0.375	0.343
3/8	0.3750	0.562	0.551	0.915	0.885	0.406	0.390
7/16	0.4375	0.687	0.675	1.131	1.100	0.468	0.437
1/2	0.5000	0.750	0.736	1.205	1.171	0.515	.0485

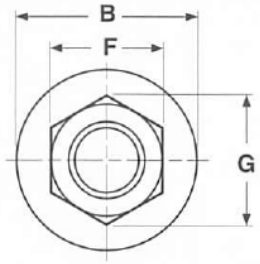
Description	A nut with a flange that is 6% to 25% wider than a regular flange nut of the same diameter.
Applications/ Advantages	Spans larger holes than a standard flange nut, as well as a more uniform bearing-stress to clamp-force ratio.
Material	AISI 1008 - 1035 carbon steel
Plating	See Appendix-A for plating information.

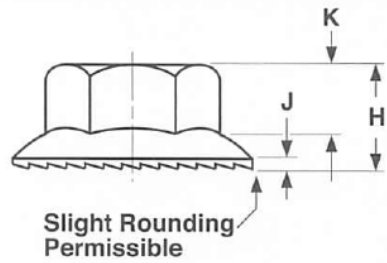
*Product standards require all grade-marked nuts 1/4" diameter and larger to have a raised or depressed insignia identifying its manufacturer. "X" represents one location such a marking may appear.

**MacLean-Fogg is the original writer of large flange grade F nut specifications. Kanebridge's flange nuts are not manufactured by or connected with the producers of MacLean-Fogg nuts.

SERRATED HEX FLANGE

Case Hardened Steel
18-8 Stainless





SERRATED HEX FLANGE LOCK NUTS

ASME B18.16.4-2008

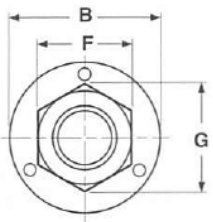
Nominal Size or Basic Major Diameter of Thread		F		G		B		H		K	J
		Width Across Flats		Width Across Corners		Flange Diameter		Nut Thickness		Wrenching Height	Flange Thickness
		Max	Min	Max	Min	Max	Min	Max	Min	Min	Min
4	0.1120	0.250	0.241	0.289	0.275	0.386	0.370	0.160	0.147	-	0.02
6	0.1380	0.312	0.302	0.361	0.342	0.422	0.406	0.171	0.156	0.10	0.02
8	0.1640	0.344	0.334	0.397	0.381	0.469	0.452	0.203	0.187	0.13	0.02
10	0.1900	0.375	0.365	0.433	0.416	0.500	0.480	0.219	0.203	0.13	0.03
12	0.2160	0.438	0.428	0.505	0.488	0.594	0.574	0.236	0.222	0.14	0.04
1/4	0.2500	0.438	0.428	0.505	0.488	0.594	0.574	0.236	0.222	0.14	0.04
5/16	0.3125	0.500	0.489	0.577	0.557	0.680	0.660	0.283	0.268	0.17	0.04
3/8	0.3750	0.562	0.551	0.650	0.628	0.750	0.728	0.347	0.330	0.23	0.04
7/16	0.4375	0.688	0.675	0.794	0.768	0.937	0.910	0.395	0.375	0.26	0.04
1/2	0.5000	0.750	0.736	0.866	0.840	1.031	1.000	0.458	0.437	0.31	0.05
9/16	0.5625	0.875	0.861	1.010	0.982	1.188	1.155	0.506	0.483	0.35	0.05
5/8	0.6250	0.938	0.922	1.083	1.051	1.281	1.248	0.569	0.545	0.40	0.05
3/4	0.7500	1.125	1.088	1.299	1.240	1.500	1.460	0.675	0.627	0.46	0.06
7/8	0.8750	1.179	1.166	1.361	1.295	1.682	-	0.786	0.742	-	0.11

*ASME specification applies to #6 through 3/4" diameters.

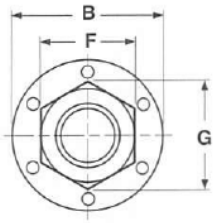
Description	Hex nut with an enlarged circular base flaring out from the bottom of the nut. The bearing surface of the flange has serrations which displace material on the mating surface when the nut is wrenched into place, forming a connection which resists loosening.	
Applications/ Advantages	Requires a greater amount of torque to loosen than to tighten the nut. Will span oversized or poorly aligned holes. Flange provides a more uniform bearing-stress to clamp-force ratio than other low carbon lock nuts. Does not gall screw threads.	
Material	*Steel*	*Stainless*
	Nuts shall be made from a carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.47% max.; ***Phosphorus***: 0.12% max.; ***Sulfur***: 0.23% max.	18-8 stainless steel
Heat Treatment	Nuts are case hardened to the proper hardness to ensure the serrations will have sufficient gripping strength.	-
Case Hardness	Rockwell HR15N 78 - 90	-
Plating	Steel flange nuts are supplied in various finishes, including clear zinc, black zinc and black oxide.	Stainless flange nuts are usually provided without any additional plating.

Grades 5 & 8

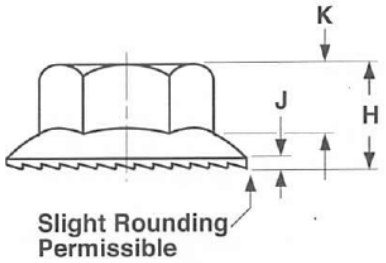
SERRATED HEX FLANGE



Grade 5



Grade 8



SERRATED HEX FLANGE LOCK NUTS—GRADES 5 & 8

ASME B18.16.4 & SAE J995*

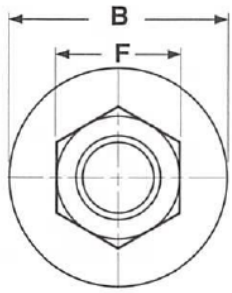
Nominal Size or Basic Major Diameter of Thread		F		G		B		H		K	J
		Width Across Flats		Width Across Corners		Flange Diameter		Nut Thickness		Wrenching Height	Flange Thickness
		Max	Min	Max	Min	Max	Min	Max	Min	Min	Min
10	0.1900	0.375	0.365	0.433	0.416	0.500	0.480	0.219	0.203	0.13	0.03
1/4	0.2500	0.438	0.428	0.505	0.488	0.594	0.574	0.236	0.222	0.14	0.04
5/16	0.3125	0.500	0.489	0.577	0.557	0.680	0.660	0.283	0.268	0.17	0.04
3/8	0.3750	0.562	0.551	0.650	0.628	0.750	0.728	0.347	0.330	0.23	0.04
7/16	0.4375	0.688	0.675	0.794	0.768	0.937	0.910	0.395	0.375	0.26	0.04
1/2	0.5000	0.750	0.736	0.866	0.840	1.031	1.000	0.458	0.437	0.31	0.05
9/16	0.5625	0.875	0.861	1.010	0.982	1.188	1.155	0.506	0.483	0.35	0.05
5/8	0.6250	0.938	0.922	1.083	1.051	1.281	1.248	0.569	0.545	0.40	0.05
3/4	0.7500	1.125	1.088	1.299	1.240	1.500	1.460	0.675	0.627	0.46	0.06

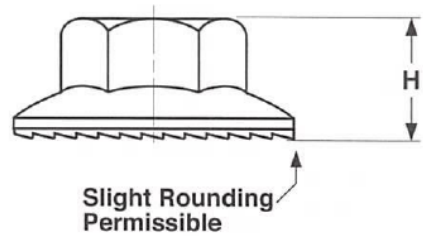
Description	Hex nut with an enlarged circular base flaring out from the bottom of the nut. The bearing surface of the flange has serrations which displace material on the mating surface when the nut is wrenched into place, forming a connection which resists loosening.	
Applications/ Advantages	Requires a greater amount of torque to loosen than to tighten the nut. Will span oversized or poorly aligned holes. Flange provides a more uniform bearing-stress to clamp-force ratio than other low carbon lock nuts. Does not gall screw threads. Grade 5 nuts are designed to be used with Grade 5 screws and bolts; Grade 8 nuts are designed to be used with Grade 8 screws and bolts.	
Material	*Grade 5*	*Grade 8*
	Nuts shall be made from a carbon steel which conforms to the following chemical composition requirements-- *Carbon*: 0.55% max.; *Manganese*: 0.30% min.; *Phosphorus*: 0.05% max.; *Sulfur*: 0.15% max.	Nuts shall be made from a carbon steel which conforms to the following chemical composition requirements-- *Carbon*: 0.55% max.; *Manganese*: 0.30% min.; *Phosphorus*: 0.04% max.; *Sulfur*: 0.05% max.
Proof Load	*Coarse thread*: 120,000 psi.; *Fine thread*: 109,000 psi.	*Coarse thread*: 150,000 psi.; *Fine thread*: 150,000 psi.
Hardness	Rockwell 32 HRC max	*1/4 thru 5/8 diameters*: 24 - 32 HRC *Over 5/8 thru 1 diameters*: 26 - 34 HRC
Plating	Grade 5 Flange Nuts are usually supplied in zinc finish	Grade 8 Flange Nuts are usually supplied in zinc yellow finish

*Dimensions are to ASME B18.16.4; material and performance requirements are to SAE J995.

SERRATED LARGE FLANGE

Free-Spinning Lock-Nut



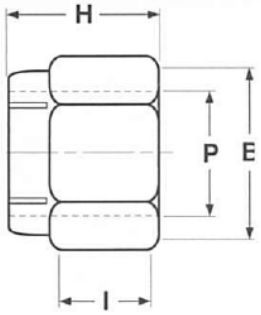


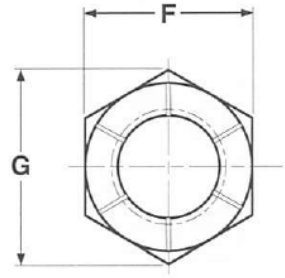
SERRATED LARGE FLANGE HEX LOCK NUTS

Nominal Size or Basic Major Diameter of Thread		F		B		H	
		Width Across the Flats		Flange Diameter		Nut Thickness	
		Max	Min	Max	Min	Max	Min
1/4	0.2500	.437	.428	.728	.687	.312	.281
5/16	0.3125	.500	.489	.823	.790	.375	.343
3/8	0.3750	.562	.551	,915	.884	.406	.390
1/2	0.5000	.750	.736	1.031	1.000	.515	.485

Description	Hex nut with a circular base flaring out from the bottom of the nut that is 6% to 25% wider than the flange of a standard serrated flange nut. The bearing surface of the flange has serrations which displace material on the mating surface when the nut is wrenched into place, forming a connection that resists loosening.
Applications/ Advantages	Offers the same advantages of the standard serrated flange lock nut, including reusability, but will span even larger holes. Also has a more uniform bearing-stress to clamp-force ratio than the standard serrated flange nut.
Material	Low carbon steel
Hardness	Rockwell C40 minimum
Plating	See Appendix-A for plating information

Light Hex, Full Height FLEXLOC® ALL METAL LOCK





FlexLoc® Light Hex Full Height Lock Nuts

SPS-N-16915

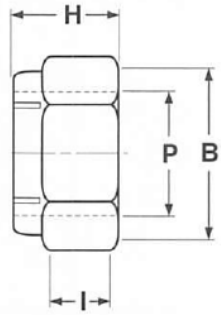
Nominal Size or Basic Thread Diameter		F		B	G	H	P	I	Tensile Strength—Steel & Stainless (psi.)	
		Width Across Flats		Bearing Surface Outside Diam.	Width Across Corners	Thickness	Bearing Surface Inside Diam.	Side Height	Coarse Thread	Fine Thread
		Max	Min	Min	Min	Max	Max	Min	Min	Min
4	0.112	0.251	0.243	0.243	0.268	0.155	0.155	0.050	1,080	1,190
6	0.138	0.313	0.305	0.305	0.339	0.180	0.181	0.075	1,620	1,890
8	0.164	0.345	0.336	0.336	0.375	0.243	0.208	0.105	2,510	2,620
10	0.190	0.376	0.367	0.367	0.410	0.243	0.230	0.085	3,120	3,590
1/4	0.250	0.439	0.430	0.430	0.481	0.290	0.293	0.122	5,730	-
1/4	0.250	0.439	0.430	0.430	0.481	0.320	0.293	0.135	-	6,550
5/16	0.3125	0.502	0.492	0.492	0.552	0.353	0.356	0.150	9,600	9,950
3/8	0.375	0.564	0.553	0.553	0.623	0.462	0.418	0.210	13,800	14,500
7/16	0.4375	0.627	0.616	0.616	0.694	0.462	0.487	0.210	14,900	15,450
1/2	0.500	0.752	0.741	0.741	0.836	0.602	0.551	0.285	22,000	23,800
5/8	0.625	0.940	0.928	0.928	1.049	0.759	0.676	0.410	34,000	38,400
3/4	0.750	1.064	1.052	1.052	1.192	0.884	0.807	0.505	50,000	52,300
7/8	0.875	1.252	1.239	1.239	1.405	1.009	0.938	0.570	64,600	71,400
1	1.000	1.440	1.427	1.427	1.619	1.134	1.064	0.635	85,000	90,500

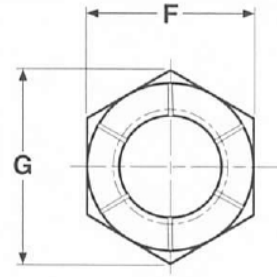
Description	An all-metal, one-piece, hex-shaped lock nut with a round collar at its back end. The collar is segmented with opposed slots cut into it above each corner of the nut. When the screw or bolt reaches the collar, the slotted portion expands which creates the prevailing torque locking action. The light hex variety has a lesser across the flats dimension resulting in a lighter-weight part with the same strength as a heavy hex variety.	
Applications/ Advantages	The full height light hex lock nut has the same locking capability as the heavy hex FlexLoc nut, but with greater wrench clearance. FlexLoc nuts maintain their locking strength through 15 removals and re-applications and re-applications. The temperature service limit for steel nuts is 550°F (450°F if zinc or cadmium plated); the temperature limit for stainless nuts (with no additional finish) is 800°F. They have superior resistance to vibration compared to all other lock nut varieties and do not gall threads.	
Material	***Steel***	***Stainless***
	Carbon steel.	18-8 Stainless
Tensile Strength	Minimum tensile strength requirements for carbon steel flexible lock nuts nuts are listed in above table.	
Plating	Unless specified as plain steel, flexible lock nuts are used with a zinc, zinc yellow or cadmium finish.	Stainless flexible lock nuts are usually provided without any additional finish.

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FLEXLOC® ALL-METAL LOCK

Light Hex, Thin Height





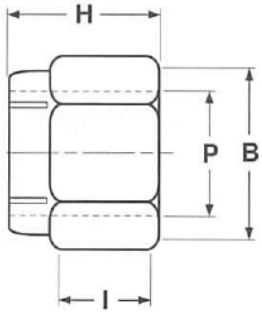
FLEXLOC® LIGHT HEX THIN HEIGHT LOCK NUTS — SPS

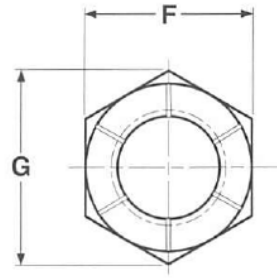
Nominal Size or Basic Thread Diameter		F		B	G	H	P	I	Tensile Strength—Steel & Stainless (psi.)	
		Width Across Flats		Bearing Surface Outside Diam.	Width Across Corners	Thickness	Bearing Surface Inside Diam.	Side Height	Coarse Thread	Fine Thread
		Max	Min	Min	Min	Max	Max	Min	Min	Min
6	0.138	0.313	0.305	0.305	0.347	0.141	0.181	0.036	1,270	1,420
8	0.164	0.345	0.336	0.336	0.383	0.188	0.208	0.070	1,960	2,060
10	0.190	0.376	0.367	0.367	0.419	0.188	0.230	0.065	2,340	2,800
1/4	0.250	0.439	0.430	0.430	0.491	0.219	0.293	0.075	4,450	5,090
5/16	0.3125	0.502	0.492	0.492	0.561	0.266	0.356	0.097	4,980	5,510
3/8	0.375	0.564	0.553	0.553	0.631	0.282	0.418	0.108	7,360	8,340
7/16	0.4375	0.627	0.616	0.616	0.703	0.328	0.487	0.138	10,100	11,300
7/16	0.4375	0.690	0.679	0.679	0.775	0.328	0.487	0.120	-	11,300
1/2	0.500	0.752	0.741	0.741	0.846	0.328	0.551	0.121	11,400	12,800
5/8	0.625	0.940	0.928	0.928	1.059	0.399	0.676	0.147	18,100	20,500
3/4	0.750	1.064	1.052	1.052	1.200	0.415	0.807	0.155	26,800	29,800
7/8	0.875	1.252	1.239	1.239	1.414	0.477	0.938	0.166	36,940	40,800
1	1.000	1.440	1.427	1.427	1.628	0.571	1.064	0.218	48,500	53,000

Description	An all-metal, one-piece, hex-shaped lock nut with a round collar at its back end. The collar is segmented with opposed slots cut into it above each corner of the nut. When the screw or bolt reaches the collar, the slotted portion expands which creates the prevailing torque locking action. The light hex, thin height variety is approximately 30% shorter than the full height nut.	
Applications/ Advantages	The thin height light hex flexible lock nut is used when an insufficient number of projecting threads are present to use a full height nut, or when a lighter-weight nut is required. Flexible lock nuts maintain their locking strength through 15 removals and re-applications. The temperature service limit for steel nuts is 550°F (450°F if zinc or cadmium plated); the temperature limit for stainless nuts (with no additional finish) is 800°F. They have superior resistance to vibration compared to all other lock nut varieties and do not gall threads.	
Material	***Steel***	***Stainless***
	Carbon steel.	18-8 Stainless
Tensile Strength	Minimum tensile strength requirements for carbon steel flexible lock nuts nuts are listed in above table.	
Plating	Unless specified as plain steel, flexible lock nuts are used with a zinc, zinc yellow or cadmium finish.	Stainless flexible lock nuts are usually provided without any additional finish.

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Heavy Hex, Full Height — FLEXLOC® ALL-METAL LOCK





FLEXLOC® HEAVY HEX FULL HEIGHT LOCKNUTS — SPS

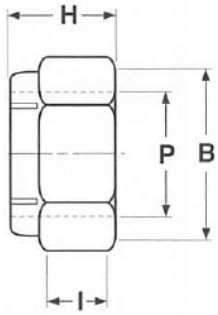
Nominal Size or Basic Thread Diameter		F		B	G	H	P	I	Tensile Strength for Coarse Thread Nuts—Steel & Stainless (psi.)
		Width Across Flats		Bearing Surface Outside Diam.	Width Across Corners	Thickness	Bearing Surface Inside Diam.	Side Height	
		Max	Min	Min	Min	Max	Max	Min	Min
1/4	0.2500	0.502	0.492	0.492	0.561	0.290	0.293	0.094	5,730
5/16	0.3125	0.564	0.553	0.553	0.631	0.321	0.356	0.113	9,600
3/8	0.3750	0.627	0.616	0.616	0.703	0.384	0.418	0.144	13,800
7/16	0.4375	0.752	0.741	0.741	0.846	0.446	0.487	0.163	14,900
1/2	0.5000	0.814	0.803	0.803	0.917	0.509	0.551	0.196	22,000
5/8	0.6250	1.002	0.990	0.990	1.130	0.634	0.676	0.216	34,000
3/4	0.7500	1.127	1.115	1.115	1.271	0.759	0.807	0.245	50,000
7/8	0.8750	1.314	1.301	1.301	1.484	0.884	0.938	0.397	64,600
1	1.0000	1.502	1.489	1.489	1.699	1.009	1.064	0.462	85,000

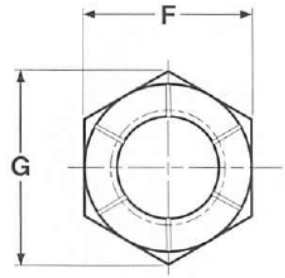
Description	An all-metal, one-piece, hex-shaped lock nut with a round collar at its back end. The collar is segmented with opposed slots cut into it above each corner of the nut. When the screw or bolt reaches the collar, the slotted portion expands which creates the prevailing torque locking action.	
Applications/ Advantages	The full height heavy hex lock nut has the greatest locking capability and largest wrenching area of all FlexLoc nuts. FlexLoc nuts maintain their locking strength through 15 removals and re-applications, and at temperatures up to 550°F (450°F if zinc or cadmium plated). They have superior resistance to vibration compared to all other lock nut varieties and do not gall threads.	The full height heavy hex lock nut has the greatest locking capability and largest wrenching area of all FlexLoc nuts. They have superior resistance to vibration compared to other stainless lock nut varieties and do not gall threads.
Material	***Steel***	***Stainless***
	Carbon steel.	18-8 Stainless
Tensile Strength	Minimum tensile strength requirements for carbon steel FlexLoc® nuts are listed in above table.	
Plating	Unless specified as plain steel, FlexLoc nuts are used with a zinc, zinc yellow or cadmium finish.	Stainless flexible lock nuts are usually provided without any additional finish.

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FLEXLOC® ALL-METAL LOCK

Heavy Hex, Thin Height





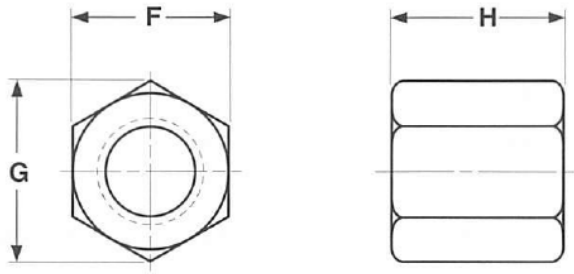
FLEXLOC® HEAVY HEX THIN HEIGHT LOCK NUTS — SPS

Nominal Size or Basic Thread Diameter		F		B	G	H	P	I	Tensile Strength for Coarse Thread Nuts (psi.)
		Width Across Flats		Bearing Surface Outside Diam.	Width Across Corners	Thickness	Bearing Surface Inside Diam.	Side Height	
		Max	Min	Min	Min	Max	Max	Min	Min
1/4	0.2500	0.502	0.492	0.492	0.561	0.219	0.293	0.053	4,450
5/16	0.3125	0.564	0.553	0.553	0.631	0.266	0.356	0.087	4,980
3/8	0.3750	0.627	0.616	0.616	0.703	0.282	0.418	0.085	7,360
7/16	0.4375	0.752	0.741	0.741	0.846	0.328	0.487	0.101	10,100
1/2	0.5000	0.814	0.803	0.803	0.917	0.328	0.551	0.101	11,400
5/8	0.6250	1.002	0.990	0.990	1.130	0.399	0.676	0.116	18,100
3/4	0.7500	1.127	1.115	1.115	1.271	0.415	0.807	0.121	26,800
7/8	0.8750	1.314	1.301	1.301	1.484	0.477	0.938	0.163	36,940
1	1.0000	1.502	1.489	1.489	1.699	0.571	1.064	0.207	48,500

Description	An all-metal, one-piece, hex-shaped lock nut with a round collar at its back end. The collar is segmented with opposed slots cut into it above each corner of the nut. When the screw or bolt reaches the collar, the slotted portion expands which creates the prevailing torque locking action. The heavy hex, thin height variety is approximately 30% shorter than the full height nut.
Applications/ Advantages	The thin height heavy hex FlexLoc nut is used when an insufficient number of projecting threads are present to use a full height nut, or when a lighter-weight nut is required. The nut has a greater wrenching area than the thin height light hex nuts. FlexLoc nuts maintain their locking strength through 15 removals and re-applications, and at temperatures up to 550°F (450°F if zinc or cadmium plated). They have superior resistance to vibration compared to all other lock nut varieties and do not gall threads.
Material	Carbon steel.
Tensile Strength	Minimum tensile strength requirements for carbon steel FlexLoc nuts are listed in above table.
Plating	Unless specified as plain steel, FlexLoc nuts are used with a zinc, zinc yellow or cadmium finish.

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Grade-8 HIGH HEX



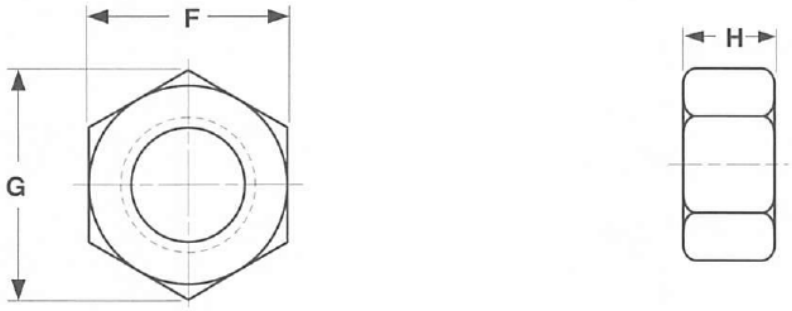
High Hex Nuts

SAE J482

Nominal Size or Basic Major Diameter of Thread		F		G		H	
		Width Across Flats		Width Across Corners		Thickness	
		Max	Min	Max	Min	Max	Min
3/8-24	0.3750	0.5625	0.551	0.650	0.628	0.509	0.491
7/16-20	0.4375	0.6875	0.675	0.794	0.768	0.619	0.599
1/2-20	0.5000	0.7500	0.736	0.866	0.840	0.667	0.645
9/16-18	0.5625	0.8750	0.861	1.010	0.982	0.778	0.754
5/8-18	0.6250	0.9375	0.922	1.083	1.051	0.857	0.831
3/4-16	0.7500	1.0312	1.000	1.227	1.175	1.015	0.985
3/4-16	0.7500	1.1250	1.088	1.299	1.240	1.015	0.985

Description	A six-sided, internally threaded fastener that is 30% to 45% thicker than a same-sized heavy hex nut.
Applications / Advantages	Primarily used in automotives, other ground vehicles and industrial equipment that require additional wrenching area.
Material	1035 or equivalent alloy steel
Hardness	1/4 thru 5/8" diameter: 24 - 32 HRC Over 5/8 thru 1" diameter: 26 - 34 HRC
Plating	Nuts are usually supplied with a plain finish. See Appendix-A for more information.

HEAVY HEX — Dimensional Information



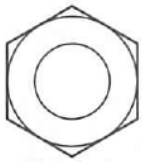
Heavy Hex Nuts

ASME B18.2.2

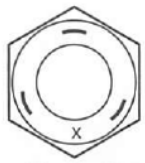
Nominal Size or Basic Major Diameter of Thread		F			G		H		
		Width Across Flats			Width Across Corners		Thickness		
		Basic	Max	Min	Max	Min	Basic	Max	Min
1/4	0.2500	1/2	0.500	0.488	0.577	0.556	15/64	0.250	0.218
5/16	0.3125	9/16	0.562	0.546	0.650	0.622	19/64	0.314	0.280
3/8	0.3750	11/16	0.688	0.669	0.794	0.763	23/64	0.377	0.341
7/16	0.4375	3/4	0.750	0.728	0.866	0.830	27/64	0.441	0.403
1/2	0.5000	7/8	0.875	0.850	1.010	0.969	31/64	0.504	0.464
9/16	0.5625	15/16	0.938	0.909	1.083	1.037	35/64	0.568	0.526
5/8	0.6250	1-1/16	1.062	1.031	1.227	1.175	39/64	0.631	0.587
3/4	0.7500	1-1/4	1.250	1.212	1.443	1.382	47/64	0.758	0.710
7/8	0.8750	1-7/16	1.438	1.394	1.660	1.589	55/64	0.885	0.833
1	1.0000	1-5/8	1.625	1.575	1.876	1.796	63/64	1.012	0.956
1-1/8	1.1250	1-13/16	1.812	1.756	2.093	2.002	1-7/64	1.139	1.079
1-1/4	1.2500	2	2.000	1.938	2.309	2.209	1-7/32	1.251	1.187
1-3/8	1.3750	2-3/16	2.188	2.119	2.526	2.416	1-11/32	1.378	1.310
1-1/2	1.5000	2-3/8	2.375	2.300	2.742	2.622	1-15/32	1.505	1.433
1-5/8	1.6250	2-9/16	2.562	2.481	2.959	2.828	1-19/32	1.632	1.556
1-3/4	1.7500	2-3/4	2.750	2.662	3.175	3.035	1-23/32	1.759	1.679
2	2.0000	3-1/8	3.125	3.025	3.608	3.449	1-31/32	2.013	1.925
2-1/4	2.2500	3-1/2	3.500	3.388	4.041	3.862	2-13/64	2.251	2.155
2-1/2	2.5000	3-7/8	3.875	3.750	4.474	4.275	2-29/64	2.505	2.401
2-3/4	2.7500	4-1/4	4.250	4.112	4.907	4.688	2-45/64	2.759	2.647
3	3.0000	4-5/8	4.625	4.475	5.340	5.102	2-61/64	3.013	2.893
3-1/4	3.2500	5	5.000	4.838	5.774	5.515	3-3/16	3.252	3.124
3-1/2	3.5000	5-3/8	5.375	5.200	6.207	5.928	3-7/16	3.506	3.370
3-3/4	3.7500	5-3/4	5.750	5.562	6.640	6.341	3-11/16	3.760	3.616
4	4.0000	6-1/8	6.125	5.925	7.073	6.755	3-15/16	4.014	3.862

Steel & Stainless

HEAVY HEX

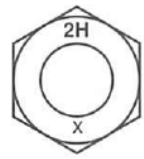


Grade-A

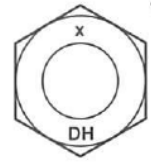


Grade-C *

STEEL



A 194 Grade-2H *

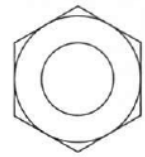


A 563 Grade-DH *



A 563 Grade-DH3 *

Description	A six-sided internally threaded fastener which is both thicker and wider across the flats than a same-sized finished hex nut. Nuts in sizes 7/16 & smaller shall be double chamfered. Larger sizes are either double chamfered or chamfered on top with a washer faced bearing surface.
Applications/ Advantages	This is the strongest of all comparably-graded nuts because of its greater length of thread engagement and greater resistance to dilation (widening or stretching). ***Grade-5*** nuts are used with medium-carbon cap screws/bolts ***Grade-A*** nuts are used with low-carbon heavy hex bolts. ***Grade-C*** nuts are recommended for use with A-325 structural bolts. ***Grade-2H*** nuts are recommended for use with bolts in high-pressure and high-temperature service. ***Grade-DH*** nuts are recommended for use with A-490, Type-1 structural bolts and Grade-DH3 nuts for use with A-490, Type-3 structural bolts.
Material	Nuts shall be made from a steel which conforms to the following chemical composition requirements (heat analysis)-- ***Grade-5*** **-- *Carbon:*** 0.55% maximum; ***Manganese***: 0.30% max; ***Phosphorus***: 0.05% maximum; ***Sulfur***: 0.15% maximum. ***Grades-A & C*** **-- *Carbon:*** 0.55% maximum; ***Phosphorus***: 0.12% maximum; ***Sulfur***: 0.023% maximum. ***A 194 Grade-2H*** **-- *Carbon***: 0.40% min; ***Manganese***: 1.00% max; ***Phosphorus***: 0.04% max; ***Sulfur***: 0.05% max; ***Silicon***: 0.40% max. ***A 563 Grade-DH*** **-- *Carbon***: 0.20-0.55%; ***Manganese***: 0.60% minimum; ***Phosphorus***: 0.04% maximum; ***Sulfur***: 0.05% maximum. ***Grade-DH3*** **-- *Carbon***: 0.20-0.53%; ***Manganese***: 0.40% minimum; ***Phosphorus***: 0.046% maximum; ***Sulfur***: 0.050% maximum; ***Copper***: 0.20% minimum; ***Chromium***: 0.45% minimum; (Either *Nickel*: 0.20% minimum or *Molybdenum*: 0.15% minimum, may be used).
Heat Treatment	***Grade-2H:*** Nuts are heat treated by quenching in a liquid medium from a temp above the transformation temp and tempering at a temp of at least 850°F. ***Grades-C, DH & DH3:*** Nuts are heat treated by quenching in a liquid medium from a temp above the transformation temp and tempering at a temp of at least 800°F.
Core Hardness	***Grade-5:*** Rockwell C32 max. ***Grade-A:*** Rockwell B68 - C32 ***Grade-C***: Rockwell B78 - C38 ***A 194 Grade-2H***; ***A 563 Grades DH & DH3***: Rockwell C24 - C38
Proof Load	***Grade-5:*** 1/4 thru 1" Diam, Coarse- 133,000 psi.; Fine- 120,000 psi. ***Grade-A:*** Coarse- 100,000 psi.; Fine- 90,000 psi. ***Grade-C:*** 144,000 psi. ***Grade-2H:*** 150,000 psi. ***Grades-DH & DH3:*** 175,000 psi.
Plating	See Appendix-A for plating information.



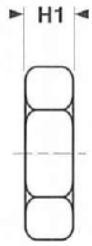
18-8 STAINLESS STEEL

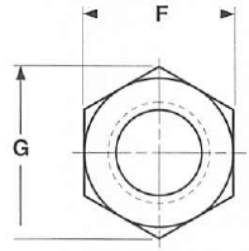
Description	A six-sided internally threaded fastener which is both thicker and wider across the flats than a same-sized finished hex nut, made of 18-8 stainless. Nuts in sizes 7/16 & smaller shall be double chamfered. Larger sizes are either double chamfered or chamfered on top with a washer faced bearing surface.
Applications/ Advantages	This is the strongest of all 18-8 stainless hex nuts because of its greater length of thread engagement and greater resistance to widening or stretching.
Material	***Nuts shall be made from one of the following austenitic stainless alloys***: 303, 303Se, 304, XM7, all of which are characterized as having a chromium content of 18% and a nickel content of 8%.
Heat Treatment	The austenitic alloys develop their strength through work hardening during the fastener manufacturing process, as seen from the hardness properties below. The only heat treatment normally available on austenitic stainless alloys is annealing, which is done at approximately 1900°F to a dead soft condition and is not normally thermally reversible.
Hardness	***1/4 through 5/8 :*** Rockwell B95 - C32 ***3/4 through 1 :*** Rockwell B80 - C32
Proof Load	***1/4 through 5/8 :*** 100,000 psi ***3/4 through 1 :*** 85,000 psi.

*Product standards require all grade-marked nuts 1/4" diameter and larger to have a raised or depressed insignia identifying its manufacturer. "X" represnets one location such a marking may appear.

HEX JAM

Steel & Stainless





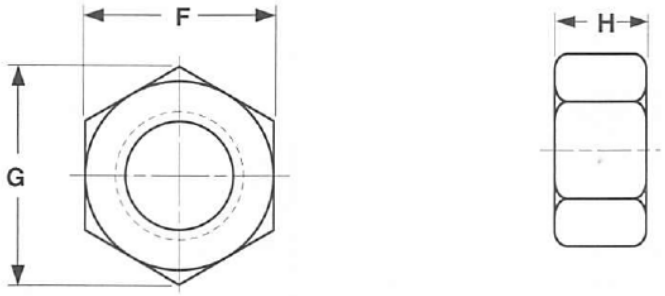
Hex Jam Nuts

ASME B18.2.2-2010

Nominal or Basic Major Diameter of Thread		F Width Across Flats			G Width Across Corners		H1 Thickness of Hex Jam Nuts		
		Basic	Max	Min	Max	Min	Basic	Max	Min
1/4	0.2500	7/16	0.438	0.428	0.505	0.488	5/32	0.163	0.150
5/16	0.3125	1/2	0.500	0.489	0.577	0.557	3/16	0.195	0.180
3/8	0.3750	9/16	0.562	0.551	0.650	0.628	7/32	0.227	0.210
7/16	0.4375	11/16	0.688	0.675	0.794	0.768	1/4	0.260	0.240
1/2	0.5000	3/4	0.750	0.736	0.866	0.840	5/16	0.323	0.302
9/16	0.5625	7/8	0.875	0.861	1.010	0.982	5/16	0.324	0.301
5/8	0.6250	15/16	0.938	0.922	1.083	1.051	3/8	0.387	0.363
3/4	0.7500	1-1/8	1.125	1.088	1.299	1.240	27/64	0.446	0.398
7/8	0.8750	1-5/16	1.312	1.269	1.516	1.447	31/64	0.510	0.458
1	1.0000	1-1/2	1.500	1.450	1.732	1.653	35/64	0.575	0.519
1-1/8	1.1250	1-11/16	1.688	1.631	1.949	1.859	39/64	0.639	0.579
1-1/4	1.2500	1-7/8	1.875	1.812	2.165	2.066	23/32	0.751	0.687
1-3/8	1.3750	2-1/16	2.062	1.994	2.382	2.273	25/32	0.815	0.747
1-1/2	1.5000	2-1/4	2.250	2.175	2.598	2.480	27/32	0.880	0.808
1-3/4	1.7500	2-5/8	2.625	2.538	3.031	2.893	31/32	1.009	0.929
2	2.0000	3	3.000	2.900	3.464	3.306	1-3/32	1.138	1.050
2-1/4	2.2500	3-1/2	3.500	3.388	4.041	3.862	1-13/64	1.267	1.155
2-1/2	2.5000	3-7/8	3.875	3.750	4.474	4.275	1-29/64	1.427	1.401

Description	A six-sided internally threaded fastener which is only 2/3 the thickness of a full form nut.			
Applications/ Advantages	Jam nuts are tightened against the work surface and a finished or heavy hex nut is tightened against the jam nut to keep it from loosening.			
Material	***Low Carbon***	***Grade-5***	***Grade-8***	***Stainless***
	Nuts shall be made from a low carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.47% maximum; ***Phosphorus***: 0.12% maximum; ***Sulfur***: 0.23% maximum.	Nuts shall be made from a medium carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.55% maximum; ***Manganese***: 0.30% minimum; ***Phosphorus***: 0.05% maximum; ***Sulfur***: 0.15% maximum.	Nuts shall be made from a high alloy steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.55% maximum; ***Manganese***: 0.30% minimum; ***Phosphorus***: 0.04% maximum; ***Sulfur***: 0.05% maximum.	Nuts shall be made from one of the following austenitic alloys: 303, 303Se, 304, XM7, all of which have a chromium content of 18% and a nickel content of 8%.
Core Hardness	***1/4 thru 1-1/2 :*** Rockwell C32 maximum	***1/4 thru 1-1/2 :*** Rockwell C32 maximum	***1/4 thru 5/8 :*** Rockwell C24-32 ***Over 5/8 thru 1 :*** Rockwell C26-34 ***Over 1 thru 1-1/2 :*** Rockwell C26-36	Rockwell B95 - C32
Proof Load	***Coarse thread:*** 54,000 psi.; ***Fine thread:*** 48,000 psi.	***Coarse, 1/4 thru 1 :*** 72,000 psi. ***Coarse, over 1 thru 1-1/2 :*** 63,000 psi. ***Fine, 1/4 thru 1 :*** 65,000 psi. ***Fine, over 1 thru 1-1/2 :*** 57,000 psi.	90,000 psi.	1/4 through 1/2"-- 60,000 psi.
Plating	See Appendix-A for information about the plating of steel jam nuts.			

Steel HEAVY HEX JAM



HEAVY HEX JAM NUTS

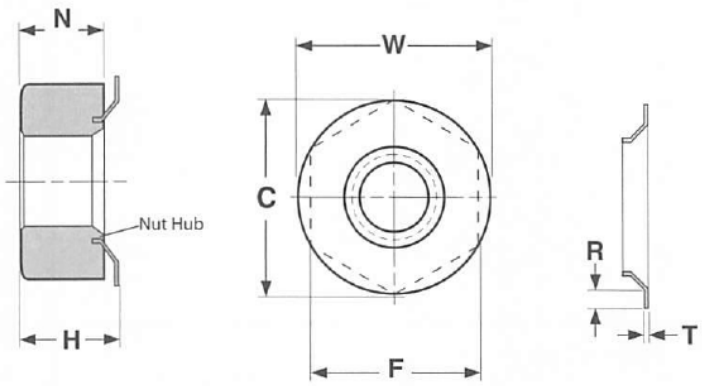
ASME B18.2.2 2010

Nominal Size	F		G		H	
	Width Across Flats		Width Across Corners		Thickness	
	Max	Min	Max	Min	Max	Min
1/4	.500	.488	.577	.556	.188	.156
5/16	.562	.546	.650	.622	.220	.186
3/8	.688	.669	.794	.763	.252	.216
7/16	.750	.728	.866	.830	.285	.247
1/2	.875	.850	1.010	.969	.317	.277
9/16	.938	.909	1.083	1.037	.349	.307
5/8	1.062	1.031	1.227	1.175	.381	.337
3/4	1.250	1.212	1.443	1.382	.446	.398
7/8	1.438	1.394	1.660	1.589	.510	.458
1	1.625	1.575	1.876	1.796	.575	.519
1-1/8	1.812	1.756	2.093	2.002	.639	.579
1-1/4	2.000	1.938	2.309	2.209	.751	.687
1-3/8	2.188	2.119	2.526	2.416	.815	.747
1-1/2	2.375	2.300	2.742	2.622	.880	.808

Description	A six-sided internally threaded fastener which is only 2/3 the thickness of a heavy hex nut.		
Applications / Advantages	Jam nuts are tightened against the work surface and a full heavy hex nut is tightened against the heavy hex jam nut to keep it from loosening.		
Material	***Low Carbon Steel***	***Grade-5 Steel***	***Grade-8 Steel***
	Low carbon steel nuts shall be made from a low carbon steel which conforms to the following chemical composition-- ***Carbon***: 0.47% maximum; ***Phosphorus***: 0.12% maximum; ***Sulfur***: 0.23% maximum	Nuts shall be made from a medium carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.55% maximum; ***Manganese***: 0.30% minimum; ***Phosphorus***: 0.05% maximum; ***Sulfur***: 0.15% maximum.	Nuts shall be made from a high alloy steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.55% maximum; ***Manganese***: 0.30% minimum; ***Phosphorus***: 0.04% maximum; ***Sulfur***: 0.05% maximum.
Hardness	Rockwell C 32 maximum	Rockwell C 32 maximum	1/4 thru 5/8"-- Rockwell C 24-32; Over 5/8 thru 1"-- Rockwell C 26-34; Over 1 thru 1 1/2"-- Rockwell C 26-36
Proof Load	Coarse thread: 54,000 psi.; Fine thread: 48,000 psi.	(1/4 thru 1"): Coarse thread: 72,000 psi.; Fine thread: 65,000 psi. (over 1" thru 1 1/2"): Coarse thread: 63,000 psi.; Fine thread: 57,000 psi.	Coarse thread: 90,000 psi.; Fine thread: 90,000 psi.
Plating	Standard finish is clear zinc.		Standard finish is yellow zinc

CONICAL K-LOCK

Steel & Stainless



Conical K-Lock Nuts

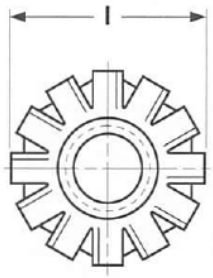
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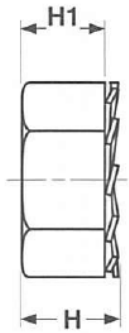
Nominal Size or Basic Thread Diameter		F		C	N		W		T	H		R	
		Across the Flats		Across Corners	Nut Height		Washer Diameter		Washer Material Thick-ness	Full Assembly Height		Washer Rim Width	
		Max	Min	Min	Max	Min	Max	Min	Ref	Max	Min	Max	Min
4	0.1120	.250	.241	.272	.098	.092	.333	.323	.015	.150	.130	.015	.010
6	0.1380	.312	.302	.344	.098	.092	.333	.323	.015	.150	.130	.015	.010
8	0.1640	.344	.332	.378	.130	.117	.380	.370	.030	.195	.170	.015	.010
10	0.1900	.376	.362	.410	.130	.117	.408	.395	.020	.195	.170	.015	.010
1/4	0.2500	.438	.423	.482	.130	.117	.506	.494	.025	.195	.170	.015	.010
1/4	0.2500	.438	.423	.482	.130	.117	.750	.730	.057				
5/16	0.3125	.500	.489	.557	.195	.180	.569	.555	.030	.265	.240	.020	.015
3/8	0.3750	.562	.551	.628	.227	.210	.632	.618	.030	.300	.260	.020	.015

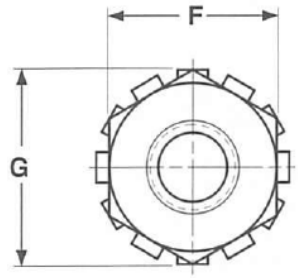
Description	A hex nut pre-assembled with a free-spinning conical washer. A high tension is maintained in the screw and nut assembly as the nut is tightened against the bearing surface.
Applications / Advantages	Having the washer pre-assembled with the nut shortens installation time. Conical washer assemblies can compensate for joint contraction and expansion and can span slightly oversized holes.
Material	**Nuts**: Shall be made from a low carbon steel that conforms to the following chemical composition: *Carbon*: 0.47% max.; *Phosphorous*: 0.12% max.; *Sulfur*: 0.15% max. **Washers**: SAE 1050 - 1065 carbon steel, fabricated and heat-treated
Hardness	**Nuts**: No. 4 thru #12 diameter: No standard applies 1/4" and larger: Rockwell HRC 32 maximum **Washers**: Rockwell C 44 - 48 Rockwell C 46 - 50 (when austempering process is used)
Plating	Nuts are usually supplied with a zinc or black oxide finish. See Appendix-A for more information.

Steel & Stainless

EXTERNAL TOOTH K-LOCK







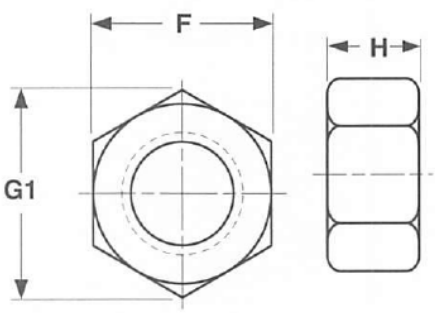
"K" Lock Nuts										Shakeproof* #501-01
Nominal Size or Basic Thread Diameter		F			G		H1		I	
		Width Across Flats			Width Across Corners		Nut Thickness		Washer Diameter	
		Basic	Max	Min	Max	Min	Max	Min	Max	Min
4	0.1120	1/4	0.250	0.241	0.289	0.275	0.098	0.087	0.286	0.277
5	0.1250	5/16	0.312	0.302	0.361	0.344	0.114	0.102	0.348	0.338
6	0.1380	5/16	0.312	0.302	0.361	0.344	0.114	0.102	0.348	0.338
6 SP	0.1380	1/4	0.250	0.241	0.289	0.275	0.098	0.087	0.287	0.277
8	0.1640	11/32	0.344	0.332	0.397	0.378	0.130	0.117	0.381	0.370
8 SP	0.1640	5/16	0.312	0.302	0.361	0.344	0.114	0.102	0.348	0.338
10	0.1900	3/8	0.375	0.362	0.433	0.413	0.130	0.117	0.406	0.395
12	0.2160	7/16	0.438	0.423	0.505	0.482	0.161	0.148	0.506	0.494
1/4	0.2500	7/16	0.438	0.423	0.505	0.482	0.193	0.178	0.506	0.494
5/16	0.3125	1/2	0.500	0.489	0.577	0.557	0.273	0.258	0.592	0.579
3/8	0.3750	9/16	0.562	0.551	0.650	0.628	0.337	0.320	0.665	0.651
1/2	0.5000	3/4	0.750	0.736	0.866	.840	0.437	0.425	0.898	0.878

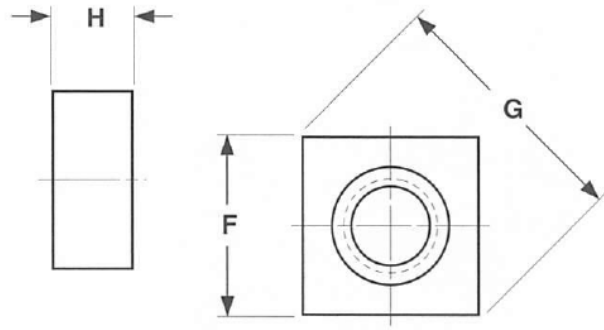
"SP" denotes a "small pattern" across the flats.
*Shakeproof standard #501-01 does not specify dimensions for the #5, #8 SP and 1/2" diameters.

Description	A hex nut pre-assembled with a free spinning external tooth lock washer. The locking action is achieved when the nut is tightened against a bearing surface as the teeth of the lock washer dig into it.
Applications/ Advantages	This is the most popular type of locknut because of its versatility, cost and ease of installation. Doesn't gall screw threads.
Material	***Steel:*** Nuts-- AISI 1008-1020 or equivalent steel; Washers-- 1050-03 or equivalent steel. ***Stainless:*** Nuts-- One of the following austenitic alloys: 302, 303, 303Se, 304, XM7; Washers-- 420 stainless.
Hardness	***Steel:*** Washers-- Rockwell C38 minimum, C44 maximum ***Stainless:*** Washers-- Rockwell C40 - 50
Plating	See Appendix-A for information about the plating of steel nuts.

*Shakeproof is the original writer of K-lock nut specifications.

MACHINE SCREW — Hex & Square





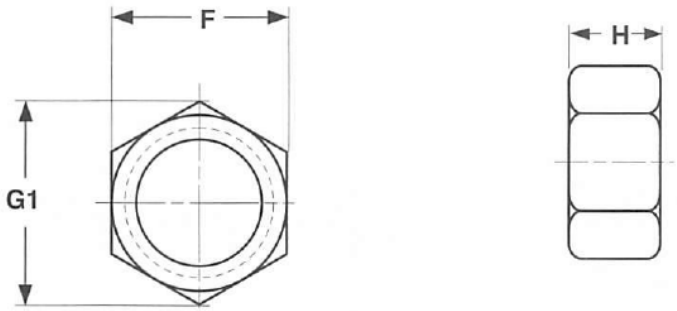
SQUARE AND HEX MACHINE SCREW NUTS

ASME B18.2.2 2010

Nominal Size or Basic Thread Diameter		F			G		G1		H	
		Width Across Flats			Width Across Corners				Thickness	
					Square		Hex			
		Basic	Max	Min	Max	Min	Max	Min	Max	Min
0	0.0600	5/32	0.156	0.150	0.221	0.206	0.180	0.171	0.050	0.043
1	0.0730	5/32	0.156	0.150	0.221	0.206	0.180	0.171	0.050	0.043
2	0.0860	3/16	0.188	0.180	0.265	0.247	0.217	0.205	0.066	0.057
3	0.0990	3/16	0.188	0.180	0.265	0.247	0.217	0.205	0.066	0.057
4	0.1120	1/4	0.250	0.241	0.354	0.331	0.289	0.275	0.098	0.087
5	0.1250	5/16	0.312	0.302	0.442	0.415	0.361	0.344	0.114	0.102
6	0.1380	5/16	0.312	0.302	0.442	0.415	0.361	0.344	0.114	0.102
8	0.1640	11/32	0.344	0.332	0.486	0.456	0.397	0.378	0.130	0.117
10	0.1900	3/8	0.375	0.362	0.530	0.497	0.433	0.413	0.130	0.117
12	0.2160	7/16	0.438	0.423	0.619	0.581	0.505	0.482	0.161	0.148
1/4	0.2500	7/16	0.438	0.423	0.619	0.581	0.505	0.482	0.193	0.178
5/16	0.3125	9/16	0.562	0.545	0.795	0.748	0.650	0.621	0.225	0.208
3/8	0.3750	5/8	0.625	0.607	0.884	0.833	0.722	0.692	0.257	0.239

Description	***Hex Machine Screw Nut:*** A six-sided internally threaded fastener with flat tops and chamfered corners. Threads shall be Unified Standard, Class 2B. ***Square Machine Screw Nut:*** A four-sided, internally threaded fastener, tops and bottoms flat, without chamfer. Threads shall be Unified coarse thread, Class 2B.
Applications/ Advantages	***Hex Machine Screw Nut:*** Designed to be used specifically with machine screws. Stainless nuts are used with stainless machine screws where parts are subject to corrosive conditions. ***Square Machine Screw Nut:*** Offers a greater bearing surface for wrenching.
Material	***Steel:*** Any low carbon steel ***Stainless:*** 18-8 stainless steel
Plating	See Appendix-A for plating information.

Hex & Square MACHINE SCREW



Small Pattern Hex Machine Screw Nuts

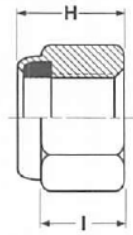
Based on ASME B18.2.2

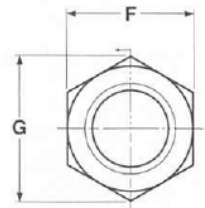
Nominal Size or Basic Thread Diameter		F			G1		H	
		Width Across Flats			Width Across Corners		Thickness	
		Basic	Max	Min	Max	Min	Max	Min
4	0.1120	3/16	0.188	0.180	0.217	0.205	0.066	0.057
5	0.1250	1/4	0.250	0.241	0.289	0.275	0.098	0.087
6	0.1380	1/4	0.250	0.241	0.289	0.275	0.098	0.087
8	0.1640	1/4	0.250	0.241	0.289	0.275	0.098	0.087
8	0.1640	5/16	0.312	0.302	0.361	0.344	0.114	0.102
10	0.1900	1/4	0.250	0.241	0.289	0.275	0.098	0.087
10	0.1900	5/16	0.312	0.302	0.361	0.344	0.114	0.102

Description	Similar in design to standard hex machine screw nuts but with smaller widths across the flats and across the corners.
Applications/ Advantages	Designed to be used with machine screws in areas where there is limited space for wrenching. Stainless nuts are used with stainless machine screws where parts are subject to corrosive conditions.
Material	***Steel:*** Any low carbon steel ***Stainless:*** 18-8 stainless steel
Plating	See Appendix-A for information about the plating of steel machine screw nuts..

NYLON INSERT (ELASTIC) STOP NUTS

Light Hex, Full Height





Nylon Insert Stop Nuts, Light Hex, Full Height

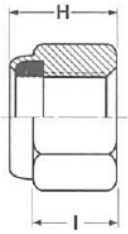
Esna®

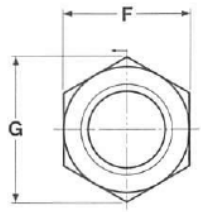
Nominal Size or Basic Thread Diameter		Esna® Part Numbers				F			H		I	G
		Steel, Zinc-plate		Stainless		Width Across Flats			Thickness		Side Height	Width Across Corners
		Coarse	Fine	Coarse	Fine	Basic	Max	Min	Max	Min	Ref	Ref
2	0.0860	21NM-26	--	79NM-26	--	1/4	0.251	0.243	0.153	0.133	0.081	0.268
3	0.0990	21NM-38	--	79NM-38	--	1/4	0.251	0.243	0.153	0.133	0.081	0.268
4	0.1120	21NM-40	--	79NM-40	--	1/4	0.251	0.243	0.153	0.133	0.081	0.268
5	0.1250	21NM-50	--	--	--	1/4	0.251	0.243	0.153	0.133	0.081	0.268
6 SP	0.1380	-	-	--	--	1/4	0.251	0.243	0.153	0.133	0.081	0.268
6	0.1380	21NM-62	--	79NM-62	--	5/16	0.313	0.305	0.188	0.168	0.103	0.339
8	0.1640	21NM-82	--	79NM-82	--	11/32	0.345	0.336	0.239	0.219	0.140	0.374
10	0.1900	21NM-04	21NM-02	79NM-04	79NM-02	3/8	0.376	0.367	0.249	0.229	0.140	0.410
12	0.2160	21NM-124	21NM-128	79NM-124	--	7/16	0.439	0.430	0.328	0.298	0.225	0.482
1/4	0.2500	21NE-040	21NE-048	79NE-040	--	7/16	0.439	0.430	0.328	0.298	0.225	0.482
5/16	0.3125	21NE-058	21NE-054	79NE-058	--	1/2	0.502	0.492	0.359	0.329	0.250	0.552
3/8	0.3750	21NE-066	21NE-064	79NE-066	--	9/16	0.564	0.553	0.468	0.438	0.335	0.622
7/16	0.4375	21NE-074	21NE-070	--	--	5/8	0.627	0.616	0.468	0.438	0.324	0.698
1/2	0.5000	21NE-083	21NE-080	79NE-083	--	3/4	0.752	0.741	0.609	0.579	0.464	0.837
9/16	0.5625	21NE-092	21NE-098	--	--	7/8	0.877	0.865	0.656	0.626	0.469	0.978
5/8	0.6250	21NE-101	21NE-108	79NE-108	--	15/16	0.940	0.928	0.765	0.735	0.593	1.051
3/4	0.7500	41NE-120	41NE-126	79NE-120	--	1-1/16	1.064	1.052	0.890	0.860	0.742	1.191
7/8	0.8750	41NE-149	41NE-144	--	--	1-1/4	1.252	1.239	0.999	0.969	0.790	1.403
1	1.0000	41NE-168	41NE-164	--	--	1-7/16	1.440	1.427	1.078	1.016	0.825	1.615
1-1/8	1.1250	41NE-177	--	--	--	1-5/8	1.627	1.614	1.203	1.141	0.930	1.826
1-1/4	1.2500	41NE-197	41NE-202	--	--	1-13/16	1.815	1.801	1.422	1.360	1.125	2.038
1-1/2	1.5000	41NE-242	--	--	--	2-3/16	2.197	2.159	1.640	1.578	1.313	2.444

Description	Hex nut with a nylon-filled collar at its back end. When a screw reaches the collar, the threads and nylon form a tight, frictional fit, restricting movement of the screw when it is subjected to vibration. The nylon insert comes in various colors.	
Applications/ Advantages	Designed to be used with like-material machine screws and bolts. It is able to be reused more times than a two-way reversible nut. Steel nylon insert stop nuts are less expensive than grade-C automation lock nuts. However, nylon will begin to deteriorate at temperatures from 150°-350° F.	
Material	*Steel*	*Stainless*
	#2 through 5/8" -- AISI 1008 - 1010 or equivalent steel; 3/4 through 1-1/2"-- AISI C1117 or equivalent steel.	18-8: AISI 303 or equivalent stainless steel. 316: Type 316 stainless steel.
Hardness	Rockwell C28 maximum	1/4 through 5/8"-- Rockwell B95 - C32; 3/4 through 1-1/2"-- Rockwell B80 - C32
Proof Load	90,000 psi. minimum	1/4 through 5/8"-- Rockwell B95 - C32; 3/4 through 1-1/2"-- Rockwell B80 - C32
Plating	Steel nylon insert stop nuts are usually supplied with a zinc plating.	Stainless nylon insert stop nuts are usually provided without any additional plating.

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Light Hex, Thin Height NYLON INSERT (ELASTIC) STOP NUTS





NYLON INSERT STOP NUTS, LIGHT HEX, THIN HEIGHT — Esna®

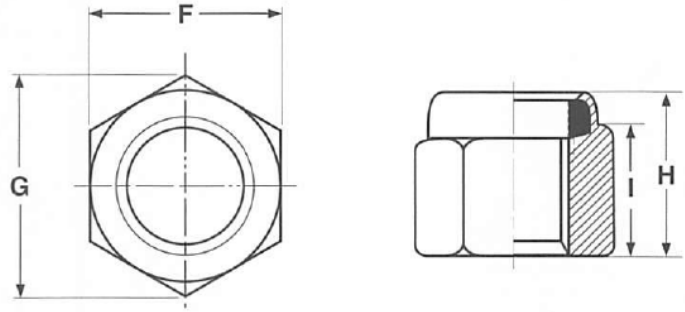
Nominal Size or Basic Thread Diameter		Esna® Part Numbers		F			H		I	G
		Steel, Zinc-plated		Width Across Flats			Thickness		Side Height	Width Across Corners
		Coarse	Fine	Basic	Max	Min	Max	Min	Ref	Ref
2	0.0860	21NTM-26	--	1/4	0.251	0.243	0.124	0.094	0.075	0.268
4	0.1120	21NTM-40	--	1/4	0.251	0.243	0.124	0.094	0.075	0.268
6	0.1380	21NTM-62	--	5/16	0.313	0.305	0.140	0.110	0.090	0.339
8	0.1640	21NTM-82	--	11/32	0.345	0.336	0.187	0.157	0.110	0.374
10	0.1900	21NTM-04	21NTM-02	3/8	0.376	0.367	0.187	0.157	0.110	0.410
12	0.2160	21NTM-124	--	7/16	0.439	0.430	0.218	0.188	0.125	0.482
1/4	0.2500	21NTE-040	21NTE-048	7/16	0.439	0.430	0.218	0.188	0.125	0.482
5/16	0.3125	21NTE-058	21NTE-054	1/2	0.502	0.492	0.265	0.235	0.158	0.552
3/8	0.3750	21NTE-066	21NTE-064	9/16	0.564	0.553	0.281	0.251	0.150	0.622
7/16	0.4375	21NTE-074	21NTE-070	5/8	0.627	0.615	0.328	0.298	0.225	0.694
1/2	0.5000	21NTE-083	21NTE-080	3/4	0.752	0.741	0.328	0.298	0.190	0.837
9/16	0.5625	--	21NTE-098	7/8	0.877	0.865	0.374	0.344	0.225	0.978
5/8	0.6250	21NTE-101	21NTE-108	15/16	0.940	0.928	0.406	0.376	0.265	1.051
3/4	0.7500	41NTE-120	41NTE-126	1-1/8	1.064	1.052	0.421	0.391	0.288	1.191
7/8	0.8750	41NTE-144	--	1-1/4	1.252	1.239	0.484	0.454	0.340	1.403
1	1.0000	41NTE-164	--	1-7/16	1.440	1.427	0.578	0.516	0.405	1.615

Description	Identical to a standard pattern nylon-insert stop nut but not as thick from top to bottom.	
Applications/ Advantages	Same general applications as the standard pattern, but thin pattern nuts are used when an insufficient number of projecting threads are present to use a standard nylon insert nut.	
Material	*Steel*	*Stainless*
	#4 through 5/8 diameters: AISI 1008 - 1010 or equivalent steel. *3/4 diameter:* AISI C1117 or equivalent steel.	*18-8:* Type 303 or equivalent stainless steel
Hardness	Rockwell C 28 maximum	*1/4 through 5/8:* Rockwell B95 - C32; *3/4 through 1-1/2 :* Rockwell B80 - C32
Proof Load	Thin pattern nylon insert nuts are intended for use in limited clearance applications and not for load bearing purposes. If a precise engineering standard is required, parts should be laboratory tested.	
Plating	Steel nylon insert stop nuts are usually supplied with a zinc plating.	Stainless nylon insert stop nuts are usually provided without any additional plating.

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NYLON INSERT (ELASTIC) STOP NUTS

Heavy Hex, Full Height



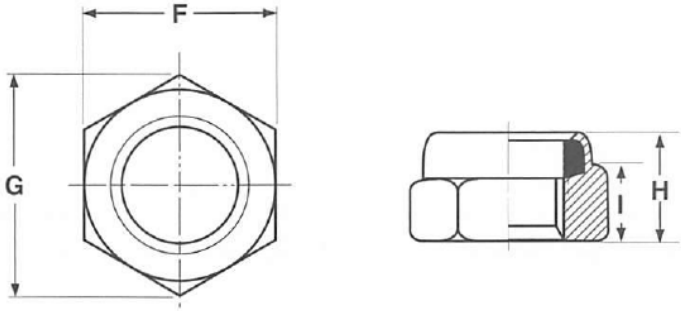
NYLON INSERT STOP NUTS, HEAVY HEX, FULL HEIGHT								Esna®
Nominal Size or Basic Thread Diameter		Esna® Part Numbers	F		H		I	G
		Steel, Zinc-plate	Width Across Flats		Thickness		Side Height	Width Across Corners
		Coarse	Max	Min	Max	Min	Ref	Ref
1/4	0.2500	21NU-040	0.503	0.489	0.390	0.360	0.290	0.556
5/16	0.3125	21NU-058	0.566	0.551	0.453	0.423	0.335	0.624
3/8	0.3750	21NU-066	0.691	0.675	0.562	0.532	0.392	0.763
7/16	0.4375	21NU-074	0.754	0.736	0.609	0.579	0.464	0.829
1/2	0.5000	21NU-083	0.879	0.861	0.718	0.688	0.544	0.969
5/8	0.6250	21NU-101	1.067	1.045	0.874	0.844	0.677	1.175
3/4	0.7500	41NU-120	1.255	1.231	1.015	0.985	0.790	1.382
7/8	0.8750	41NU-149	1.444	1.417	1.140	1.110	0.883	1.589
1	1.0000	41NU-168	1.632	1.602	1.312	1.250	1.000	1.796
1 1/4	1.2500	41NU-207	2.008	1.973	1.672	1.610	1.250	2.209
1 1/2	1.5000	41NU-246	2.384	2.344	1.953	1.891	1.413	2.622
1 5/8	1.6250	-	2.572	2.530	2.172	2.110	1.637	2.886
1 3/4	1.7500	41NU-285	2.762	2.715	2.376	2.250	1.830	3.035
2	2.0000	41NU-324	3.137	3.086	2.469	2.343	1.750	3.449
2 1/4	2.2500	-	3.514	3.457	2.876	2.750	2.063	3.862

Specifications for 1.625 and 2.25" nominal sizes are independent of Esna® specifications.

Description	Heavy hex nut with a nylon-filled collar at its back end. When the cap-screw or bolt reaches the collar, the threads and nylon form a tight, frictional fit, restricting movement of the cap-screw or bolt when it is subjected to vibration. The nylon insert comes in various colors.
Applications/ Advantages	Has greater surface area than NM-series nuts, making wrenching easier. Designed to be used with cap-screws and bolts which have a minimum tensile strength not greater than 90,000 psi.. Used in bridge and building construction, material handling, heavy equipment and oil field machinery. Steel nylon insert stop nuts are less expensive than grade-C automation lock nuts. Nylon insert nuts are not designed to be used at temperatures over 250° F.
Material	*1/4 through 5/8* -- AISI 1008 - 1010 or equivalent steel; *3/4 through 1* -- AISI C1117 or equivalent steel.
Hardness	Rockwell C 28 maximum
Proof Load	90,000 psi.
Plating	See Appendix-A for information about the plating of steel nylon-insert stop nuts.

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Heavy Hex, Thin Height NYLON INSERT (ELASTIC) STOP NUTS



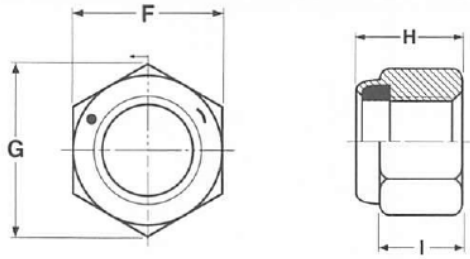
NYLON INSERT STOP NUTS, HEAVY HEX, THIN HEIGHT								Esna®
Nominal Size or Basic Thread Diameter		Esna® Part Numbers	F		H		I	G
		Steel, Zinc-plate	Width Across Flats		Thickness		Side Height	Width Across Corners
		Coarse	Max	Min	Max	Min	Ref	Ref
1/4	0.2500	21NTU-040	0.502	0.492	0.296	0.266	0.194	0.552
5/16	0.3125	21NTU-058	0.564	0.553	0.328	0.298	0.212	0.622
3/8	0.3750	21NTU-066	0.690	0.679	0.421	0.391	0.251	0.766
7/16	0.4375	21NTU-074	0.752	0.741	0.453	0.423	0.316	0.837
1/2	0.5000	21NTU-083	0.877	0.865	0.546	0.516	0.360	0.978
5/8	0.6250	21NTU-101	1.064	1.052	0.624	0.594	0.428	1.191
3/4	0.7500	41NTU-120	1.252	1.239	0.718	0.688	0.488	1.403
7/8	0.8750	41NTU-149	1.440	1.427	0.796	0.766	0.535	1.615
1	1.0000	41NTU-168	1.627	1.614	0.922	0.860	0.600	1.826

Description	Identical to the NU-series heavy hex nylon insert stop nut but approximately 35% less thick from top to bottom.
Applications/ Advantages	Thin pattern heavy hex nuts are used when an insufficient number of projecting threads are present to use a full heavy hex nylon insert stop nut.
Material	***1/4 through 5/8*** -- AISI 1008 - 1010 or equivalent steel; ***3/4 through 1*** -- AISI C1117 or equivalent steel.
Hardness	Rockwell C 28 maximum
Plating	See Appendix-A for information about the plating of steel nylon-insert stop nuts.

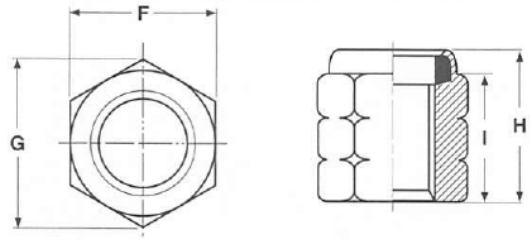
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NYLON INSERT (ELASTIC) STOP

Light Hex, Grades 5 & 8



Grade-5



Grade-8

Nylon Insert Stop Nuts, Light Hex, Grades 5 & 8

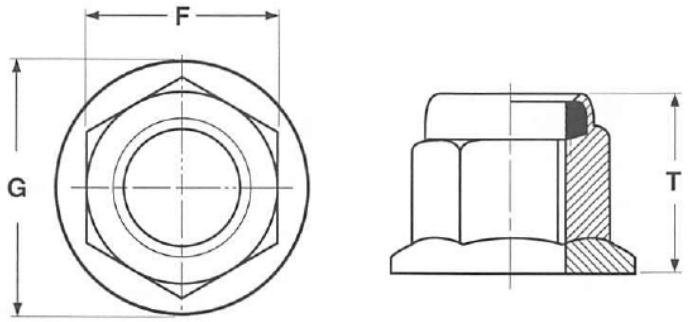
Esna®

Nominal Size or Basic Thread Diameter		F		H		I	G
		Width Across Flats		Thickness		Side Height	Width Across Corners
		Max	Min	Max	Min	Ref	Ref
1/4	0.2500	.439	.430	.328	.298	.225	.482
5/16	0.3125	.502	.492	.359	.329	.250	.552
3/8	0.3750	.564	.553	.468	.438	.335	.622
7/16	0.4375	.627	.616	.468	.438	.324	.694
1/2	0.5000	.752	.741	.609	.579	.464	.837
9/16	0.5625	.877	.865	.656	.626	.469	.978
5/8	0.6250	.940	.928	.765	.735	.593	1.051
3/4	0.7500	1.064	1.052	.890	.860	.742	1.191
7/8	0.8750	1.252	1.239	.999	.969	.790	1.403
1	1.0000	1.440	1.427	1.078	1.016	.825	1.615
1-1/8	1.1250	1.627	1.614	1.203	1.141	.930	1.826
1-1/4	1.2500	1.814	1.801	1.422	1.360	1.125	2.038
1-3/8	1.3750	2.008	1.973	1.609	1.547	1.282	2.232
1-1/2	1.5000	2.197	2.159	1.640	1.578	1.313	2.416

Description	Heat treated hex nut with a nylon-filled collar at its back end. The grade-5 nut shall be marked with a dot and dash on the chamfered surface of the nut, 120° apart. The grade-8 nut shall be grade-marked in one of two ways: (1) with double notched corners or (2) with six symmetrically spaced identical symbols on the chamfered surface on top of the nut. When the cap-screw or bolt reaches the collar, the threads and nylon form a tight, frictional fit, restricting movement of the cap-screw or bolt when it is subjected to vibration. The nylon insert comes in various colors.	
Applications/ Advantages	Designed to be used in structural applications with Grade-5 cap-screws or bolts which have a minimum tensile strength of 120,000 psi.. Nylon insert nuts are not designed to be used at temperatures over 250° F.	Designed to be used in structural applications with Grade-8 cap-screws or bolts which have a minimum tensile strength of 150,000 psi. or greater. Some such applications include engines, turbines, hydraulic cylinders, railroads and aerospace. Nylon insert nuts are not designed to be used at temperatures over 250° F.
Material	Shall be made from a low carbon steel that conforms to the following chemical composition: *Carbon*: 0.55% max.; *Manganese*: 0.30% min.; *Phosphorous*: 0.05% max.; *Sulfur*: 0.05% max.	Heat treated AISI C1137 or equivalent steel.
Hardness	Rockwell C28 max.	Rockwell C 26 - 34
Proof Load	120,000 psi.	150,000 psi.
Plating	Grade-5 nylon insert stop nuts are usually supplied zinc-plated.	Grade-8 nylon insert stop nuts are usually supplied zinc yellow-plated. See Appendix-A for more information.

Esna® is a registered trademark of the MacLean-Fogg Company. Our stop nuts are not manufactured by or connected with the producers of Esna® nuts.

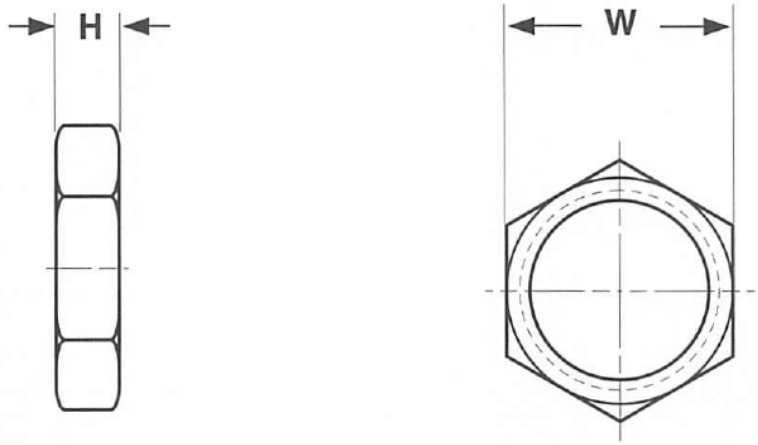
Low Carbon Steel & Grade 8 NYLON INSERT FLANGE STOP



NYLON INSERT FLANGE LOCKNUTS				
Size	B		G	T
	Width Across Flats		Flange Diameter	Thickness
	Max	Min	Max	Max
10-32	.375	.365	.500	.264
1/4-20	.438	.428	.560	.300
1/4-28	.438	.428	.560	.300
5/16-18	.500	.489	.680	.364
5/16-24	.500	.489	.680	.364
3/8-16	.562	.555	.810	.425
3/8-24	.562	.555	.810	.425
7/16-14	.688	.675	.930	.493
7/16-20	.688	.675	.930	.493
1/2-13	.750	.736	1.070	.554
1/2-20	.750	.736	1.070	.554
5/8-11	.938	.922	1.330	.690
5/8-18	.938	.922	1.330	.690
3/4-10	1.125	1.088	1.585	.825
3/4-16	1.125	1.088	1.585	.825

Description	Hex nut with a nylon-filled collar at its back end and an enlarged circular base flaring out from the front end of the nut. When an externaly threaded fastener reaches the collar, the threads and nylon form a tight, frictional fit as the nylon applies downward pressure that forces contact between the internal and external threads.	
Applications / Advantages	The nut may be reused up to 50 times, does not damage the threads of the fastener it is used with, withstands extreme vibrations without loosening. The flange design allows the nut to span larger holes than a standard nylon insert stop nut while providing a more uniform bearing-stress to clamp-force ratio.	
Material	Low Carbon Steel	Grade-8
	AISI 1008 - 1035 steel	AISI C 1137 or equivalent steel
Proof Load	90,000 psi.	150,000 psi.
Hardness	Rockwell C 28 maximum	Rockwell C 26 - 34
Plating	Standard finish is clear zinc.	Standard finish is yellow zinc.

HEX PANEL — Steel



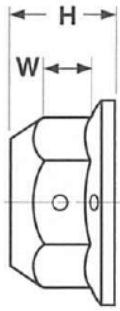
HEX PANEL NUTS				Jacobson Mfg.*
Part Number	Thread Size	Basic Pitch Diameter	W	H
			Wrench Size	Thickness
020208NP	1/8-27	.3726	1/2	1/8
020209NP	1/8-27	.3726	9/16	1/8
020309NP	1/8-27	.3726	9/16	3/16
3709307NP	3/8-32	.3547	7/16	3/32
3709308NP	3/8-32	.3547	1/2	3/32
3709309NP	3/8-32	.3547	9/16	3/32
4609309NP	15/32-32	.4485	9/16	3/32

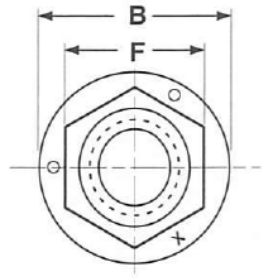
Description	A double chamfered hex nut with significantly less surface area than a standard hex nut.
Applications/ Advantages	Popular uses are in switch mounts, volume controls and electrical fixtures.
Material	Nuts shall be made from a low-carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.47% max.; ***Phosphorus***: 0.12% max.; ***Sulfur***: 0.23% max..
Plating	See Appendix-A for plating information.

Panel nuts meet the same specifications as published by Jacobson Manufacturing Co.

Reversible Center Lock, Grade F

REGULAR FLANGE NUTS



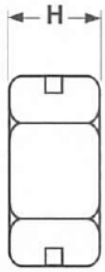


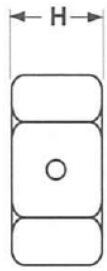
REGULAR FLANGE CENTER LOCKNUTS, GRADE F						Aztech*
Nominal Size and Thread Pitch	F		B	W	H	
	Width Across Flats		Flange Diameter	Wrench Height	Total Thickness	
	Max	Min	Max	Min	Max	Min
1/4-20	0.438	0.428	0.594	0.14	0.234	0.223
5/16-18	0.502	0.489	0.680	0.17	0.281	0.268
3/8-16	0.562	0.551	0.750	0.23	0.347	0.330
1/2-13	0.750	0.736	1.031	0.31	0.458	0.437
5/8-11	0.938	0.922	1.281	0.40	0.569	0.545

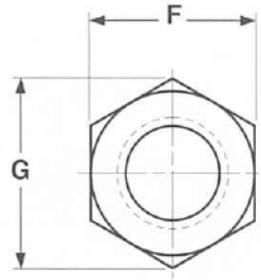
Description	A hex nut with two or three, round or rectangular indentations, compressed onto the flat sides of the nut equidistant from each other and an enlarged circular base flaring out from the bottom of the nut. The compressions create slightly distorted center threads resulting in a controlled locking action when the threads of the mating part become engaged.
Applications/ Advantages	This is usually a more inexpensive prevailing torque type of nut, designed for use with steel bolts and screws of a tensile strength not greater than 120,000 psi. It creates a locking action even without being fully threaded onto its mating screw.
Material	SAE 1010 or equivalent steel
Hardness	Rockwell C28 maximum
Proof Load	120,000 psi.
Plating	See Appendix-A for plating information.

*Aztech is the author of these flange center lock nut specifications.

TWO-WAY REVERSIBLE LOCK — Steel & Stainless







Two Way Reversible Lock Nuts — Aztech*

Nominal or Basic Major Diameter of Thread		F			G		H		
		Width Across Flats			Width Across Corners		Thickness		
		Basic	Max	Min	Max	Min	Basic	Max	Min
8	0.1640	11/32	0.344	0.332	0.397	0.378	3/16	0.193	0.178
10	0.1900	3/8	0.375	0.362	0.433	0.413	13/64	0.203	0.187
1/4	0.2500	7/16	0.438	0.428	0.505	0.488	7/32	0.226	0.212
5/16	0.3125	1/2	0.500	0.489	0.577	0.557	17/64	0.273	0.258
3/8	0.3750	9/16	0.562	0.551	0.650	0.628	21/64	0.337	0.320
7/16	0.4375	11/16	0.688	0.675	0.794	0.768	3/8	0.385	0.365
1/2	0.5000	3/4	0.750	0.736	0.866	0.840	7/16	0.448	0.427
9/16	0.5625	7/8	0.875	0.861	1.010	0.982	31/64	0.496	0.473
5/8	0.6250	15/16	0.938	0.922	1.083	1.051	35/64	0.559	0.535
3/4	0.7500	1-1/8	1.125	1.088	1.299	1.240	41/64	0.665	0.617
7/8	0.8750	1-5/16	1.312	1.269	1.516	1.447	3/4	0.776	0.724
1	1.0000	1-1/2	1.500	1.450	1.732	1.653	55/64	0.887	0.831

Description	Hex nut with two or three, round or rectangular indentations, compressed onto the flat sides of the nut equidistant from each other. The compressions create slightly distorted center threads resulting in a controlled locking action when the threads of the mating part become engaged.	
Applications/ Advantages	This is the least expensive prevailing torque type of nut, designed for use with machine screws and low-carbon bolts (or 18-8 screws with the stainless nuts). It allows for automatic assembly because the top and bottom of the nut are identical. It creates a locking action even without being fully threaded onto its mating screw.	
Material	***Steel***	***Stainless***
	Nuts shall be made from a low-carbon steel which conforms to the following chemical composition requirements-- *Carbon*: 0.47% max.; *Phosphorus*: 0.12% max.; *Sulfur*: 0.23% max..	18-8 Stainless
Hardness	Rockwell C28 maximum	-
Proof Load	90,000 psi.	-
Plating	See Appendix-A for plating information.	Parts are typically supplied plain with a wax coating.

*Aztech is the author of these two-way reversible lock nut specifications.

Prevailing Torque—STEEL Nuts TWO-WAY REVERSIBLE LOCK

STEEL Two Way Reversible Lock Nuts, Coarse Thread

ASME B18.16.6 2014

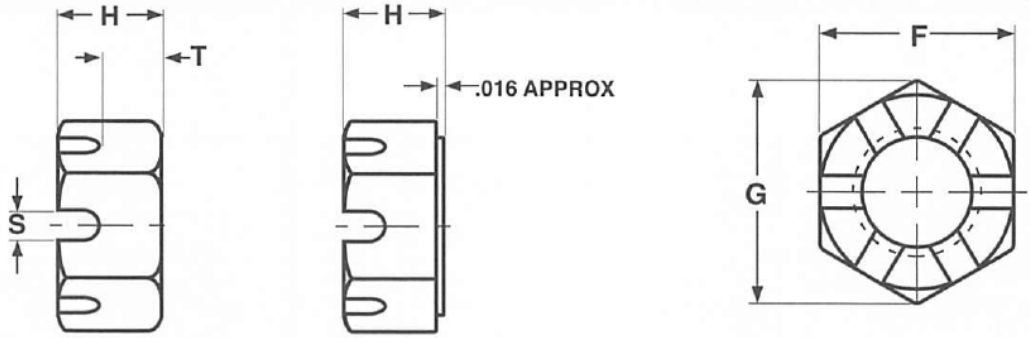
Nut Size & Threads per Inch	Prevailing Torque		
	First Installation, Max (in.-lb.)	First Removal, Min. (in.-lb.)	Third Removal, Min. (in.-lb.)
8-32	12.0	2.0	0.5
10-24	17	2.5	1.0
12-24	27	3.5	1.0
1/4-20	40	5.0	1.5
5/16-18	80	8.0	2.5
3/8-16	110	12.0	4.0
7/16-14	135	17.0	5.0
1/2-13	204	22.0	7.5
9/16-12	300	30.0	10.0
5/8-11	420	39.0	12.5
3/4-10	540	58.0	20.0
7/8-9	840	88.0	30.0
1-8	1,080	120.0	40.0

STEEL Two Way Reversible Lock Nuts, Fine Thread

ASME B18.16.6 2014

Nut Size & Threads per Inch	Prevailing Torque		
	First Installation, Max (in.-lb.)	First Removal, Min. (in.-lb.)	Third Removal, Min. (in.-lb.)
10-32	17	2.5	1.0
1/4-28	40	5.0	1.5
5/16-24	80	8.0	2.5
3/8-24	110	12.0	4.0
7/16-20	135	17	5.0
1/2-20	204	22	7.5
9/16-18	300	30	10.0
5/8-18	420	39	12.5
3/4-16	540	58	20.0

HEX SLOTTED NUTS — Steel



Hex Slotted Nuts

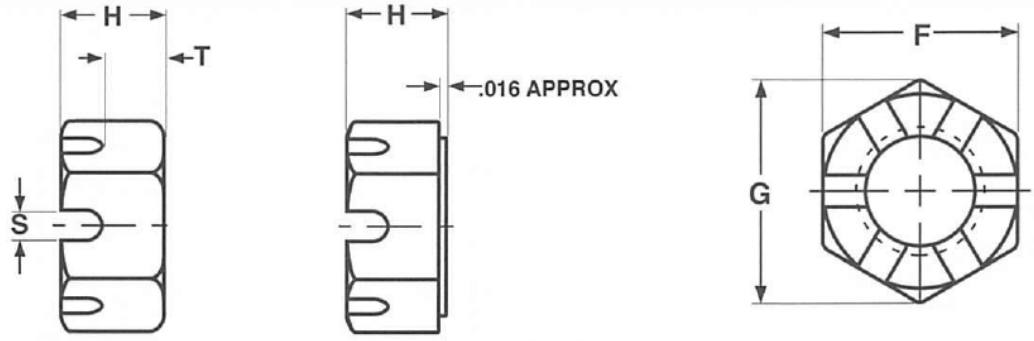
ANSI/ASME B18.2.2

Nominal Size or Basic Major Diameter of Thread		F			G		H			T		S		Runout of Bearing Surface FIM
		Width Across Flats			Width Across Corners		Thickness			Unslotted Thickness		Width of Slot		
		Basic	Max	Min	Max	Min	Basic	Max	Min	Max	Min	Max	Min	Max
1/4	0.2500	7/16	0.438	0.428	0.505	0.488	7/32	0.226	0.212	0.14	0.12	0.10	0.07	0.015
5/16	0.3125	1/2	0.500	0.489	0.577	0.557	17/64	0.273	0.258	0.18	0.16	0.12	0.09	0.016
3/8	0.3750	9/16	0.562	0.551	0.650	0.628	21/64	0.337	0.320	0.21	0.19	0.15	0.12	0.018
7/16	0.4375	11/16	0.688	0.675	0.794	0.768	3/8	0.385	0.365	0.23	0.21	0.15	0.12	0.018
1/2	0.5000	3/4	0.750	0.736	0.866	0.840	7/16	0.448	0.427	0.29	0.27	0.18	0.15	0.019
9/16	0.5625	7/8	0.875	0.861	1.010	0.982	31/64	0.496	0.473	0.31	0.29	0.18	0.15	0.020
5/8	0.6250	15/16	0.938	0.922	1.083	1.051	35/64	0.559	0.535	0.34	0.32	0.24	0.18	0.021
3/4	0.7500	1-1/8	1.125	1.088	1.299	1.240	41/64	0.665	0.617	0.40	0.38	0.24	0.18	0.023
7/8	0.8750	1-5/16	1.312	1.269	1.516	1.447	3/4	0.776	0.724	0.52	0.49	0.24	0.18	0.025
1	1.0000	1-1/2	1.500	1.450	1.732	1.653	55/64	0.887	0.831	0.59	0.56	0.30	0.24	0.027
1-1/8	1.1250	1-11/16	1.688	1.631	1.949	1.859	31/32	0.999	0.939	0.64	0.61	0.33	0.24	0.030
1-1/4	1.2500	1-7/8	1.875	1.812	2.165	2.066	1-1/16	1.094	1.030	0.70	0.67	0.40	0.31	0.033
1-3/8	1.3750	2-1/16	2.062	1.994	2.382	2.273	1-11/64	1.206	1.138	0.82	0.78	0.40	0.31	0.036
1-1/2	1.5000	2-1/4	2.250	2.175	2.598	2.480	1-9/32	1.317	1.245	0.86	0.82	0.46	0.37	0.039
2	2.0000	3	3.000	2.900	3.464	3.306	1-23/32	1.759	1.679	1.24	1.20	0.52	0.43	0.048

Description	Hex nut with opposed slots cut into the top of the nut through the centers of the flats. The slots are on the end opposite the nut's bearing surface.
Applications/ Advantages	The slots are for the insertion of a cotter pin to secure the nut when used with a drilled shank fastener.
Material	Nuts shall be made from a low-carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.47% max.; ***Phosphorus***: 0.12% max.; ***Sulfur***: 0.23% max..
Hardness	Rockwell C32 maximum
Proof Load	72,000 psi.
Plating	See Appendix-A for plating information.

HEAVY HEX SLOTTED NUTS

Steel



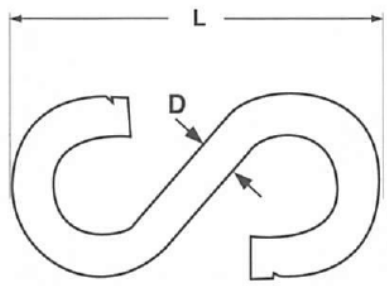
Heavy Hex Slotted Nuts

ASME B18.2.2 2010

Nominal Size or Basic Major Diameter of Thread		F			G		H			T		S		Runout of Bearing Surface FIM
		Width Across Flats			Width Across Corners		Thickness			Unslotted Thickness		Width of Slot		
		Basic	Max	Min	Max	Min	Basic	Max	Min	Max	Min	Max	Min	Max
1/2	0.5000	7/8	0.875	0.850	1.010	0.969	31/64	0.504	0.464	0.34	0.32	0.18	0.15	0.023
5/8	0.6250	1-1/16	1.062	1.031	1.227	1.175	39/64	0.631	0.587	0.40	0.38	0.24	0.18	0.025
3/4	0.7500	1-1/4	1.250	1.212	1.443	1.382	47/64	0.758	0.710	0.49	0.47	0.24	0.18	0.027
7/8	0.8750	1-7/16	1.438	1.394	1.660	1.589	55/64	0.885	0.833	0.62	0.59	0.24	0.18	0.029
1	1.0000	1-5/8	1.625	1.575	1.876	1.796	63/64	1.012	0.956	0.72	0.69	0.30	0.24	0.031
1-1/8	1.1250	1-13/16	1.812	1.756	2.093	2.002	1-7/64	1.139	1.079	0.78	0.75	0.33	0.24	0.033
1-1/4	1.2500	2	2.000	1.938	2.309	2.209	1-7/32	1.251	1.187	0.86	0.83	0.40	0.31	0.035
1-3/8	1.3750	2-3/16	2.188	2.119	2.526	2.416	1-11/32	1.378	1.310	0.99	0.95	0.40	0.31	0.038
1-1/2	1.5000	2-3/8	2.375	2.300	2.742	2.622	1-15/32	1.505	1.433	1.05	1.01	0.46	0.37	0.041

Description	Heavy hex nut with opposed slots cut into the top of the nut through the centers of the flats. The slots are on the end opposite the nut's bearing surface.
Applications/ Advantages	The slots are for the insertion of a cotter pin to secure the nut when used with a drilled shank fastener. The heavy hex variety can withstand a somewhat greater proof load than a standard slotted nut.
Material	Nuts shall be made from a low-carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.47% max.; ***Phosphorus***: 0.12% max.; ***Sulfur***: 0.23% max..
Hardness	Rockwell C32 maximum
Proof Load	79,000 psi.
Plating	See Appendix-A for plating information.

S-HOOKS

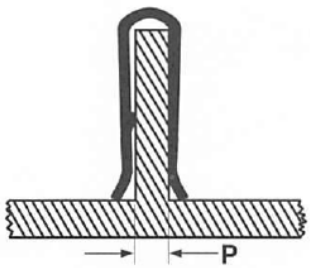


STEEL S-HOOKS		
Nominal Size	L	D
	Overall Length	Major Diameter
1/4	2.0	0.25

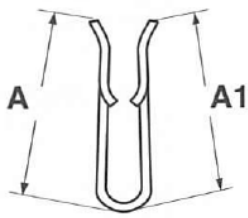
Description	A steel part manufactured into an S-shape with blunt ends and single notches cut into the outer edge of the two ends.
Applications / Advantages	Designed to be used in conjunction with other components to temporarily lift and/or suspend light weights. Working load limits will differ depending on the manufacturer and should be tested before the part is put into use.
Material	Low carbon cold drawn steel
Plating	S-Hooks are typically supplied with a zinc finish.

Spring Steel

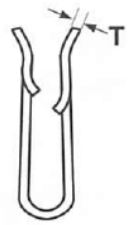
U-TYPE SPEED CLIPS



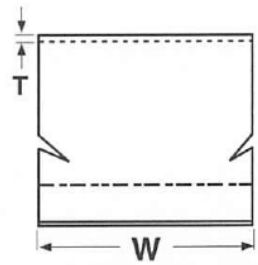
Panel Range



Dual Barbs



Uneven Barbs



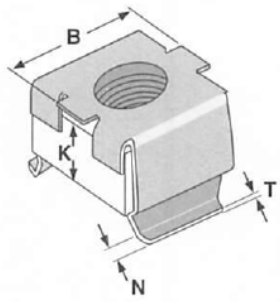
"U"-Type Spring Steel Speed Clips						Tinnerman®
Industry Part Number	P	A	A1	W	T	Design Type: Dual Barbs (B) or Uneven Barbs (U)
	Panel Range	Leg Length	2nd Leg Length	Width	Material Thickness	
		Ref	Ref	Ref	Ref	
22503-014	.015-.060	.34	.34	.50	.014	U
20285-017	.050-.100	.34	.35	.50	.017	B
5207-014	.060-.090	.34	.34	.50	.014	B
27091-014	.115-.185	.42	.42	.50	.014	B
43806-014	.170-.205	.43	.43	.50	.014	B
45931-014	.245-.255	.36	.36	.50	.014	B

Description	A fastener manufactured from spring steel that is permanently bent in the shape of a "U". The spring action of the steel permanently holds the two sides of the "U" at a constant distance from each other. Barbs are formed on each of the four edges, above the 90° corners. The barbs are bent inward to add to the clip's holding power when the part is set in place.
Applications / Advantages	Designed to clamp panels together or apply spring-loaded tension on delicate surfaces. They offer the convenience of not requiring screws or welds while being inexpensive.
Material	SAE 1050 or higher carbon spring steel
Hardness	Rockwell C 40 - 50
Plating	Parts are commonly supplied in zinc or black phosphate finish.

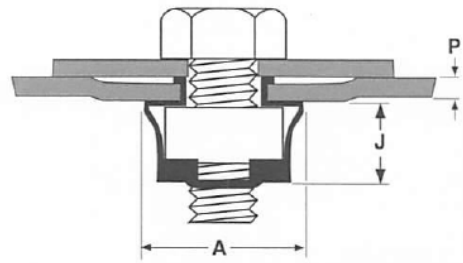
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Cage Style

SPRING NUTS



Profile of
Typical Assembly



CAGE NUTS

Tinnerman® Palnut

Screw Size	Part Numbers (Steel)		B		A	J		N		T	K	P	
	Kanebridge	Tinnerman®	Cage Width (Static)		Cage Width (Assembled)	Cage Height		Foot Width		Material Thickness	Nut Thickness	Panel Range	
			Max	Min	Min	Max	Min	Max	Min	Ref	Ref	Max	Min
6-32	06NCAG 0608NCAG	7931-632	.530	.510	.540	.260	.240	.070	.050	.020	.156	.063	.025
8-32	08NCAG	7931-832	.530	.510	.531	.260	.240	.070	.050	.020	.156	.063	.025
8-32	08-064NCAG	7941-832	.530	.510	.475	.265	.235	.070	.050	.020	.156	.105	.064
10-24	10NCAG	7941-1024	.530	.510	.531	.260	.240	.070	.050	.020	.156	.105	.064
10-24	10-025NCAG	7931-1024	.530	.510	.475	.265	.235	.070	.050	.020	.156	.063	.025
10-32	11NCAG	7931-1032	.530	.510	.531	.260	.240	.070	.050	.020	.156	.063	.025
10-32	11-064NCAG	98579-1032	.530	.510	.525	.260	.240	.070	.050	.020	.156	.105	.064
10-32	11-093NCAG	7951-1032	.530	.510	.525	.260	.240	.070	.050	.020	.156	.126	.093
12-24	12NCAG	7941-1224	.530	.510	.531	.260	.240	.070	.050	.020	.156	.105	.064
1/4-20	14NCAG	7988-1420	.530	.510	.531	.260	.240	.070	.050	.020	.187	.063	.025
1/4-20	14-064NCAG	98580-1420	.530	.510	.525	.260	.240	.070	.050	.020	.187	.105	.064
1/4-20	14-093NCAG	7956-1420	.530	.510	.525	.260	.240	.070	.050	.020	.187	.126	.093
5/16-18	31NCAG	7957-5618	.728	.650	.734	.310	.290	.110	.090	.025	.218	.126	.093
5/16-18	31-057NCAG	-	.670	.650	.734	.310	.290	.110	.090	.025	.218	.092	.057
3/8-16	37NCAG	7937-3816	.670	.650	.734	.310	.290	.110	.090	.025	.218	.056	.028
3/8-16	37-.057NCAG	7953-3816	.670	.650	.700	.310	.290	.110	.090	.025	.218	.092	.057
3/8-16	37-.093NCAG	7957-3816	.670	.650	.700	.310	.290	.110	.090	.025	.218	.126	.093
1/2-13	50NCAG	7968-1213	.880	.860	.828	.420	.400	.120	.100	.025	.304	.092	.059

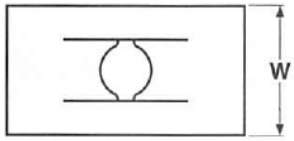
Description	A free floating square nut retained within a spring steel cage. The cage has two retaining legs on the same side of the nut, positioned 180° from each other, that hold the nut in place at panel edges or center panel locations.			
Applications/ Advantages	More economical and easier to install than other heavy duty nuts for blind side applications. Free floating nut will compensate for poorly aligned holes. The square cage design keeps the nut from rotating during tightening. Cage nuts are successfully used in heavy duty farm machinery, rail cars, home entetainment components and heating equipment among other applications.			
Material	*Steel*		*Stainless*	
	<u>Cage:</u> SAE 1050 - 1065 spring steel	<u>Nut:</u> ***6-32 thru 1/4-20:*** SAE 1108 or equivalent steel ***5/16-18 & 3/8-16:*** SAE 1018 or equivalent steel ***1/2-13:*** SAE 1108 or equivalent steel	<u>Cage:</u> Class 304 3/4-hard stainless steel	<u>Nut:</u> Class 304 J3 stainless steel
Heat Treatment	Parts are quenched from the proper austentizing temperature directly into a salt bath at between 590°F and 710°F. Parts are held at this quench temperature for a recommended period. Parts are then removed from the salt quenched and air cooled to room temperature.		-	
Hardness	Rockwell C 44 - 51		-	
Plating	Steel Cage nuts are typically supplied with a zinc plating.		Stainless Cage nuts are usually supplied plain.	

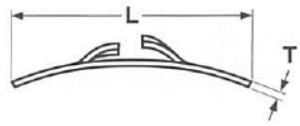
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SPRING NUTS

Flat Type

TINNERMAN® NUT ALTERNATIVES





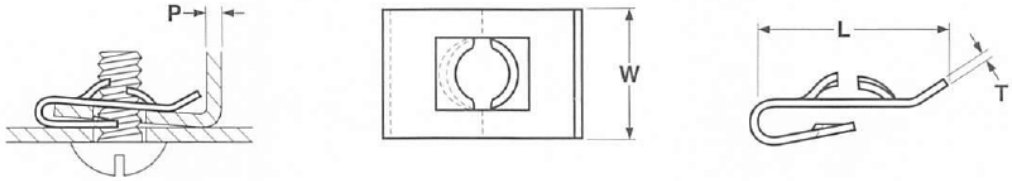
STEEL SPRING NUTS FLAT TYPE						Tinnerman®.*, SAE J891
Industry Part Number	Screw Size	L	W	T	PERMORMANCE DATA	
		Length	Width	Material Thickness	Recommended Installation Torque (lb.-in.)	Ultimate Tensile Strength (lb.)
					Max	Min
C105SS-440-4	4-40	.44	.25	.012	3	100
C430-1032-4	10-32	.75	.44	.017	-	-
C7000-4-4	4A or B	.38	.25	.022	9	300
C7000-632-4	6-32	.44	.28	.017	6	155
C7000-6-4	6A or B	.50	.31	.025	12	500
C7000-832-4	8-32	.50	.31	.017	8	200
C7000-8-4	8A or B	.63	.41	.028	20	620
C1150-1024	10-24	.73	.44	.022	14	315
C7000-1024-4	10-24	.63	.38	.022	14	315
C7000-10-4	10A or B	.75	.50	.031	35	1000
C7000-1420	1/4-20	.75	.50	.025	35	570

Description	A one piece, self-locking fastener made of spring steel. The perimeter of the nut is rectangular in shape. Some variations have an arched base and/or corners which are trimmed or turned.
Applications/ Advantages	It reduces inventories by eliminating need for lockwashers and spanners. Its single thread engagement design makes it easy to apply and remove. Parts are reusable. Provides the correct amount of spring tension without damaging enamel, glass or porcelain surfaces.
Material	SAE 1050 or higher carbon steel, with the exception of part# C105SS-440-4 which is made of stainless steel.
Hardness (Steel)	For material thickness 0.017-0.024 in., Rockwell 30N C40 minimum, C50 maximum. For material thickness 0.025-0.039 in., Rockwell 45N C40 minimum, C50 maximum.
Plating	See Appendix-A for information on the plating of steel spring nuts.

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J-Type SPRING NUTS

TINNERMAN® NUT ALTERNATIVES



STEEL SPRING NUTS "J" TYPE

Tinnerman® & SAE J891

Industry Part Number	Screw Size	P	L	W	D	T	PERFORMANCE DATA	
		Panel Range	Length	Width	Distance Center of Hole to Edge	Material Thickness	Recommended Installation Torque (lb.-in.)	Ultimate Tensile Strength (lb.)
					Max		Max	Min
C8019-632-4	6/32	.025-.040	.47	.50	.218	.017	6	156
C8020-632-4	6/32	.045-.062	.47	.50	.218	.017	6	156
C8022-632-4	6/32	.045-.062	.63	.31	.296	.017	6	156
C8023-632-4	6/32	.025-.040	.81	.31	.468	.017	6	156
C8024-632-4	6/32	.045-.062	.81	.31	.468	.017	6	156
C8025-6-4	6A or B	.025-.040	.47	.50	.218	.025	12	425
C8026-6-4	6A or B	.045-.062	.47	.50	.218	.025	12	425
C8029-6-4	6A or B	.025-.040	.81	.31	.468	.025	12	425
C8030-6-4	6A or B	.045-.062	.81	.31	.468	.025	12	425
C8031-832-4	8/32	.025-.040	.53	.50	.234	.017	8	189
C8032-832-4	8/32	.045-.062	.52	.50	.234	.017	8	189
C8035-832-4	8/32	.025-.040	.87	.41	.514	.017	8	189
C8036-832-4	8/32	.045-.062	.87	.41	.514	.017	8	189
C8037-8-4	8A or B	.025-.045	.53	.50	.234	.028	20	534
C8038-8-4	8A or B	.045-.062	.53	.50	.234	.028	20	534
C8041-8-4	8A or B	.025-.040	.87	.41	.515	.028	20	534
C8042-8-4	8A or B	.045-.062	.86	.41	.515	.028	20	534
C8043-1024-4	10/24	.025-.040	.59	.63	.203	.022	14	274
C8044-1024-4	10/24	.045-.062	.59	.63	.203	.022	14	274
C8045-1024-4	10/24	.025-.040	.79	.38	.359	.022	14	274
C8047-1024-4	10/24	.025-.040	.97	.35	.562	.022	14	274
C8048-1024-4	10/24	.045-.062	.97	.38	.562	.022	14	274
C8043-1032-4	10/32	.025-.040	.59	.63	.203	.017	-	-
C8049-10-4	10A or B	.025-.040	.58	.63	.250	.031	35	672
C8050-10-4	10A or B	.045-.062	.58	.63	.250	.031	35	672
C8053-10-4	10A or B	.025-.040	.97	.50	.562	.031	35	672
C8054-10-4	10A or B	.045-.062	.97	.50	.562	.031	35	672
C7740-1420-4	1/4-20	.075-.094	1.10	.625	.687	.025	35	570

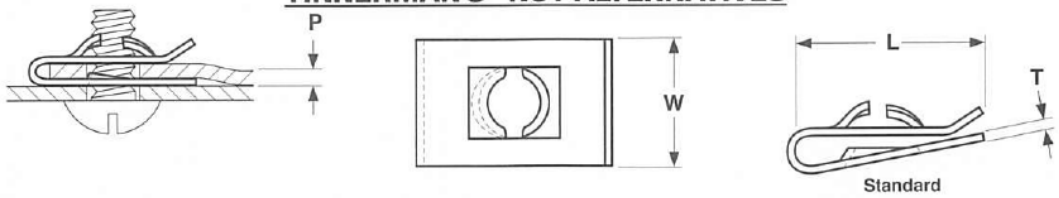
Description	A self-retaining spring steel fastener manufactured in the shape of a "J", enabling it to snap into place over the edge of a panel and hold its position.
Applications/ Advantages	Same advantages as a flat-type spring nut, but more versatile. Can reduce assembly time by eliminating such steps as welding and riveting. Nut surface will accept paint without clogging inside the thread.
Material	SAE 1050 or higher carbon steel.
Hardness	For material thickness 0.017-0.024 in., Rockwell 30N C40 minimum, C50 maximum. For material thickness 0.025-0.039 in., Rockwell 45N C40 minimum, C50 maximum.
Plating	See Appendix-A for information about the plating of steel spring nuts.

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SPRING NUTS

U-Type

TINNERMAN® NUT ALTERNATIVES



STEEL SPRING NUTS "U" TYPE

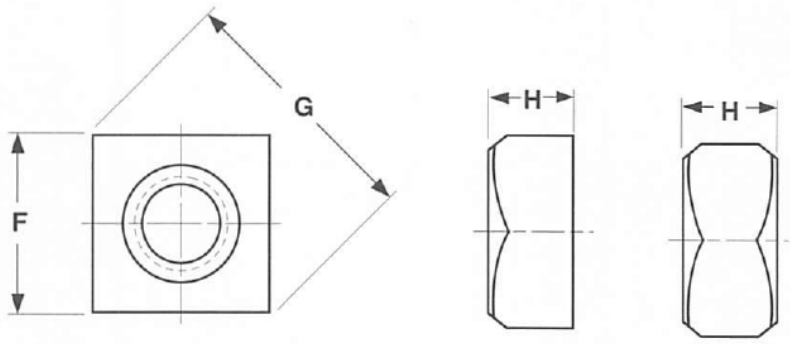
SAE J891, Tinnerman® Palnut

Industry Part Number	Screw Size	P	L	W	D	T	PERFORMANCE DATA	
		Panel Range	Length	Width	Distance Center of Hole to Edge	Material Thickness	Recommended Installation Torque (lb.-in.)	Ultimate Tensile Strength (lb.)
					Max		Max	Min
C8090-632-4	6-32	.025-.040	.48	.50	.218	.017	6	156
C8091-632-4	6-32	.045-.062	.48	.50	.218	.017	6	156
C8092-632-4	6-32	.025-.040	.64	.31	.296	.017	6	156
C8093-632-4	6-32	.045-.062	.65	.31	.296	.017	6	156
C8094-632-4	6-32	.025-.040	.82	.31	.468	.017	6	156
C8095-632-4	6-32	.045-.062	.82	.31	.468	.017	6	156
C8096-6-4	6A or B	.025-.040	.48	.50	.218	.025	12	425
C8097-6-4	6A or B	.045-.062	.47	.50	.218	.025	12	425
C8099-6-4	6A or B	.045-.062	.65	.31	.296	.025	12	425
C8100-6-4	6A or B	.025-.040	.81	.31	.468	.025	12	425
C8102-832-4	8-32	.025-.040	.52	.50	.234	.017	8	189
C8103-832-4	8-32	.045-.062	.52	.50	.234	.017	8	189
C8104-832-4	8-32	.025-.040	.69	.41	.328	.017	8	189
C8105-832-4	8-32	.045-.062	.67	.41	.328	.017	8	189
C8106-832-4	8-32	.025-.040	.86	.41	.515	.017	8	189
C8107-832-4	8-32	.045-.062	.87	.41	.515	.017	8	189
C14783-832-4	8-32	.051-.064	.46	.50	.187	.017	8	189
C8108-8-4	8A or B	.025-.040	.52	.50	.234	.028	20	534
C8109-8-4	8A or B	.045-.062	.52	.50	.234	.028	20	534
C8110-8-4	8A or B	.025-.040	.69	.41	.328	.028	20	534
C8112-8-4	8A or B	.025-.040	.85	.41	.515	.028	20	534
C8113-8-4	8A or B	.045-.062	.86	.41	.515	.028	20	534
C8114-1024-4	10-24	.025-.040	.58	.63	.203	.022	14	274
C8115-1024-4	10-24	.045-.062	.56	.63	.250	.022	14	274
C8116-1024-4	10-24	.025-.040	.76	.38	.359	.022	14	274
C8117-1024-4	10-24	.045-.062	.76	.38	.359	.022	14	274
C8118-1024-4	10-24	.025-.040	.95	.38	.562	.022	14	274
C8119-1024-4	10-24	.045-.062	.95	.38	.562	.022	14	274
C8120-10-4	10A or B	.025-.040	.56	.63	.250	.031	35	672
C8121-10-4	10A or B	.045-.062	.56	.63	.250	.031	35	672
C8123-10-4	10A or B	.045-.062	.76	.50	.359	.031	35	672
C8124-10-4	10A or B	.025-.040	.96	.50	.562	.031	35	672
C8125-10-4	10A or B	.045-.062	.95	.50	.562	.031	35	672
C1303-1420-4	1/4-20	.064-.125	.97	.50	.500	.025	35	570
C7343-1420-4	1/4-20	.062-.125	.96	.50		.025	35	570

Description	A self-retaining spring steel nut manufactured in the shape of a "U", enabling it to snap into place over the edge of a panel and hold its position.
Applications/ Advantages	Same advantages as a J-Type nut, but used where the lower leg of the spring nut requires full bearing.
Material	SAE 1050 or higher carbon steel.
Hardness	For material thickness 0.017-0.024 in., Rockwell 30N C40 minimum, C50 maximum. For material thickness 0.025-0.039 in., Rockwell 45N C40 minimum, C50 maximum.
Plating	See Appendix-A for information on the plating of steel spring nuts.

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SQUARE — Heavy Style



Heavy Square Nuts

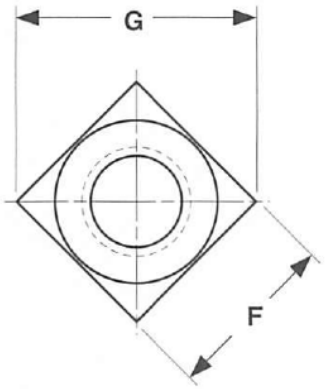
ANSI/ASME B18.2.2

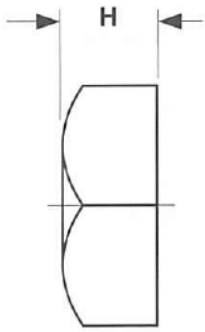
Nominal Size or Basic Major Diameter of Thread		F		G		H	
		Width Across Flats		Width Across Corners		Thickness	
		Max	Min	Max	Mln	Max	Min
1/4	0.2500	0.500	0.488	0.707	0.640	0.266	0.218
5/16	0.3125	0.562	0.546	0.795	0.720	0.330	0.280
3/8	0.3750	0.688	0.669	0.973	0.889	0.393	0.341
7/16	0.4375	0.750	0.728	1.060	0.970	0.456	0.403
1/2	0.5000	0.875	0.850	1.237	1.137	0.520	0.464
5/8	0.6250	1.062	1.031	1.503	1.386	0.647	0.587
3/4	0.7500	1.250	1.212	1.768	1.635	0.774	0.710
7/8	0.8750	1.438	1.394	2.033	1.884	0.901	0.833
1	1.0000	1.625	1.575	2.298	2.132	1.028	0.956
1-1/8	1.1250	1.812	1.756	2.563	2.381	1.155	1.079
1-1/4	1.2500	2.000	1.938	2.828	2.631	1.282	1.187
1-3/8	1.3750	2.188	2.119	3.094	2.879	1.409	1.310
1-1/2	1.5000	2.375	2.300	3.359	3.128	1.536	1.433

Description	A four-sided, internally threaded fastener with a washer-faced top side, and a flat or chamfered bottom. They are wider and thicker than regular square nuts.
Applications/ Advantages	For use with A307 Grade A or Grade B bolts.
Material	Nuts shall be made from a carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.58% maximum; ***Phosphorus***: 0.13% maximum
Hardness	Rockwell B68 - C32
Proof Load	***Plain or Zinc-Plated:*** 90,000 psi.; ***Hot-Dip Galvanized***: 68,000 psi.
Plating	See Appendix-A for plating information.

Regular Style

SQUARE





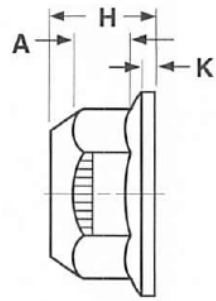
Regular Square Nuts

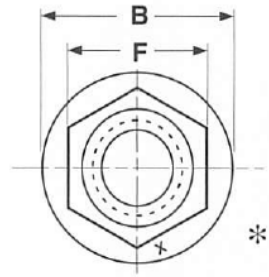
ASME B18.2.2

Nominal or Basic Major Diameter of Thread		F			G		H		
		Width Across Flats			Width Across Corners		Thickness		
		Basic	Max	Min	Max	Min	Basic	Max	Min
1/4	0.2500	7/16	0.438	0.425	0.619	0.554	7/32	0.235	0.203
5/16	0.3125	9/16	0.562	0.547	0.795	0.721	17/64	0.283	0.249
3/8	0.3750	5/8	0.625	0.606	0.884	0.802	21/64	0.346	0.310
7/16	0.4375	3/4	0.750	0.728	1.061	0.970	3/8	0.394	0.356
1/2	0.5000	13/16	0.812	0.788	1.149	1.052	7/16	0.458	0.418
5/8	0.6250	1	1.000	0.969	1.414	1.300	35/64	0.569	0.525
3/4	0.7500	1-1/8	1.125	1.088	1.591	1.464	21/32	0.680	0.632
7/8	0.8750	1-5/16	1.312	1.269	1.856	1.712	49/64	0.792	0.740
1	1.0000	1-1/2	1.500	1.450	2.121	1.961	7/8	0.903	0.847
1-1/8	1.1250	1-11/16	1.688	1.631	2.386	2.209	1	1.030	0.970
1-1/4	1.2500	1-7/8	1.875	1.812	2.652	2.458	1-3/32	1.126	1.062
1-1/2	1.5000	2-1/4	2.250	2.175	3.182	2.956	1-5/16	1.348	1.276

Description	A four-sided, internally threaded fastener with a flat bottom side and a chamfered, washer-crowned top.
Applications/ Advantages	Designed for use with square bolts.
Material	Nuts shall be made from a low carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.55% maximum; ***Phosphorus***: 0.12% maximum; ***Sulfur***: 0.23% maximum.
Core Hardness	Rockwell B68 - C32
Proof Load	90,000 psi.
Plating	See Appendix-A for plating information.

STOVER®-EQUIVALENT LOCK — Grade C & G





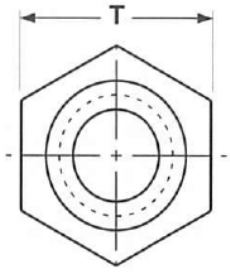
GRADE G FLANGE STYLE LOCK NUTS — RB&W Corp

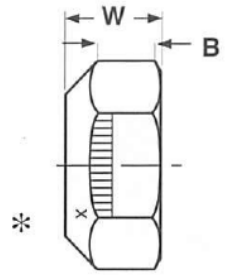
Nominal Size in Inches	F			B	H		A	K
	Width Across Flats			Flange Diameter	Overall Thickness		Hex Height	Flange Thickness
	Nom	Max	Min	Max	Max	Min	Min	Min
1/4	7/16	0.4385	0.428	0.560	0.300	0.265	0.140	0.04
5/16	1/2	0.5020	0.489	0.680	0.365	0.320	0.170	0.05
3/8	9/16	0.5645	0.551	0.810	0.425	0.420	0.200	0.06
7/16	11/16	0.6895	0.675	0.930	0.495	0.482	0.230	0.07
1/2	3/4	0.7520	0.736	1.070	0.555	0.550	0.260	0.08
5/8	15/16	0.9395	0.922	1.330	0.690	0.685	0.320	0.10
3/4	1-1/8	1.1270	1.088	1.585	0.825	0.810	0.380	0.11

Description	***Grade-C Automation Lock Nut:*** An all-metal, one-piece hex nut which derives its prevailing torque characteristics from controlled distortion of its top threads from their normal helical form to a more elliptical shape. ***Grade-G Flange Style Automation Lock Nut:*** Similar to Grade-C but with a flange on the bottom side of the nut.
Applications/ Advantages	***Grade-C:*** These nuts are reusable and can withstand temperatures of up to 450°F. Can withstand severe vibration and shock loads. Frequently used in farm machinery, plus the automotive and related metalworking industries. ***Grade-G:*** Has a lower, more uniform bearing stress to clamp force ratio. This style reduces inventory (by eliminating a washer) and in-place cost. It is designed to be used specifically, but not exclusively, with grade-8 frame bolts.
Material	C1022 - 1045 steel.
Heat Treatment	Nuts are heat treated to the austenitizing temperature of the material of which the nut is made, quenched in a proper medium to obtain a predominately martensitic microstructure, and tempered to the specified hardness.
Hardness	***1/4 through 5/8 in.:*** Rockwell C24 - C32 ***3/4 through 1 in.:*** Rockwell C26 - C34 ***1-1/8 through 2 in.:*** Rockwell C26 - C36
Proof Load	150,000 psi.
Plating	See Appendix-A for plating information.

*Product standards require all grade-marked nuts 1/4" diameter and larger to have a raised or depressed insignia identifying its manufacturer. "X" represents one location such a marking may appear.

Grade C STOVER®-EQUIVALENT LOCK

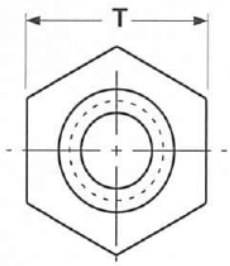


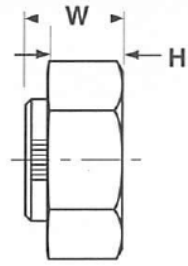


Grade C Automation Style Lock Nuts

RB&W Corp.

Nominal Size in Inches	T			W		B
	Width Across Flats			Overall Thickness		Hex Height
	Nom	Max	Min	Max	Min	Min
1/4	7/16	0.4385	0.428	0.226	0.212	0.145
5/16	1/2	0.5020	0.489	0.273	0.258	0.166
3/8	9/16	0.5645	0.551	0.337	0.320	0.198
7/16	11/16	0.6895	0.675	0.385	0.365	0.223
1/2	3/4	0.7520	0.736	0.448	0.427	0.262
9/16	7/8	0.8770	0.861	0.496	0.473	0.286
5/8	15/16	0.9395	0.922	0.559	0.535	0.329
3/4	1-1/8	1.1270	1.088	0.665	0.617	0.382
7/8	1-5/16	1.3145	1.2690	0.776	0.724	0.450
1	1-1/2	1.5020	1.4500	0.887	0.831	0.513





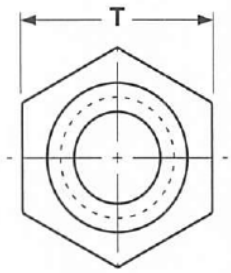
Grade C Hex Collar Lock Nuts

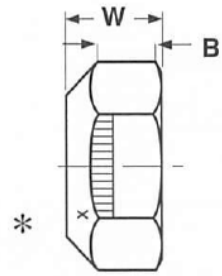
RB&W Corp.

Nominal Size in Inches	T		W		H	
	Width Across Flats		Overall Thickness		Hex Height	
	Max	Min	Max	Min	Max	Min
1-1/8	1.688	1.631	0.999	0.939	0.657	0.636
1-1/4	1.875	1.812	1.094	1.030	0.719	0.698
1-3/8	2.062	1.994	1.206	1.138	0.793	0.771
1-1/2	2.250	2.175	1.317	1.245	0.865	0.843
1-3/4	2.625	2.538	1.540	1.460	1.012	0.989
2	3.000	2.900	1.763	1.675	1.158	1.134

*Product standards require all grade-marked nuts 1/4" diameter and larger to have a raised or depressed insignia identifying its manufacturer. "X" represents one location such a marking may appear.

STOVER®-EQUIVALENT LOCK — Grade B





Grade B Automation Style Lock Nuts

RB&W Corp.

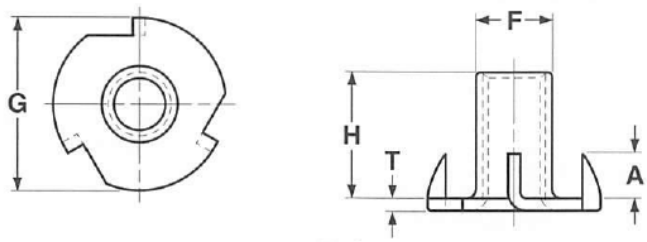
Nominal Size in Inches	T			W		B
	Width Across Flats			Overall Thickness		Hex Height
	Nom	Max	Min	Max	Min	Min
1/4	7/16	0.4385	0.428	0.257	0.243	0.145
5/16	1/2	0.5020	0.489	0.302	0.292	0.166
3/8	9/16	0.5645	0.551	0.377	0.360	0.198
7/16	11/16	0.6895	0.675	0.430	0.410	0.223
1/2	3/4	0.7520	0.736	0.510	0.490	0.262
5/8	15/16	0.9395	0.922	0.645	0.621	0.329
3/4	1-1/8	1.1270	1.088	0.750	0.702	0.382
7/8	1-5/16	1.3145	1.2690	0.862	0.810	0.450
1	1-1/2	1.5020	1.4500	0.958	0.902	0.513

Description	***Grade-B Automation Lock Nut:*** An all-metal, one-piece hex nut, thicker than a Grade-C across the flats, which derives its prevailing torque characteristics from controlled distortion of its top threads from their normal helical form to a more elliptical shape.
Applications/ Advantages	***Grade-B:*** These nuts are reusable and can withstand temperatures of up to 450°F. The conical-shaped top enables this nut to be used with an automatic feeder. The Grade-B can be used with low or medium carbon steel screws (i.e. a SAE Grade-2 or Grade-5).
Material	Low carbon steel.
Proof Load	120,000 psi.
Plating	See Appendix-A for plating information.

*Product standards require all grade-marked nuts 1/4" diameter and larger to have a raised or depressed insignia identifying its manufacturer. "X" represents one location such a marking may appear.

Straight Barrel— 3 Prong

TEE



3-PRONG

3-Prong T-Nuts, Straight Barrel

Part Number**	Thread Size	H Barrel Height (±1/32)	G Flange Diam. (±1/32)	F Barrel Diam. (±.015)	A Prong Height (±1/32)	T Material Thick-ness (±.015)	Drill Size	Part Number**	Thread Size	H Barrel Height (±1/32)	G Flange Diam. (±1/32)	F Barrel Diam. (± .015)	A Prong Height (±1/32)	T Material Thick-ness (± .015)	Drill Size
0402NT3	4-40	1/8	23/64	.130	3/32	.024	9/64	1406NT3	1/4-20	3/8	3/4	.305	1/4	.047	5/16
0404NT3	4-40	1/4	23/64	.141	3/32	.031	9/64	1407NT3	1/4-20	7/16	3/4	.305	5/16	.047	5/16
0604NT3	6-32	1/4	1/2	.188	1/8	.035	13/64	1408NT3	1/4-20	1/2	3/4	.305	7/32-1/4	.047	5/16
0804NT3	8-32	1/4	23/32	.208	7/32	.030	7/32	1409NT3	1/4-20	9/16	3/4	.305	7/32	.047	5/16
0805NT3	8-32	5/16	3/4	.208	1/4	.035	7/32	3105NT3	5/16-18	5/16	7/8	.360	9/32	.047	3/8
1004NT3	10-24	1/4	3/4	.243	5/32	.039	1/4	3106NT3	5/16-18	3/8	7/8	.390	1/4	.063	25/64
1005NT3	10-24	5/16	3/4	.243	7/32	.040	1/4	3107NT3	5/16-18	7/16	7/8	.390	1/4	.063	13/32
1007NT3	10-24	7/16	3/4	.243	5/16	.040	1/4	3108NT3	5/16-18	1/2	7/8	.360	1/4	.063	3/8
1105NT3	10-32	5/16	3/4	.243	7/32	.040	1/4	3110NT3	5/16-18	5/8	7/8	.390	5/16	.063	25/64
1106NT3	10-32	3/8	3/4	.243	1/4	.040	1/4	3705NT3	3/8-16	5/16	1	.420	9/32	.063	27/64
1107NT3	10-32	7/16	3/4	.243	5/16	.040	1/4	3707NT3	3/8-16	7/16	1	.440	11/32	.063	29/64
1404NT3	1/4-20	1/4	3/4	.305	3/16	.047	5/16	3710NT3	3/8-16	5/8	1	.440	9/32	.063	29/64
1405NT3	1/4-20	5/16	3/4	.305	7/32	.047	5/16								

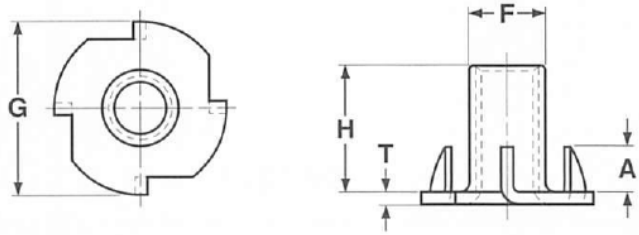
**Last digit of part number denotes number of prongs.

Description	Internally threaded barrel-shaped fasteners integrally formed with a flat base, which has prong-type projections extending perpendicular from the base aside the barrel.
Applications/ Advantages	Used for fastening metal to products made of wood, particle board or plastic. The 3-prong style is used in harder materials to minimize splitting of the mating surface.
Material	C1004-10 low-carbon steel.
Plating	See Appendix-A for plating information.

NOTE: There is no single standard forT-nut dimensions. These values are offered as a guide; deviations from these specifications may occur.

TEE

Straight Barrel— 4 Prong



4-PRONG

T-Nuts, Straight Barrel

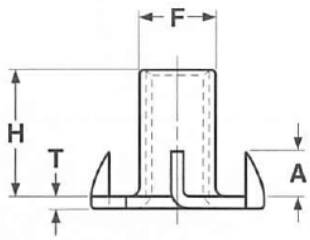
Part Number**	Thread Size	H Barrel Height (±1/32)	G Flange Diam. (±1/32)	F Barrel Diam. (±.015)	A Prong Height (±1/32)	T Material Thick-ness (±.015)	Drill Size	Part Number**	Thread Size	H Barrel Height (±1/32)	G Flange Diam. (±1/32)	F Barrel Diam. (± .015)	A Prong Height (±1/32)	T Material Thick-ness (± .015)	Drill Size
0604NT4	6-32	1/4	1/2	.188	1/8	.035	13/64	1407NT4	1/4-20	7/16	3/4	.305	1/4	.047	5/16
0804NT4	8-32	1/4	23/32	.208	3/16	.031	7/32	1408NT4	1/4-20	1/2	3/4	.305	7/32	.047	5/16
0805NT4	8-32	5/16	3/4	.208	1/4	.035	7/32	1409NT4	1/4-20	9/16	3/4	.305	1/4	.047	5/16
0806NT4	8-32	3/8	3/4	.208	1/4	.035	7/32	1410NT4	1/4-20	5/8	3/4	.306	1/4	.047	5/16
0807NT4	8-32	7/16	3/4	.208	1/4	.035	7/32	3105NT4	5/16-18	5/16	7/8	.360	9/32	.047	3/8
1005NT4	10-24	5/16	3/4	.243	7/32	.040	1/4	3106NT4	5/16-18	3/8	7/8	.390	1/4	.063	25/64
1007NT4	10-24	7/16	23/32	.243	7/32	.040	1/4	3107NT4	5/16-18	7/16	7/8	.360	1/4	.047	3/8
1105NT4	10-32	5/16	3/4	.243	7/32	.040	1/4	3108NT4	5/16-18	1/2	7/8	.390	1/4	.063	13/32
1106NT4	10-32	3/8	3/4	.243	1/4	.043	1/4	3110NT4	5/16-18	5/8	7/8	.375-.390	1/4-5/16	.060-.063	3/8, 25/64
1107NT4	10-32	7/16	3/4	.243	7/32	.043	1/4	3705NT4	3/8-16	5/16	1	.440	9/32	.063	27/64
1404NT4	1/4-20	1/4	3/4	.305	7/32	.047	5/16	3707NT4	3/8-16	7/16	1	.440	11/32	.063	29/64
1405NT4	1/4-20	5/16	3/4	.305	7/32	.047	5/16	3710NT4	3/8-16	5/8	1	.440	5/16	.063	29/64
1406NT4	1/4-20	3/8	3/4	.305	7/32	.047	5/16								

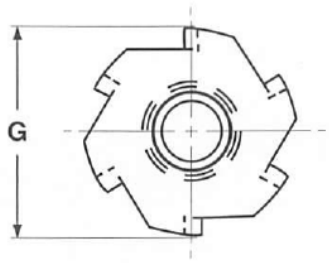
**Last digit of part number denotes number of prongs.

Description	Internally threaded barrel-shaped fasteners integrally formed with a flat base, which has prong-type projections extending perpendicular from the base aside the barrel.
Applications/ Advantages	Used for fastening metal to products made of wood, particle board or plastic. Four prong tee-nuts can be used in hard or soft woods.
Material	C1004-10 low-carbon steel.
Plating	See Appendix-A for plating information.

NOTE: There is no single standard forT-nut dimensions. These values are offered as a guide; deviations from these specifications may occur.

Straight Barrel— 6 Prong





6-PRONG

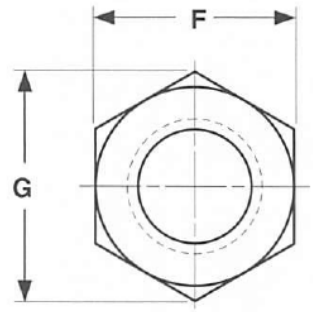
T-Nuts, Straight Barrel with 6-Prongs

Part Number**	Thread Size	H Barrel Height (±1/32)	G Flange Diam. (±1/32)	F Barrel Diam. (±.015)	A Prong Height (±1/32)	T Material Thick-ness (±.015)	Drill Size	Part Number**	Thread Size	H Barrel Height (±1/32)	G Flange Diam. (±1/32)	F Barrel Diam. (± .015)	A Prong Height (±1/32)	T Material Thick-ness (± .015)	Drill Size
1404NT6	1/4-20	1/4	3/4	.305	3/16	.047	5/16	1407NT6	1/4-20	7/16	3/4	.305	7/32	.047	5/16
1405NT6	1/4-20	5/16	3/4	.305	7/32	.047	5/16	1409NT6	1/4-20	9/16	3/4	.305	7/32	.047	5/16

Description	Internally threaded barrel-shaped fasteners integrally formed with a flat base, which has six prong-type projections extending perpendicular from the base aside the barrel.
Applications/ Advantages	*6-Prong:* Used in soft woods including particle board, plywood and soft plastics
Material	C1004-10 low-carbon steel.
Plating	See Appendix-A for plating information.

THICK HEX — Grade 9





THICK HEX NUTS

ASME B18.2.2--2010

Nominal or Basic Major Diameter of Thread		F			G		H		
		Width Across Flats			Width Across Corners		Thickness of Hex Nuts		
		Basic	Max	Min	Max	Min	Basic	Max	Min
1/4	0.2500	7/16	0.438	0.428	0.505	0.488	9/32	0.288	0.274
5/16	0.3125	1/2	0.500	0.489	0.577	0.557	21/64	0.336	0.320
3/8	0.3750	9/16	0.562	0.551	0.650	0.628	13/32	0.415	0.398
7/16	0.4375	11/16	0.688	0.675	0.794	0.768	29/64	0.463	0.444
1/2	0.5000	3/4	0.750	0.736	0.866	0.840	9/16	0.573	0.552
9/16	0.5625	7/8	0.875	0.861	1.010	0.982	39/64	0.621	0.598
5/8	0.6250	15/16	0.938	0.922	1.083	1.051	23/32	0.731	0.706
3/4	0.7500	1-1/8	1.125	1.088	1.299	1.240	13/16	0.827	0.798
7/8	0.8750	1-5/16	1.312	1.269	1.516	1.447	29/32	0.922	0.890

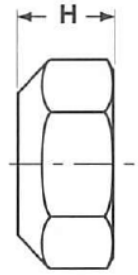


GRADE-9

Description	A thick hex nut made from steel with a maximum carbon content of 0.55%, a minimum manganese content of 0.60% and a maximum sulfur content of 0.05%. Nuts are thicker than heavy hex nuts of the same nominal size.
Applications/ Advantages	For use with bolts with a minimum tensile strength equal to or less than 180,000 psi..
Material	Nuts shall be made from a steel which conforms to the following chemical composition requirements: ***Carbon***: 0.20-0.55%; ***Manganese***: 0.60% minimum; ***Phosphorous***: 0.04% maximum; ***Sulfur***: 0.05% maximum
Hardness	1/4 through 5/8 in.: Rockwell C32 - C38 3/4 and 7/8 in.: Rockwell C35 - C40
Proof Load	180,000 psi.
Plating	EcoGuard™ 1000-hour gray/silver coating

Grade 9 TOP LOCK



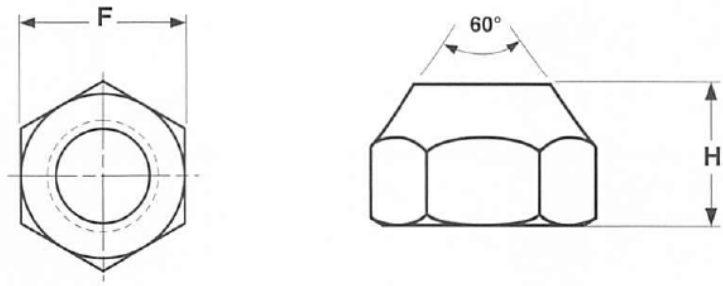


GRADE 9 TOP LOCK NUTS

Nominal Size in Inches	T			H	
	Width Across Flats			Overall Thickness	
	Nom	Max	Min	Max	Min
1/4	7/16	0.438	0.428	0.288	0.274
5/16	1/2	0.500	0.489	0.336	0.320
3/8	9/16	0.562	0.551	0.415	0.398
7/16	11/16	0.688	0.675	0.463	0.444
1/2	3/4	0.750	0.736	0.573	0.542
9/16	7/8	0.875	0.861	0.621	0.575
5/8	15/16	0.938	0.922	0.731	0.625
3/4	1-1/8	1.125	1.088	0.827	0.735
7/8	1-5/16	1.312	1.269	0.922	0.823
1	1-1/2	1.500	1.450	1.023	1.003
1 1/8	1-5/8	1.687	1.631	1.181	1.161
1 1/4	1-7/8	1.875	1.812	1.277	1.257
1 1/2	2-1/4	2.250	2.175	1.531	1.511

Description	An all-metal, one-piece hex nut which derives its prevailing torque characteristics from controlled distortion of its top threads from their normal helical form to a more elliptical shape.
Applications/ Advantages	Designed specifically to be used with bolts with a minimum tensile strength equal to or less than 180,000 psi..
Material	Medium carbon or alloy steel
Hardness	1/4 through 5/8 in.: Rockwell C32 - C38 3/4 and 7/8 in.: Rockwell C35 - C40
Proof Load	180,000 psi.
Plating	EcoGuard™ 1000-hour gray/silver coating

WHEEL, RIGHT-HAND — Steel

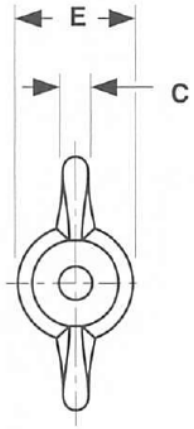


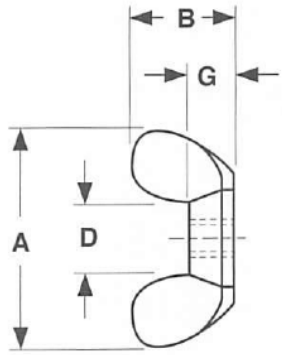
Wheel Nuts						
Nominal Size or Basic Major Diameter of Thread		F		G		H
		Width Across Flats		Width Across Corners		Thickness
		Max	Min	Max	Min	Max
7/16-20 x 9/16	0.4375	0.752	0.736	0.866	0.840	0.573
1/2-20 x 9/16	0.5000	0.752	0.736	0.866	0.840	0.573
1/2-20 x 5/8	0.5000	0.814	0.798	0.932	0.905	0.636

Description	A six-sided, internally threaded fastener that has chamfered corners at one end and a conical top on the opposite side.
Applications / Advantages	Primary use is as a lug nut for attaching wheels to the threaded studs of an auto's wheel assembly.
Material	Low carbon steel
Plating	Nuts are usually supplied with a zinc finish.

Cold Forged

WING NUTS





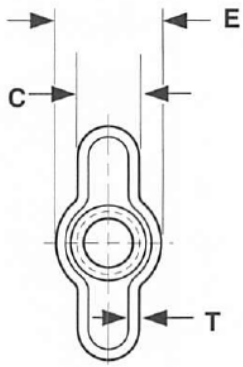
WING NUTS - COLD FORGED (TYPE-A)

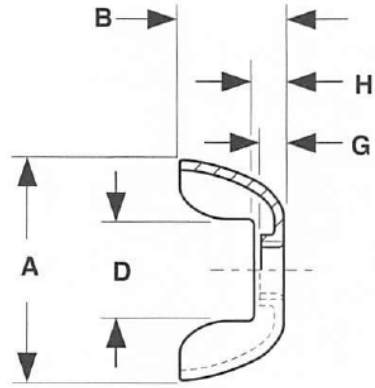
ASME B18.6.9-2010

Nominal Size or Basic Major Diameter of Thread		Threads Per Inch	A		B		C		D		E		G	
			Wing Spread		Wing Height		Wing Thickness		Between Wings		Boss Diameter		Boss Height	
			Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4	0.1120	40 & 48	0.72	0.59	0.41	0.28	0.11	0.07	0.21	0.17	0.33	0.29	0.14	0.10
6	0.1380	32 & 40	0.72	0.59	0.41	0.28	0.11	0.07	0.21	0.17	0.33	0.29	0.14	0.10
8	0.1640	32 & 36	0.91	0.78	0.47	0.34	0.14	0.10	0.27	0.22	0.43	0.39	0.18	0.14
10	0.1900	24 & 32	0.91	0.78	0.47	0.34	0.14	0.10	0.27	0.22	0.43	0.39	0.18	0.14
12	0.2160	24 & 28	1.10	0.97	0.57	0.43	0.18	0.14	0.33	0.26	0.50	0.45	0.22	0.17
1/4	0.2500	20 & 28	1.10	0.97	0.57	0.43	0.18	0.14	0.33	0.26	0.50	0.45	0.22	0.17
5/16	0.3125	18 & 24	1.25	1.12	0.66	0.53	0.21	0.17	0.39	0.32	0.58	0.51	0.25	0.20
3/8	0.3750	16 & 24	1.44	1.31	0.79	0.65	0.24	0.20	0.48	0.42	0.70	0.64	0.30	0.26
7/16	0.4375	14 & 20	1.94	1.81	1.00	0.87	0.33	0.26	0.65	0.54	0.93	0.86	0.39	0.35
1/2	0.5000	13 & 20	1.94	1.81	1.00	0.87	0.33	0.26	0.65	0.54	0.93	0.86	0.39	0.35
5/8	0.6250	11 & 18	2.76	2.62	1.44	1.31	0.40	0.34	0.90	0.80	1.19	1.13	0.55	0.51
3/4	0.7500	10 & 16	2.76	2.62	1.44	1.31	0.40	0.34	0.90	0.80	1.19	1.13	0.55	0.51

Description	A nut with wings which allows the part to be manually turned.
Applications/ Advantages	Used when a part is frequently assembled and disassembled at a place where torque greater than that achieved with finger pressure is not needed.
Material	***Steel:*** Carbon steel adaptable to the cold-forging process. ***Stainless:*** 18-8 stainless steel.
Plating	See Appendix-A for information about plating steel wing screws.

WING NUTS — Stamped





WING NUTS - STAMPED (TYPE-D)

ASME B18.6.9-2010*

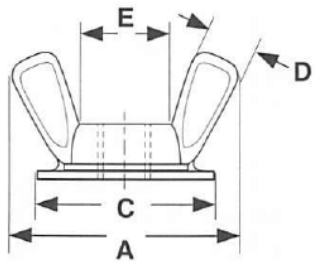
Nominal Size or Basic Major Diameter of Thread		Threads Per Inch	A		B		C		D	E		G	H	T	
			Wing Spread		Wing Height		Wing Thickness		Between Wings	Boss Diameter		Boss Height	Wall Height	Stock Thickness	
			Max	Min	Max	Min	Max	Min	Min	Max	Min	Min	Min	Max	Min
4	0.1120	40	0.76	0.73	0.39	0.37	0.16	0.13	0.23	0.39	0.36	0.07	0.12	0.04	0.02
6	0.1380	32	0.78	0.72	0.40	0.34	0.18	0.14	0.25	0.41	0.35	0.08	0.12	0.04	0.03
8	0.1640	32 & 36	0.78	0.72	0.40	0.34	0.18	0.14	0.25	0.41	0.35	0.08	0.12	0.04	0.03
10	0.1900	24 & 32	0.91	0.85	0.47	0.41	0.21	0.17	0.34	0.53	0.47	0.10	0.12	0.04	0.03
12	0.2160	24 & 28	1.09	1.03	0.47	0.41	0.21	0.17	0.34	0.53	0.47	0.10	0.12	0.05	0.04
1/4	0.2500	20 & 28	1.11	1.05	0.50	0.44	0.25	0.21	0.34	0.62	0.56	0.11	0.12	0.05	0.04
5/16	0.3125	18 & 24	1.30	1.24	0.59	0.53	0.30	0.26	0.46	0.73	0.67	0.14	0.18	0.06	0.05
3/8	0.3750	16 & 24	1.41	1.34	0.67	0.61	0.34	0.30	0.69	0.83	0.77	0.16	0.18	0.06	0.05
7/16	0.4375	14	1.75	1.72	0.67	0.64	0.30	0.27	0.73	1.00	0.97	0.19	0.20	0.07	0.04
1/2	0.5000	13	1.75	1.72	0.67	0.64	0.30	0.27	0.73	1.00	0.97	0.19	0.20	0.07	0.04

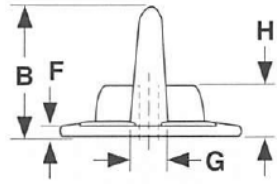
*ASME B18.6.9 does not specify dimensions for #4, 7/16, and 1/2 inch diameter Type-D stamped wing nuts.

Description	A nut made from stamped sheet metal with wings of moderate height and a larger bearing surface than other wing nuts.
Applications/ Advantages	More economical than the cold-forged style but not as strong.
Material	Carbon steel
Plating	See Appendix-A for plating information.

Washer Base Zinc Alloy

WING NUTS





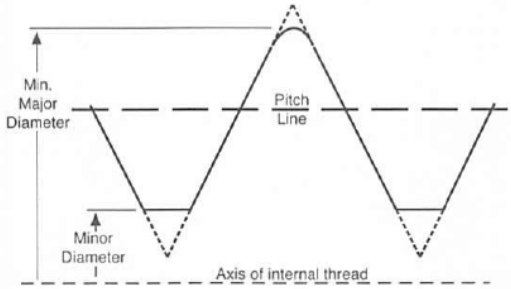
WASHER-BASED WING NUTS

Kanebridge Part Number	Dynacast Part Number	Thread Size	A Wing Spread	B Total Height	C Washer Outside Diameter	D Individual Wing Width	E Between Wings	F Washer Thickness	G Wing Thickness at Base	H Boss & Washer Height
0810NWA	232416	8-32	7/8	7/16	5/8	.207	.250	.032	.125	.182
1010NWA	232417	10-24	7/8	7/16	5/8	.207	.250	.032	.125	.182
1110NWA	232418	10-32	7/8	7/16	5/8	.207	.250	.032	.125	.182
1412NWA	232521	1/4-20	1	1/2	3/4	.234	.312	.035	.140	.205
1414NWA	232621	1/4-20	1 1/8	37/64	7/8	.260	.375	.040	.150	.225
3112NWA	232523	5/16-18	1	1/2	3/4	.234	.312	.035	.140	.205
3114NWA	232623	5/16-18	1 1/8	37/64	7/8	.260	.375	.040	.150	.225
3714NWA	232625	3/8-16	1 1/8	37/64	7/8	.260	.375	.040	.150	.225

Description	A zinc alloy nut featuring a wide-diameter, integral washer base with a recessed wing design.
Applications/ Advantages	Suitable for most wing nut applications, specifically in those where a separate flat washer would be used. Integral washer design eliminates need for other washers and speeds assembly time. Used with adjustment slots, oversized or offset holes, and soft surfaces such as wood or plastic. Popular in displays, furniture and storm windows.
Material	Nuts are made from the zinc die cast alloy Zamak #3 which conforms to the following chemical composition requirements-- ***Aluminum***: 3.5-4.3%; ***Magnesium***: 0.02-0.05%; ***Copper***: 0.25%* max.; Iron: 0.10% max.; ***Lead***: 0.005% max.; ***Cadmium***: 0.004% max.; ***Tin***: 0.003% max.; ***Zinc***: balance (*Note: Most commercial applications will accept copper content within the range of 0.25-0.75% without rejecting the product).

NOTE: There is no single standard for washer-based wing nut dimensions. These values are offered as a guide; deviations from these specifications may occur.

Class 2B INTERNAL THREADS



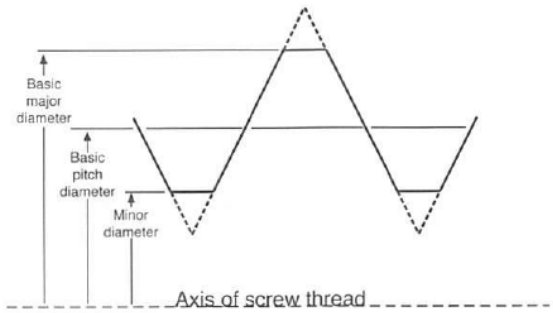
INTERNAL THREADS - CLASS 2B

ASME B1.1--2008

Nominal Size & Threads per Inch	Series Designation	Minor Diameter		Pitch Diameter			Major Diameter
		Min	Max	Min	Max	Tolerance	Min
0-80	UNF	0.0465	0.0514	0.0519	0.0542	0.0023	0.0600
1-64	UNC	0.0561	0.0623	0.0629	0.0655	0.0026	0.0730
1-72	UNF	0.0580	0.0635	0.0640	0.0665	0.0025	0.0730
2-56	UNC	0.0667	0.0737	0.0744	0.0772	0.0028	0.0860
2-64	UNF	0.0691	0.0752	0.0759	0.0786	0.0027	0.0860
3-48	UNC	0.0764	0.0845	0.0855	0.0885	0.0030	0.0990
3-56	UNF	0.0797	0.0865	0.0874	0.0902	0.0028	0.0990
4-40	UNC	0.0849	0.0939	0.0958	0.0991	0.0033	0.1120
4-48	UNF	0.0894	0.0968	0.0985	0.1016	0.0031	0.1120
5-40	UNC	0.0979	0.1062	0.1088	0.1121	0.0033	0.1250
6-32	UNC	0.104	0.114	0.1177	0.1214	0.0037	0.1380
6-40	UNF	0.1110	0.1190	0.1218	0.1252	0.0034	0.1380
8-32	UNC	0.130	0.139	0.1437	0.1475	0.0038	0.1640
8-36	UNF	0.1340	0.1420	0.1460	0.1496	0.0036	0.1640
10-24	UNC	0.145	0.156	0.1629	0.1672	0.0043	0.1900
10-32	UNF	0.156	0.164	0.1697	0.1736	0.0039	0.1900
12-24	UNC	0.171	0.181	0.1889	0.1933	0.0044	0.2160
1/4-20	UNC	0.196	0.207	0.2175	0.2224	0.0049	0.2500
1/4-28	UNF	0.211	0.220	0.2268	0.2311	0.0043	0.2500
5/16-18	UNC	0.252	0.265	0.2764	0.2817	0.0053	0.3125
5/16-24	UNF	0.267	0.277	0.2854	0.2902	0.0048	0.3125
3/8-16	UNC	0.307	0.321	0.3344	0.3401	0.0057	0.3750
3/8-24	UNF	0.330	0.340	0.3479	0.3528	0.0049	0.3750
7/16-14	UNC	0.360	0.376	0.3911	0.3972	0.0061	0.4375
7/16-20	UNF	0.383	0.395	0.4050	0.4104	0.0054	0.4375
1/2-13	UNC	0.417	0.434	0.4500	0.4565	0.0065	0.5000
1/2-20	UNF	0.446	0.457	0.4675	0.4731	0.0056	0.5000
9/16-12	UNC	0.472	0.490	0.5084	0.5152	0.0068	0.5625
9/16-18	UNF	0.502	0.515	0.5264	0.5323	0.0059	0.5625
5/8-11	UNC	0.527	0.546	0.5660	0.5732	0.0072	0.6250
5/8-18	UNF	0.565	0.578	0.5889	0.5949	0.0060	0.6250
3/4-10	UNC	0.642	0.663	0.6850	0.6927	0.0077	0.7500
3/4-16	UNF	0.682	0.696	0.7094	0.7159	0.0065	0.7500
7/8-9	UNC	0.755	0.778	0.8028	0.8110	0.0082	0.8750
7/8-14	UNF	0.798	0.814	0.8286	0.8356	0.0070	0.8750

INTERNAL THREADS

Class 2B



INTERNAL THREADS - CLASS 2B (CONTINUED)

ASME B1.1--2008

Nominal Size & Threads per Inch	Series Designation	Allowance	Minor Diameter		Pitch Diameter			Major Diameter
			Min	Max	Min	Max	Tolerance	Min
1-8	UNC	0.0020	0.865	0.890	0.9188	0.9276	0.0088	1.0000
1-14	UNS	0.0017	0.923	0.938	0.9536	0.9609	0.0073	1.0000
1 1/8-7	UNC	0.0022	0.970	0.998	1.0322	1.0416	0.0094	1.1250
1 1/8-12	UNF	0.0018	1.035	1.053	1.0709	1.0787	0.0078	1.1250
1 1/4-7	UNC	0.0022	1.095	1.123	1.1572	1.1668	0.0096	1.2500
1 1/4-12	UNF	0,0018	1.160	1.178	1.1959	1.2039	0.0080	1.2500
1 3/8-6	UNC	0.0024	1.195	1.225	1.2667	1.2771	0.0104	1.3750
1 3/8-12	UNF	0.0019	1.285	1.303	1.3209	1.3291	0.0082	1.3750
1 1/2-6	UNC	0.0024	1.320	1.350	1.3917	1.4022	0.0105	1.5000
1 1/2-12	UNF	0.0019	1.410	1.428	1.4459	1.4542	0.0083	1.5000
1 5/8-6	UN	0.0025	1.445	1.475	1.5167	1.5274	0.0107	1.6250
1 5/8-8	UN	0.0022	1.490	1.515	1.5438	1.5535	0.0097	1.6250
1 3/4-5	UNC	0.0027	1.534	1.568	1.6201	1.6317	0.0116	1.7500
1 3/4-12	UN	0.0018	1.660	1.678	1.6959	1.7037	0.0078	1.7500
2-4.5	UNC	0.0029	1.759	1.795	1.8557	1.8681	0.0124	2.0000
2-12	UN	0.0018	1.910	1.928	1.9459	1.9538	0.0079	2.0000
2 1/4-4.5	UNC	0.0029	2.009	2.045	2.1057	2.1183	0.0126	2.2500
2 1/4-12	UN	0.0018	2.160	2.178	2.1959	2.2038	0.0079	2.2500
2 1/2-4	UNC	0.0031	2.229	2.267	2.3376	2.3511	0.0135	2.5000
2 1/2-12	UN	0.0019	2.410	2.428	2.4459	2.4540	0.0081	2.5000
2 3/4-4	UNC	0.0032	2.479	2.517	2.5876	2.6013	0.0137	2.7500
2 3/4-12	UN	0.0019	2.660	2.678	2.6959	2.7040	0.0081	2.7500
3-4	UNC	0.0032	2.729	2.767	2.8376	2.8515	0.0139	3.0000
3-12	UN	0.0019	2.910	2.928	2.9459	2.9541	0.0082	3.0000
3 1/4-4	UNC	0.0033	2.979	3.017	3.0876	3.1017	0.0141	3.2500
3 1/2-4	UNC	0.0033	3.229	3.267	3.3376	3.3519	0.0143	3.5000
3 3/4-4	UNC	0.0034	3.479	3.517	3.5876	3.6021	0.0145	3.7500
4-4	UNC	0.0034	3.729	3.767	3.8376	3.8523	0.0147	4.0000

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WASHERS

LOCK WASHERS

Tooth Lock

External, Steel & Stainless 228
Internal, Steel & Stainless 229
Countersunk External 230
Combination External-Internal 231

Helical Spring Lock

High Alloy Split 232
Regular Split, Carbon Steel 232
Regular Split, Stainless 232
Hi-Collar Split 233
Heavy Split & Extra Duty Split 234

FLAT WASHERS

Dock Washers 235
USS, Low Carbon & Stainless 236
SAE, Low Carbon & Stainless 237
USS, Through-Hard 238
SAE, Through-Hard 239
USS, Extra Thick 240
SAE, Extra Thick 241
USS, Through-Hard, (Gr-9 applications) 242
SAE, Through-Hard, (Gr-9 applications) 243
Fender, Steel & Stainless 244
Fender, Extra Heavy 245
Standard Flat, 18-8 Stainless Steel 246
Standard Flat, 316 Stainless Steel 247
Type-B, Narrow Series 248
Type-B, Regular Series 249
Type-B, Wide Series 250
Machine Screw, Steel and Stainless 251

COUNTERSUNK FINISHING 252

SEALING NEO-EPDM 253

BEVELED, HARDENED STEEL 254

STRUCTURAL & SPECIALTY WASHERS

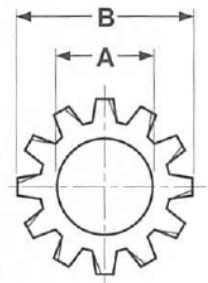
Round Structural, ASTM F436 255

Tension Indicating for Structural 256

Tension Indicating for Grade 5 & 8 257

EXTERNAL TOOTH

Steel & Stainless Lockwashers





External Tooth Lock Washers

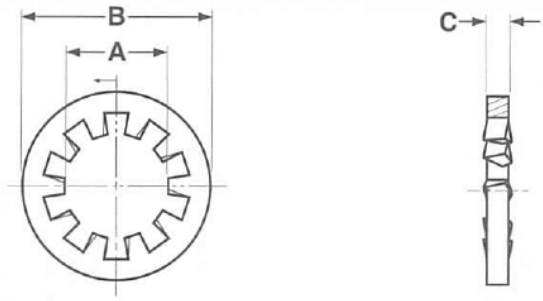
ASME B18.21.1-2009

Nominal Washer Size		A Inside Diameter		B Outside Diameter		C Thickness	
		Max	Min	Max	Min	Max	Min
#2	0.086	0.095	0.086	0.189	0.177	0.013	0.010
#3	0.099	0.109	0.102	0.235	0.220	0.016	0.010
#4	0.112	0.123	0.115	0.260	0.245	0.018	0.012
#5	0.125	0.136	0.129	0.285	0.270	0.020	0.014
#6	0.138	0.150	0.141	0.320	0.305	0.022	0.016
#8	0.164	0.176	0.168	0.381	0.365	0.023	0.018
#10	0.190	0.204	0.195	0.410	0.395	0.024	0.018
#12	0.216	0.231	0.221	0.475	0.460	0.027	0.020
1/4	0.250	0.267	0.256	0.510	0.494	0.028	0.023
5/16	0.3125	0.332	0.320	0.610	0.588	0.034	0.028
3/8	0.375	0.398	0.384	0.694	0.670	0.040	0.032
7/16	0.438	0.464	0.448	0.760	0.740	0.040	0.032
1/2	0.500	0.530	0.513	0.900	0.880	0.045	0.037
9/16	0.5625	0.596	0.576	0.985	0.960	0.045	0.037
5/8	0.625	0.663	0.641	1.070	1.045	0.050	0.042
3/4	0.750	0.795	0.768	1.260	1.220	0.055	0.047
7/8	0.875	0.927	0.897	1.410	1.380	0.060	0.052
1	1.000	1.060	1.025	1.620	1.590	0.067	0.059

Description	A hardened circular washer with twisted prongs or teeth which extend out from the outer edge of the washer.
Applications/ Advantages	This is the most preferable of all tooth-lock washers. It offers the greatest locking efficiency since the teeth are on the largest radius and provide greater torsional resistance.
Material	***Steel:*** SAE 1050 - 1065 spring steel. ***18-8 Stainless:*** SAE 301 - 305 stainless steel. ***316 Stainless:*** SAE 316 stainless steel. ***410 Stainless:*** SAE 410 stainless steel.
Hardness	***Steel:*** Rockwell C40 - 50 ***18-8 Stainless:*** Annealed 88 minimum Rockwell B, 1/4 hard through full hard Rockwell C20 - 45 ***410 Stainless:*** Rockwell C40 - 50
Plating	See Appendix-A for information on the plating of steel lock washers.

Steel & Stainless Lockwashers

INTERNAL TOOTH



INTERNAL TOOTH LOCK WASHERS

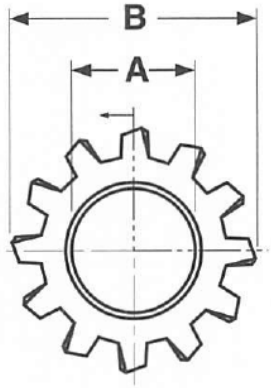
ASME B18.21.1-2009

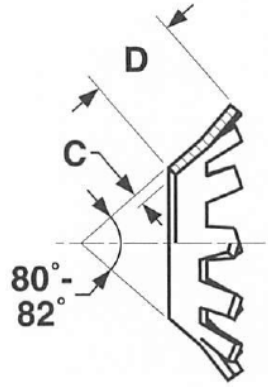
Nominal Washer Size		A Inside Diameter		B Outside Diameter		C Thickness	
		Max	Min	Max	Min	Max	Min
#2	0.086	0.095	0.089	0.200	0.175	0.016	0.010
#3	0.099	0.109	0.102	0.232	0.215	0.016	0.010
#4	0.112	0.123	0.115	0.270	0.245	0.018	0.012
#5	0.125	0.136	0.129	0.280	0.255	0.020	0.014
#6	0.138	0.150	0.141	0.295	0.275	0.022	0.016
#8	0.164	0.176	0.168	0.340	0.325	0.023	0.018
#10	0.190	0.204	0.195	0.381	0.365	0.024	0.018
#12	0.216	0.231	0.221	0.410	0.394	0.027	0.020
1/4	0.250	0.267	0.256	0.478	0.460	0.028	0.023
5/16	0.312	0.332	0.320	0.610	0.594	0.034	0.028
3/8	0.375	0.398	0.384	0.692	0.670	0.040	0.032
7/16	0.438	0.464	0.448	0.789	0.740	0.040	0.032
1/2	0.500	0.530	0.512	0.900	0.867	0.045	0.037
9/16	0.5625	0.596	0.576	0.985	0.957	0.045	0.037
5/8	0.625	0.663	0.640	1.071	1.045	0.050	0.042
3/4	0.750	0.795	0.769	1.245	1.220	0.055	0.047
7/8	0.875	0.927	0.894	1.410	1.364	0.060	0.052
1	1.000	1.060	1.019	1.637	1.590	0.067	0.059
1 1/8	1.125	1.192	1.144	1.830	1.799	0.067	0.059
1 1/4	1.250	1.325	1.275	1.975	1.921	0.067	0.059
1/8	Pipe	0.425	0.410	0.615	0.595	0.022	0.017

Description	A hardened circular washer with twisted prongs or teeth which extend inward from the inside edge of the washer.
Applications/ Advantages	This is preferred when finished appearance is crucial and the teeth must be hidden under the head of the screw; also recommended for use with small heads such as fillisters.
Material	***Steel:*** SAE 1050 - 1065 spring steel. ***18-8 Stainless:*** SAE 301 - 305 stainless steel. ***316 Stainless:*** SAE 316 stainless steel. ***410 Stainless:*** SAE 410 stainless steel.
Hardness	***Steel:*** Rockwell C40 - 50 ***18-8 Stainless:*** Annealed 88 minimum Rockwell B, 1/4 hard through full hard Rockwell C20 - 45 ***410 Stainless:*** Rockwell C40 - 50
Plating	See Appendix-A for information on the plating of steel lock washers.

COUNTERSUNK EXTERNAL TOOTH

Steel & Stainless Lockwashers





COUNTERSUNK EXTERNAL TOOTH LOCKWASHERS

ASME B18.21.1-2009

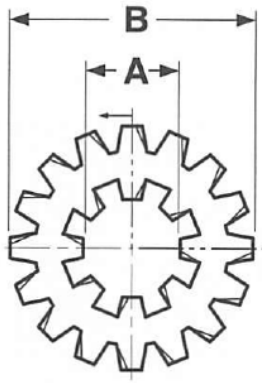
Nominal Washer Size		A		B	C		D	
		Inside Diameter		Outside Diameter	Thickness		Length	
		Max	Min	Approx	Max	Min	Max	Min
2**	0.086	0.095	0.089	0.180	-	0.013	-	-
4	0.112	0.123	0.113	0.213	0.019	0.015	0.065	0.050
6	0.138	0.150	0.140	0.289	0.021	0.017	0.092	0.082
8	0.164	0.177	0.167	0.322	0.021	0.017	0.099	0.083
10	0.190	0.205	0.195	0.354	0.025	0.020	0.105	0.088
12	0.216	0.231	0.220	0.421	0.025	0.020	0.128	0.118
1/4	0.250	0.267	0.255	0.454	0.025	0.020	0.128	0.113
5/16	0.3125	0.333	0.318	0.599	0.028	0.023	0.192	0.165
3/8	0.375	0.398	0.383	0.765	0.034	0.028	0.255	0.242
1/2	0.500	0.529	0.512	0.976	0.045	0.037	0.304	0.294

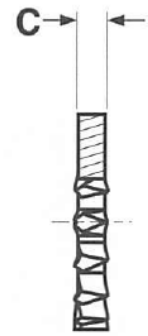
**ITW Shakeproof specification, not ASME B18.21.1

Description	An external tooth lock washer with a conical shaped bearing surface.
Applications/ Advantages	Designed for use with flat or oval head screws with countersunk angles of 82° or 100°.
Material	***Steel:*** SAE 1050 - 1065 spring steel. ***18-8 Stainless:*** SAE 301 - 305 stainless steel.
Hardness	***Steel:*** Rockwell C40 - 50 ***18-8 Stainless:*** Annealed 88 minimum Rockwell B, 1/4 hard through full hard Rockwell C20 - 45
Plating	See Appendix-A for information on the plating of steel lock washers.

Steel & Stainless Lockwashers

COMBINATION TOOTH





INTERNAL-EXTERNAL TOOTH LOCK WASHERS

ASME B18.21.1 2009

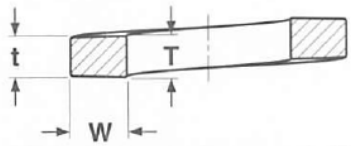
Nominal Washer Size		A Inside Diameter		B Outside Diameter *		C Thickness	
		Max	Min	Max	Min	Max	Min
4	0.112	0.123	0.115	0.475	0.460	0.021	0.016
6	0.138	0.150	0.141	0.510	0.495	0.028	0.023
8**	0.164	0.176	0.168	0.506	0.494	0.028	0.023
8	0.164	0.176	0.168	0.610	0.580	0.034	0.028
10	0.190	0.204	0.195	0.610	0.580	0.034	0.028
1/4	0.250	0.267	0.256	0.760	0.725	0.040	0.032
5/16	0.312	0.332	0.320	0.900	0.865	0.040	0.032
3/8	0.375	0.398	0.384	0.985	0.965	0.045	0.037
7/16	0.438	0.464	0.448	1.070	1.045	0.050	0.042
1/2	0.500	0.530	0.512	1.260	1.220	0.055	0.047
5/8	0.625	0.663	0.640	1.410	1.380	0.060	0.052

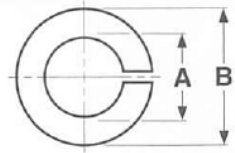
*Industry standards allow for washers with larger outside diameter dimensions.
**ITW Shakeproof specification, not ASME B18.21.1

Description	A circular washer with twisted prongs or teeth protruding from both the inside and outer edges of the washer.	
Applications/ Advantages	Preferred lockwasher in the following situations: (1) where a larger bearing surface is desired; (2) for an optimum electrical connection; (3) where the hole is oversized or out of round; (4) as an insert between two adjustable pieces where a longitudinal or rotational adjustment must be maintained.	
Material	Steel	Stainless
	SAE 1050 - 1065 or equivalent spring steel	301 - 305 stainless steel
Hardness	Rockwell C40 - 50	Annealed: Rockwell B88 minimum 1/4 hard thru full hard: Rockwell C 20 - 45
Plating	See Appendix-A for information about the plating of steel lock washers.	Stainless lockwashers are usually supplied plain or with a black oxide conversion finish.

REGULAR & HIGH-ALLOY SPLIT

Steel & Stainless Lockwashers







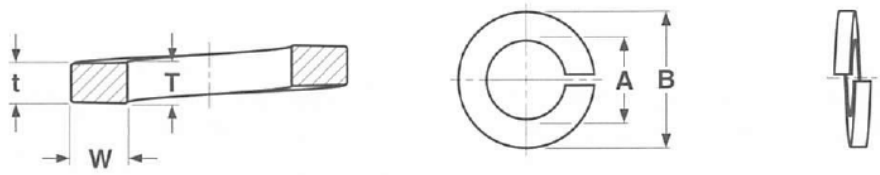
REGULAR & HIGH ALLOY HELICAL SPRING LOCKWASHERS

ASME B18.21.1-2009

Nominal Washer Size		A		B	(T+t)/2	W
		Inside Diameter		Outside Diameter	Mean Section Thickness	Section Width
		Max	Min	Max	Min	Min
#2	0.086	0.094	0.088	0.172	0.020	0.035
#3	0.099	0.107	0.101	0.195	0.025	0.040
#4	0.112	0.120	0.114	0.209	0.025	0.040
#5	0.125	0.133	0.127	0.236	0.031	0.047
#6	0.138	0.148	0.141	0.250	0.031	0.047
#8	0.164	0.174	0.167	0.293	0.040	0.055
#10	0.190	0.200	0.193	0.334	0.047	0.062
#12	0.216	0.227	0.220	0.377	0.056	0.070
1/4	0.250	0.260	0.252	0.487	0.062	0.109
5/16	0.312	0.322	0.314	0.583	0.078	0.125
3/8	0.375	0.385	0.377	0.680	0.094	0.141
7/16	0.438	0.450	0.440	0.776	0.109	0.156
1/2	0.500	0.512	0.502	0.869	0.125	0.171
9/16	0.562	0.574	0.564	0.965	0.141	0.188
5/8	0.625	0.641	0.628	1.073	0.156	0.203
3/4	0.750	0.766	0.753	1.265	0.188	0.234
7/8	0.875	0.894	0.878	1.459	0.219	0.266
1	1.000	1.024	1.003	1.656	0.250	0.297
1-1/8	1.125	1.153	1.129	1.847	0.281	0.328
1-1/4	1.250	1.280	1.254	2.036	0.312	0.359
1-3/8	1.375	1.408	1.379	2.219	0.344	0.391
1-1/2	1.500	1.534	1.504	2.419	0.375	0.422
1-3/4	1.750	1.789	1.758	2.679	0.389	0.424
2	2.000	2.039	2.008	2.936	0.422	0.427

Description	***Regular:*** A coiled, hardened, split circular washer with a slightly trapezoidal wire section. ***High-Alloy:*** Dimensionally identical to a regular split lock washer but made from 4037 alloy steel (sizes over 1" are equivalent to heavy split lockwashers in size and material). ***Stainless:*** A regular split lock washer made from austenitic stainless steel.
Applications/ Advantages	***Regular:*** (A) Applies greater bolt tension per unit of applied torque; (B) Provides a hardened bearing surface, creating more uniform torque control; (C) Provides more uniform load distribution; (D) Resists loosening caused by vibration and corrosion; (E) Is preferred lockwasher for use with hardened bearing surfaces. ***High-Alloy:*** Designed for use with Grade-5 & Grade-8 bolts and nuts. ***Stainless:*** For use with stainless nuts and screws of a similar stainless alloy in corrosive environments.
Material	***Carbon Steel:*** SAE J403 1055 - 1065 carbon steel. ***High-Alloy Steel:*** 1/4 thru 1": SAE J404 4037 alloy steel; 1-1/8 thru 1-1/2": SAE J403 1055 - 1065 carbon steel ***18-8 Stainless:*** SAE J405 302 - 305 stainless steel. ***316 Stainless:*** SAE J405 316 stainless steel.
Hardness	***Carbon & High-Alloy Steel:*** Rockwell C38 - 46 ***Stainless:*** Thru 5/8": Rockwell C35 - 43; Sizes over 5/8": Rockwell C32 - 43
Twist Test	With the washer in a vice with the split ends free and straight above the vice jaws, a 90° segment of the free end is gripped with a wrench and bent. Carbon steel washers are to withstand being twisted through a 90° angle without signs of fracture. Stainless steel washers shall withstand twisting to a 45° angle without fracturing.
Plating	See Appendix-A for information about the plating of carbon steel and alloy steel lock washers.

Steel & Stainless Lockwashers
HIGH-COLLAR HELICAL SPRING



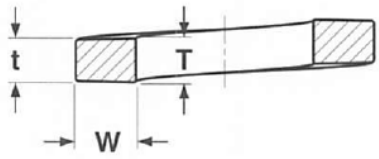
HIGH-COLLAR HELICAL SPRING LOCK WASHERS

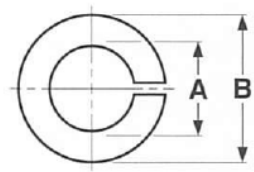
ASME B18.21.1-2009

Nominal Washer Size		A		B	W	$\frac{T+t}{2}$
		Inside Diameter		Outside Diameter	Washer Section	
					Width	Thickness
		Max	Min	Max	Min	Min
#4	0.112	0.120	0.114	0.173	0.022	0.022
#6	0.138	0.148	0.141	0.216	0.030	0.030
#8	0.164	0.174	0.167	0.267	0.042	0.047
#10	0.190	0.200	0.193	0.294	0.042	0.047
1/4	0.250	0.260	0.252	0.363	0.047	0.078
5/16	0.312	0.322	0.314	0.457	0.062	0.093
3/8	0.375	0.385	0.377	0.550	0.076	0.125
7/16	0.4375	0.450	0.440	0.644	0.090	0.140
1/2	0.500	0.512	0.502	0.733	0.103	0.172
9/16	0.5625	0.574	0.564	0.819	0.116	0.187
5/8	0.625	0.641	0.628	0.917	0.125	0.203
3/4	0.750	0.766	0.753	1.105	0.154	0.218
7/8	0.875	0.894	0.878	1.291	0.182	0.234
1	1.000	1.024	1.003	1.478	0.208	0.250
1 1/8	1.125	1.153	1.129	1.663	0.236	0.313
1 1/4	1.250	1.280	1.254	1.790	0.236	0.313
1 1/2	1.500	1.534	1.504	2.159	0.292	0.375

Description	A Hi-Collar washer is thicker and has a smaller outside diameter than a regular split lock washer.
Applications/ Advantages	Designed for use with smaller head screws, particularly sockets. Performs comparably to a regular split lock washer as a greater thickness compensates for smaller outside diameter.
Material	**Carbon Steel**: SAE J403 1055 - 1065 **Stainless**: SAE J405 302-305
Hardness	**Carbon Steel**: Rockwell C38 - 46 **Stainless**: Rockwell C35 - 43 (thru 5/8" diameter); Rockwell C32 - 43 (diameters over 5/8")
Twist Test	With the washer in a vice with the split ends free and straight above the vice jaws, a 90° segment of the free end is gripped with a wrench and bent. **Steel washers** are to withstand being twisted through a 90° angle without signs of fracture; **Stainless washers** are to withstand being twisted through a 45° angle without fracturing.
Plating	See Appendix-A for information about the plating of Hi-Collar split lock washers.

HEAVY SPLIT & EXTRA DUTY Steel Lockwashers



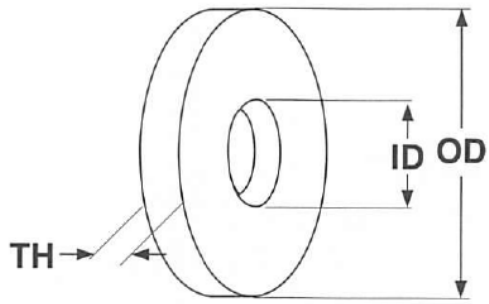




HEAVY SPLIT HELICAL SPRING LOCK WASHERS						ASME B18.21.1-2009
Nominal Washer Size Max		A		B	$\frac{(T+t)}{2}$	W
		Inside Diameter		Outside Diameter	Mean Section Thickness	Section Width
		Max	Min	Max	Min	Min
#10	0.190	0.200	0.193	0.350	0.056	0.070
1/4	0.250	0.260	0.252	0.489	0.077	0.110
5/16	0.312	0.322	0.314	0.593	0.097	0.130
3/8	0.375	0.385	0.377	0.688	0.115	0.145
7/16	0.438	0.450	0.440	0.784	0.133	0.160
1/2	0.500	0.512	0.502	0.879	0.151	0.176
9/16	0.562	0.574	0.564	0.975	0.170	0.193
5/8	0.625	0.641	0.628	1.087	0.189	0.210
3/4	0.750	0.766	0.753	1.285	0.226	0.244
7/8	0.875	0.894	0.878	1.489	0.266	0.281
1	1.000	1.024	1.003	1.700	0.306	0.319
1-1/8	1.125	1.153	1.129	1.903	0.345	0.356
1-1/4	1.250	1.280	1.254	2.104	0.384	0.393
1-1/2	1.500	1.534	1.504	2.491	0.458	0.458
EXTRA DUTY HELICAL SPLIT LOCKWASHERS						
3/8	0.375	0.385	0.377	0.738	0.123	0.170
5/8	0.625	0.641	0.628	1.151	0.202	0.242

Description	Similar to a regular split lock washer, but with a greater outside diameter and thickness.
Applications/ Advantages	The increased bearing area makes this suitable for applications involving higher tightening torques.
Material	SAE 1055 - 1065 carbon steel.
Hardness	Rockwell C38 - 46
Twist Test	With the washer in a vice with the split ends free and straight above the vice jaws, a 90° segment of the free end is gripped with a wrench and bent. Washers are to withstand being twisted through a 90° angle without signs of fracture. When the washer ultimately fractures beyond the prescribed 90° limit, the structure at the breaking point shall show a fine grain.
Plating	See Appendix-A for information about plating heavy split lock washers.

Steel DOCK

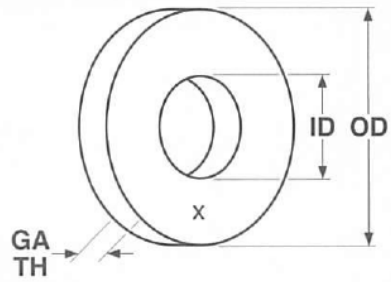


Dock Washers							
Bolt Size (In.)	ID		OD		TH		Approximate Number of Washers per 50 lb. Box
	Inside Diameter		Outside Diameter		Thickness		
	Max	Min	Max	Min	Max	Min	
1/2	.578	.558	3.020	2.993	.280	.230	103
5/8	.718	.681	3.020	2.993	.280	.230	105
3/4	.843	.806	3.020	2.993	.280	.230	108
7/8	.968	.931	3.020	2.993	.280	.230	111
1	1.093	1.056	3.280	3.240	.280	.230	95

Description	A circular flat washer that is significantly thicker than most other washers and has greater surface area than even fender washers.
Applications/ Advantages	Commonly used in dock and construction applications where thicker washers are required but a low carbon part is acceptable.
Material	Washers are punched from hot-rolled or hot-rolled and pickled steel.
Plating	Dock washers are provided in both plain and hot-dip galvanized finishes.

USS FLAT

Low Carbon Steel



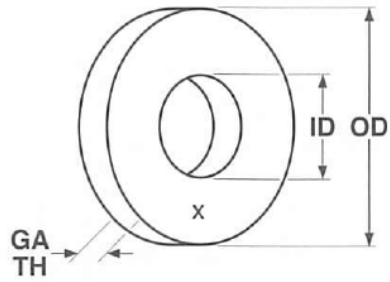
USS Low Carbon & Stainless Washers

ASME B18.21.1-2009

Bolt Size	Outside Diameter			Inside Diameter			Thickness			Approximate Number of STEEL washers per 50 Pounds
	Nominal	Max	Min	Nominal	Max	Min	American Standard (Gauge)	Max	Min	
3/16	9/16	0.577	0.557	1/4	0.265	0.245	18 (3/64)	.065	.036	18050
1/4	3/4	0.749	0.727	5/16	0.327	0.307	16 (1/16)	.080	.051	7450
5/16	7/8	0.905	0.868	3/8	0.390	0.370	14 (5/64)	.104	.064	4350
3/8	1	1.030	0.993	7/16	0.453	0.433	14 (5/64)	.104	.064	2940
7/16	1-1/4	1.280	1.243	1/2	0.515	0.495	14 (5/64)	.104	.064	2050
1/2	1-3/8	1.405	1.368	9/16	0.577	0.557	12 (7/64)	.132	.086	1300
9/16	1-1/2	1.499	1.462	5/8	0.640	0.620	21 (7/64)	.132	.086	1100
5/8	1-3/4	1.780	1.743	11/16	0.718	0.681	10 (9/64)	.160	.108	650
3/4	2	2.030	1.993	13/16	0.842	0.805	9 (5/32)	.177	.122	455
7/8	2-1/4	2.280	2.243	15/16	0.968	0.931	8 (11/64)	.192	.136	325
1	2-1/2	2.530	2.493	1-1/16	1.092	1.055	8 (11/64)	.192	.136	265
1-1/8	2-3/4	2.780	2.743	1-1/4	1.280	1.243	8 (11/64)	.192	.136	225
1-1/4	3	3.030	2.993	1-3/8	1.405	1.368	8 (11/64)	.192	.136	190
1-3/8	3-1/4	3.295	3.240	1-1/2	1.545	1.490	7 (3/16)	.213	.153	150
1-1/2	3-1/2	3.545	3.490	1-5/8	1.670	1.615	7 (3/16)	.213	.153	130
1-5/8	3-3/4	3.795	3.740	1-3/4	1.795	1.740	7 (3/16)	.213	.153	115
1-3/4	4	4.045	3.990	1-7/8	1.920	1.865	7 (3/16)	.213	.153	100
1-7/8	4-1/4	4.295	4.240	2	2.045	1.990	7 (3/16)	.213	.153	90
2	4-1/2	4.545	4.490	2-1/8	2.170	2.115	7 (3/16)	.213	.153	79
2-1/4	4-3/4	4.795	4.740	2-3/8	2.420	2.365	5 (7/32)	.248	.193	60
2-1/2	5	5.045	4.990	2-5/8	2.670	2.615	4 (15/64)	.280	.210	52
2-3/4	5-1/4	5.315	5.240	2-7/8	2.940	2.865	3 (1/4)	.310	.228	45
3	5-1/2	5.565	5.490	3-1/8	3.190	3.115	2 (5/32)	.327	.249	43

Description	A thin, flat, circular metal part with a centrally located hole.	
Applications/ Advantages	Washers are designed for assembly around a bolt or screw, between the bearing surface of the fastener and the part to which it is attached. Flat washers are used to improve stress distribution, and to span large clearance holes. USS washers are designed to meet the majority of industrial applications in manufacturing, maintenance and repair.	
Material	***Steel***	***Stainless***
	Plain washers shall be punched from hot-rolled, hot-rolled and pickled, or cold-rolled steel, or shall be machined from bar stock or tubing, or many be forged at the maufacturer's option.	18-8 Stainless / 316 Stainless
Plating	See Appendix-A for information about the plating of low carbon flat washers.	Stainless USS flat washers are typically furnished plain or with a black oxide finish.

Low Carbon Steel
18-8 Stainless
SAE FLAT



SAE Low Carbon & Stainless Washers

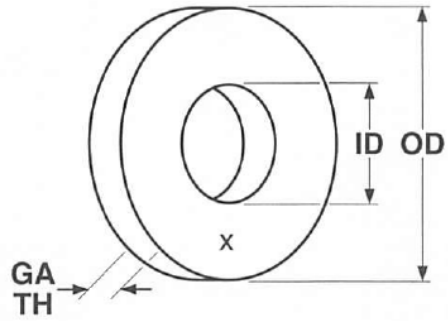
ASME B18.21.1-2009

Bolt Size	Outside Diameter			Inside Diameter			Thickness			Approximate Number of STEEL Washers per 50 Pounds
	Nominal	Max	Min	Nominal	Max	Min	American Standard (Gauge)	Max	Min	
4	5/16	0.320	0.307	1/8	0.133	0.120	(1/32)	.040	.025	83300
6	3/8	0.390	0.370	5/32	0.164	0.151	18 (3/64)	.065	.036	39500
8	7/16	0.453	0.433	3/16	0.196	0.183	18 (3/64)	.065	.036	29500
10	1/2	0.515	0.495	7/32	0.227	0.214	18 (3/64)	.065	.036	22750
3/16	9/16	0.577	0.557	1/4	0.265	0.245	18 (3/64)	.065	.036	
12	9/16	0.577	0.557	1/4	0.265	0.245	16 (1/16)	.080	.051	14700
1/4	5/8	0.640	0.620	9/32	0.296	0.276	16 (1/16)	.080	.051	11100
5/16	11/16	0.703	0.681	11/32	0.359	0.339	16 (1/16)	.080	.051	9750
3/8	13/16	0.827	0.805	13/32	0.419	0.401	16 (1/16)	.080	.051	7000
7/16	59/64	0.937	0.915	15/32	0.484	0.464	16 (1/16)	.080	.051	5500
1/2	1-1/16	1.092	1.055	17/32	0.546	0.526	13 (3/32)	.121	.074	2800
9/16	1-3/16	1.186	1.149	19/32	0.609	0.589	13 (3/32)	.121	.074	2250
5/8	1-5/16	1.342	1.305	21/32	0.686	0.649	13 (3/32)	.121	.074	1850
3/4	1-1/2	1.499	1.462	13/16	0.842	0.805	10 (9/64)	.160	.108	1050
7/8	1-3/4	1.780	1.743	15/16	0.968	0.931	10 (9/64)	.160	.108	775
1	2	2.030	1.993	1-1/16	1.092	1.055	10 (9/64)	.160	.108	585
1-1/8	2-1/4	2.280	2.243	1-3/16	1.280	1.243	10 (9/64)	.160	.108	460
1-1/4	2-1/2	2.530	2.493	1-5/16	1.405	1.368	9 (5/32)	.192	.136	335
1-3/8	2-3/4	2.780	2.743	1-7/16	1.530	1.493	9 (5/32)	.213	.136	275
1-1/2	3	3.030	2.993	1-9/16	1.655	1.618	9 (5/32)	.213	.153	230

Description	Similar to a USS washer, but with slightly smaller inside and outside diameters. Also, most but not all SAE washers are made from thinner materials than USS washers.		
Applications/ Advantages	SAE washers were designed to serve similar purposes as the USS washers, but specifically to meet the requirements in the field of automotive engineering.		
Material	***Steel***	***Stainless***	
	Plain washers shall be punched from hot-rolled, hot-rolled and pickled, or cold-rolled steel, or shall be machined from bar stock or tubing, or may be forged at the manufacturer's option.	18-8 Stainless Steel	316 Stainless Steel
Plating	Steel SAE washers are supplied in zinc and black oxide finishes. Other platings are available. See Appendix-A for more information.	Stainless SAE washers are usually supplied without any secondary finish.	

USS THROUGH-HARDENED

Flat



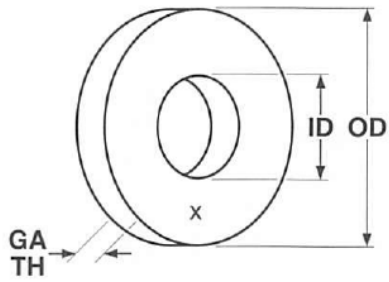
USS Through-Hardened Flat Washers

Bolt Size	Outside Diameter			Inside Diameter			Thickness		Approximate Number per 50 Pounds
	Nominal	Max	Min	Nominal	Max	Min	Max	Min	
1/4	3/4	0.749	0.727	5/16	0.327	0.307	.080	.051	7500-8000
5/16	7/8	0.905	0.868	3/8	0.390	0.370	.104	.064	5000
3/8	1	1.030	0.993	7/16	0.453	0.433	.104	.064	2900-3500
7/16	1-1/4	1.280	1.243	1/2	0.515	0.495	.104	.064	2500
1/2	1-3/8	1.405	1.368	9/16	0.577	0.557	.132	.086	1500-1800
9/16	1-1/2	1.499	1.462	5/8	0.640	0.620	.132	.086	1100-1500
5/8	1-3/4	1.780	1.743	21/32	0.687	0.649	.160	.108	700-800
3/4	2	2.030	1.993	13/16	0.842	0.805	.177	.122	500-600
7/8	2-1/4	2.280	2.243	15/16	0.968	0.931	.192	.136	350
1	2-1/2	2.530	2.493	1-1/16	1.092	1.055	.192	.136	300
1-1/8	2-3/4	2.780	2.743	1-1/4	1.280	1.243	.192	.136	250
1-1/4	3	3.030	2.993	1-3/8	1.405	1.368	.192	.136	200-225
1-1/2	3-1/2	3.545	3.490	1-5/8	1.670	1.615	.213	.136	150

Description	Dimensionally similar to the USS plain washer counterparts, but with tighter tolerances on thickness, manufactured from a higher grade of steel and heat-treated.
Applications/ Advantages	Designed to perform the same functions as USS plain washers, but for use specifically with high-strength hardened steel bolts.
Material	SAE 1035 - 1050 steel
Hardness	Rockwell C38 - 45
Plating	See Appendix-A for information about the plating of through-hardened flat washers.

*Product standards require all through-hardened washers 1/4" diameter and larger to bear the insignia indentifying its manufacturer. "X" represents one location such an insignia may appear.

Flat SAE THROUGH-HARDENED



SAE Through-Hardened Flat Washers

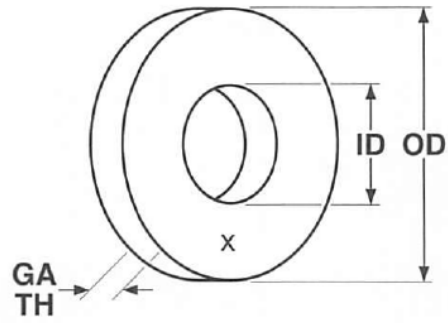
Bolt Size	Outside Diameter			Inside Diameter			Thickness		Approximate Number per 50 Pounds
	Nominal	Max	Min	Nominal	Max	Min	Max	Min	
6	3/8	0.390	0.370	5/32	0.164	0.151	.065	.036	39500
8	7/16	0.453	0.433	3/16	0.196	0.183	.065	.036	29500
10	1/2	0.515	0.495	7/32	0.227	0.214	.065	.036	22750
12	9/16	0.577	0.557	1/4	0.265	0.245	.080	.051	14700
1/4	5/8	0.640	0.620	9/32	0.296	0.276	.080	.051	13000
5/16	11/16	0.703	0.681	11/32	0.359	0.339	.080	.051	10000
3/8	13/16	0.827	0.805	13/32	0.419	0.401	.080	.051	7000 - 8000
7/16	59/64	0.937	0.915	15/32	0.484	0.464	.080	.051	5000 - 6000
1/2	1-1/16	1.092	1.055	17/32	0.546	0.526	.121	.074	2425 - 3000
9/16	1-3/16	1.186	1.149	19/32	0.609	0.589	.121	.074	2000 - 2250
5/8	1-5/16	1.342	1.305	21/32	0.686	0.649	.177	.108	1340 - 1800
3/4	1-15/32	1.499	1.462	13/16	0.842	0.805	.177	.122	1120 - 1300
7/8	1-3/4	1.780	1.743	15/16	0.968	0.931	.177	.136	695 - 700
1	2	2.030	1.993	1-1/16	1.092	1.055	.177	.136	555 - 600
1-1/8	2-1/4	2.280	2.243	1-1/4	1.280	1.243	.177	.146	435 - 450
1-1/4	2-1/2	2.530	2.493	1-3/8	1.405	1.368	.177	.136	350 - 400
1-1/2	3	3.030	2.993	1-5/8	1.655	1.618	.177	.136	240 - 250
1-3/4	3-3/8	3.405	3.368	1-7/8	1.905	1.868	.201	.178	150
2	3-3/4	3.780	3.748	2-1/8	2.155	2.118	.201	.178	125

Description	Dimensionally equivalent to the low carbon SAE flat washer counterparts, but with tighter tolerances on thickness, manufactured from a higher grade of steel and heat-treated.
Applications/ Advantages	Designed to perform the same functions as low carbon SAE flat washers, but for use specifically with high-strength hardened steel bolts.
Material	SAE 1035 - 1050 steel
Hardness	Rockwell C38 - 45
Plating	See Appendix-A for information about the plating of through-hardened flat washers.

*Product standards require all through-hardened washers 1/4" diameter and larger to bear the insignia indentifying its manufacturer.
"X" represents one location such an insignia may appear.

USS THROUGH-HARDENED

Extra Thick

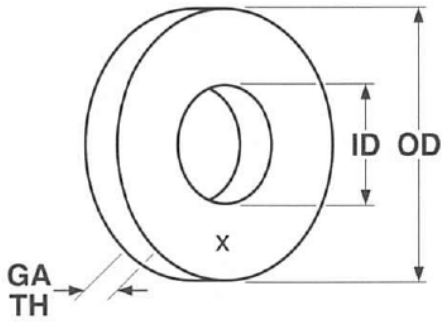


USS Through-Hardened Flat Washers-Extra Thick									ASME B18.22.1, Wrought Washer
Bolt Size	Outside Diameter			Inside Diameter			Thickness		Approximate Number per 50 Pounds
	Nominal	Max	Min	Nominal	Max	Min	Max	Min	
1/4	3/4	0.749	0.727	5/16	0.327	0.307	.080	.064	6600
5/16	7/8	0.905	0.868	3/8	0.390	0.370	.093	.079	4200
3/8	1	1.030	0.993	7/16	0.453	0.433	.093	.079	3250
7/16	1-1/4	1.280	1.243	1/2	0.515	0.495	.106	.090	1750
1/2	1-3/8	1.405	1.368	9/16	0.577	0.557	.146	.122	1100
9/16	1-1/2	1.499	1.462	5/8	0.640	0.620	.146	.122	950
5/8	1-3/4	1.780	1.743	21/32	0.687	0.649	.160	.136	550
3/4	2	2.030	1.993	13/16	0.842	0.805	.160	.136	450
7/8	2-1/4	2.280	2.243	15/16	0.968	0.931	.160	.136	375
1	2-1/2	2.530	2.493	1-1/16	1.092	1.055	.160	.136	300

Description	Has identical inside and outside diameters as USS thru-hardened washer, but can be as much as 50% thicker. They are manufactured from a medium grade of steel and heat-treated.
Applications/ Advantages	Designed for heavy duty use in machinery construction, assembly, in-plant maintenance and building construction
Material	SAE 1035 - 1050 steel
Hardness	Rockwell C38 - 45
Plating	Parts are mechanically zinc yellow plated.

Extra Thick

SAE THROUGH-HARDENED

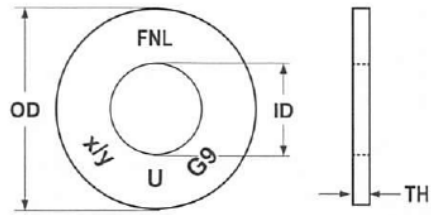


SAE Through-Hardened Flat Washers - Extra Thick									ASME B18.22.1, Wrought Washer
Bolt Size	Outside Diameter			Inside Diameter			Thickness		Approximate Number per 50 Pounds
	Nominal	Max	Min	Nominal	Max	Min	Max	Min	
1/4	5/8	0.640	0.620	9/32	0.296	0.276	.080	.064	9400
5/16	11/16	0.703	0.681	11/32	0.359	0.339	.093	.079	8000
3/8	13/16	0.827	0.805	13/32	0.419	0.401	.093	.079	5300
7/16	59/64	0.937	0.915	15/32	0.484	0.464	.106	.090	3600
1/2	1-1/16	1.092	1.055	17/32	0.546	0.526	.146	.122	2000
9/16	1-3/16	1.186	1.149	19/32	0.609	0.589	.146	.122	1600
5/8	1-5/16	1.342	1.305	21/32	0.686	0.649	.160	.136	1150
3/4	1-15/32	1.499	1.462	13/16	0.842	0.805	.160	.136	950
7/8	1-3/4	1.780	1.743	15/16	0.968	0.931	.160	.136	650
1	2	2.030	1.993	1-1/16	1.092	1.055	.160	.136	500

Description	Has identical inside and outside diameters as SAE thru-hardened washer, but can be as much as 50% thicker. They are manufactured from a medium grade of steel and heat-treated.
Applications/ Advantages	Designed for heavy duty use in machinery construction, assembly, in-plant maintenance and building construction
Material	SAE 1035 - 1050 steel
Hardness	Rockwell C38 - 45
Plating	Parts are mechanically zinc yellow plated.

USS THROUGH-HARDENED

For Grade-9 Applications

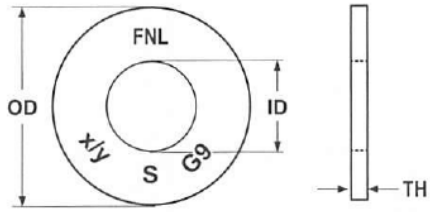


USS Washers for use with Grade-9 Applications

Bolt Size	Outside Diameter			Inside Diameter		Thickness	
	Nominal	Max	Min	Max	Min	Max	Min
1/4	3/4	0.760	0.740	0.276	0.266	.080	.065
5/16	7/8	0.885	0.865	0.339	0.329	.093	.079
3/8	1	1.010	0.990	0.401	0.391	.093	.079
7/16	1-1/4	1.260	1.240	0.464	0.454	.106	.090
1/2	1-3/8	1.385	1.365	0.531	0.521	.146	.122
5/8	1-3/4	1.760	1.740	0.651	0.641	.160	.136
3/4	2	2.015	1.985	0.780	0.770	.160	.136

Description	A thin, flat, circular metal stamping with a centrally located hole.
Applications/ Advantages	Designed for use with Grade-9 cap screws and nuts in harsh environmental and fatigue conditions.
Material	SAE 1035 - 1075 carbon or alloy steel
Hardness	Rockwell C38 - 45
Plating	Parts have an EcoGuard™ 1000-hour corrosion resistant finish that is grayish silver in color.

For Grade-9 Applications — SAE THROUGH-HARDENED



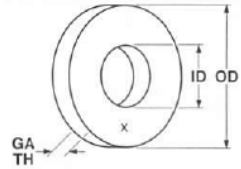
SAE Washers for use with Grade-9 Applications

Bolt Size	Outside Diameter			Inside Diameter		Thickness	
	Nominal	Max	Min	Max	Min	Max	Min
1/4	5/8	0.635	0.615	0.276	0.266	.080	.065
5/16	11/16	0.698	0.678	0.339	0.329	.093	.079
3/8	13/16	0.823	0.803	0.401	0.391	.093	.079
7/16	59/64	0.933	0.913	0.464	0.454	.106	.090
1/2	1-1/16	1.073	1.053	0.531	0.521	.146	.122
5/8	1-5/16	1.323	1.303	0.651	0.641	.152	.136
3/4	1-1/2	1.478	1.458	0.780	0.770	.160	.136

Description	Similar to the USS washer designed for Grade-9 applications, but with a smaller outside diameter.
Applications/ Advantages	Designed for use with Grade-9 cap screws and nuts in harsh environmental and fatigue conditions.
Material	SAE 1035 - 1075 carbon or alloy steel
Hardness	Rockwell C38 - 45
Plating	Parts have an EcoGuard™ 1000-hour corrosion resistant finish that is grayish silver in color.

FENDER

Steel & Stainless



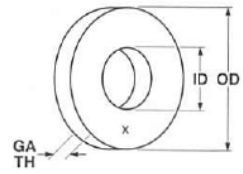
Fender Washers

Bolt Size	Inside Diameter (± .010)	Outside Diameter (± .010)	Thickness		Approximate Number in 20 Pounds (Steel)	Approximate Number in 50 Pounds (Steel)
			Max	Min		
10	.219	.688	.080	.036		9530 *
10	.219	.750	.080	.036		8000
10	.219	.875	.080	.036		5000
10	.219	1.000	.084	.036		3500
10	.219	1.250	.084	.036		2145
10	.219	1.500	.080	.036		1760 *
10	.219	2.000	.080	.036		796
1/4	.281	1.000	.132	.036	1500	3750
1/4	.281	1.250	.132	.036	921	2300
1/4	.281	1.500	.132	.036	620	1550
1/4	.281	1.750	.080	.036		1100
1/4	.281	2.000	.080	.036		810
5/16	.344	1.000	.080	.036		4670 *
5/16	.344	1.250	.132	.036	960	2400
5/16	.344	1.500	.132	.036	640	1600
5/16	.344	2.000	.080	.036	328	820
5/16	.344	2.500	.080	.036	200	500
3/8	.406	1.250	.132	.036	1200	2350
3/8	.406	1.500	.132	.036		1650
3/8	.406 or .422	1.750	.132	.051	458	1130
3/8	.422	2.000	.080	.051	380	1000
3/8	.422	2.500	.080	.051	267	512
1/2	.531	1.250	.080	.051	1436	3000
1/2	.531	1.500	.080	.051	793	2000
1/2	.531	1.750	.080	.051	458	1145
1/2	.531	2.000	.132	.051	380	950
1/2	.531	2.500	.080	.051	267	668
1/2	.531	3.000	.080	.051	142	355
5/8	.688	1.250	.084	.074		3590 *
5/8	.688	2.000	.080	.051		1015
5/8	.688	3.000	.080	.051		365
3/4	.812	2.000 (± .015)	.080	.051		1155 *
7/8	.938	2.500 (± .015)	.118	.101		715 *

*Represents a count based on stainless steel washers.

Description	A flat washer with significantly more surface area than a USS or SAE washer. They are also made from a thinner gauge metal than most flat washers.	
Applications/ Advantages	Used where an extra wide bearing surface is required. Originally designed for auto body repair work, they are also used in sheet metal, plumbing, and electrical work. Also used to attach signs to posts, to install drywall and wood paneling.	
Material	*Steel*	*Stainless*
	Washers shall be punched from hot-rolled, hot-rolled and pickled or cold-rolled steel, or shall be machined from bar stock or tubing, or may be forged at the manufacturer's option.	18-8 or 316 Stainless steel
Plating	Fender washers are usually provided zinc plated or with no finish.	Parts are usually supplied with no additional finish.

Steel EXTRA HEAVY FENDER

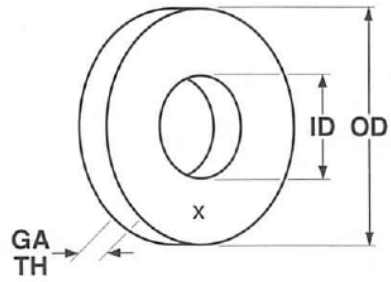


Extra Heavy Fender Washers

Bolt Size	Inside Diameter (± .010)	Outside Diameter (± .010)	Thickness		Approximate Number of Washers per Each 50# Carton
			Max	Min	
10	.219	.938	.132	.108	2,250
1/4	.281	1.000	.132	.108	2,000
1/4	.281	1.125	.132	.108	1,500
1/4	.281	1.250	.132	.108	1,250
1/4	.281	1.500	.132	.108	850
5/16	.343	1.250	.132	.108	1,250
5/16	.343	1.500	.132	.108	875
3/8	.406	1.250	.132	.108	1,300
3/8	.406	1.500	.132	.108	900
3/8	.438	1.250	.132	.108	1,350
3/8	.438	1.750	.132	.108	650
1/2	.531	2.000	.132	.108	500

Description	A flat washer with significantly more surface area than a USS or SAE washer. They are also made from a thinner gauge metal than most flat washers.
Applications/ Advantages	Used where a thicker than normal fender washer is required.
Material	*Steel*
	G3131 or equivalent steel
Plating	Fender washers are usually provided zinc plated or with no finish.

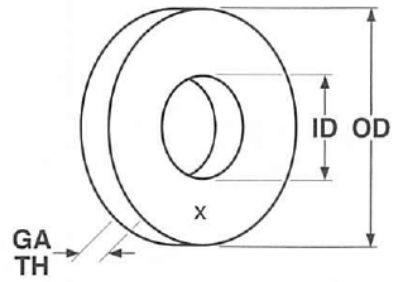
STANDARD FLAT — 18-8 Stainless



Standard Flat Washers - 18-8 Stainless Steel						
Size	OD		ID		TH	
	Outside Diameter		Inside Diameter		Thickness	
	Max	Min	Max	Min	Max	Min
4	.317	.307	.130	.120	.034	.028
6	.375	.370	.161	.151	.034	.028
8	.375	.370	.177	.167	.034	.028
10	.438	.432	.208	.198	.034	.028
1/4	.625	.620	.286	.276	.054	.046
1/4	.750	.745	.327	.281	.080	.051
5/16	.630	.620	.348	.338	.080	.051
5/16	.755	.745	.348	.338	.054	.046
5/16	.880	.870	.348	.338	.080	.051
5/16	1.005	.995	.348	.338	.080	.051
3/8	.755	.745	.416	.396	.080	.051
3/8	.880	.870	.396	.386	.054	.046
3/8	1.005	.995	.396	.386	.066	.058
7/16	1.130	1.120	.505	.495	.066	.058
1/2	1.255	1.245	.567	.557	.066	.058
5/8	1.505	1.495	.693	.683	.084	.074
3/4	1.755	1.745	.817	.807	.097	.082
7/8	2.005	1.995	.943	.933	.117	.102
1	2.005	1.995	1.067	1.057	.133	.117

Description	A thin, flat, circular stamping with a centrally located hole, made from an 18-8 austenitic stainless steel.
Applications/ Advantages	Designed for use with 18-8 stainless steel screws and nuts in general industrial applications where parts are subject to corrosion.
Material	18-8 stainless steel

316 Stainless STANDARD FLAT

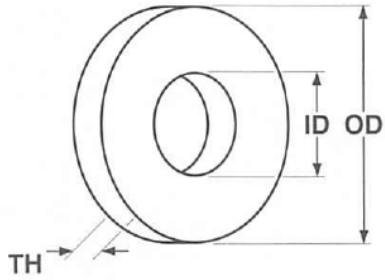


COMMERCIAL FLAT WASHERS - 316 STAINLESS STEEL						
Size	OD		ID		TH	
	Outside Diameter		Inside Diameter		Thickness	
	Max	Min	Max	Min	Max	Min
1/4	.630	.620	.286	.276	.055	.045
1/4	.693	.683	.286	.276	.055	.045
5/16	.755	.745	.348	.338	.055	.045
3/8	.880	.870	.411	.401	.055	.045
3/8	1.005	.995	.411	.401	.055	.045
1/2	1.255	1.245	.567	.557	.067	.057
5/8	1.505	1.495	.692	.682	.084	.074
3/4	1.755	1.745	.817	.807	.083	.073
7/8	2.005	1.995	.943	.933	.117	.101
7/8	2.255	2.245	.943	.933	.117	.101
1	2.005	1.995	1.067	1.057	.133	.117
1	2.505	2.495	1.067	1.057	.133	.117

Description	A thin, flat, circular stamping with a centrally located hole, made from a 316 austenitic stainless steel.
Applications/ Advantages	Designed for use with 316 stainless steel screws and nuts in general industrial applications where parts are subject to corrosion.
Material	316 stainless steel

TYPE-B FLAT

Narrow Series, Steel & Stainless



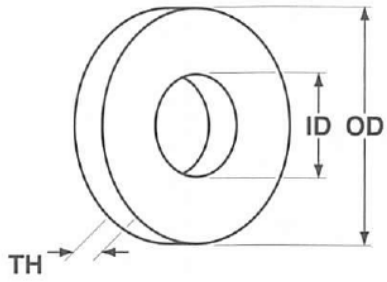
TYPE-B PLAIN WASHERS—NARROW SERIES

ASME B18.21.1--2009

Washer Size	Inside Diameter		Outside Diameter		Thickness	
	Max	Min	Max	Min	Max	Min
0	0.068	0.063	0.125	0.120	0.028	0.022
1	0.084	0.079	0.156	0.151	0.028	0.022
2	0.094	0.089	0.188	0.183	0.028	0.022
3	0.109	0.104	0.219	0.214	0.028	0.022
4	0.125	0.120	0.250	0.245	0.036	0.028
5	0.141	0.136	0.281	0.276	0.036	0.028
6	0.156	0.151	0.312	0.307	0.036	0.028
8	0.196	0.183	0.383	0.370	0.045	0.036
10	0.211	0.198	0.414	0.401	0.045	0.036
12	0.242	0.229	0.446	0.433	0.045	0.036
1/4	0.296	0.276	0.515	0.495	0.071	0.056
5/16	0.359	0.339	0.640	0.620	0.071	0.056
3/8	0.421	0.401	0.749	0.727	0.071	0.056
7/16	0.484	0.464	0.890	0.868	0.071	0.056
1/2	0.546	0.526	1.015	0.993	0.071	0.056
5/8	0.686	0.649	1.280	1.243	0.112	0.090
3/4	0.842	0.805	1.405	1.368	0.112	0.090
7/8	0.968	0.931	1.499	1.439	0.112	0.090
1	1.092	1.055	1.780	1.743	0.112	0.090
1 1/8	1.218	1.181	2.030	1.993	0.112	0.090

Description	A thin, flat, circular metal part with a centrally located hole. The tolerances of the thickness and outside diameter of Type-B washers are tighter than for USS and SAE flat washers.	
Applications/ Advantages	For use with low-carbon steel materials. Type-B washers distribute load over larger areas than the comparable USS or SAE washers of the same nominal size.	For use with stainless materials. Type-B washers distribute load over larger areas than the comparable USS or SAE washers of the same nominal size.
Material	***Steel***	***Stainless***
	Low Carbon steel	Class 300 stainless

Regular Series, Steel & Stainless — TYPE-B FLAT



TYPE-B PLAIN WASHERS—REGULAR SERIES

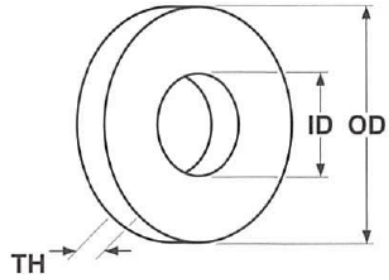
ASME B18.21.1-2009

Washer Size	Inside Diameter		Outside Diameter		Thickness	
	Max	Min	Max	Min	Max	Min
0	0.068	0.063	0.188	0.183	0.028	0.022
1	0.084	0.079	0.219	0.214	0.028	0.022
2	0.094	0.089	0.250	0.245	0.036	0.028
3	0.109	0.104	0.312	0.307	0.036	0.028
4	0.133	0.120	0.383	0.370	0.045	0.036
5	0.149	0.136	0.414	0.401	0.045	0.036
6	0.164	0.151	0.446	0.433	0.045	0.036
8	0.196	0.183	0.508	0.495	0.045	0.036
10	0.211	0.198	0.570	0.557	0.045	0.036
12	0.242	0.229	0.640	0.620	0.071	0.056
1/4	0.296	0.276	0.749	0.727	0.071	0.056
5/16	0.359	0.339	0.890	0.868	0.071	0.056
3/8	0.421	0.401	1.015	0.993	0.071	0.056
7/16	0.484	0.464	1.140	1.118	0.071	0.056
1/2	0.546	0.526	1.280	1.243	0.112	0.090
9/16	0.609	0.589	1.499	1.462	0.112	0.090
5/8	0.686	0.649	1.780	1.743	0.112	0.090
3/4	0.842	0.805	2.030	1.993	0.112	0.090
7/8	0.968	0.931	2.280	2.243	0.174	0.146
1	1.092	1.055	2.530	2.493	0.174	0.146
1 1/8	1.218	1.181	2.780	2.743	0.174	0.146

Description	A thin, flat, circular metal part with a centrally located hole. The tolerances of the thickness and outside diameter of Type-B washers are tighter than for USS and SAE flat washers. Regular Series are thicker and have greater outside diameter than Type-B Narrow Series washers.	
Applications/ Advantages	For use with low-carbon steel materials. Type-B washers distribute load over larger areas than the comparable USS or SAE washers of the same nominal size.	For use with stainless materials. Type-B washers distribute load over larger areas than the comparable USS or SAE washers of the same nominal size.
Material	***Steel***	***Stainless***
	Low Carbon steel	Class 300 stainless

TYPE-B FLAT

Wide Series, Steel & Stainless



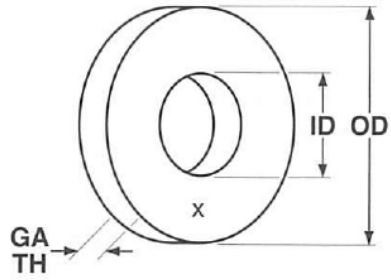
TYPE-B PLAIN WASHERS—WIDE SERIES

ASME B18.21.1-2009

Washer Size	Inside Diameter		Outside Diameter		Thickness	
	Max	Min	Max	Min	Max	Min
0	0.068	0.063	0.250	0.245	0.028	0.022
1	0.084	0.079	0.281	0.276	0.036	0.028
2	0.094	0.089	0.344	0.339	0.036	0.028
3	0.117	0.104	0.414	0.401	0.045	0.036
4	0.133	0.120	0.446	0.433	0.045	0.036
5	0.149	0.136	0.508	0.495	0.045	0.036
6	0.164	0.151	0.570	0.557	0.045	0.036
8	0.196	0.183	0.640	0.620	0.071	0.056
10	0.211	0.198	0.749	0.727	0.071	0.056
12	0.242	0.229	0.890	0.868	0.071	0.056
1/4	0.296	0.276	1.015	0.993	0.071	0.056
5/16	0.359	0.339	1.140	1.118	0.071	0.056
3/8	0.421	0.401	1.280	1.243	0.112	0.090
7/16	0.484	0.464	1.499	1.462	0.112	0.090
1/2	0.546	0.526	1.780	1.743	0.112	0.090
9/16	0.609	0.589	2.030	1,997	0.112	0.090
5/8	0.686	0.649	2.280	2.243	0.174	0.146
3/4	0.842	0.805	2.280	2.243	0.174	0.146
7/8	0.968	0.931	2.780	2.743	0.174	0.146

Description	A thin, flat, circular metal part with a centrally located hole. The tolerances of the thickness and outside diameter of Type-B washers are tighter than for USS and SAE flat washers. Wide Series are thicker and have greater outside diameter than Type-B Reguar Series washers.	
Applications/ Advantages	For use with low-carbon steel materials. Type-B washers distribute load over larger areas than the comparable USS or SAE washers of the same nominal size.	For use with stainless materials. Type-B washers distribute load over larger areas than the comparable USS or SAE washers of the same nominal size.
Material	***Steel***	***Stainless***
	Low Carbon steel	Class 300 stainless

Steel & Stainless MACHINE SCREW



Machine Screw Washers

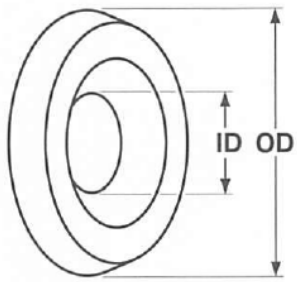
Washer Size	Inside Diameter		Outside Diameter		Thickness	
	Max	Min	Max	Min	Max	Min
2 (Steel)	0.097	0.087	0.224	0.214	0.022	0.014
* 2 (Stainless)	0.109	0.089	0.270	0.245	0.036	0.028
3	0.114	0.104	0.255	0.245	0.023	0.018
4 (Steel)	0.130	0.120	0.286	0.276	0.030	0.022
* 4 (Stainless)	0.135	0.115	0.332	0.307	0.036	0.028
5	0.145	0.135	0.286	0.276	0.030	0.022
6	0.155	0.145	0.380	0.370	0.036	0.028
8	0.175	0.165	0.380	0.370	0.036	0.028
10	0.209	0.199	0.443	0.433	0.036	0.028
12	0.232	0.222	0.505	0.495	0.052	0.044
1/4	0.270	0.260	0.567	0.557	0.052	0.044
5/16	0.335	0.325	0.630	0.620	0.054	0.046
3/8	0.397	0.387	0.693	0.683	0.054	0.046

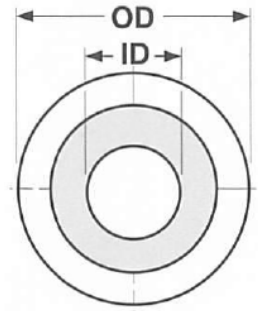
* #2 & #4 washers in stainless are supplied to AN 960 dimensions.

Description	The smallest type of flat washer with an outside diameter equal to slightly twice the size of the inside diameter.	
Applications/ Advantages	Designed for use with machine screws in general industrial applications.	
Material	***Steel***	***Stainless***
	Washers are punched from cold-rolled steel.	18-8 Stainless steel
Plating	See Appendix-A for plating information.	Although usually furnished plain, stainless machine screw washers are also available with a black oxide finish.

COUNTERSUNK FINISHING

Steel & Stainless



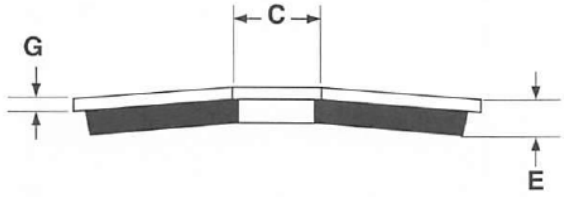


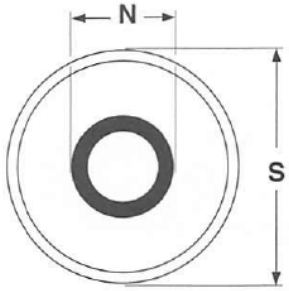
Countersunk Finishing Washers						
Screw Size	Outside Diameter		Inside Diameter		Overall Height	
	Max	Min	Max	Min	Max	Min
#4	.375	.334	.150	.113	.103	.078
#6	.469	.424	.200	.161	.103	.078
#8	.543	.518	.220	.180	.110	.086
#10	.606	.581	.279	.235	.126	.103
#12	.704	.656	.299	.259	.138	.113
1/4	.794	.762	.338	.305	.156	.125
5/16	.938	.864	.409	.373	.188	.141
3/8	1.125	.980	.460	.425	.260	.235

NOTE: There is currently no single set of specifications for countersunk finishing washers that is accepted as the industry standard. We offer these dimensions as a guideline to what is available. When meeting specific dimensions is critical, please confirm with your supplier.

Description	A formed circular washer designed for use with flat or oval head screws. This is a raised type of finishing washer which is convex shaped. For use with 82° countersunk flat and oval head screws.
Applications/ Advantages	Designed for accommodating the heads of countersunk screws. It provides additional bearing area on the material being fastened and can be used to give a neat, finished appearance.
Material	***Steel:*** Washers shall be punched from hot-rolled, hot-rolled and pickled or cold-rolled steel, or shall be machined from bar stock or tubing, or may be forged at the manufacturer's option. ***Stainless:*** 18-8 Stainless Steel
Plating	Steel countersunk finishing washers are typically supplied with a nickel plating. Other coatings such as black oxide are also popular. Stainless washers are usually supplied without additional finish.

With Neo-EPDM Surface SEALING





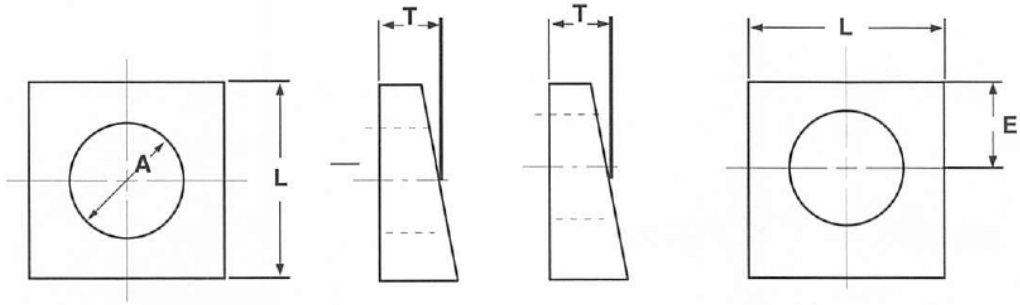
Neo-EPDM Sealing Washers

For Use with Screw of this Nominal Diameter	S		N		G	C		E	
	Outside Diameter of Steel Section		Inside Diameter of Steel Section		Thickness of Steel Section	Inside Diameter of EPDM Section		Thickness of EPDM Section	
	Max	Min	Max	Min	Ref	Max	Min	Max	Min
10	.505	.493	.219	.204	.031	.154	.129	.087	.070
12	.556	.544	.246	.225	.031	.189	.165	.087	.070
1/4	.635	.622	.305	.261	.031	.224	.200	.087	.070
3/8	.753	.740	.427	.406	.031	.358	.334	.087	.070
7/16	.871	.858	.505	.485	.031	.386	.361	.087	.070
1/2	1.004	.992	.560	.540	.031	.484	.459	.087	.070
3/4	1.504	1.491	.836	.815	.031	.771	.746	.087	.070
1	2.003	1.990	1.032	1.011	.031	-	-	.087	.070

Description	A thin conically-shaped circular steel stamping with a centrally located hole, bonded to a similarly shaped rubber-like piece which has a slightly smaller outside and inside diameter. When these washers are assembled (rubber side down) to self-piercing or self-drilling screws, those fasteners become "sealing screws".	
Applications / Advantages	When assembled with the proper sized screw, this washer: (a) offers protection against leakage; (b) provides load bearing qualities superior to that of a regular flat washer; (c) reduces the chance of the fastening becoming loose due to vibration; (d) minimizes damage to the mating surface caused by contact with a steel washer.	
Material	*Steel*	*Stainless*
	Steel Section of washer: 20 gauge steel ***Elastic Section of washer:*** Style 40 EPDM sheet	***Steel Section of washer:*** 18-8 Stainless steel ***Elastic Section of washer:*** Style 40 EPDM sheet
Hardness	***EPDM material:*** Shore A 65 - 75 (Durometer scale)	***EPDM material:*** Shore A 65 - 75 (Durometer scale)
Plating	***Metal Section of washer:*** Galvanized	***Metal Section of washer:*** Stainless is passivated.

BEVELED

Steel



Square Beveled

Clipped Square Beveled

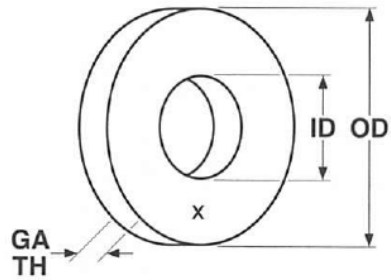
HARDENED BEVELED WASHERS

ASTM F436-2010

Nominal Washer Size		Inside Diameter - A			L	T	E
		Basic	Tolerance		Minimum Side Length	Thickness	Nominal Edge Distance
			Plus	Minus			
1/2	0.500	17/32	0.032	0	1.750	5/16	7/16
5/8	0.625	11/16	0.032	0	1.750	5/16	9/16
3/4	0.750	13/16	0.032	0	1.750	5/16	21/32
7/8	0.875	15/16	0.032	0	1.750	5/16	25/32
1	1.000	1 1/8	0.063	0	1.750	5/16	7/8
1-1/8	1.125	1 1/4	0.063	0	2.250	5/16	1
1-1/4	1.250	1 3/8	0.063	0	2.250	5/16	1 3/32
1-3/8	1.375	1 1/2	0.063	0	2.250	5/16	1 7/32
1-1/2	1.500	1 5/8	0.063	0	2.250	5/16	1 5/16

Description	A flat washer which can be square or circular, with one bearing surface having an oblique angle.
Applications/ Advantages	Commonly used when fastening bolts through the flanges of "I" beams.
Material	Washers shall be made from a carbon steel which conforms to the following chemical composition requirements (heat analysis): ***Phosphorus***: 0.040% maximum; ***Sulfur***: 0.050% maximum
Hardness	Plain or Zinc-plated - Rockwell C 38 - 45 Hot-Dip Galvanized - Rockwell C 26 - 45
Plating	See Appendix-A for plating information.

ASTM F436 ROUND, STRUCTURAL

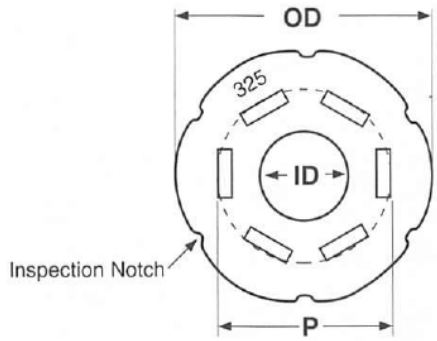


ASTM F436 Round Structural Washers						ASTM F436-2010
Bolt Size	OD		ID		TH	
	Outside Diameter		Inside Diameter		Thickness	
	Max	Min	Max	Min	Max	Min
1/2	1.094	1.031	.563	.531	.177	.097
5/8	1.344	1.281	.720	.688	.177	.122
3/4	1.500	1.438	.845	.813	.177	.122
7/8	1.781	1.719	.970	.938	.177	.136
1	2.063	1.927	1.126	1.000	.177	.136

Description	Dimensionally comparable to the USS plain washer, but with a smaller outside diameter, manufactured from a higher grade of steel and heat-treated.
Applications/ Advantages	Designed to be used with A325 & A490 structural bolts.
Material	Structural washers shall be manufactured from a steel which conforms to the following chemical composition requirements: ***Phosphorous***- 0.050%; ***Sulfur***- 0.060%
Hardness	Rockwell C38 - 45
Plating	Structural washers are usually supplied plain or with a galvanized finish.

TENSION INDICATING

For Use with Structural Fasteners



ASTM F959 Direct Tension Indicator Washers - used w/type 325 Structural Fasteners

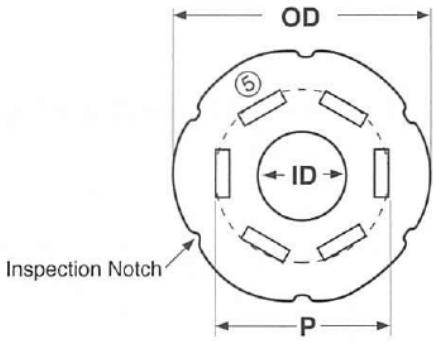
ASTM F959

Nominal Size	OD		ID		TH		P	Number of Protrusions (equally spaced)	Compression Load Range (lbs.)	
	Outside Diameter		Inside Diameter		Thickness		Protrusion Tangential Diameter			
	Max	Min	Max	Min	With Protrusion Max	Without Protrusion Min	Max		Max	Min
1/2	1.187	1.167	0.527	0.523	0.180	0.104	0.788	4	14,000	12,000
5/8	1.375	1.355	0.658	0.654	0.220	0.126	0.956	4	23,000	19,000
3/4	1.625	1.605	0.790	0.786	0.230	0.126	1.125	5	34,000	28,000
7/8	1.875	1.855	0.921	0.917	0.240	0.142	1.294	5	47,000	39,000
1	2.000	1.980	1.052	1.048	0.270	0.158	1.463	6	61,000	51,000
1 1/8	2.250	2.230	1.183	1.179	0.270	0.158	1.631	6	67,000	56,000
1 1/4	2.500	2.480	1.315	1.311	0.270	0.158	1.800	7	85,000	71,000
1 3/8	2.750	2.730	1.446	1.442	0.270	0.158	1.969	7	102,000	85,000
1 1/2	3.000	2.980	1.577	1.573	0.270	0.158	2.138	8	124,000	103,000

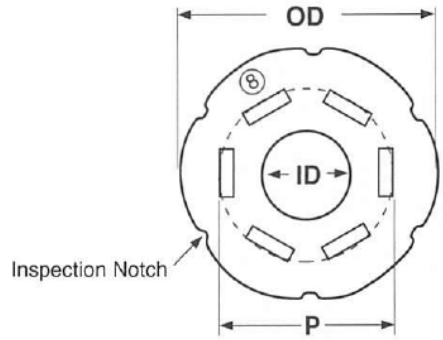
Description	A round washer with notches formed into its outer edge, protrusions equally spaced from each other on the top face and corresponding pockets on the bottom face.
Applications/ Advantages	These washers are designed to be used with A325 structural bolts. The washer is placed beneath the head of the bolt and as the bolt is tightened, the protrusions compress. When the protrusions have been flattened a sufficient amount the fastening has achieved the proper tension. Direct tension indicators are not affected by the presence of oil or other lubricants, and they measure tension regardless of surface condition. They help ensure proper tension is achieved even when a simple box wrench or socket wrench are the only tools that can be used to tighten the screw.
Material	Direct tension indicator washers shall be manufactured from a steel which conforms to the following chemical composition requirements (product analysis): ***Carbon***- 0.27-0.53%; ***Manganese***- 0.47-0.93%; ***Phosphorous***- 0.043% maximum; ***Sulfur***- 0.048% maximum; ***Silicon***- 0.13-0.37%
Heat Treatment	Parts shall be through hardened by heating to a temperature above the upper transformation temperature, quenched in liquid, then retempered by reheating to a suitable temperature to achieve the listed mechanical and performance requirements.
Hardness	Rockwell C35 maximum
Plating	Direct tension indicator washers are usually supplied plain or zinc plated.

For Use with Grades 5 & 8 Fasteners

TENSION INDICATING



GRADE 5



GRADE 8

DIRECT TENSION INDICATOR WASHERS - USED W/ GRADES 5 & 8 FASTENERS									SAE J 2486
Nominal Size	OD	ID		TH	P	Grade 5 Loads		Grade 8 Loads	
	Outside Diameter	Inside Diameter		Thickness	Protrusion Bearing Diameter	Target Clamp Load	Proof Load	Target Clamp Load	Proof Load
	Max	Max	Min	Min	Max		Min		Min
1/2	0.970	0.527	0.523	0.104	0.675	10,197	12,100	14,396	17,000
5/8	1.224	0.658	0.654	0.126	0.844	16,317	19,200	23,036	27,100
3/4	1.494	0.790	0.786	0.142	1.012	23,776	28,400	33,567	40,100
7/8	1.650	0.921	0.917	0.158	1.181	32,449	39,300	45,825	55,400
1	1.866	1.052	1.048	0.158	1.350	42,269	51,500	59,674	72,700
1 1/8	2.083	1.183	1.179	0.158	1.519	47,508	56,500	77,040	91,600
1 1/4	2.299	1.315	1.311	0.193	1.688	59,552	71,700	96,570	116,300
1 1/2	2.732	1.577	1.573	0.193	2.025	87,746	104,000	142,290	169,200

Description	A round washer with notches formed into its outer edge, protrusions on the top face equally spaced from each other, and corresponding pockets on the bottom face.
Applications/ Advantages	These washers are designed to be used with grade 5 and grade 8 cap screws. The washer is placed beneath the head of the cap screw and as the screw is tightened, the protrusions compress. When the protrusions have been flattened a sufficient amount the fastening has achieved the proper tension. Direct tension indicators are not affected by the presence of oil or other lubricants, and they measure tension regardless of surface condition. They help ensure proper tension is achieved even when a simple box wrench or socket wrench are the only tools that can be used to tighten the screw. They are used in the fleet industry, off-highway vehicles, construction, mining, and other heavy industrial equipment.
Material	Direct tension indicator washers shall be manufactured from a steel which conforms to the following chemical composition requirements (product analysis): ***Carbon***- 0.27-0.53%; ***Manganese***- 0.47-0.93%; ***Phosphorous***- 0.043% maximum; ***Sulfur***- 0.048% maximum; ***Silicon***- 0.13-0.37%
Heat Treatment	Parts shall be through hardened by heating to a temperature above the upper transformation temperature, quenched in liquid, then retempered by reheating to a suitable temperature to achieve the listed mechanical and performance requirements.
Hardness	Rockwell C35 maximum
Plating	Direct tension indicator washers are usually supplied plain or zinc plated.

RIVETS

Standard Break-Mandrel Blind Rivets

Dome Head, Aluminum/Aluminum 260-261
Dome Head, Aluminum/Steel 262-263
Dome Head, Steel/Steel 264-265
Dome Head, Stainless/Stainless 266-267
Dome Head, Stainless/Steel 268-269
Dome Head, Copper/Copper-plated Steel 270
Dome Head, Copper/Brass 271
Large Flange, Aluminum/Aluminum 272-273
Large Flange, Aluminum/Steel 272-273
Large Flange, Steel/Steel 274-275
Large Flange, Stainless/Steel 274-275
Large Flange, Stainless/Stainless 276-277

Closed End, Dome Head

Alumimum/Alumimum 278
Stainless/Stainless 279
Alumimum/Steel 280-281
Steel/Steel 282-283

Application Data & Part Number Key

Protruding Heads, Standard Blind Rivets 284
Countersunk Heads, Standard Blind Rivets 285

Countersunk Head Standard Blind Rivets

Alumimum/Steel 286-287
Steel/Steel 286-287
Stainless/Steel 286-287
Alumimum/Alumimum 288

Closed End, Countersunk Head

Alumimum/Steel 289

Multi-Grip Rivets

Dome Head, Aluminum/Steel 290
Low Profile Head, Aluminum/Steel 291
Countersunk Head, Aluminum/Steel 292
Large Flange, Aluminum/Steel 293
Low-Profile Head, Type US, Steel/Steel 294
Countersunk Head, Steel/Steel 295-296
Large Flange, Steel/Steel 295-296
Dome Head, Steel/Steel 295-296

3-Star™ Bulbing Style, Aluminum/Aluminum 297

RIVETS

Drive Pins, All Metal

Liner Head 298
Universal Head 299-301
Brazier Head 302-303
Countersunk Head 304-305
Tamper-Resistant 306

Drive Pin Anchor Rivets, Nylon

Round Head 307
Truss Head 308
Mushroom Head 309
Flat Countersunk Head 310

Full-Tubular Rivets

Oval Head 311
Truss Head 311
Flat Countersunk Head 311

Semi-Tubular Rivets

Oval Head 312
Truss Head 313
120° Countersunk Flat Head 314
150° Countersunk Flat Head 315

Solid Rivets

Button Head 316
Pan Head 317
Flat Head 318
Flat Countersunk Head 319

Split Rivets

Oval Head 320
Flat Countersunk Head 321

High Strength, Double Locking Orlock® Rivets

Dome Head, Steel & Aluminum 322
Countersunk Head, Steel & Aluminum 323
Dome Head, Stainless 324

Structural Rivets

Monobolt® brand 325
Protruding Head-- Steel, Aluminum, SS 326-327

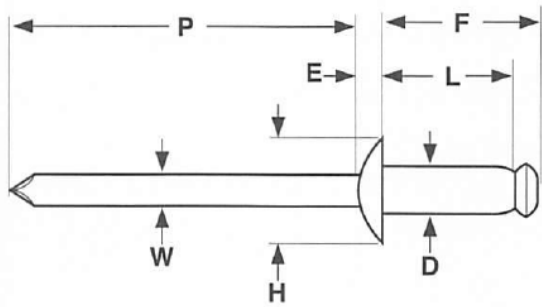
Rivet Nuts (Blind Threaded Inserts)

Ribbed Body, Flat Head, Large Flange 328-329
Flat Head, Large Flange 330
Smooth Body, Small Head 331
Ribbed Body, Small Flange 332-333

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BLIND, DOME HEAD

Aluminum Rivet
Aluminum Mandrel



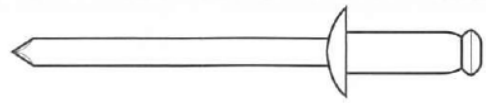
ALUMINUM BODY/ALUMINUM MANDREL DOME HEAD BREAK-STEM BLIND RIVETS

SAE J-1200

Nominal Rivet Diameter	D		H		E	W	P	F	Ultimate Shear Load	Ultimate Tensile Load	Mandrel Break Load	
	Rivet Shank Diameter		Head Diameter		Head Height	Mandrel Diameter	Mandrel Protrusion	Blind Side Protrusion				
	Max	Min	Max	Min	Max	Nom	Min	Max	Min, lb.	Min, lb.	Max	Min
3/32	0.096	0.090	0.198	0.178	0.032	0.057	1.00	L + 0.100	70	80	240	140
1/8	0.128	0.122	0.262	0.238	0.040	0.076	1.00	L + 0.120	120	150	400	250
5/32	0.159	0.153	0.328	0.296	0.050	0.095	1.06	L + 0.140	190	230	600	425
3/16	0.191	0.183	0.394	0.356	0.060	0.114	1.06	L + 0.160	260	320	825	625
1/4	0.255	0.246	0.525	0.475	0.080	0.151	1.25	L + 0.180	460	560	1400	1100

Description	An aluminum blind fastener which has a self-contained mechanical feature (a mandrel) which permits the formation of an upset on the blind end of the rivet and expansion of the rivet shank during rivet setting to join the component parts of an assembly. The aluminum mandrel is pulled into or against the rivet body, breaking at or near the junction of the mandrel shank and its upset end. The dome head is slightly rounded and twice as wide as the body diameter.
Applications/ Advantages	Dome head is the most commonly specified head style because of its low profile and neat, finished appearance. Aluminum/aluminum rivets have the lowest tensile and shear values of all break mandrel rivets. They should be used when fastening materials with similar mechanical and physical properties.
Material	***Rivet:*** Aluminum Alloy 5050 or 5052 or equivalent alloy. Rivets have no additional finish except for sizes #42 & 44 which are also available painted white. ***Mandrel:*** Aluminum Alloy 7178, 7075, 5056 or 2024 or equivalent alloy.
Shear Strength	Rivets shall have ultimate shear loads not less than the minimum ultimate shear loads specified for the applicable size given in the above table.
Tensile Strength	Rivets shall have ultimate tensile loads not less than the minimum ultimate tensile loads specified for the applicable size given in the above table.
Mandrel Break Load	While the rivet is being set, the axially applied load necessary to break the mandrel shall be within the limits specified for the applicable rivet size given in the above table.

Aluminum Rivet
Aluminum Mandrel
BLIND, DOME HEAD



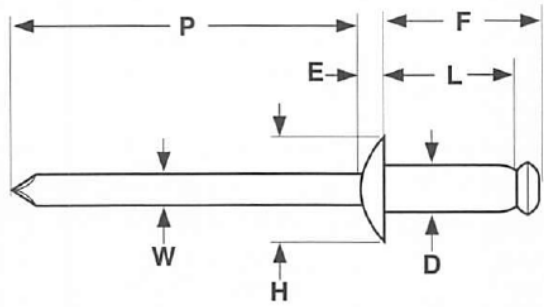
Part Number Comparison - Dome Head Aluminum Rivet/Aluminum Mandrel

Catalog Part Number	Huck/ Automatic	Pop®	Marson/ Creative	Star	Celus®	Cherry	Gesipa®
ADA32	ABA32	AD32ABS	AB3-2A	-	A/A32D	AAP-32	GAMD32A
ADA34	ABA34	AD34ABS	AB3-4A	-	A/A34D	AAP-34	GAMD34A
ADA41	ABA41	AD41ABS	AB4-1A	4-1AAD	A/A41D	AAP-41	GAMD41A
ADA42	ABA42	AD42ABS	AB4-2A	4-2AAD	A/A42D	AAP-42	GAMD42A
ADA43	ABA43	AD43ABS	AB4-3A	4-3AAD	A/A43D	AAP-43	GAMD43A
ADA44	ABA44	AD44ABS	AB4-4A	4-4AAD	A/A44D	AAP-44	GAMD44A
ADA45	ABA45	AD45ABS	AB4-5A	4-5AAD	A/A45D	AAP-45	GAMD45A
ADA46	ABA46	AD46ABS	AB4-6A	4-6AAD	A/A46D	AAP-46	GAMD46A
ADA48	ABA48	AD48ABS	AB4-8A	4-8AAD	A/A48D	AAP-48	GAMD48A
ADA410	ABA410	AD410ABS	AB4-10A	-	A/A410D	AAP-410	-
ADA52	ABA52	AD52ABS	AB5-2A	5-2AAD	A/A52D	AAP-52	GAMD52A
ADA53	ABA53	AD53ABS	AB5-3A	5-3AAD	A/A53D	-	GAMD53A
ADA54	ABA54	AD54ABS	AB5-4A	5-4AAD	A/A54D	AAP-54	GAMD54A
ADA56	ABA56	AD56ABS	AB5-6A	5-6AAD	A/A56D	AAP-56	GAMD56A
ADA58	ABA58	AD58ABS	AB5-8A	5-8AAD	A/A58D	AAP-58	GAMD58A
ADA510	ABA510	-	-	-	A/A510D	AAP-510	-
ADA512	-	-	-	-	-	-	-
ADA62	ABA62	AD62ABS	AB6-2A	6-2AAD	A/A62D	AAP-62	GAMD62A
ADA63	-	-	-	-	A/A63D	-	-
ADA64	ABA64	AD64ABS	AB6-4A	6-4AAD	A/A64D	AAP-64	GAMD64A
ADA66	ABA66	AD66ABS	AB6-6A	6-6AAD	A/A66D	AAP-66	GAMD66A
ADA68	ABA6 8	AD68ABS	AB6-8A	6-8AAD	A/A68D	AAP-68	GAMD68A
ADA610	ABA610	AD610ABS	AB6-10A	6-10AAD	A/A610D	AAP-610	GAMD610A
ADA612	ABA612	AD612ABS	AB6-12A	6-12AAD	A/A612D	AAP-612	GAMD612A
ADA614	ABA614	AD614ABS	-	-	A/A614D	AAP-614	GAMD614A
ADA616	ABA616	AD616ABS	AB6-16A	-	A/A616D	AAP-616	GAMD616A
ADA618	ABA618	-	-	-	-	-	-
ADA82	ABA82	-	-	-	-	AAP-82	-
ADA84	ABA84	AD84ABS	AB8-4A	-	A/A84D	AAP-84	GAMD84A
ADA86	ABA86	AD86ABS	AB8-6A	-	A/A86D	AAP-86	GAMD86A
ADA88	ABA88	AD88ABS	AB8-8A	-	A/A88D	AAP-88	GAMD88A
ADA810	ABA810	-	AB8-10A	-	A/A810D	AAP-810	GAMD810A
ADA812	ABA812	AD812ABS	AB8-12A	-	A/A812D	AAP-812	GAMD812A
ADA814	ABA814	-	-	-	A/A814D	AAP-814	-
ADA816	ABA816	-	-	-	A/A816D	AAP-816	GAMD816A

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Gesipa® is a registered trademark of Gesipa Fasteners USA, Inc.
Pop® is a registered trademark of Emhart Teknologies, LLC.
Kanebridge's rivets are not necessarily manufactured by or connected with the producers of Gesipa® or Pop® rivets.

BLIND, DOME HEAD

Aluminum Rivet
Steel Mandrel



ALUMINUM BODY/STEEL MANDREL DOME HEAD BREAK-STEM BLIND RIVETS

SAE J-1200

Nominal Rivet Diameter	D		H		E	W	P	F	Ultimate Shear Load	Ultimate Tensile Load	Mandrel Break Load	
	Rivet Shank Diameter		Head Diameter		Head Height	Mandrel Diameter	Mandrel Protrusion	Blind Side Protrusion				
	Max	Min	Max	Min	Max	Nom	Min	Max	Min, lb.	Min, lb.	Max	Min
3/32	0.096	0.090	0.198	0.178	0.032	0.057	1.00	L + 0.100	90	120	275	175
1/8	0.128	0.122	0.262	0.238	0.040	0.076	1.00	L + 0.120	170	220	600	400
5/32	0.159	0.153	0.328	0.296	0.050	0.095	1.06	L + 0.140	260	350	850	600
3/16	0.191	0.183	0.394	0.356	0.060	0.114	1.06	L + 0.160	380	500	1050	750
1/4	0.255	0.246	0.525	0.475	0.080	0.151	1.25	L + 0.180	700	920	1850	1450

Description	An aluminum blind fastener which has a self-contained steel mandrel which permits the formation of an upset on the blind end of the rivet and expansion of the rivet shank during rivet setting to join the component parts of an assembly. The steel mandrel is pulled into or against the rivet body, breaking at or near the junction of the mandrel shank and its upset end. The head of the body is slightly rounded and twice as wide as the body diameter.
Applications/ Advantages	Dome head is the most commonly specified head style because of its low profile and neat, finished appearance. The steel mandrel gives this style rivet greater tensile and shear values than aluminum rivets with aluminum mandrels. They should be used when fastening materials with similar mechanical and physical properties.
Material	***Rivet:*** Aluminum Alloy 5056 or 5154 or equivalent alloy. Rivets have no additional finish except for sizes #42 & 44 which are also available painted white. Note: Some manufacturers use aluminum alloy 5052 which is acceptable but will lower the shear, tensile and mandrel break load standards to those of aluminum rivets with aluminum mandrels. ***Mandrel:*** Carbon steel 1006 or equivalent. May be furnished plain or with a protective coating, at the option of the manufacturer.
Shear Strength	Rivets shall have ultimate shear loads not less than the minimum ultimate shear loads specified for the applicable size given in the above table.
Tensile Strength	Rivets shall have ultimate tensile loads not less than the minimum ultimate tensile loads specified for the applicable size given in the above table.
Mandrel Break Load	While the rivet is being set, the axially applied load necessary to break the mandrel shall be within the limits specified for the applicable rivet size given in the above table.

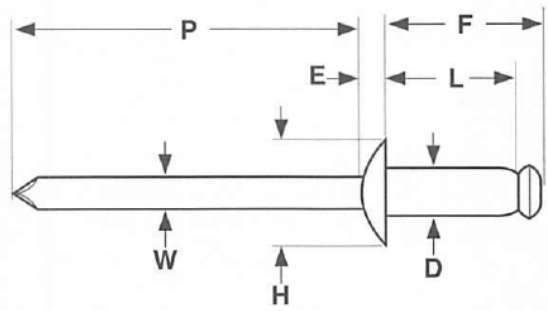
Aluminum Rivet Steel Mandrel — BLIND, DOME HEAD

PART NUMBER COMPARISON - ALUMINUM RIVET/STEEL MANDREL, DOME HEAD							
Catalog Part Number	Huck/ Automatic	Pop®	Marson/ Creative	Star	Celus®	Cherry	Gesipa®
ADS31	-	-	-	-	-	-	-
ADS32	ABS32	AD32BS	AB3-2	-	-	BSP-32	GSMD32A
ADS34	ABS34	AD34BS	AB3-4	-	-	BSP-34	GSMD34A
ADS41	ABS41	AD41BS	AB4-1	4-1ASD	-	BSP-41	GSMD41A
ADS42	ABS42	AD42BS	AB4-2	4-2ASD	A/S 42D	BSP-42	GSMD42A
ADS43	ABS43	AD43BS	AB4-3	4-3ASD	A/S 43D	BSP-43	GSMD43A
ADS44	ABS44	AD44BS	AB4-4	4-4ASD	A/S 44D	BSP-44	GSMD44A
ADS45	ABS45	AD45BS	AB4-5	4-5ASD	-	BSP-45	GSMD45A
ADS46	ABS46	AD46BS	AB4-6	4-6ASD	A/S 46D	BSP-46	GSMD46A
ADS48	ABS48	AD48BS	AB4-8	4-8ASD	-	BSP-48	GSMD48A
ADS410	ABS410	AD410BS	AB4-10	-	A/S 410D	BSP-410	-
ADS52	ABS52	AD52BS	AB5-2	5-2ASD	A/S 52D	BSP-52	GSMD52A
ADS53	ABS53	AD53BS	AB5-3	5-3ASD	-	-	GSMD53A
ADS54	ABS54	AD54BS	AB5-4	5-4ASD	A/S 54D	BSP-54	GSMD54A
ADS56	ABS56	AD56BS	AB5-6	5-6ASD	A/S 56D	BSP-56	GSMD56A
ADS58	ABS58	AD58BS	AB5-8	-	-	BSP-58	GSMD58A
ADS510	ABS510	-	-	-	-	BSP-510	-
ADS512	-	-	-	-	-	-	-
ADS516	-	-	-	-	-	-	-
ADS62	ABS62	AD62BS	AB6-2	6-2ASD	A/S 62D	BSP-62	GSMD62A
ADS63	-	-	-	-	-	-	-
ADS64	ABS64	AD64BS	AB6-4	6-4ASD	A/S 64D	BSP-64	GSMD64A
ADS66	ABS66	AD66BS	AB6-6	6-6ASD	A/S 66D	BSP-66	GSMD66A
ADS68	ABS68	AD68BS	AB6-8	6-8ASD	A/S 68D	BSP-68	GSMD68A
ADS610	ABS610	AD610BS	AB6-10	6-10ASD	A/S610D	BSP-610	GSMD610A
ADS612	ABS612	AD612BS	AB6-12	6-12ASD	-	BSP-612	GSMD612A
ADS614	ABS614	AD614BS	-	-	-	BSP-614	GSMD614A
ADS616	ABS616	AD616BS	AB6-16	-	-	BSP-616	GSMD616A
ADS618	ABS618	-	-	-	-	-	-
ADS620	-	-	-	-	-	-	-
ADS622	-	-	-	-	-	-	-
ADS82	-	-	-	-	-	BSP-82	-
ADS84	ABS84	AD84BS	AB8-4	-	-	BSP-84	GSMD84A
ADS86	ABS86	AD86BS	AB8-6	-	-	BSP-86	GSMD86A
ADS88	ABS88	AD88BS	AB8-8	-	-	BSP-88	GSMD88A
ADS810	ABS810	AD810BS	AB8-10	-	-	BSP-810	GSMD810A
ADS812	ABS812	AD812BS	AB8-12	-	-	BSP-812	GSMD812A
ADS814	ABS814	-	-	-	A/S 814D	BSP-814	-
ADS816	-	AD816BS	-	-	-	BSP-816	GSMD816A

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Gesipa® is a registered trademark of Gesipa Fasteners USA, Inc.
Pop® is a registered trademark of Emhart Teknologies, LLC.
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BLIND, DOME HEAD

Steel Rivet
Steel Mandrel



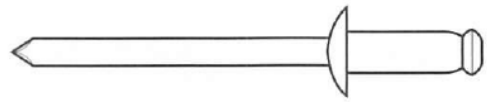
STEEL BODY/STEEL MANDREL DOME HEAD BREAK-STEM BLIND RIVETS

SAE J-1200

Nominal Rivet Diameter	D		H		E	W	P	F	Ultimate Shear Load	Ultimate Tensile Load	Mandrel Break Load	
	Rivet Shank Diameter		Head Diameter		Head Height	Mandrel Diameter	Mandrel Protrusion	Blind Side Protrusion				
	Max	Min	Max	Min	Max	Nom	Min	Max	Min, lb.	Min, lb.	Max	Min
3/32	0.096	0.090	0.198	0.178	0.032	0.057	1.00	L + 0.100	130	170	360	260
1/8	0.128	0.122	0.262	0.238	0.040	0.076	1.00	L + 0.120	260	310	800	600
5/32	0.159	0.153	0.328	0.296	0.050	0.095	1.06	L + 0.140	370	470	1000	750
3/16	0.191	0.183	0.394	0.356	0.060	0.114	1.06	L + 0.160	540	680	1450	1150
1/4	0.255	0.246	0.525	0.475	0.080	0.151	1.25	L + 0.180	1000	1240	2350	1950

Description	A steel blind fastener which has a self-contained steel mandrel which permits the formation of an upset on the blind end of the rivet and expansion of the rivet shank during rivet setting to join the component parts of an assembly. The steel mandrel is pulled into or against the rivet body, breaking at or near the junction of the mandrel shank and its upset end. The head of the body is slightly rounded and twice as wide as the body diameter.
Applications/ Advantages	Dome head is the most commonly specified head style because of its low profile and neat, finished appearance. The steel mandrel gives this style rivet greater tensile and shear values than aluminum rivets with aluminum mandrels. They should be used when fastening materials with similar mechanical and physical properties.
Material	***Rivet:*** Low carbon steel. Rivets have no additional finish except for the #42 size which is also available painted white. ***Mandrel:*** Carbon steel 1006 or equivalent. May be furnished plain or with a protective coating, at the option of the manufacturer.
Shear Strength	Rivets shall have ultimate shear loads not less than the minimum ultimate shear loads specified for the applicable size given in the above table.
Tensile Strength	Rivets shall have ultimate tensile loads not less than the minimum ultimate tensile loads specified for the applicable size given in the above table.
Mandrel Break Load	While the rivet is being set, the axially applied load necessary to break the mandrel shall be within the limits specified for the applicable rivet size given in the above table.

Steel Rivet
Steel Mandrel
BLIND, DOME HEAD

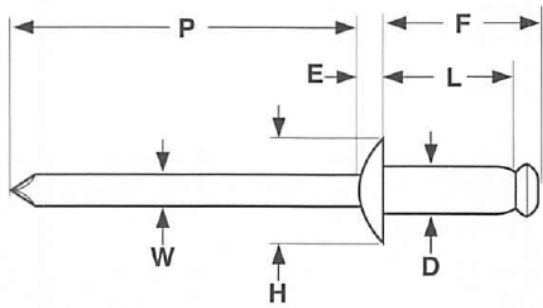


Part Number Comparison - Dome Head Steel Rivet/Steel Mandrel							
Catalog Part Number	Huck-Automatic	Pop®	Marson/ Creative	Star	Celus®	Cherry	Gesipa®
SDS32	SBS32	SD32BS	SB3-2	-	S/S32D	SSP-32	GSMD32S
SDS34	SBS34	SD34BS	SB3-4	-	S/S34D	SSP-34	GSMD34S
SDS41	SBS41	SD41BS	SB4-1	4-1SSD	S/S41D	SSP-41	GSMD41S
SDS42	SBS42	SD42BS	SB4-2	4-2SSD	S/S42D	SSP-42	GSMD42S
SDS43	SBS43	SD43BS	SB4-3	4-3SSD	S/S43D	SSP-43	GSMD43S
SDS44	SBS44	SD44BS	SB4-4	4-4SSD	S/S44D	SSP-44	GSMD44S
SDS45	SBS45	SD45BS	SB4-5	4-5SSD	S/S45D	SSP-45	GSMD45S
SDS46	SBS46	SD46BS	SB4-6	4-6SSD	S/S46D	SSP-46	GSMD46S
SDS48	SBS48	SD48BS	SB4-8	4-8SSD	S/S48D	SSP-48	GSMD48S
SDS410	SBS410	-	SB4-10	-	S/S410D	-	-
SDS52	SBS52	SD52BS	SB5-2	5-2SSD	S/S52D	SSP-52	GSMD52S
SDS53	SBS53	SD53BS	SB5-3	5-3SSD	S/S53D	-	GSMD53S
SDS54	SBS54	SD54BS	SB5-4	5-4SSD	S/S54D	SSP-54	GSMD54S
SDS56	SBS56	SD56BS	SB5-6	5-6SSD	S/S56D	SSP-56	GSMD56S
SDS58	SBS58	-	SB5-8	5-8SSD	S/S58D	SSP-58	GSMD58S
SDS510	SBS510	-	-	-	S/S510D	SSP-510	-
SDS62	SBS62	SD62BS	SB6-2	6-2SSD	S/S62D	SSP-62	GSMD62S
SDS63	SBS63	-	-	-	S/S63D	-	-
SDS64	SBS64	SD64BS	SB6-4	6-4SSD	S/S64D	SSP-64	GSMD64S
SDS66	SBS66	SD66BS	SB6-6	6-6SSD	S/S66D	SSP-66	GSMD66S
SDS68	SBS68	SD68BS	SB6-8	6-8SSD	S/S68D	SSP-68	GSMD68S
SDS610	SBS610	SD610BS	SB6-10	6-10SSD	S/S610D	SSP-610	GSMD610S
SDS612	SBS612	SD612BS	SB6-12	-	S/S612D	SSP-612	GSMD612S
SDS614	SBS614	-	-	-	S/S614D	SSP-614	-
SDS616	-	SD616BS	SB6-16	-	S/S616D	SSP-616	GSMD616S
SDS82	-	-	-	-	-	SSP-82	-
SDS84	SBS84	SD84BS	SB8-4	-	S/S 84D	SSP-84	GSMD84S
SDS86	SBS86	SD86BS	SB8-6	-	S/S 86D	SSP-86	GSMD86S
SDS88	SBS88	SD88BS	SB8-8	-	S/S 88D	SSP-88	GSMD88S
SDS810	SBS810	SD810BS	SB8-10	-	S/S810D	SSP-810	GSMD810S
SDS812	SBS812	SD812BS	SB8-12	-	S/S812D	SSP-812	GSMD812S

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BLIND, DOME HEAD

Stainless Rivet
Stainless Mandrel

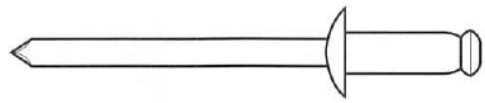


STAINLESS STEEL BODY/STAINLESS STEEL MANDREL DOME HEAD BREAK-STEM BLIND RIVETS SAE J-1200

Nominal Rivet Diameter	D		H		E	W	P	F	Ultimate Shear Load	Ultimate Tensile Load	Mandrel Break Load, lb.	
	Rivet Shank Diameter		Head Diameter		Head Height	Mandrel Diameter	Mandrel Protrusion	Blind Side Protrusion				
	Max	Min	Max	Min	Max	Nom	Min	Max	Min, lb.	Min, lb.	Max	Min
3/32	0.096	0.090	0.198	0.178	0.032	0.057	1.00	L + 0.100	230	280	500	300
1/8	0.128	0.122	0.262	0.238	0.040	0.076	1.00	L + 0.120	420	530	950	650
5/32	0.159	0.153	0.328	0.296	0.050	0.095	1.06	L + 0.140	650	820	1450	1150
3/16	0.191	0.183	0.394	0.356	0.060	0.114	1.06	L + 0.160	950	1200	1900	1400
1/4	0.255	0.246	0.525	0.475	0.080	0.151	1.25	L + 0.180	1700	2100	3600	3000

Description	A stainless steel blind fastener with a self-contained stainless steel mandrel which is otherwise designed identically to other dome head rivets. The head of the body is slightly rounded and twice as wide as the diameter of the body.
Applications/ Advantages	Stainless rivets have the strongest tensile strengths, shear strengths and mandrel break-load standards of all the break mandrel rivets discussed in this section. They resist tarnishing under most atmospheric conditions and offers high strength at moderately raised temperatures. They should be used when fastening materials with mechanical and physical properties similar to stainless steel.
Material	***Rivet:*** 305 (or equivalent) Stainless Steel ***Mandrel:*** Stainless Steel (300 series)
Shear Strength	Rivets shall have ultimate shear loads not less than the minimum ultimate shear loads specified for the applicable size given in the above table.
Tensile Strength	Rivets shall have ultimate tensile loads not less than the minimum ultimate tensile loads specified for the applicable size given in the above table.
Mandrel Break Load	While the rivet is being set, the axially applied load necessary to break the mandrel shall be within the limits specified for the applicable rivet size given in the above table.

Stainless Rivet
Stainless Mandrel
BLIND, DOME HEAD



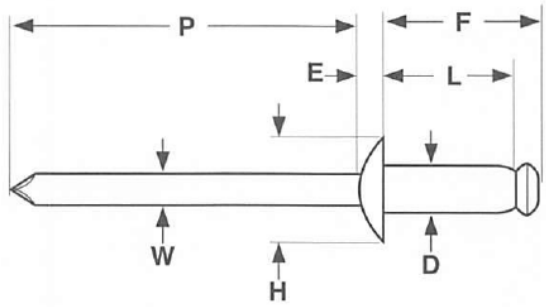
Part Number Comparison - Dome Head All Stainless Steel Blind Rivets

Catalog Part Number	Huck/ Automatic	Pop®	Marson/ Creative	Star	Celus®	Cherry	Gesipa®
SSDSS32	-	SSD32SSBS	-	-	SS/SS32D	CCP-32	-
SSDSS34	-	SSD34SSBS	-	-	SS/SS34D	CCP-34	-
SSDSS40	-	-	-	-	-	-	-
SSDSS41	-	SSD41SSBS	SSB4-1S	-	SS/SS41D	CCP-41	-
SSDSS42	FBF42	SSD42SSBS	SSB4-2S	4-2STSTD	SS/SS42D	CCP-42	GSSMD42SS
SSDSS43	FBF43	SSD43SSBS	SSB4-3S	-	SS/SS43D	CCP-43	GSSMD43SS
SSDSS44	FBF44	SSD44SSBS	SSB4-4S	4-4STSTD	SS/SS44D	CCP-44	GSSMD44SS
SSDSS45	-	SSD45SSBS	SSB4-5S	-	SS/SS45D	CCP-45	-
SSDSS46	FBF46	SSD46SSBS	SSB4-6S	4-6STSTD	SS/SS46D	CCP-46	GSSMD46SS
SSDSS48	FBF48	SSD48SSBS	SSB4-8S	-	SS/SS48D	-	GSSMD48SS
SSDSS52	FBF52	SSD52SSBS	SSB5-2S	-	SS/SS52D	CCP-52	GSSMD52SS
SSDSS53	-	SSD53SSBS	-	-	-	-	-
SSDSS54	FBF54	SSD54SSBS	SSB5-4S	-	SS/SS54D	CCP-54	GSSMD54SS
SSDSS56	FBF56	SSD56SSBS	SSB5-6S	-	SS/SS56D	CCP-56	GSSMD56SS
SSDSS58	-	SSD58SSBS	-	-	SS/SS58D	-	-
SSDSS510	-	-	-	-	SS/SS510D	-	-
SSDSS62	FBF62	SSD62SSBS	SSB6-2S	-	SS/SS62D	CCP-62	GSSMD62SS
SSDSS63	-	-	-	-	SS/SS63D	-	-
SSDSS64	FBF64	SSD64SSBS	SSB6-4S	-	SS/SS64D	CCP-64	GSSMD64SS
SSDSS66	FBF66	SSD66SSBS	SSB6-6S	-	SS/SS66D	CCP-66	GSSMD66SS
SSDSS68	FBF68	SSD68SSBS	SSB6-8S	-	SS/SS68D	CCP-68	GSSMD68SS
SSDSS610	-	SSD610SSBS	SSB6-10S	-	SS/SS610D	-	-
SSDSS612	-	SSD612SSBS	SSB6-12S	-	-	-	-
SSDSS614	-	-	-	-	-	-	-
SSDSS616	-	-	-	-	-	-	-
SSDSS82	-	-	-	-	-	CCP-82	-
SSDSS84	-	SSD84SSBS	-	-	SS/SS84D	CCP-84	-
SSDSS86	-	SSD86SSBS	-	-	SS/SS86D	CCP-86	-
SSDSS88	-	SSD88SSBS	-	-	SS/SS88D	CCP-88	-
SSDSS810	-	-	-	-	-	CCP-810	-
SSDSS812	-	-	-	-	-	-	-

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BLIND, DOME HEAD

Stainless Rivet Steel Mandrel



STAINLESS STEEL BODY/STEEL MANDREL DOME HEAD BREAK-STEM BLIND RIVETS — SAE J-1200

Nominal Rivet Diameter	D		H		E	W	P	F	Ultimate Shear Load	Ultimate Tensile Load	Mandrel Break Load, lb.	
	Rivet Shank Diameter		Head Diameter		Head Height	Mandrel Diameter	Mandrel Protrusion	Blind Side Protrusion				
	Max	Min	Max	Min	Max	Nom	Min	Max	Min, lb.	Min, lb.	Max	Min
3/32	0.096	0.090	0.198	0.178	0.032	0.057	1.00	L + 0.100	230	280	500	300
1/8	0.128	0.122	0.262	0.238	0.040	0.076	1.00	L + 0.120	420	530	950	650
5/32	0.159	0.153	0.328	0.296	0.050	0.095	1.06	L + 0.140	650	820	1450	1150
3/16	0.191	0.183	0.394	0.356	0.060	0.114	1.06	L + 0.160	950	1200	1900	1400
1/4	0.255	0.246	0.525	0.475	0.080	0.151	1.25	L + 0.180	1700	2100	3600	3000

Description	A stainless steel blind fastener with a self-contained steel mandrel which is otherwise designed identically to other dome head rivets. The head of the body is slightly rounded and twice as wide as the diameter of the body.
Applications/ Advantages	The Stainless rivet/Steel mandrel combo is more economical than the all stainless variety. Stainless rivets have the strongest tensile strengths, shear strengths and mandrel break-load standards of all the break mandrel rivets discussed in this section. They resist tarnishing under most atmospheric conditions and offers high strength at moderately raised temperatures. They should be used when fastening materials with mechanical and physical properties similar to stainless steel.
Material	***Rivet:*** 305 (or equivalent) Stainless Steel ***Mandrel:*** Carbon Steel
Shear Strength	Rivets shall have ultimate shear loads not less than the minimum ultimate shear loads specified for the applicable size given in the above table.
Tensile Strength	Rivets shall have ultimate tensile loads not less than the minimum ultimate tensile loads specified for the applicable size given in the above table.
Mandrel Break Load	While the rivet is being set, the axially applied load necessary to break the mandrel shall be within the limits specified for the applicable rivet size given in the above table.

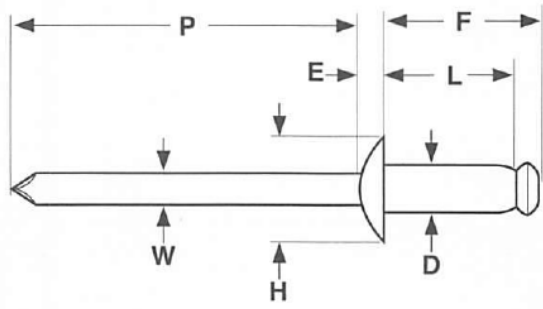
Stainless Rivet Steel Mandrel

BLIND, DOME HEAD

DOME HEAD Stainless Steel Rivet/Steel Mandrel							
Kanebridge Part Number	Huck/ Automatic	Pop®	Marson®	Star	Celus®	Cherry	Gesipa®
SSDS41	-	SSD41BS	SSB4-1	-	SS/S41D	CSP-41	-
SSDS42	FBS42	SSD42BS	SSB4-2	-	SS/S42D	CSP-42	GSMD42SS
SSDS43	FBS43	SSD43BS	SSB4-3	-	SS/S43D	CSP-43	GSMD43SS
SSDS44	FBS44	SSD44BS	SSB4-4	4-4STSD	SS/S44D	CSP-44	GSMD44SS
SSDS45	-	-	SSB4-5	-	SS/S45D	CSP-45	-
SSDS46	FBS46	SSD46BS	SSB4-6	-	SS/S46D	CSP-46	GSMD46SS
SSDS48	FBS48	SSD48BS	SSB4-8	-	SS/S48D	-	GSMD48SS
SSDS52	FBS52	SSD52BS	SSB5-2	-	SS/S52D	CSP-52	GSMD52SS
SSDS53	-	-	-	-	-	-	-
SSDS54	FBS54	SSD54BS	SSB5-4	-	SS/S54D	CSP-54	GSMD54SS
SSDS56	FBS56	SSD56BS	SSB5-6	-	SS/S56D	CSP-56	GSMD56SS
SSDS58	-	-	-	-	SS/S58D	-	-
SSDS510	-	-	-	-	SS/S510D	-	-
SSDS62	FBS62	SSD62BS	SSB6-2	-	SS/S62D	CSP-62	GSMD62SS
SSDS63	-	-	-	-	SS/S63D	-	-
SSDS64	FBS64	SSD64BS	SSB6-4	-	SS/S64D	CSP-64	GSMD64SS
SSDS66	FBS66	SSD66BS	SSB6-6	-	SS/S66D	CSP-66	GSMD66SS
SSDS68	FBS68	SSD68BS	SSB6-8	-	SS/S68D	CSP-68	GSMD68SS
SSDS610	-	-	SSB6-10	-	SS/S610D	-	-
SSDS612	-	-	SSB6-12	-	-	-	-
SSDS614	-	-	-	-	-	-	-
SSDS616	-	-	-	-	-	-	-
SSDS82	-	-	-	-	-	CSP-82	-
SSDS84	-	-	-	-	SS/S84D	CSP-84	-
SSDS86	-	-	-	-	SS/S86D	CSP-86	-
SSDS88	-	-	-	-	SS/S88D	CSP-88	-
SSDS810	-	-	-	-	-	CSP-810	-
SSDS812	-	-	-	-	-	-	-

BLIND, DOME HEAD

Copper Rivet Copper-Plated Mandrel



Copper Body/Copper-Plated Steel Mandrel, Dome Head Break-Stem Blind Rivets — SAE J-1200

Nominal Rivet Diameter	D		H		E	W	P	F	Mandrel Break Load	
	Rivet Shank Diameter		Head Diameter		Head Height	Mandrel Diameter	Mandrel Protrusion	Blind Side Protrusion		
	Max	Min	Max	Min	Max	Nom	Min	Max	Max	Min
1/8	0.128	0.122	0.262	0.238	0.040	0.076	1.00	L + 0.120	600	400

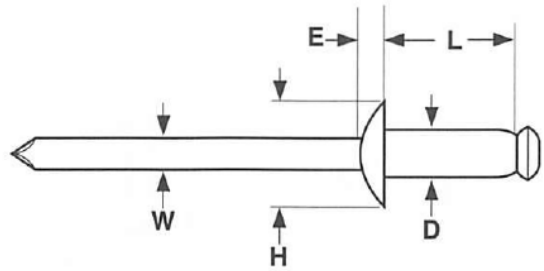
Description	A copper blind fastener with a self-contained steel mandrel which is otherwise designed identically to an aluminum rivet with a steel mandrel. The head of the rivet body is slightly rounded and twice as wide as the body diameter.
Applications/ Advantages	Dome head is the only head style in which the copper rivet is offered. Copper rivets are not subject to tensile or shear strength testing, but meet the same mandrel break-load standards as aluminum rivets with steel mandrels. Copper is the most malleable of the various rivet metals. It has a higher electrical conductivity than any of the other rivet metals which make it useful in many electrical applications. They should be used when fastening materials with mechanical and physical properties similar to copper.
Material	***Rivet:*** Copper Alloy No. 110. ***Mandrel:*** Carbon steel 1006 or equivalent, copper plated.
Shear Strength	Copper rivets are not subject to shear testing (SAE J1200).
Tensile Strength	Copper rivets are not subject to tensile testing (SAE J1200).
Mandrel Break Load	While the rivet is being set, the axially applied load necessary to break the mandrel shall be within 600 lbs. max, and 400 lbs. min.

Part Number Comparison - Dome Head Copper Rivet/Copper-plated Steel Mandrel

Catalog Part Number	Huck/ Automatic	Pop®	Marson/ Creative	Star	Celus®	Cherry	Gesipa®
KDS42	CBS42	CD42BS	CB4 - 2C	-	C/S42D	USP-42	-
KDS44	CBS44	CD44BS	CB4 - 4C	-	C/S44D	USP-44	-

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Copper Rivet Brass Mandrel — BLIND, DOME HEAD



Copper Body/Brass Mandrel, Dome Head Break-Stem Blind Rivets

Nominal Rivet Diameter	D		H		E	W	Shear Strength (lbs)	Tensile Strength (lbs)
	Rivet Shank Diameter		Head Diameter		Head Height	Mandrel Diameter		
	Max	Min	Max	Min	Max	Nom	Nom	Nom
1/8	0.128	0.122	0.262	0.238	0.040	0.076	215	300

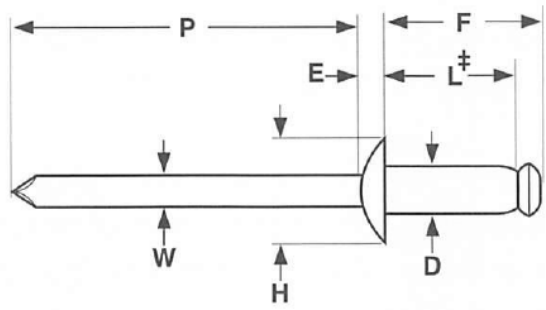
Description	A copper blind fastener with a self-contained brass mandrel which is otherwise designed identically to an aluminum rivet with a steel mandrel. The head of the rivet body is slightly rounded and twice as wide as the body diameter.
Applications/ Advantages	Dome head is the only head style in which the copper rivet is offered. Copper is the most malleable of the various rivet metals. It has a higher electrical conductivity than any of the other rivet metals which make it useful in many electrical applications. The brass mandrel has superior resistance to corrossion as compared to steel. They should be used when fastening materials with mechanical and physical properties similar to copper.
Material	*Rivet:* Copper Alloy No. 110. *Mandrel:* Brass.
Shear Strength	Rivets shall have ultimate shear loads not less than the minimum ultimate shear loads specified for the applicable size given in the above table.
Tensile Strength	Rivets shall have ultimate tensile loads not less than the minimum ultimate tensile loads specified for the applicable size given in the above table.

Part Number Comparison - DOME Copper Rivet / Brass Mandrel

Kanebridge Part Number	Huck/ Automatic	Pop®	Marson®	Star	Celus®	Cherry®	Gesipa®
KDB42	-	-	CB4 - 2B	-	-	-	-
KDB44	-	-	CB4 - 4B	-	-	-	-

BLIND, LARGE FLANGE

Aluminum / Aluminum, Aluminum / Steel



LARGE FLANGE BREAK-STEM BLIND RIVETS

SAE J-1200

Nominal Rivet Diameter	D		H		E	W	P	F
	Rivet Shank Diameter		Head Diameter		Head Height	Mandrel Diameter	Mandrel Protrusion	Blind Side Protrusion
	Max	Min	Max	Min	Max	Nom	Min	Max
1/8	0.128	0.122	.390	.360	.065	0.076	1.00	L + 0.120
5/32	0.159	0.153	.488	.448	.075	0.095	1.06	L + 0.140
3/16	0.191	0.183	.650	.600	.092	0.114	1.06	L + 0.160

Description	A blind fastener which has a self-contained mandrel which permits the formation of an upset on the blind end of the rivet and expansion of the rivet shank during rivet setting to join the component parts of an assembly. The mandrel is pulled into or against the rivet body, breaking at or near the junction of the mandrel shank and its upset end. The large flange head has twice the under-head bearing surface of comparably sized dome head rivets.
Applications/ Advantages	Large flange rivets are preferred where extra brittle or soft materials are being assembled to a rigid surface.
Material	***Rivet Body:*** *Aluminum*-- Aluminum Alloy 5050, 5052, 5056 or 5154. ***Mandrel:*** *Aluminum*-- Aluminum Alloy 7178, 5056 or 2024. *Steel*-- Carbon steel 1006 or equivalent. May be furnished plain or with a protective coating, at the option of the manufacturer.
Shear Strength (Min)	***Aluminum Rivet/Aluminum Mandrel***-- *1/8*: 120 lbs.; *5/32*: 190 lbs.; *3/16*: 260 lbs. ***Aluminum Rivet/Steel Mandrel***-- *1/8*: 170 lbs.; *5/32*: 260 lbs.; *3/16*: 380 lbs.
Tensile Strength (Min)	***Aluminum Rivet/Aluminum Mandrel***-- *1/8:* 150 lbs.; *5/32*: 230 lbs.; *3/16*: 320 lbs. ***Aluminum Rivet/Steel Mandrel***-- *1/8:* 220 lbs.; *5/32*: 350 lbs.; *3/16*: 500 lbs.
Mandrel Break Load	***Alum Rivet/Alum Mandrel***-- *1/8:* 400 lbs. max, 250 lbs. min; *5/32*: 600 lbs max, 425 lbs. min; *3/16*: 825 lbs. max, 625 lbs. min. ***Alum Rivet/Steel Mandrel***-- *1/8:* 600 lbs. max, 400 lbs. min; *5/32*: 850 lbs max, 600 lbs. min; *3/16*: 1050 lbs. max, 750 lbs. min.

Aluminum / Aluminum
Aluminum / Steel
BLIND, LARGE FLANGE

Part Number Comparison - Large Flange Aluminum Rivet/Aluminum Mandrel

Catalog Part Number	Huck-Automatic	Pop®	Marson/ Creative	Star	Celus®	Cherry	Gesipa®
ADA42L	ABA42L	AD42ABSLF	ABL4-2A	4-2AALF	A/A42LF	AAL-42	GAML42A
ADA43L	-	AD43ABSLF	ABL4-3A	-	A/A43LF	-	-
ADA44L	ABA44L	AD44ABSLF	ABL4-4A	4-4AALF	A/A44LF	AAL-44	GAML44A
ADA45L	-	-	-	-	-	-	-
ADA46L	ABA46L	AD46ABSLF	-	-	A/A46LF	AAL-46	GAML46A
ADA48L	-	-	-	-	-	AAL-48	-
ADA52L	-	-	-	-	-	-	-
ADA53L	-	-	-	-	A/A53LF	-	-
ADA54L	ABA54L	AD54ABSLF	-	-	A/A54LF	AAL-54	-
ADA56L	ABA56L	AD56ABSLF	-	-	A/A56LF	AAL-56	-
ADA58L	-	AD58ABSLF	-	-	-	AAL-58	-
ADA510L	-	-	-	-	-	-	-
ADA62L	-	-	-	-	-	-	-
ADA64L	ABA64L	AD64ABSLF	ABL6-4A	-	A/A64LF	AAL-64	GAML64A
ADA66L	ABA66L	AD66ABSLF	ABL6-6A	6-6AALF	A/A66LF	AAL-66	GAML66A
ADA68L	ABA68L	AD68ABSLF	ABL6-8A	6-8AALF	A/A68LF	AAL-68	GAML68A
ADA610L	ABA610L	AD610ABSLF	ABL6-10A	6-10AALF	A/A610LF	AAL-610	GAML610A
ADA612L	ABA612L	AD612ABSLF	ABL6-12A	-	A/A612LF	AAL-612	GAML612A

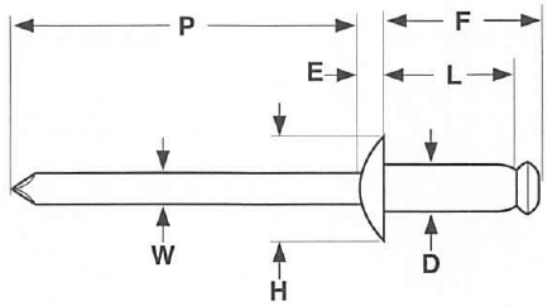
Part Number Comparison - Large Flange Aluminum Rivet/Steel Mandrel

Catalog Part Number	Huck/ Automatic	Pop®	Marson/ Creative	Star	Celus®	Cherry	Gesipa®
ADS42L	ABS42L	AD42BSLF	ABL4-2	-	A/S42LF	BSL-42	GSML42A
ADS43L	ABS43L	AD43BSLF	ABL4-3	-	A/S43LF	-	-
ADS44L	ABS44L	AD44BSLF	ABL4-4	4-4 ASLF	A/S44LF	BSL-44	GSML44A
ADS46L	-	AD46BSLF	-	-	A/S46LF	BSL-46	GSML46A
ADS48L	-	AD48BSLF	-	-	-	BSL-48	-
ADS52L	-	-	-	-	-	-	-
ADS53L	-	-	-	-	A/S53LF	-	-
ADS54L	ABS54L	AD54BSLF	-	-	A/S54LF	BSL-54	-
ADS56L	ABS56L	-	-	-	A/S56LF	BSL-56	-
ADS58L	-	-	-	-	-	BSL-58	-
ADS510L	-	-	-	-	-	-	-
ADS62L	-	-	-	-	-	-	-
ADS63L	-	-	-	-	-	-	-
ADS64L	ABS64L	AD64BSLF	ABL6-4	-	A/S64LF	BSL-64	GSML64A
ADS66L	ABS66L	AD66BSLF	ABL6-6	6-6ASLF	A/S66LF	BSL-66	GSML66A
ADS68L	ABS68L	AD68BSLF	ABL6-8	6-8ASLF	A/S68LF	BSL-68	GSML68A
ADS610L	ABS610L	AD610BSLF	ABL6-10	6-10ASLF	A/S610LF	BSL-610	GSML610A
ADS612L	ABS612L	AD612BSLF	ABL6-12	6-12ASLF	A/S612LF	BSL-612	GSML612A

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Gesipa® is a registered trademark of Gesipa Fasteners USA, Inc.
Pop® is a registered trademark of Emhart Teknologies, LLC.
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BLIND, LARGE FLANGE

Steel / Steel
Stainless / Steel



LARGE FLANGE BREAK-STEM BLIND RIVETS

SAE J-1200

Nominal Rivet Diameter	D		H		E	W	P	F
	Rivet Shank Diameter		Head Diameter		Head Height	Mandrel Diameter	Mandrel Protrusion	Blind Side Protrusion
	Max	Min	Max	Min	Max	Nom	Min	Max
1/8	.128	.122	.390	.360	.065	.076	1.00	L + 0.120
5/32	.159	.153	.488	.448	.075	.095	1.06	L + 0.140
3/16	.191	.183	.650	.600	.092	.114	1.06	L + 0.160
1/4	.255	.246	.780	.720	.107	.151	1.25	L + 0.180

Description	A blind fastener with a self-contained carbon steel mandrel which permits the formation of an upset on the blind end of the rivet and expansion of the rivet shank during rivet setting. The steel mandrel is pulled into or against the rivet body, breaking at or near the junction of the mandrel shank and its upset end. The large flange head has twice the under-head bearing surface of comparably sized dome head rivets.	
Applications/ Advantages	Large flange rivets are preferred where extra brittle or soft materials are being assembled to a rigid surface. Stainless rivets offer both corrosion resistance as well as high shear and tensile values. The stainless rivet body/steel mandrel combination is usually less expensive than the all stainless rivet.	
Material	***Steel Body / Steel Mandrel***	***Stainless Body / Steel Mandrel***
	Rivet Body: *Steel*-- Low carbon steel, plated zinc. **Mandrel:** *Steel*-- Carbon steel 1006 or equivalent. May be furnished plain or with a protective coating, at the option of the manufacturer.	**Rivet Body:** 300-series stainless; **Mandrel:** Carbon steel
Shear Strength (Min.)	*1/8:* 260 lbs.; *5/32:* 370 lbs.; *3/16:* 540 lbs.; *1/4:* 1000 lbs.	*1/8:* 420 lbs.; *5/32:* 650 lbs.; *3/16:* 950 lbs.; *1/4:* 1700 lbs
Tensile Strength (Min.)	*1/8:* 220 lbs.; *5/32:* 470 lbs.; *3/16:* 680 lbs.; *1/4:* 1240 lbs.	*1/8:* 530 lbs.; *5/32:* 820 lbs.; *3/16:* 1200 lbs.; *1/4:* 2100 lbs
Mandrel Break Load	*1/8:* 800 lbs. max, 600 lbs. min. *5/32:* 1000 lbs max, 750 lbs. min. *3/16:* 1450 lbs. max, 1150 lbs. min. *1/4:* 2350 lbs. max, 1950 lbs. min.	*1/8:* 650 - 950 lbs. *5/32:* 1150 - 1450 lbs. *3/16:* 1400 - 1900 lbs. *1/4:* 3000 - 3600 lbs

Steel / Steel
Stainless / Steel
BLIND, LARGE FLANGE

Part Number Comparison - Large Flange Steel Rivet/Steel Mandrel

Catalog Part Number	Huck/ Automatic	Pop®	Marson/ Creative	Star	Celus®	Cherry	Gesipa®
SDS42L	SBS42L	SD42BSLF	SBL4-2	4-2SSLF	S/S42LF	SSL-42	GSML42S
SDS43L	-	-	SBL4-3	-	S/S43LF	-	-
SDS44L	SBS44L	SD44BSLF	SBL4-4	4-4SSLF	S/S44LF	SSL-44	GSML44S
SDS45L	-	-	-	-	-	-	-
SDS46L	-	-	SBL4-6	-	S/S46LF	SSL-46	GSML46S
SDS48L	-	-	SBL4-8	-	S/S48LF	SSL-48	-
SDS52L	-	-	-	-	-	-	-
SDS53L	-	-	-	-	S/S53LF	-	-
SDS54L	-	SD54BSLF	SBL5-4	-	S/S54LF	SSL-54	GSML54S
SDS56L	-	-	SBL5-6	-	S/S56LF	SSL-56	-
SDS58L	-	-	SBL5-8	-	-	SSL-58	-
SDS510L	-	-	-	-	-	-	-
SDS62L	-	-	-	-	-	-	-
SDS63L	-	-	-	-	-	-	-
SDS64L	SBS64L	SD64BSLF	SBL6-4	-	S/S 64LF	SSL-64	GSML64S
SDS66L	SBS66L	SD66BSLF	SBL6-6	6-6SSLF	S/S 66LF	SSL-66	GSML66S
SDS68L	SBS68L	SD68BSLF	SBL6-8	6-8SSLF	S/S 68LF	SSL-68	GSML68S
SDS610L	SBS610L	SD610BSLF	SBL6-10	6-10SSLF	S/S610LF	SSL-610	GSML610S
SDS612L	SBS612L	SD612BSLF	SBL6-12	-	S/S612LF	SSL-612	GSML612S

Part Number Comparison - Stainless Steel Rivet/Steel Mandrel *Large Flange*

Catalog Part Number	Huck/ Automatic	Pop®	Marson/ Creative	Star	Celus®	Cherry	Gesipa®
SSDS41L	-	-	-	-	-	-	-
SSDS42L	-	SSD42BSLF	SSBL4-2	-	SS/S42LF	CSL-42	-
SSDS43L	-	SSD43BSLF	SSBL4-3	-	-	-	-
SSDS44L	-	SSD44BSLF	SSBL4-4	-	SS/S44LF	CSL-44	-
SSDS45L	-	-	-	-	-	-	-
SSDS46L	-	-	SSBL4-6	-	SS/S46LF	CSL-46	-
SSDS48L	-	-	-	-	-	-	-
SSDS52L	-	-	-	-	-	-	-
SSDS53L	-	-	-	-	-	-	-
SSDS54L	-	-	-	-	SS/S54LF	CSL-54	-
SSDS56L	-	-	-	-	-	CSL-56	-
SSDS58L	-	-	-	-	-	-	-
SSDS510L	-	-	-	-	-	-	-
SSDS62L	-	-	-	-	-	-	-
SSDS63L	-	-	-	-	-	-	-
SSDS64L	-	-	SSBL6-4	-	-	CSL-64	-
SSDS66L	-	-	SSBL6-6	-	SS/S66LF	CSL-66	-
SSDS68L	-	-	SSBL6-8	-	SS/S68LF	CSL-68	-
SSDS610L	-	-	SSBL6-10	-	SS/S610LF	-	-
SSDS612L	-	-	SSBL6-12	-	SS/S612LF	-	-
SSDS614L	-	-	-	-	-	-	-
SSDS616L	-	-	-	-	SS/S616LF	-	-

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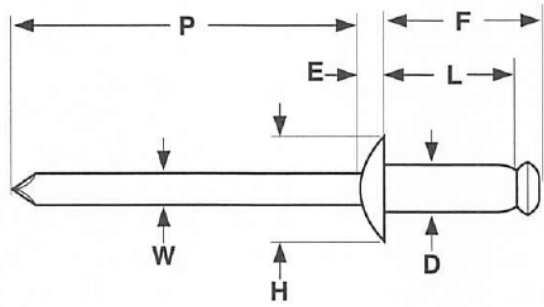
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LARGE FLANGE, DOME HEAD

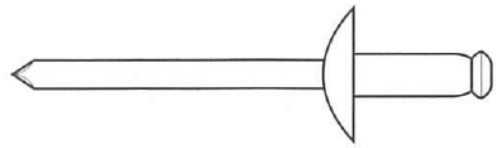
Stainless Rivet
Stainless Mandrel



LARGE FLANGE BREAK-STEM BLIND RIVETS								SAE J-1200
Nominal Rivet Diameter	D		H		E	W	P	F
	Rivet Shank Diameter		Head Diameter		Head Height	Mandrel Diameter	Mandrel Protrusion	Blind Side Protrusion
	Max	Min	Max	Min	Max	Nom	Min	Max
1/8	.128	.122	.390	.360	.065	.076	1.00	L + 0.120
5/32	.159	.153	.488	.448	.075	.095	1.06	L + 0.140
3/16	.191	.183	.650	.600	.092	.114	1.06	L + 0.160
1/4	.255	.246	.780	.720	.107	.151	1.25	L + 0.180

Description	A blind fastener with a self-contained stainless steel mandrel which permits the formation of an upset on the blind end of the rivet and expansion of the rivet shank during rivet setting. The stainless steel mandrel is pulled into or against the rivet body, breaking at or near the junction of the mandrel shank and its upset end. The large flange head has twice the under-head bearing surface of comparably sized dome head rivets.
Applications/ Advantages	Large flange rivets are preferred where extra brittle or soft materials are being assembled to a rigid surface. Stainless rivets offer both corrosion resistance as well as high shear and tensile values. The stainless rivet body/stainless mandrel combination offers corrosion resistance superior to a stainless rivet with a steel mandrel..
Material	**Rivet Body:** 300 series stainless **Mandrel:** 300 series stainless
Shear Strength (Min.)	*5/32:* 370 lbs.; *3/16:* 540 lbs.
Tensile Strength (Min.)	*5/32:* 470 lbs.; *3/16:* 680 lbs.
Mandrel Break Load	*5/32:* 1000 lbs max, 750 lbs. min; *3/16:* 1450 lbs. max, 1150 lbs. min.

Stainless Rivet
Stainless Mandrel
LARGE FLANGE, DOME HEAD



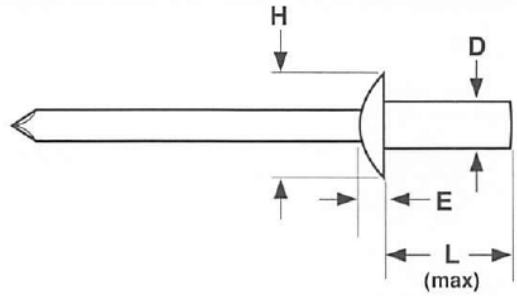
Part Number Comparison - Large Flange All Stainless Steel Blind Rivets

Catalog Part Number	Huck/ Automatic	Pop®	Marson/ Creative	Star	Celus®	Cherry	Gesipa®
SSDSS42L	-	SSD42SSBSLF	SSBL4-2S	-	SS/SS42LF	CCL-42	-
SSDSS43L	-	SSD43SSBSLF	SSBL4-3S	-	-	-	-
SSDSS44L	-	SSD44SSBSLF	SSBL4-4S	-	-	CCL-44	-
SSDSS45L	-	-	-	-	-	-	-
SSDSS46L	-	-	-	-	-	CCL-46	-
SSDSS48L	-	-	-	-	-	-	-
SSDSS52L	-	-	-	-	-	-	-
SSDSS53L	-	-	-	-	-	-	-
SSDSS54L	-	-	-	-	-	CCL-54	-
SSDSS56L	-	-	-	-	-	CCL-56	-
SSDSS58L	-	-	-	-	-	-	-
SSDSS510L	-	-	-	-	-	-	-
SSDSS62L	-	-	-	-	-	-	-
SSDSS63L	-	-	-	-	-	-	-
SSDSS64L	-	-	SSBL6-4S	-	-	CCL-64	-
SSDSS66L	-	-	SSBL6-6S	-	SS/SS66LF	CCL-66	-
SSDSS68L	-	-	SSBL6-8S	-	-	CCL-68	-
SSDSS610L	-	-	SSBL6-10S	-	SS/SS610LF	-	-
SSDSS612L	-	-	SSBL6-12S	-	SS/SS612LF	-	-

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BLIND, DOME HEAD, CLOSED-END

Aluminum Rivet
Aluminum Mandrel



Closed-End, Dome Head, Aluminum Body/Aluminum Mandrel Blind Rivets

IFI-126 2003

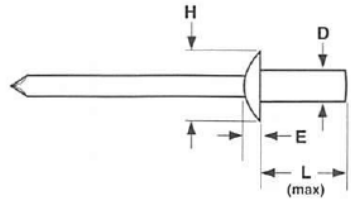
Part Number	D		Hole Size	Drill Number	Grip Range	L	H		E	Ultimate Shear Load	Ultimate Tensile Load
	Rivet Body Diameter					Length	Head Diameter		Head Height		
	Max	Min			Inches	Max	Max	Min	Max	Min, lb.	Min, lb.
ADAC42	.128	.122	.129 - .133	#30	.063 - .125	.360	.252	.224	.050	100	110
ADAC43	.128	.122	.129 - .133	#30	.126 - .187	.422	.252	.224	.050	100	110
ADAC44	.128	.122	.129 - .133	#30	.188 - .250	.485	.252	.224	.050	100	110
ADAC54	.159	.153	.160 - .164	#20	.188 - .250	.500	.328	.296	.065	130	160
ADAC62	.191	.183	.192 - .196	#11	.020 - .125	.406	.394	.356	.080	210	250
ADAC64	.191	.183	.192 - .196	#11	.188 - .250	.531	.394	.356	.080	210	250
ADAC66	.191	.183	.192 - .196	#11	.251 - .375	.656	.394	.356	.080	210	250
ADAC68	.191	.183	.192 - .196	#11	.376 - .500	.781	.394	.356	.080	210	250
ADAC610	.191	.183	.192 - .196	#11	.501 - .625	.906	.394	.356	.080	210	250

Description	An aluminum blind fastener with a self-contained aluminum mandrel whose mandrel head is completely protected and secured within the closed end of the rivet. The head of the rivet body is slightly rounded and twice as wide as the body diameter.
Applications/ Advantages	Closed-end rivets are used where the adjoining back-plate cannot be accessed but must be kept weatherproof. The installed rivet forms a tight seal preventing seepage of liquid or gas through the fastener assembly. The dome head is the most popular style offered on closed end rivets. They are preferred in many electronics applications because there is no chance of the mandrel falling into the work area on the blind side. Closed-end rivets provide greater tensile and shear strength than similar-sized open end rivets. They should be used when fastening materials with mechanical and physical properties similar to aluminum.
Material	*Rivet Body*: Aluminum Alloy 1100 *Mandrel*: Aluminum Alloy
Shear Strength	Rivets shall have ultimate shear loads not less than the minimum ultimate shear loads specified in the above table.
Tensile Strength	Rivets shall have ultimate tensile loads not less than the minimum ultimate tensile loads specified in the above table.

DOME Closed-End Aluminum Rivet / Aluminum Mandrel

Kanebridge Part Number	Huck/ Automatic	Pop®	Marson®	Star	Celus®	Cherry	Gesipa®
ADAC42	-	AD42H	-	-	A42AD-CE	BAPH-04-02	GAMD42AC
ADAC43	-	AD43H	-	-	A43AD-CE	BAPH-04-04	GAMD43AC
ADAC44	-	AD44H	-	-	A44AD-CE	BAPH-04-04	GAMD44AC
ADAC54	-	AD54H	-	-	A54AD-CE	-	GAMD54AC
ADAC62	-	AD62H	-	-	A62AD-CE	BAPH-06-02	GAMD62AC
ADAC64	-	AD64H	-	-	A64AD-CE	BAPH-06-04	GAMD64AC
ADAC66	-	AD66H	-	-	A66AD-CE	BAPH-06-06	GAMD66AC
ADAC68	-	AD68H	-	-	A68AD-CE	BAPH-06-08	GAMD68AC
ADAC610	-	-	-	-	-	BAPH-06-10	-

Stainless Rivet Stainless Mandrel BLIND, DOME HEAD, CLOSED-END



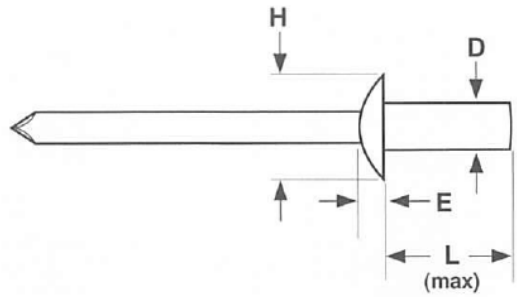
CLOSED-END, DOME HEAD, STAINLESS BODY/STAINLESS MANDREL BLIND RIVETS											IFI-126
Part Number	D		Hole Size	Drill Number	Grip Range	L	H		E	Ultimate Shear Load	Ultimate Tensile Load
	Rivet Body Diameter					Length	Head Diameter		Head Height		
	Max	Min			Inches	Max	Max	Min	Max	Min, lb.	Min, lb.
SSDSSC42	.128	.122	.129 - .133	#30	.063 - .125	.360	.252	.224	.050	400	450
SSDSSC43	.128	.122	.129 - .133	#30	.126 - .187	.422	.252	.224	.050	400	450
SSDSSC44	.128	.122	.129 - .133	#30	.188 - .250	.485	.252	.224	.050	400	450
SSDSSC62	.191	.183	.192 - .196	#11	.020 - .125	.406	.394	.356	.080	850	900
SSDSSC64	.191	.183	.192 - .196	#11	.188 - .250	.531	.394	.356	.080	850	900
SSDSSC66	.191	.183	.192 - .196	#11	.251 - .375	.656	.394	.356	.080	850	900

Description	A stainless blind fastener with a self-contained stainless mandrel whose mandrel head is completely protected and secured within the closed end of the rivet. The head of the rivet body is slightly rounded and twice as wide as the body diameter.
Applications/ Advantages	Closed-end rivets are used where the adjoining back-plate cannot be accessed but must be kept weatherproof. The installed rivet forms a tight seal preventing seepage of liquid or gas through the fastener assembly. The dome head is the most popular style offered on closed end rivets. They are preferred in many electronics applications because there is no chance of the mandrel falling into the work area on the blind side. Closed-end rivets provide greater tensile and shear strength than similar-sized open end rivets. They should be used when fastening materials with mechanical and physical properties similar to stainless.
Material	*Rivet Body*: Stainless Steel *Mandrel*: Stainless Steel
Shear Strength	Rivets shall have ultimate shear loads not less than the minimum ultimate shear loads specified in the above table.
Tensile Strength	Rivets shall have ultimate tensile loads not less than the minimum ultimate tensile loads specified in the above table.

DOME Closed-End Stainless Rivet / Stainless Mandrel							
Kanebridge Part Number	Huck/ Automatic	Pop®	Marson®	Star	Celus®	Cherry	Gesipa®
SSDSSC42	-	-	SSB4-2SCLD	-	-	CCPH-04-02	GSSMD42SSC
SSDSSC43	-	SSD43SSH	SSB4-3SCLD	-	SS43SSD-CE	CCPH-04-03	GSSMD43SSC
SSDSSC44	-	-	SSB4-4SCLD	-	-	CCPH-04-04	GSSMD44SSC
SSDSSC62	-	SSD62SSH	SSB6-2SCLD	-	-	CCPH-06-02	GSSMD62SSC
SSDSSC64	-	SSD64SSH	SSB6-4SCLD	-	SS64SSD-CE	CCPH-06-04	GSSMD64SSC
SSDSSC66	-	-	SSB6-6SCLD	-	SS68SSD-CE	CCPH-06-06	GSSMD66SSC

BLIND, DOME HEAD, CLOSED-END

Aluminum Rivet
Steel Mandrel



CLOSED-END, DOME HEAD, ALUMINUM BODY/STEEL MANDREL BLIND RIVETS											IFI-126
Part Number	D		Hole Size	Drill Number	Grip Range	L	H		E	Ultimate Shear Load	Ultimate Tensile Load
	Rivet Body Diameter					Length	Head Diameter		Head Height		
	Max	Min			Inches	Max	Max	Min	Max	Min, lb.	Min, lb.
ADSC41	.128	.122	.129 - .133	#30	.020 - .062	.297	.252	.224	.050	240	280
ADSC42	.128	.122	.129 - .133	#30	.063 - .125	.360	.252	.224	.050	240	280
ADSC43	.128	.122	.129 - .133	#30	.126 - .187	.422	.252	.224	.050	240	280
ADSC44	.128	.122	.129 - .133	#30	.188 - .250	.485	.252	.224	.050	240	280
ADSC45	.128	.122	.129 - .133	#30	.251 - .312	.547	.252	.224	.050	240	280
ADSC46	.128	.122	.129 - .133	#30	.313 - .375	.610	.252	.224	.050	240	280
ADSC48	.128	.122	.129 - .133	#30	.376 - .500	.735	.252	.224	.050	240	280
ADSC52	.159	.153	.160 - .164	#20	.020 - .125	.375	.328	.296	.065	350	480
ADSC53	.159	.153	.160 - .164	#20	.126 - .187	.437	.328	.296	.065	350	480
ADSC54	.159	.153	.160 - .164	#20	.188 - .250	.500	.328	.296	.065	350	480
ADSC55	.159	.153	.160 - .164	#20	.251 - .312	.562	.328	.296	.065	350	480
ADSC56	.159	.153	.160 - .164	#20	.313 - .375	.625	.328	.296	.065	350	480
ADSC58	.159	.153	.160 - .164	#20	.376 - .500	.750	.328	.296	.065	350	480
ADSC62	.191	.183	.192 - .196	#11	.020 - .125	.406	.394	.356	.080	500	690
ADSC63	.191	.183	.192 - .196	#11	.126 - .187	.468	.394	.356	.080	500	690
ADSC64	.191	.183	.192 - .196	#11	.188 - .250	.531	.394	.356	.080	500	690
ADSC66	.191	.183	.192 - .196	#11	.251 - .375	.656	.394	.356	.080	500	690
ADSC68	.191	.183	.192 - .196	#11	.376 - .500	.781	.394	.356	.080	500	690
ADSC610	.191	.183	.192 - .196	#11	.501 - .625	.906	.394	.356	.080	500	690
ADSC612	.191	.183	.192 - .196	#11	.626 - .750	1.026	.394	.356	.080	500	690
ADSC82	.255	.246	.257 - .261	F	.020 - .125	.445	.525	.475	.100	900	1100
ADSC84	.255	.246	.257 - .261	F	.126 - .250	.570	.525	.475	.100	900	1100
ADSC86	.255	.246	.257 - .261	F	.251 - .375	.695	.525	.475	.100	900	1100
ADSC88	.255	.246	.257 - .261	F	.376 - .500	.820	.525	.475	.100	900	1100
ADSC810	.255	.246	.257 - .261	F	.501 - .625	.945	.525	.475	.100	900	1100

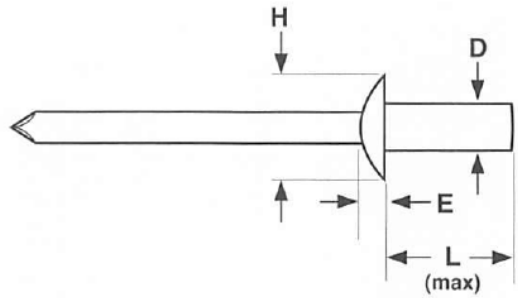
Aluminum Rivet Steel Mandrel — BLIND, DOME HEAD, CLOSED-END

Part Number Comparison - Closed-End Aluminum Rivet/Steel Mandrel, *Dome*							
Catalog Part Number	Huck/Auto-matic	Pop®	Marson/Cre-ative	Star	Celus®	Cherry	Gesipa®
ADSC41	-	AD41H	AB4-1CLD	-	-	-	-
ADSC42	-	AD42H	AB4-2CLD	-	A42D-CE	-	-
ADSC43	-	AD43H	AB4-3CLD	-	A43D-CE	-	-
ADSC44	-	AD44H	AB4-4CLD	-	A44D-CE	-	-
ADSC45	-	AD45H	AB4-5CLD	-	-	-	-
ADSC46	-	AD46H	-	-	A46D-CE	-	-
ADSC48	-	AD48H	-	-	-	-	-
ADSC52	-	AD52H	AB5-2CLD	-	-	-	-
ADSC53	-	AD53H	AB5-3CLD	-	-	-	-
ADSC54	-	-	-	-	A54D-CE	-	-
ADSC55	-	AD55H	AB5-5CLD	-	-	-	-
ADSC56	-	-	-	-	-	-	-
ADSC58	-	-	-	-	-	-	-
ADSC62	-	AD62H	AB6-2CLD	-	A62D-CE	-	-
ADSC63	-	-	-	-	-	-	-
ADSC64	-	AD64H	AB6-4CLD	-	-	-	-
ADSC66	-	AD66H	AB6-6CLD	-	A66D-CE	-	-
ADSC68	-	AD68H	AB6-8CLD	-	A68D-CE	-	-
ADSC610	-	-	A6-10CLD	-	-	-	-
ADSC612	-	-	-	-	-	-	-
ADSC82	-	-	-	-	-	-	-
ADSC84	-	AD84H	AB8-4CLD	-	A84D-CE	-	-
ADSC86	-	AD86H	AB8-6CLD	-	A86D-CE	-	-
ADSC88	-	-	-	-	-	-	-
ADSC810	-	-	-	-	-	-	-

Description	A steel blind fastener with a self-contained steel mandrel whose mandrel head is completely protected and secured within the closed end of the rivet. The head of the rivet body is slightly rounded and twice as wide as the body diameter.
Applications/ Advantages	Closed-end rivets are used where the adjoining back-plate cannot be accessed but must be kept weatherproof. The installed rivet forms a tight seal preventing seepage of liquid or gas through the fastener assembly. The dome head is the most popular style offered on closed end rivets. They are preferred in many electronics applications because there is no chance of the mandrel falling into the work area on the blind side. Closed-end rivets provide greater tensile and shear strength than similar-sized open end rivets. They should be used when fastening materials with mechanical and physical properties similar to aluminum.
Material	*Rivet Body*: Aluminum *Mandrel*: Carbon steel
Shear Strength	Rivets shall have ultimate shear loads not less than the minimum ultimate shear loads specified in the above table.
Tensile Strength	Rivets shall have ultimate tensile loads not less than the minimum ultimate tensile loads specified in the above table.

BLIND, DOME HEAD, CLOSED-END

Steel Rivet
Steel Mandrel



CLOSED-END, DOME HEAD, STEEL BODY/STEEL MANDREL BLIND RIVETS											IFI-126
Part Number	D Rivet Body Diameter		Hole Size	Drill Number	Grip Range	L Length	H Head Diameter		E Head Height	Ultimate Shear Load	Ultimate Tensile Load
	Max	Min			Inches	Max	Max	Min	Max	Min, lb.	Min, lb.
SDSC41	.128	.122	.129 - .133	#30	.020 - .062	.297	.252	.224	.042	240	-
SDSC42	.128	.122	.129 - .133	#30	.063 - .125	.360	.252	.224	.042	240	-
SDSC43	.128	.122	.129 - .133	#30	.126 - .187	.422	.252	.224	.042	240	-
SDSC44	.128	.122	.129 - .133	#30	.188 - .250	.485	.252	.224	.042	240	-
SDSC45	.128	.122	.129 - .133	#30	.251 - .312	.547	.252	.224	.042	240	-
SDSC46	.128	.122	.129 - .133	#30	.313 - .375	.610	.252	.224	.042	240	-
SDSC52	.159	.153	.160 - .164	#20	.020 - .125	.375	.328	.296	.051	-	-
SDSC53	.159	.153	.160 - .164	#20	.126 - .187	.437	.328	.296	.051	-	-
SDSC54	.159	.153	.160 - .164	#20	.188 - .250	.500	.328	.296	.051	-	-
SDSC55	.159	.153	.160 - .164	#20	.251 - .312	.562	.328	.296	.051	-	-
SDSC56	.159	.153	.160 - .164	#20	.313 - .375	.625	.328	.296	.051	-	-
SDSC62	.191	.183	.192 - .196	#11	.020 - .125	.406	.394	.356	.060	-	-
SDSC63	.191	.183	.192 - .196	#11	.126 - .187	.468	.394	.356	.060	-	-
SDSC64	.191	.183	.192 - .196	#11	.188 - .250	.531	.394	.356	.060	-	-
SDSC66	.191	.183	.192 - .196	#11	.251 - .375	.656	.394	.356	.060	-	-
SDSC68	.191	.183	.192 - .196	#11	.376 - .500	.781	.394	.356	.060	-	-
SDSC610	.191	.183	.192 - .196	#11	.501 - .625	.906	.394	.356	.060	-	-

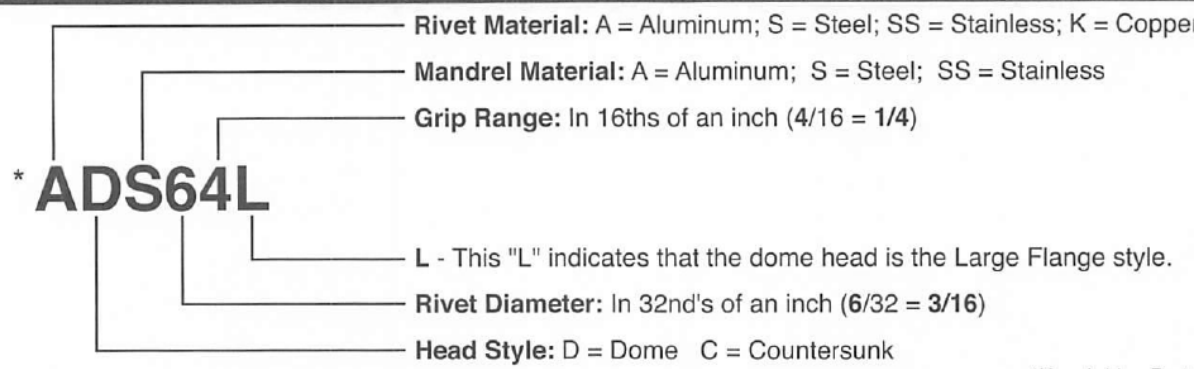
Description	A steel blind fastener with a self-contained steel mandrel whose mandrel head is completely protected and secured within the closed end of the rivet. The head of the rivet body is slightly rounded and twice as wide as the body diameter.
Applications/ Advantages	Closed-end rivets are used where the adjoining back-plate cannot be accessed but must be kept weatherproof. The installed rivet forms a tight seal preventing seepage of liquid or gas through the fastener assembly. The dome head is the most popular style offered on closed end rivets. They are preferred in many electronics applications because there is no chance of the mandrel falling into the work area on the blind side. Closed-end rivets provide greater tensile and shear strength than similar-sized open end rivets. They should be used when fastening materials with mechanical and physical properties similar to aluminum.
Material	***Rivet Body:*** Low carbon steel ***Mandrel:*** Carbon steel
Shear Strength	Rivets shall have ultimate shear loads not less than the minimum ultimate shear loads specified in the above table.

Steel Rivet Steel Mandrel BLIND, DOME HEAD, CLOSED-END

DOME Closed-End Steel Rivet / Steel Mandrel							
Kanebridge Part Number	Huck/ Automatic	Pop®	Marson®	Star	Celus®	Cherry	Gesipa®
SDSC41	-	-	-	-	-	-	-
SDSC42	-	-	-	-	-	-	-
SDSC43	-	-	-	-	-	-	-
SDSC44	-	-	-	-	-	-	-
SDSC45	-	-	-	-	-	-	-
SDSC46	-	SD46SB	-	-	-	-	-
SDSC52	-	-	-	-	-	-	-
SDSC53	-	-	-	-	-	-	-
SDSC54	-	-	-	-	-	-	-
SDSC55	-	-	-	-	-	-	-
SDSC56	-	SD56SB	-	-	-	-	-
SDSC62	-	-	-	-	-	-	-
SDSC63	-	-	-	-	-	-	-
SDSC64	-	SD64SB	-	-	-	-	-
SDSC66	-	-	-	-	-	-	-
SDSC68	-	SD68SB	-	-	-	-	-
SDSC610	-	-	-	-	-	-	-

DOME & LARGE FLANGE

Part Number Key & Application Data



*Kanebridge Part Number

Notes on Rivet Selection

Strength - The tensile and shear strengths required for an application must be determined and a rivet selected that meets those requirements.

Materials - Choose a rivet that is made of a metal with similar mechanical and physical properties as the materials being joined. This is especially critical in assemblies where higher temperatures and/or corrosive elements are present. Metal compatibility helps reduce the risks of galvanic corrosion and material fatigue.

Grip Range - Measure the total thickness of the materials being fastened. This is known as the rivet grip . The grip ranges of the most commonly available rivets are listed in the table below. Sufficient rivet length is necessary for proper formation of the secondary head on the blind side of the assembly. Multi-grip rivets have wider grip ranges than standard break-stem blind rivets.

Application Data for Standard Break-Stem Blind Rivets -- Protruding Heads

SAE J-1200

Rivet Number	Grip Range	Barrel Length	Recommended Hole Size		Drill Size
		Max	Max	Min	
31	.020-.062	.187	0.100	0.097	#41
32	.020-.125	.250			
33	.087-.187	.312			
34	.126-.250	.375			
40	.010-.030	.150	0.133	0.129	#30
41	.020-.062	.212			
42	.063-.125	.275			
43	.126-.187	.337			
44	.188-.250	.400			
45	.251-.312	.462			
46	.313-.375	.525			
48	.376-.500	.650			
410	.501-.625	.775			
52	.020-.125	.300	0.164	0.160	#20
53	.126-.187	.362			
54	.188-.250	.425			
56	.251-.375	.550			
58	.376-.500	.675			
510	.501-.625	.800			
512	.626-.750	.925			
516	.876-1.000	1.175			

Rivet Number	Grip Range	Barrel Length	Recommended Hole Size		Drill Size
		Max	Max	Min	
62	.020-.125	.325	0.196	0.192	#11
63	.126-.187	.387			
64	.188-.250	.450			
66	.251-.375	.575			
68	.376-.500	.700			
610	.501-.625	.825			
612	.626-.750	.950			
614	.751-.875	1.075			
616	.876-1.000	1.200			
618	1.001-1.125	1.325			
620	1.126-1.250	1.450			
622	1.251-1.375	1.575			
82	.020-.125	.375	0.261	0.257	F
84	.126-.250	.500			
86	.251-.375	.625			
88	.376-.500	.750			
810	.501-.625	.875			
812	.626-.750	1.000			
814	.751-.875	1.125			
816	.876-1.000	1.250			

Part Number Key & Application Data

COUNTERSUNK HEAD



*Catalog Part Number

Notes on Rivet Selection

Strength - The tensile and shear strengths required for an application must be determined and a rivet selected that meets those requirements.

Materials - Choose a rivet that is made of a metal with similar mechanical and physical properties as the materials being joined. This is especially critical in assemblies where higher temperatures and/or corrosive elements are present. Metal compatibility helps reduce the risks of galvanic corrosion and material fatigue.

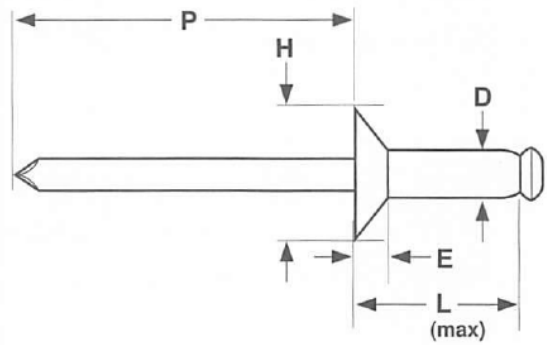
Grip Range - Measure the total thickness of the materials being fastened. This is known as the rivet grip . The grip ranges of the most commonly available rivets are listed in the table below. Sufficient rivet length is necessary for proper formation of the secondary head on the blind side of the assembly. Multi-grip rivets have wider grip ranges than standard break-stem blind rivets.

Application Data for Standard Break-Stem Blind Rivets - Countersunk Head — SAE J-1200

Rivet Number	Grip Range	Rivet Length	Recommended Hole Size		Drill Size	Rivet Number	Grip Range	Rivet Length	Recommended Hole Size		Drill Size
		Max	Max	Min				Max	Max	Min	
42	.092-.125	.275	0.133	0.129	#30	54	.188-.250	.425	0.164	0.160	#20
43	.126-.187	.337				56	.251-.375	.550			
44	.188-.250	.400				58	.376-.500	.675			
45	.251-.312	.462				64	.188-.250	.450	0.196	0.192	#11
46	.313-.375	.525				66	.251-.375	.575			
48	.376-.500	.650				68	.376-.500	.700			

BLIND, COUNTERSUNK HEAD

Aluminum / Steel
Steel / Steel
Stainless / Steel



120° Countersunk Head Break-Stem Blind Rivets

SAE J-1200

Nominal Rivet Diameter	D		H		E	W	P	F
	Rivet Shank Diameter		Head Diameter		Head Height	Mandrel Diameter	Mandrel Protrusion	Blind Side Protrusion
	Max	Min	Max	Min	Max	Nom	Min	Max
1/8	.128	.122	.233	.207	.031	.076	1.00	L + 0.120
5/32	.159	.153	.294	.268	.040	.095	1.06	L + 0.140
3/16	.191	.183	.361	.335	.050	.114	1.06	L + 0.160

Description	A blind fastener with a self-contained carbon steel mandrel which permits the formation of an upset on the blind end of the rivet and expansion of the rivet shank during rivet setting. The steel mandrel is pulled into or against the rivet body, breaking at or near the junction of the mandrel shank and its upset end. The head of the rivet body is countersunk at an angle of 120 .
Applications/ Advantages	The countersunk head style provides a smooth offside surface and sufficient clearance for moving parts which pass over the rivet head. Aluminum rivets are the most lightweight of the three varieties profiled here, offer resistance to corrosion, but have the lowest tensile and shear values. Steel rivets have superior tensile and shear strength compared to aluminum, are less expensive than stainless rivets, but are less resistant to corrosion than either aluminum or stainless. Stainless rivets offer both corrosion resistance as well as the highest shear and tensile values.
Material	*Rivet Body:* Aluminum--Aluminum alloy 5052, 5056, 5154 or equivalent; Steel--Low carbon steel; Stainless--300-series stainless *Mandrel:* Carbon steel
Shear Strength (Min.)	*Aluminum Rivet/Steel Body-- 1/8:* 170 lbs.; *5/32:* 260 lbs.; *3/16:* 380 lbs. *Steel Rivet/Steel Body-- 1/8:* 260 lbs.; *5/32:* 370 lbs.; *3/16:* 540 lbs. *Stainless Rivet/Steel Body-- 1/8:* 420 lbs.; *5/32:* 650 lbs.; *3/16:* 950 lbs.
Tensile Strength (Min.)	*Aluminum Rivet/Steel Body-- 1/8:* 220 lbs.; *5/32:* 350 lbs.; *3/16:* 500 lbs. *Steel Rivet/Steel Body-- 1/8:* 310 lbs.; *5/32:* 470 lbs.; *3/16:* 680 lbs. *Stainless Rivet/Steel Body-- 1/8:* 530 lbs.; *5/32:* 820 lbs.; *3/16:* 1200 lbs.
Mandrel Break Load	*Aluminum Rivet/Steel Body-- 1/8:* 400 - 600 lbs.; *5/32:* 600 - 850 lbs.; *3/16:* 750 - 1050 lbs. *Steel Rivet/Steel Body-- 1/8:* 600 - 800 lbs.; *5/32:* 750 - 1000 lbs.; *3/16:* 1150 - 1450 lbs. *Stainless Rivet/Steel Body-- 1/8:* 650 - 950 lbs.; *5/32* 1150 - 1450 lbs.; *3/16:* 1400 - 1900 lbs.

Aluminum / Steel
Steel / Steel
Stainless / Steel
BLIND, COUNTERSUNK HEAD

Part Number Comparison - Aluminum Rivet/Steel Mandrel *Countersunk*

Catalog Part Number	Huck/ Automatic	Pop®	Marson/ Creative	Star	Celus®	Cherry	Gesipa®
ACS42	ACS42	AK42BS	AC4-2	-	A/S42C	BSC-42	GSMC42A
ACS43	ACS43	AK43BS	AC4-3	-	A/S43C	BSC-43	GSMC43A
ACS44	ACS44	AK44BS	AC4-4	-	A/S44C	BSC-44	GSMC44A
ACS45	-	-	-	-	-	BSC-46	GSMC45A
ACS54	ACS54	AK54BS	-	-	-	BSC-54	GSMC54A
ACS56	ACS56	AK56BS	-	-	-	BSC-56	GSMC56A
ACS58	-	-	-	-	-	BSC-58	-
ACS64	ACS64	AK64BS	AC6-4	-	A/S64C	BSC-64	GSMC64A
ACS66	ACS66	-	-	-	-	BSC-66	-
ACS68	ACS68	-	-	-	-	BSC-68	-

Part Number Comparison - Steel Rivet/Steel Mandrel *Countersunk*

Catalog Part Number	Huck/ Automatic	Pop®	Marson/ Creative	Star	Celus®	Cherry	Gesipa®
SCS42	SCS42	SK42BS	SC4-2	-	S/S42C	SSC-42	GSMC42S
SCS43	SCS43	-	SC4-3	-	S/S43C	SSC-43	GSMC43S
SCS44	SCS44	SK44BS	SC4-4	-	S/S44C	SSC-44	GSMC44S
SCS46	-	-	-	-	-	SSC-46	GSMC45S
SCS48	-	-	-	-	-	SSC-48	-
SCS54	-	-	-	-	-	SSC-54	GSMC54S
SCS64	-	-	SC6-4	-	S/S64C	SSC-64	GSMC64S
SCS68	-	-	-	-	-	SSC-68	-

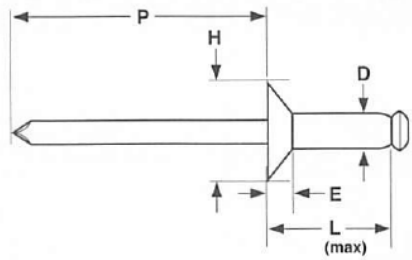
Part Number Comparison - Stainless Steel Rivet/Steel Mandrel *Countersunk*

Catalog Part Number	Huck/ Automatic	Pop®	Marson/ Creative	Star	Celus®	Cherry	Gesipa®
SSCS42	-	-	SSC4-2	-	-	CSL-42	-
SSCS43	-	-	SSC4-3	-	-	CSL-43	-
SSCS44	-	-	SSC4-4	-	-	CSL-44	-
SSCS64	-	-	SSC6-4	-	-	CSL-64	-

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Gesipa® is a registered trademark of Gesipa Fasteners USA Inc.
Pop® is a registered trademark of Emhart Teknologies, LLC.
Kanebridge's rivets are not necessarily manufactured by or connected with the producers of Gesipa® or Pop® rivets.

BLIND, COUNTERSUNK

Aluminum Rivet
Aluminum Mandrel



120° Countersunk Head Break-Stem Blind Rivets

SAE J-1200

Nominal Rivet Diameter	D		H		E	W	P	F
	Rivet Shank Diameter		Head Diameter		Head Height	Mandrel Diameter	Mandrel Protrusion	Blind Side Protrusion
	Max	Min	Max	Min	Max	Nom	Min	Max
1/8	.128	.122	.233	.207	.031	.076	1.00	L + 0.120
5/32	.159	.153	.294	.268	.040	.095	1.06	L + 0.140
3/16	.191	.183	.361	.335	.050	.114	1.06	L + 0.160

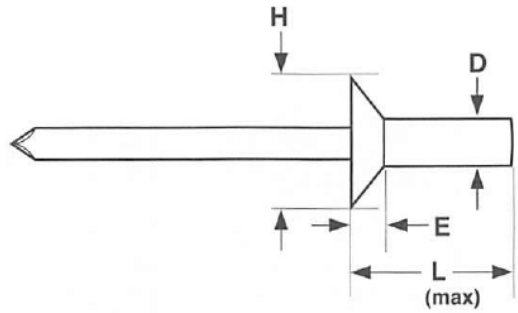
Description	An all aluminum blind fastener with a self-contained carbon mandrel which permits the formation of an upset on the blind end of the rivet and expansion of the rivet shank during rivet setting. The mandrel is pulled into or against the rivet body, breaking at or near the junction of the mandrel shank and its upset end. The head of the rivet body is countersunk at an angle of 120 .
Applications/ Advantages	The countersunk head style provides a smooth offside surface and sufficient clearance for moving parts which pass over the rivet head. Aluminum rivets are lightweight and resist corrosion, but have lower tensile and shear values than steel or stainless rivets.
Material	*Rivet Body:* Aluminum alloy 5050 or 5052 or equivalent *Mandrel:* Aluminum alloy 7178 or 2024 or equivalent
Shear Strength (Min.)	*1/8:* 120 lbs.; *5/32:* 190 lbs.; *3/16:* 260 lbs.
Tensile Strength (Min.)	*1/8:* 150 lbs.; *5/32:* 230 lbs.; *3/16:* 320 lbs.
Mandrel Break Load	*1/8:* 250 - 400 lbs.; *5/32:* 425 - 600 lbs.; *3/16:* 625 - 825 lbs.

Part Number Comparison - Aluminum Rivet/Aluminum Mandrel

Catalog Part Number	Huck/ Automatic	Pop®	Marson/ Creative	Star	Celus®	Cherry	Gesipa®
ACA42	ACA42	AK42ABS	AC4-2A	-	A/A42C	AAC-42	GAMC42A
ACA43	ACA43	-	AC4-3A	-	A/A43C	AAC-43	GAMC43A
ACA44	ACA44	-	AC4-4A	-	A/A44C	AAC-44	GAMC44A
ACA46	-	-	-	-	-	AAC-46	-
ACA54	ACA54	-	-	-	-	AAC-54	GAMC54A
ACA56	ACA56	-	-	-	-	AAC-56	GAMC56A
ACA64	ACA64	-	AC6-4A	-	A/A64C	AAC-64	GAMC64A
ACA66	ACA66	-	-	-	-	AAC-66	-
ACA68	ACA68	-	-	-	-	AAC-68	-

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Gesipa® is a registered trademark of Gesipa Fasteners USA Inc.
Pop® is a registered trademark of Emhart Teknologies, LLC.
Kanebridge's rivets are not necessarily manufactured by or connected with the producers of Gesipa® or Pop® rivets.

Aluminum Rivet Steel Mandrel BLIND, COUNTERSUNK, CLOSED-END



CLOSED-END, COUNTERSUNK, ALUMINUM BODY/STEEL MANDREL BLIND RIVETS											IFI-126
Part Number	D		Hole Size	Drill Number	Grip Range	L	H		E	Ultimate Shear Load	Ultimate Tensile Load
	Rivet Body Diameter					Length	Head Diameter		Head Height		
	Max	Min			Inches	Max	Max	Min	Max	Min, lb.	Min, lb.
ACSC42	.128	.122	.129 - .133	#30	.063 - .125	.395	.245	.221	.042	240	280
ACSC43	.128	.122	.129 - .133	#30	.126 - .187	.457	.245	.221	.042	240	280
ACSC44	.128	.122	.129 - .133	#30	.188 - .250	.520	.245	.221	.042	240	280
ACSC64	.191	.183	.192 - .196	#11	.188 - .250	.601	.394	.356	.060	500	690

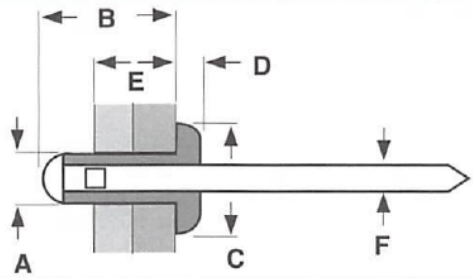
Description	An aluminum blind fastener with a self-contained steel mandrel whose mandrel head is completely protected and secured within the closed end of the rivet. The head of the rivet body is countersunk at an angle of 120 .
Applications/ Advantages	Closed-end rivets are used where the adjoining back-plate cannot be accessed but must be kept weatherproof. The installed rivet forms a tight seal preventing seepage of liquid or gas through the fastener assembly. The countersunk head style provides a smooth offside surface and sufficient clearance for moving parts which pass over the rivet head. They are preferred in many electronics applications because there is no chance of the mandrel falling into the work area on the blind side. Closed-end rivets provide greater tensile and shear strength than similar-sized open end rivets. They should be used when fastening materials with mechanical and physical properties similar to aluminum.
Material	*Rivet Body:* Aluminum alloy 5052 or equivalent *Mandrel:* Carbon steel
Shear Strength	Rivets shall have ultimate shear loads not less than the minimum ultimate shear loads specified in the above table.
Tensile Strength	Rivets shall have ultimate tensile loads not less than the minimum ultimate tensile loads specified in the above table.

PART NUMBER COMPARISON - CLOSED-END ALUMINUM RIVET/STEEL MANDREL *COUNTERSUNK*							
Catalog Part Number	Huck/Auto-matic	Pop®	Marson/Cre-ative	Star	Celus®	Cherry	Gesipa®
ACSC42	-	AK42H	-	-	-	-	-
ACSC43	-	AK43H	-	-	-	-	-
ACSC44	-	AK44H	-	-	-	-	-
ACSC64	-	AK64H	-	-	-	-	-

Celus® is a registered trademark of Gesipa Blindniettechnik Gesellschaft Mit Beschrankter Haftung, Gesellschaft Fur Internationale Patentverwertung M.B.H.-Gesipa.
Gesipa® is a registered trademark of Gesipa Fasteners USA, Inc.

MULTI-GRIP, DOME HEAD

Aluminum Body
Steel Mandrel



Dome Head Multi-Grip Aluminum Body / Steel Mandrel Blind Rivets

Avdel

Part Number	A	B	C	D	E		F	Recommended Hole Size	Shear Strength	Tensile Strength
	Rivet Diameter	Length	Head Diameter	Head Height	Grip Range		Mandrel Diameter			
		Max	Max	Max	Min	Max	Max		Pounds	Pounds
D-0410	1/8	.409	.217	.045	.031	.189	.070	.134	165	230
D-0414		.530			.125	.312				
D-0512	5/32	.480	.257	.058	.046	.250	.082	.165	255	375
D-0516		.610			.156	.375				
D-0613	3/16	.550	.351	.071	.062	.250	.114	.197	350	530
D-0619		.730			.187	.437				
D-0621		.780			.250	.500				
D-0631		1.09			.500	.781				

Description	An aluminum blind fastener with a self-contained steel mandrel. The multi-grip rivet design differs from a standard blind rivet two ways: (1) a section of the body shank has a slightly reduced outside diameter, and (2) the stem of the mandrel is pinched at a point above the mandrel head. The head of the rivet is slightly rounded, similar to a pan head screw.
Applications / Advantages	Multi-grip rivets provide maximum clamping action over a full range of material thicknesses while using the same rivet length. This allows flexibility in design, cuts production costs and reduces inventories. Dome heads are used in standard applications which call for maximum clamp up and hole fill. They should be used when fastening materials with mechanical and physical properties similar to aluminum.
Material	Rivet Body: Aluminum Alloy 5251 or equivalent alloy. Mandrel: Low carbon steel
Shear Strength	Rivets shall have ultimate shear loads not less than the minimum ultimate shear loads specified for the applicable size given in the above table.
Tensile Strength	Rivets shall have ultimate tensile loads not less than the minimum ultimate tensile loads specified for the applicable size given in the above table.

Dome Head Multi-Grip Rivets

Aluminum Rivet / Steel Black Phosphate Mandrel

Part Number Comparison

Catalog Part #	Avdel Avex®
D-0410B	1601-0410
D-0414B	1601-0414
D-0512B	1601-0512
D-0516B	1601-0516
D-0613B	1601-0613
D-0619B	1601-0619

Dome Head Multi-Grip Rivets

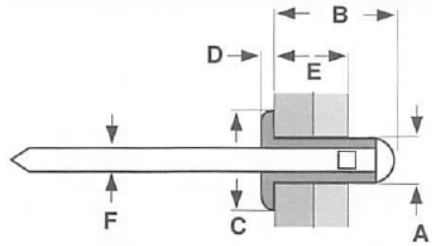
Aluminum Rivet / Steel Zinc Mandrel

Part Number Comparison

Catalog Part #	Avdel Avex®
D-0410Y	1693-0410
D-0414Y	1693-0414
D-0512Y	1693-0512
D-0613Y	1693-0613
D-0619Y	1693-0619
D-0621Y	1693-0621
D-0631Y	1693-0631

*Rivets meet the same dimensions as those published by the manufacturers of the Avdel UK Limited brand.

Aluminum Body Steel Mandrel — MULTI-GRIP, LOW-PROFILE HEAD



Low-Profile Multi-Grip Aluminum Body / Steel Mandrel Blind Rivets

Avdel

Part Number	A	B	C	D	E		F	Recommended Hole Size	Shear Strength	Tensile Strength
	Rivet Diameter	Length	Head Diameter	Head Height	Grip Range		Mandrel Diameter			
		Max	Max	Max	Min	Max	Max		Pounds	Pounds
L-0410	1/8	.409	.263	.051	.031	.189	.070	.134	165	230
L-0414		.535			.157	.311				
L-0416		.629			.216	.374				
L-0512	5/32	.492	.322	.063	.056	.248	.082	.165	255	375
L-0514		.570			.125	.312				
L-0516		.637			.157	.373				
L-0521		.770			.251	.499				
L-0613	3/16	.546	.397	.070	.062	.247	.114	.197	350	530
L-0619		.735			.188	.436				
L-0621		.793			.188	.499				
L-0631		1.108			.499	.778				

Description	An aluminum blind fastener with a self-contained steel mandrel. The multi-grip rivet design differs from a standard blind rivet two ways: (1) a section of the body shank has a slightly reduced outside diameter, and (2) the stem of the mandrel is pinched at a point above the mandrel head. The head of the rivet body is lower and wider than a Dome Head (approximately twice the diameter of the shank).
Applications / Advantages	Multi-grip rivets provide maximum clamping action over a full range of material thicknesses while using the same rivet length. This allows flexibility in design, cuts production costs and reduces inventories. Low-Profile heads are usually chosen to improve the product's finished appearance. They should be used when fastening materials with mechanical and physical properties similar to aluminum.
Material	***Rivet Body:*** Aluminum Alloy 5251 or equivalent alloy. ***Mandrel:*** Low carbon steel
Shear Strength	Rivets shall have ultimate shear loads not less than the minimum ultimate shear loads specified for the applicable size given in the above table.
Tensile Strength	Rivets shall have ultimate shear loads not less than the minimum ultimate tensile loads specified for the applicable size given in the above table.

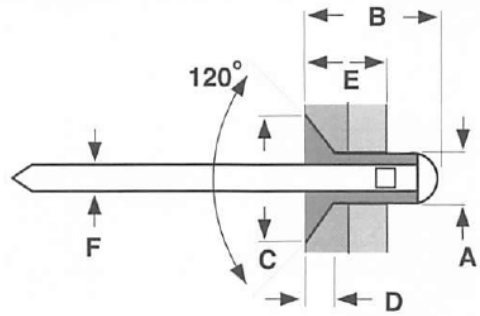
Low Profile Multi-Grip Rivets Part Number Comparison

Aluminum Rivet / Steel Black Phosphate Mandrel		Aluminum Rivet / Steel Zinc Mandrel	
Catalog Part #	Avdel Avex®	Catalog Part #	Avdel Avex®
L-0410B	1661-0410	L-0410Y	1691-0410
L-0414B	1661-0414	L-0414Y	1691-0414
L-0613B	1661-0613	L-0416Y	1691-0416
L-0619B	1661-0619	L-0512Y	1691-0512
L-0621B	1661-0621	L-0514Y	1691-0514
L-0631B	1661-0631	L-0516Y	1691-0516
		L-0521Y	1691-0521
		L-0613Y	1691-0613
		L-0619Y	1691-0619
		L-0621Y	1691-0621
		L-0631Y	1691-0631

*Rivets meet the same dimensions as those published by the manufacturers of the Avdel UK Limited brand.

MULTI-GRIP, COUNTERSUNK HEAD

Aluminum Body
Steel Mandrel



COUNTERSUNK MULTI-GRIP ALUMINUM BODY / STEEL MANDREL BLIND RIVETS

Avdel

Part Number	A	B	C	D	E		F	Recommended Hole Size	Shear Strength	Tensile Strength
	Rivet Diameter	Length	Head Diameter	Head Height	Grip Range		Mandrel Diameter			
		Max	Max	Max	Min	Max	Max		Pounds	Pounds
C-0412	1/8	.480	.216	.051	.094	.251	.070	.134	165	230
C-0414		.527			.157	.310				
C-0416										
C-0514	5/32	.562	.255	.055	.110	.310	.082	.165	255	375
C-0615	3/16	.609	.350	.074	.126	.310	.114	.197	350	530
C-0621		.802			.248	.499				

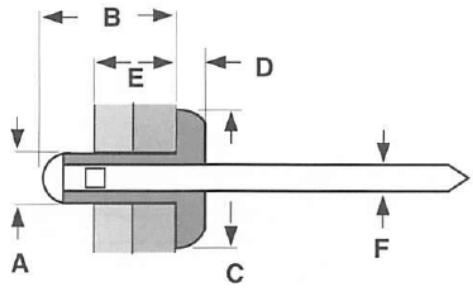
Description	An aluminum blind fastener with a self-contained steel mandrel. The multi-grip rivet design differs from a standard blind rivet two ways: (1) a section of the body shank has a slightly reduced outside diameter, and (2) the stem of the mandrel is pinched at a point above the mandrel head. The head of the rivet is countersunk at an angle of 120 .
Applications / Advantages	Multi-grip rivets provide maximum clamping action over a full range of material thicknesses while using the same rivet length. This allows flexibility in design, cuts production costs and reduces inventories. The Countersunk head style provides a smooth offside surface and sufficient clearance for moving parts which pass over the rivet head. They should be used when fastening materials with mechanical and physical properties similar to aluminum.
Material	*Rivet Body:* Aluminum Alloy 5251 or equivalent alloy. *Mandrel:* Low carbon steel
Shear Strength	Rivets shall have ultimate shear loads not less than the minimum ultimate shear loads specified for the applicable size given in the above table.
Tensile Strength	Rivets shall have ultimate tensile loads not less than the minimum ultimate tensile loads specified for the applicable size given in the above table.

PART NUMBER COMPARISON - COUNTERSUNK HEAD MULTI-GRIP RIVETS

ALUMINUM RIVET / STEEL BLACK PHOSPHATE MANDREL		ALUMINUM RIVET / STEEL ZINC MANDREL	
Catalog Part #	Avdel Avex®	Catalog Part #	Avdel Avex®
C-0615B	1604-0615	C-0412Y	1682-0412
C-0621B	1604-0621	C-0414Y	1682-0414
		C-0416Y	1682-0416
		C-0514Y	1682-0514
		C-0615Y	1682-0615
		C-0621Y	1682-0621

*Rivets meet the same dimensions as those published by the manufacturers of the Avdel UK Limited brand.

Aluminum Body Steel Mandrel MULTI-GRIP, LARGE FLANGE



Large Flange Multi-Grip Aluminum Body / Steel Mandrel Blind Rivets

Avdel

Part Number	A	B	C	D	E		F	Recommended Hole Size	Shear Strength	Tensile Strength
	Rivet Diameter	Length	Head Diameter	Head Height	Grip Range		Mandrel Diameter			
		Max	Max	Max	Min	Max	Max		Pounds	Pounds
X-0410	1/8	.410	.337	.045	.031	.187	.074	.132 - .138	165	230
X-0414		.530			.125	.312				
X-0416		.590			.187	.375				
X-0514	5/32	.550	.387	.058	.125	.312	.090	.161 - .166	255	375
X-0613	3/16	.550	.637	.075	.062	.250	.112	.194 - .201	350	530
X-0621		.790			.250	.500				
X-0631		1.100			.500	.781				

Description	An aluminum blind fastener with a self-contained steel mandrel. The multi-grip rivet design differs from a standard blind rivet two ways: (1) a section of the body shank has a slightly reduced outside diameter, and (2) the stem of the mandrel is pinched at a point above the mandrel head. The head of the Large Flange rivet is approximately 50% wider than the Dome head.
Applications / Advantages	Multi-grip rivets provide maximum clamping action over a full range of material thicknesses while using the same rivet length. This allows flexibility in design, cuts production costs and reduces inventories. The Large Flange style is preferred when the rivet is seated in soft material to prevent it from pulling through. They should be used when fastening materials with mechanical and physical properties similar to aluminum.
Material	***Rivet Body:*** Aluminum Alloy 5251 or equivalent alloy. ***Mandrel:*** Low carbon steel
Shear Strength	Rivets shall have ultimate shear loads not less than the minimum ultimate shear loads specified for the applicable size given in the above table.
Tensile Strength	Rivets shall have ultimate tensile loads not less than the minimum ultimate tensile loads specified for the applicable size given in the above table.

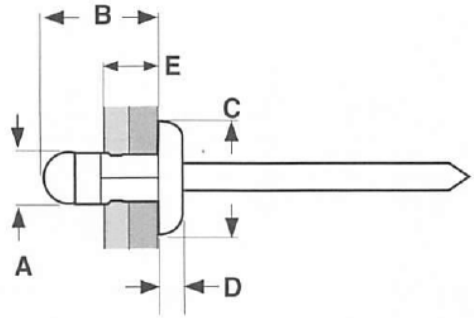
Large Flange Multi-Grip Rivets Part Number Comparison

Aluminum Rivet / Steel Black Phosphate Mandrel		Aluminum Rivet / Steel Zinc Mandrel	
Catalog Part #	Avdel Avex®	Catalog Part #	Avdel Avex®
X-0410B	1641-0410	X-0410Y	1692-0410
X-0613B	1641-0613	X-0414Y	1692-0414
X-0621B	1641-0621	X-0416Y	1692-0416
X-0631B	1641-0631	X-0514Y	1692-0514
		X-0613Y	1692-0613
		X-0621Y	1692-0621
		X-0631Y	1692-0631

*Rivets meet the same dimensions as those published by the manufacturers of the Avdel UK Limited brand.

TYPE "US" MULTI-GRIP, LOW PROFILE

Steel Rivet
Steel Mandrel



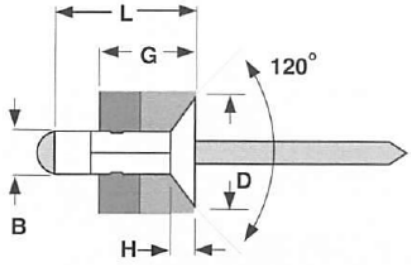
LOW-PROFILE ALL-STEEL TYPE-US MULIT-GRIP RIVETS

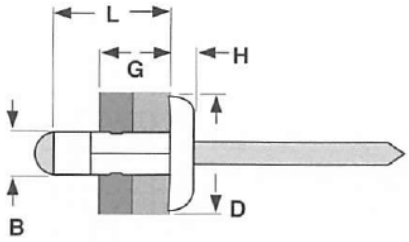
Ornit

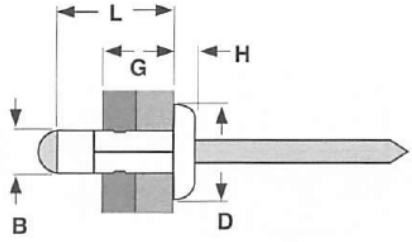
Part Number	Ornit Part Number	Avdel Steel Avex® Part Number	A	B	C	D	E	Recommeneded Drill Size	Shear Strength	Tensile Strength
			Rivet Diameter	Length	Head Diameter	Head Heigth	Grip Range			
				Ref	Ref	Ref			Pounds	Pounds
LS-0411	US32090LM	1624-0411	1/8	.354	.283	.034	.044-.156	#30	340	385
LS-0514	US40110LM	1624-0514	5/32	.432	.319	.046	.056-.196	#20	440	530
LS-0612	US48103LM	1624-0612	3/16	.405	.386	.069	.047-.187	#11	810	750
LS-0616	US48127LM	1624-0616	3/16	.499	.386	.069	.156-.250	#11	1025	780

Description	An all steel blind fastener with a self-contained mandrel. The multi-grip rivet designed differs from a standard blind rivet two ways: (1) the body has a somewhat reduced diameter from the area under the head, extending about halfway down the shank, and (2) the stem of the mandrel is pinched at a point above the mandrel head. The head has a dome shape.
Applications / Advantages	Multi-grip rivets provide maximum clamping action over a full range of material thicknesses while using the same rivet length. This allows flexibility in design, cuts production costs and reduces inventories. Steel mulit-grip rivets offer superior shear and tensile strength than like-sized aluminum/ steel mulit-grips and should be used when fastening materials with mechanical and physical properties similar to carbon steel. Dome heads are used in standard applications which call for mixiumum clamp-up and hole fill.
Material	***Rivet Body:*** carbon steel ***Mandrel:*** carbon steel
Shear Strength	See above table for typical shear strength (assumes stem is in shear plane).
Tensile Strength	See above table for typical tensile strength
Plating	Both the rivet body and the mandrel are zinc coated.

Steel Body Steel Mandrel — MULTI-GRIP: DOME, COUNTERSUNK & LARGE FLANGE







COUNTERSUNK **LARGE FLANGE** **DOME HEAD**

All Steel Multi-Grip Blind Rivets — Ornit

Head Style	Part Number	B Nominal Rivet Diam.	Drill Size	L Rivet Body Length	G Grip Range	D Head Diameter	H Head Height	Typical Strength (lbs.) Shear	Tensile
Countersunk	SF48110K	3/16"	11	.43	.098 - .236	.341	.051	990	858
	SF48140K			.55	.118 - .354				
	SF48170K			.67	.157 - .472				
	SF48220K			.86	.335 - .650				
Extra Large Flange	SF48110L	3/16"	11	.43	.039 - .236	.624	.069	990	858
	SF48140L			.55	.039 - .354				
	SF48170L			.67	.118 - .472				
Dome	SF32090D	1/8"	30	.35	.043 - .157	.283	.033	339	385
	SF32130D			.51	.039 - .354				
	SF40110D	5/32"	20	.43	.055 - .197	.319	.047	440	528
	SF40140D			.53	.055 - .315				
	SF48110D	3/16"	11	.43	.039 - .236	.386	.057	990	858
	SF48140D			.55	.039 - .354				
	SF48170D			.67	.118 - .472				

Description	An all steel blind fastener with a self-contained steel mandrel. The multi-grip rivet design differs from a standard blind rivet two ways: (1) the body shank has several circumferential indents equidistant from each other, and (2) the stem of the mandrel is pinched at a point above the mandrel head. Three head styles are available: dome, large flange and countersunk.
Applications/ Advantages	Multi-grip rivets provide maximum clamping action over a full range of material thicknesses while using the same rivet length. This allows flexibility in design, cuts production costs and reduces inventories. All steel multi grip rivets offer greater shear and tensile strength than like-sized aluminum/steel multi grips and should be used when fastening materials with mechanical and physical properties similar to carbon steel. Dome heads are used in standard applications which call for maximum clamp-up and hole fill. The large flange style is preferred when the rivet is seated in soft material. The countersunk head style provides a smooth offside surface and sufficient clearance for moving parts which pass over the rivet head.
Material	*Rivet:* Low carbon steel *Mandrel:* Low carbon steel.
Shear Strength	See above table for typical shear strength (assumes stem is in shear plane).
Tensile Strength	See above table for typical tensile strength.

MULTI-GRIP: DOME, COUNTERSUNK & LARGE FLANGE

Steel Body
Steel Mandrel

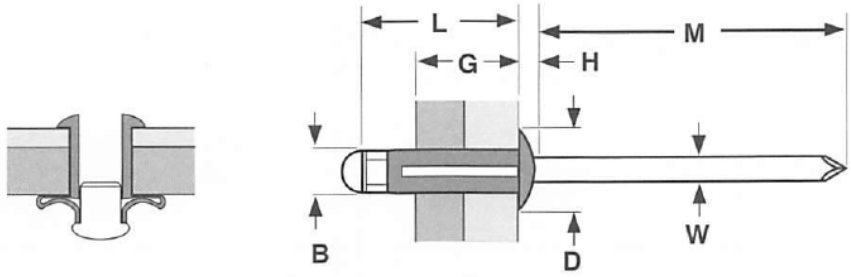
Part Number Comparison - Large Flange All-Steel Multi-Grip Rivets			
Catalog Part #	**Avdel Stavex®**	**Catalog Part #**	**Avdel Stavex®**
SF48110L	BE34-0614	SF48170L	BE34-0622
SF48140L	BE34-0618		

Part Number Comparison - Dome All-Steel Multi-Grip Rivets			
Catalog Part #	**Avdel Stavex®**	**Catalog Part #**	**Avdel Stavex®**
SF32090D	BS01-0411	SF48140D	BS01-0618
SF32130D	BS01-0416	SF48140DY	BS01-0618
SF40110D	BS01-0514	SF48170D	BS01-0622
SF40140D	BS01-0518	SF48170DY	BS01-0622
SF48110D	BS01-0614		

Part Number Comparison - Low-Profile Multi-Grip Rivets, All Steel			
Catalog Part #	**Avdel Steel Avex®**	**Catalog Part #**	**Avdel Steel Avex®**
LS-0411	1624-0411	LS-0612	1624-0612
LS-0514	1624-0514	LS-0616	1624-0616

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All Aluminum 3-STAR BULBING STYLE, DOME HEAD

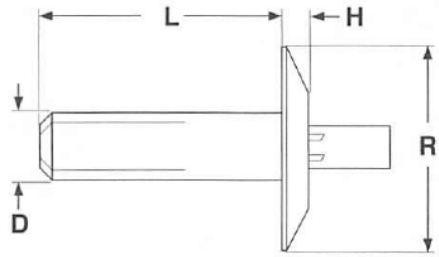


3-STAR™ BULB-TYPE RIVETS, ALL ALUMINUM										Ornit
B	Part Number	L	D	H	W	M	Recommended Hole Size	G	Typical Strength (lbs.)	
Nominal Rivet Diameter		Shank Length	Head Diameter	Head Height	Mandrel Width	Mandrel Protrusion		Grip Range	Shear	Tensile
5/32	ADATSB-0516	.534	.314	.055	.094	1.18	.165 - .177	.039 - .118	112	225
	ADATSB-0523	.739						.039 - .275		
3/16	ADATSB-0619	.601	.346	.063	.114	1.18	.197 - .207	.039 - .118	202	247
	ADATSB-0625	.806						.039 - .354		
	ADATSB-0630	.963						.157 - .472		

Description	An aluminum blind fastener with a self-contained aluminum mandrel. The body of the rivet has three longitudinal slits extending from directly beneath the dome-shaped rivet head, down the shank but not completely to the head of the mandrel. The bottom portion of the shank is not slit and has a slightly smaller body diameter where the rivet is snug against the mandrel within it.
Applications/ Advantages	When the rivet is installed, the body disrupts on the blind side in a way that forms three petals which extend away from the mandrel head. This makes this rivet ideal in out-of-round or oversized holes. The rivet requires less pulling force during installation than does a standard blind rivet which makes it useful in thin, soft or brittle materials. Each size has a relatively wide grip range and is corrosion resistant.
Material	***Rivet:*** Aluminum ***Mandrel:*** Aluminum
Shear Strength	Typical shear strengths are listed in the above table.
Tensile Strength	Typical tensile strengths are listed in the above table.

DRIVE PIN, LINER HEAD

All Aluminum



Liner Head Drive Pin Rivets - All Aluminum

Part Number	D	L	Grip Range		R	H
	Shank Diameter (± .001)	Length (+.010, -.005)	Min	Max	Head Diameter (+.005, -.010)	Head Height (± .005)
10125ALA	.187	.281	.075	.175	.609	.085
10219ALA		.391	.175	.275		
10312ALA		.484	.275	.375		
10406ALA		.578	.375	.475		
10500ALA		.688	.475	.575		
10625ALA	.187	.781	.575	.675	.609	.085
10750ALA		.875	.675	.775		
10813ALA		.984	.775	.875		
10938ALA		1.078	.875	.975		

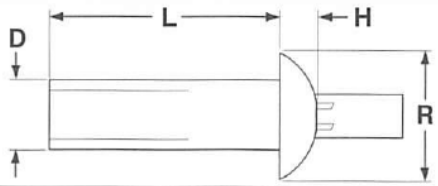
Description	A two-piece fastening system consisting of (1) a self-contained pin within (2) the body of a tubular-shaped rivet with a wide, trapezoidal-shaped head. The head has a very low profile and is approximately three times the diameter of the shank. The top of the rivet has an opening through which the pin protrudes. The opposite end of the rivet is enclosed but with two cross-wise slits cut into the body extending from the tip, up the shank a limited distance.
Applications/ Advantages	Drive pin rivets can join two or more pieces of low-density metal without the use of special installation tools. The rivet is inserted into pre-drilled, aligned holes and is set in place by striking the top of the pin with a hammer so that the pin is flush with the top of the head. This action causes the pin to drive through the opposite end and flare out in four directions creating a head on the blind side of the fastening. Drive pins have superior shear strength to standard break stem rivets because the pin remains inside of the installed rivet for its entire length. The liner head variety is designed specifically to be used to attach plywood or plastic liners in truck trailers.
Material	***Body:*** Aluminum alloy 2117 H15 or equivalent alloy ***Pin:*** Aluminum alloy 2024 T4 or equivalent alloy
Shear Strength (approximate)	***3/16 diameter:*** 650 lbs. minimum; ***1/4 diameter.*** 1150 lbs. minimum
Tensile Strength (approximate)	***3/16 diameter:*** 460 lbs. minimum; ***1/4 diameter.*** 820 lbs. minimum

Part Number Comparison - Liner Head Drive Pin Rivets, aluminum

Catalog	Indux	Southco®	Catalog	Indux	Southco®
10125ALA	37-06-04	10-11-706-13	10625ALA	37-06-20	10-16-706-13
10219ALA	37-06-07	10-12-706-13	10750ALA	37-06-23	10-17-706-13
10312ALA	37-06-10	10-13-706-13	10813ALA	37-06-26	10-18-706-13
10406ALA	37-06-13	10-14-706-13	10938ALA	37-06-29	10-18-706-13
10500ALA	37-06-17	10-15-706-13			

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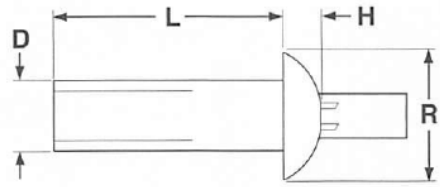
DRIVE PIN, UNIVERSAL HEAD



Universal Head Drive Pin Rivets

Part Number	D Shank Diameter (± .001)	L Length (+.010, -.005)	Grip Range Min	Grip Range Max	R Head Diameter (+.005, -.015)	H Head Height (± .005)
05031AUSS	.125	.156	.015	.046	.250	.054
05063AUSS		.156	.046	.078		
05094AUSS		.188	.078	.109		
05125AUA		.219	.109	.141		
05156AUA		.250	.141	.172		
05188AUA		.281	.172	.203		
05219AUA		.313	.203	.235		
05250AUA		.344	.235	.266		
05281AUA		.375	.266	.297		
05313AUA		.406	.297	.328		
05344AUA		.438	.328	.360		
05375AUA		.469	.360	.391		
05406AUA		.500	.391	.422		
05438AUSS		.531	.422	.453		
07031AUSS	.156	.188	.015	.046	.312	.067
07063AUSS		.188	.046	.078		
07094AUSS		.219	.078	.109		
07125AUA		.250	.109	.141		
07156AUA		.281	.141	.172		
07188AUA		.313	.172	.203		
07219AUA		.344	.203	.234		
07250AUA		.375	.234	.266		
07281AUA		.406	.266	.297		
07313AUA		.438	.297	.328		
07344AUA		.469	.328	.360		
07406AUA		.531	.391	.422		
07438AUSS		.563	.422	.453		
07500AUSS		.625	.484	.515		
07531AUSS		.656	.515	.546		
07563AUSS		.688	.546	.578		
07625AUSS		.750	.609	.640		
All sizes in gray-shaded area have stainless steel pins.						
10094AUA	.187	.250	.047	.141	.375	.080
10125AUA		.281	.078	.172		
10188AUA		.344	.141	.234		
10250AUA		.406	.203	.297		
10313AUA		.469	.266	.359		
10375AUA		.531	.328	.422		
10438AUA		.594	.391	.484		
10500AUA		.656	.453	.547		
10563AUA		.719	.516	.609		
10625AUA		.781	.578	.672		
10688AUA		.844	.641	.734		
10813AUA	.187	.969	.766	.859	.375	.080
10875AUA		1.031	.828	.922		
101000AUA		1.156	.953	1.047		
101125AUA		1.281	1.078	1.172		
14094AUA	.250	.250	.047	.141	.500	.107
14125AUA		.281	.078	.172		
14188AUA		.344	.141	.234		
14250AUA		.406	.203	.297		
14313AUA		.312	.266	.359		
14375AUA		.531	.328	.422		
14438AUA		.594	.391	.484		
14500AUA		.656	.453	.547		
14563AUA		.719	.516	.609		
14625AUA		.781	.578	.672		
14688AUA		.844	.641	.735		
14750AUA		.906	.703	.797		
14813AUA		.969	.766	.860		
14875AUA		1.031	.828	.922		
14938AUA		1.094	.891	.985		
141000AUA		1.156	.953	1.047		
141125AUA		1.281	1.078	1.172		
141375AUA		1.531	1.328	1.422		
31188AUA	.313	.438	.132	.242	.625	.138
31281AUA		.531	.226	.336		
31375AUA		.625	.320	.430		
31469AUA		.719	.414	.523		
31563AUA		.813	.508	.617		
31656AUA		.906	.602	.711		
31750AUA		1.000	.696	.805		
31844AUA		1.094	.790	.899		
31938AUA		1.188	.884	.993		
311031AUA		1.282	.978	1.087		
37188AUA	.375	.500	.125	.250	.750	.166
37281AUA		.594	.219	.344		
37375AUA		.688	.313	.438		
37469AUA		.781	.406	.531		
37563AUA		.875	.500	.625		
37656AUA		.969	.594	.719		
37750AUA		1.063	.688	.813		
37844AUA		1.157	.782	.907		
37938AUA		1.250	.875	1.000		
371031AUA		1.345	.970	1.094		

DRIVE PIN, UNIVERSAL HEAD



Description	A two-piece fastening system consisting of (1) a self-contained pin within (2) the body of a tubular-shaped rivet with a dome-shaped head. The head is approximately twice as wide as the shank diameter. The top of the rivet has an opening through which the pin protrudes. The opposite end of the rivet is enclosed but with two cross-wise slits cut into the body extending from the tip, up the shank a limited distance.	
Applications/ Advantages	Drive pin rivets can join two or more pieces of low-density metal without the use of special installation tools. The rivet is inserted into pre-drilled, aligned holes and is set in place by striking the top of the pin with a hammer so that the pin is flush with the top of the head. This action causes the pin to drive through the opposite end and flare out in four directions creating a head on the blind side of the fastening. Drive pins have superior shear strength to standard break stem rivets because the pin remains inside of the installed rivet for its entire length. The universal head is the most versatile variety of drive pin, giving the neat, finished look of the brazier but with a lower head profile.	
Material	*Aluminum Body*	*Steel Body*
	Body: Aluminum alloy 2117 H15 or equivalent alloy ***Pin (1/8 & 5/32 diam):*** 302 series Stainless Steel ***Pin (3 /16 thru 3/8 diam):*** Aluminum alloy 2024 T4 or equivalent alloy	***Body:*** AISI 1006 - 1008 or equivalent steel, zinc-plated ***Pin:*** AISI 1008 or equivalent steel, zinc-plated
Shear Strength (approximate)	***1/8 diameter:*** 480 lbs. (w/Stainless pin) ***5/32 diameter:*** 715 lbs. (w/Stainless pin) ***3/16 diameter:*** 700 lbs. (w/Aluminum pin) ***1/4 diameter:*** 1030 lbs. (w/Aluminum pin) ***5/16 diameter:*** 1490 lbs. (w/Aluminum pin) ***3/8 diameter:*** 2300 lbs. (w/Aluminum pin)	***3/8 diameter:*** 3000 lbs. (w/Steel pin)
Tensile Strength (approximate)	***1/8 diameter:*** 175 lbs. (w/Stainless pin) ***5/32 diameter:*** 310 lbs. (w/Stainless pin) ***3/16 diameter:*** 360 lbs. (w/Aluminum pin) ***1/4 diameter:*** 815 lbs. (w/Aluminum pin) ***5/16 diameter:*** 1480 lbs. (w/Aluminum pin) ***3/8 diameter:*** 1795 lbs. (w/Aluminum pin)	***3/8 diameter:*** 2500 lbs. (w/Steel pin)

DRIVE PIN, UNIVERSAL HEAD

Part Number Comparison-Universal Head Drive Pins, Aluminum Body/Stainless Pin

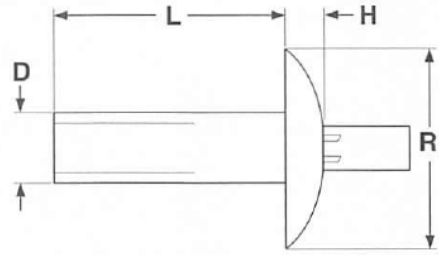
Catalog	Indux	Southco®	Catalog	Indux	Southco®
05031AUSS	31-04-01	38-104-01-13	07094AUSS	31-05-03	38-105-03-13
05063AUSS	31-04-02	38-104-02-13	07125AUA	31-05-04	38-105-04-13
05094AUSS	31-04-03	38-104-03-13	07156AUA	31-05-05	38-105-05-13
05125AUA	31-04-04	38-104-04-13	07188AUA	31-05-06	38-105-06-13
05156AUA	31-04-05	38-104-05-13	07219AUA	31-05-07	38-105-07-13
05188AUA	31-04-06	38-104-06-13	07250AUA	31-05-08	38-105-08-13
05219AUA	31-04-07	38-104-07-13	07281AUA	31-05-09	38-105-09-13
05250AUA	31-04-08	38-104-08-13	07313AUA	31-05-10	38-105-10-13
05281AUA	31-04-09	38-104-09-13	07344AUA	31-05-11	38-105-11-13
05313AUA	31-04-10	38-104-10-13	07406AUA	31-05-13	38-105-13-13
05344AUA	31-04-11	38-104-11-13	07438AUSS	31-05-14	38-105-13-13
05375AUA	31-04-12	38-104-12-13	07500AUSS	31-05-16	38-105-16-13
05406AUA	31-04-13	38-104-13-13	07532AUSS	31-05-17	38-105-17-13
05438AUSS	31-04-14	38-104-14-13	07563AUSS	31-05-18	38-105-18-13
07031AUSS	31-05-01	38-105-01-03	07625AUSS	31-05-20	38-105-20-13
07063AUSS	31-05-02	38-105-02-13			

UNIVERSAL HEAD Drive Pin Rivets, Aluminum

Kanebridge	Indux	Southco®	Kanebridge	Indux	Southco®
10094AUA	31-06-03	38-106-02-16	14750AUA	31-08-24	38-108-24-16
10125AUA	31-06-04	38-106-04-16	14813AUA	31-08-26	38-108-26-16
10188AUA	31-06-06	38-106-06-16	14875AUA	31-08-28	38-108-28-16
10250AUA	31-06-08	38-106-08-16	14938AUA	31-08-30	38-108-30-16
10313AUA	31-06-10	38-106-10-16	141000AUA	31-08-32	38-108-32-16
10375AUA	31-06-12	38-106-12-16	141125AUA	31-08-36	38-108-36-16
10438AUA	31-06-14	38-106-14-16	141375AUA	31-08-44	38-108-44-16
10500AUA	31-06-16	38-106-16-16	31188AUA	31-10-06	38-110-06-16
10563AUA	31-06-18	38-106-18-16	31281AUA	31-10-09	38-110-09-16
10625AUA	31-06-20	38-106-20-16	31375AUA	31-10-12	38-110-12-16
10688AUA	31-06-22	38-106-22-16	31469AUA	31-10-15	38-110-15-16
10750AUA	31-06-24	38-106-24-16	31563AUA	31-10-18	38-110-18-16
10813AUA	31-06-26	38-106-26-16	31656AUA	31-10-21	38-110-21-16
10875AUA	31-06-28	38-106-28-16	31750AUA	31-10-24	38-110-24-16
101000AUA	31-06-32	38-106-32-16	31844AUA	31-10-27	38-110-27-16
101125AUA	31-06-36	38-106-36-16	31938AUA	31-10-30	38-110-30-16
14094AUA	31-08-03	38-108-02-16	311031AUA	31-10-33	-
14125AUA	31-08-04	38-108-04-16	37188AUA	31-12-06	38-112-06-16
14188AUA	31-08-06	38-108-06-16	37281AUA	31-12-09	38-112-09-16
14250AUA	31-08-08	38-108-08-16	37375AUA	31-12-12	38-112-12-16
14313AUA	31-08-10	38-108-10-16	37469AUA	31-12-06	38-112-15-16
14375AUA	31-08-12	38-108-12-16	37563AUA	31-12-18	38-112-18-16
14438AUA	31-08-14	38-108-14-16	37656AUA	31-12-21	38-112-21-16
14500AUA	31-08-16	38-108-16-16	37750AUA	31-12-24	-
14563AUA	31-08-18	38-108-18-16	37844AUA	31-12-27	-
14625AUA	31-08-20	38-108-20-16	37938AUA	31-12-30	-
14688AUA	31-08-22	38-108-22-16	371031AUA	31-12-33	-

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DRIVER PIN, BRAZIER HEAD



Brazier Head Drive Pin Rivets

Part Number	D	L	Grip Range		R	H
	Shank Diameter (± .001)	Length (+.010, -.005)	Min	Max	Head Diameter (+.005, -.015)	Head Height (± .005)
05094ABSS	.125	.187	.078	.109	.312	.062
05125ABA		.219	.109	.141		
05156ABA		.250	.141	.172		
05188ABA		.281	.172	.203		
05219ABA		.313	.203	.235		
05250ABA		.344	.235	.266		
05281ABA		.375	.266	.297		
10094ABA	.187	.250	.047	.141	.469	.094
10125ABA		.281	.078	.172		
10188ABA		.344	.141	.235		
10250ABA		.406	.203	.297		
10313ABA		.469	.266	.360		
10375ABA		.531	.328	.422		
10438ABA		.594	.391	.485		
10500ABA		.656	.453	.547		
10563ABA		.719	.516	.610		
10625ABA		.781	.578	.672		
10750ABA		.906	.703	.797		
10813ABA		.969	.766	.860		
10875ABA		1.031	.828	.922		
10938ABA		1.094	.891	.985		
101000ABA		1.156	.953	1.047		
14094ABA	.250	.250	.047	.141	.625	.125
14125ABA		.281	.078	.172		
14188ABA		.344	.141	.235		
14250ABA		.406	.203	.297		
14313ABA		.469	.266	.360		
14375ABA		.531	.328	.422		
14438ABA		.594	.391	.485		
14500ABA		.656	.453	.547		
14563ABA		.719	.516	.610		
14625ABA		.781	.578	.672		
14688ABA		.844	.641	.735		
14750ABA		.906	.703	.797		
14813ABA		.969	.766	.860		
14875ABA		1.031	.828	.922		
14938ABA		1.094	.891	.985		
141000ABA		1.156	.953	1.047		
141125ABA		1.281	1.078	1.172		
141188ABA		1.344	1.141	1.235		
141250ABA		1.406	1.203	1.297		
141313ABA		1.469	1.266	1.360		
141375ABA		1.531	1.328	1.422		
141438ABA		1.594	1.484	1.578		

Description	A two-piece fastening system consisting of (1) a self-contained pin within (2) the body of a tubular-shaped rivet with a dome-shaped head. The head is approximately 2-1/2 times as wide as the shank diameter. The top of the rivet has an opening through which the pin protrudes. The opposite end of the rivet is enclosed but with two cross-wise slits cut into the body extending from the tip, up the shank a limited distance.
Applications/ Advantages	Drive pin rivets can join two or more pieces of low-density metal without the use of special installation tools. The rivet is inserted into pre-drilled, aligned holes and is set in place by striking the top of the pin with a hammer so that the pin is flush with the top of the head. This action causes the pin to drive through the opposite end and flare out in four directions creating a head on the blind side of the fastening. Drive pins have superior shear strength to standard break stem rivets because the pin remains inside of the installed rivet for its entire length. The brazier head variety offers a greater bearing surface area than the universal head. The rivets with a grip range of an inch or greater may be used for fastening into masonry.
Material	***Body:*** Aluminum alloy 2117 H15 or equivalent alloy ***Pin (1/8 diameter):*** 302 series Stainless Steel ***Pin (3/16 & 1/4 diameters):*** Aluminum alloy 2024 T4 or equivalent alloy"
Shear Strength (approximate)	***3/16 diameter:*** 650 lbs. minimum; 1/4" diameter: 1150 lbs. minimum
Tensile Strength (approximate)	***3/16 diameter:*** 460 lbs. minimum; 1/4" diameter: 820 lbs. minimum

DRIVE PIN, BRAZIER HEAD

Part Number Comparison - Brazier Head Drive Pins, Aluminum Body/Stainless Pin

Catalog	Indux	Southco®	Catalog	Indux	Southco®
05094ABSS	32-04-03	38-204-03-13	05219ABA	32-04-07	38-204-07-13
05125ABA	32-04-04	38-204-04-13	05250ABA	32-04-08	38-204-08-13
05156ABA	32-04-05	38-204-05-13	05281ABA	32-04-09	38-204-09-13
05188ABA	32-04-06	38-204-06-13			

Part Number Comparison - Brazier Head Drive Pins, Aluminum

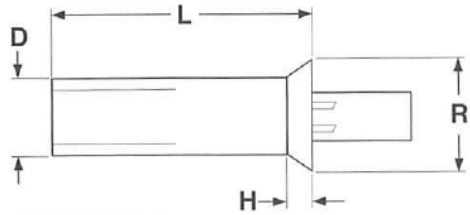
Catalog	Indux	Southco®	Catalog	Indux	Southco®
10094ABA	32-06-03	38-206-02-16	14188ABA	32-08-06	38-208-06-16
10125ABA	32-06-04	38-206-04-16	14250ABA	32-08-08	38-208-08-16
10188ABA	32-06-06	38-206-06-16	14313ABA	32-08-10	38-208-10-16
10250ABA	32-06-08	38-206-08-16	14375ABA	32-08-12	38-208-12-16
10313ABA	32-06-10	38-206-10-16	14438ABA	32-08-14	38-208-14-16
10375ABA	32-06-12	38-206-12-16	14500ABA	32-08-16	38-208-16-16
10438ABA	32-06-14	38-206-14-16	14563ABA	32-08-18	38-208-18-16
10500ABA	32-06-16	38-206-16-16	14625ABA	32-08-20	38-208-20-16
10563ABA	32-06-18	38-206-18-16	14688ABA	32-08-22	38-208-22-16
10625ABA	32-06-20	38-206-20-16	14750ABA	32-08-24	38-208-24-16
10750ABA	32-06-24	38-206-24-16	14813ABA	32-08-26	38-208-26-16
10813ABA	32-06-26	38-206-26-16	14875ABA	32-08-28	38-208-28-16
10875ABA	32-06-28	38-206-28-16	14938ABA	32-08-30	38-208-30-16
10938ABA	32-06-30	38-206-30-16	141000ABA	32-08-32	38-208-32-16
101000ABA	32-06-32	38-206-32-16	141188ABA	32-08-38	38-208-38-16
14094ABA	32-08-03	38-208-02-16	141250ABA	32-08-40	38-208-40-16
14125ABA	32-08-04	38-208-04-16	141313ABA	32-08-42	38-208-42-16
			141438ABA	32-08-46	38-208-46-16

Part Number Comparison - Brazier Head Masonry Rivets, aluminum

Catalog	Indux	Southco®	Catalog	Indux	Southco®
141000ABA	32-08-32	38-208-32-16	141375ABA	32-08-44	38-208-44-16
141125ABA	32-08-36	38-208-36-16			

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DRIVE PIN, COUNTERSUNK HEAD



COUNTERSUNK DRIVE PIN RIVETS

Part Number	D Shank Diameter (± .001)	L Length (+.010, -.005)	Grip Range Min	Grip Range Max	R Head Diameter (+.005, -.015)	H Head Height (± .005)
05094ACSS	.125	.188	.078	.109	.216	.042
05125ACSS		.219	.109	.141		
05156ACSS		.250	.141	.172		
05188ACSS		.281	.172	.203		
05219ACSS		.313	.203	.235		
05250ACSS		.344	.235	.266		
05281ACSS		.375	.266	.297		
05312ACSS		.406	.297	.328		
05344ACSS		.438	.328	.360		
05375ACSS		.469	.360	.391		
05406ACSS		.500	.391	.422		
07125ACSS	.156	.250	.109	.141	.278	.055
07156ACSS		.281	.141	.172		
07188ACSS		.313	.172	.203		
07219ACSS		.344	.203	.235		
07250ACSS		.375	.235	.266		
07281ACSS		.406	.266	.297		
07312ACSS		.438	.297	.328		
07344ACSS		.469	.328	.360		
07375ACSS		.500	.360	.391		
07406ACSS		.531	.391	.422		

Rivets listed above have stainless pin; all others have aluminum pin.

Part Number	D Shank Diameter (± .001)	L Length (+.010, -.005)	Grip Range Min	Grip Range Max	R Head Diameter (+.005, -.015)	H Head Height (± .005)
10188ACA	.187	.344	.141	.234	.344	.070
10250ACA		.406	.203	.297		
10313ACA		.469	.266	.359		
10375ACA		.531	.328	.422		
10438ACA		.594	.391	.484		
10500ACA		.656	.453	.547		
10563ACA		.719	.516	.609		
10625ACA		.781	.578	.672		
14188ACA	.250	.344	.141	.234	.467	.095
14250ACA		.406	.203	.297		
14313ACA		.469	.266	.359		
14375ACA		.531	.328	.422		
14438ACA		.594	.391	.484		
14500ACA		.656	.453	.547		
14563ACA		.719	.516	.609		
14625ACA		.781	.578	.672		
14688ACA		.844	.641	.734		
14750ACA		.906	.703	.797		
14813ACA		.969	.766	.859		
14875ACA		1.031	.828	.922		
14938ACA		1.094	.891	.984		
141000ACA		1.156	.953	1.047		

Description	A two-piece fastening system consisting of (1) a self-contained pin within (2) the body of a tubular-shaped rivet with a flat, countersunk head. The head is countersunk at an angle of 100 and is a little less than twice the diameter of the shank. The top of the rivet has an opening through which the pin protrudes. The opposite end of the rivet is enclosed but with two cross-wise slits cut into the body extending from the tip, up the shank a limited distance.
Applications/ Advantages	Drive pin rivets can join two or more pieces of low-density metal without the use of special installation tools. The rivet is inserted into pre-drilled, aligned holes and is set in place by striking the top of the pin with a hammer so that the pin is flush with the top of the head. This action causes the pin to drive through the opposite end and flare out in four directions creating a head on the blind side of the fastening. Drive pins have superior shear strength to standard break stem rivets because the pin remains inside of the installed rivet for its entire length. The flat head style provides a smooth offside surface with sufficient clearance for moving parts that pass over the rivet head.
Material	***Body (All diameters):*** Aluminum alloy 2117 H15 or equivalent alloy ***Pin (1/8 & 5/32 diam):*** 302 series Stainless Steel ***Pin (3/16 & 1/4 diam):*** Aluminum alloy 2024 T4 or equivalent alloy
Shear Strength (approximate)	***3/16 diameter:*** 650 lbs. minimum;1/4" diameter: 1150 lbs. minimum
Tensile Strength (approximate)	***3/16 diameter:*** 460 lbs. minimum;1/4" diameter: 820 lbs. minimum

DRIVE PIN, COUNTERSUNK HEAD

Part Number Comparison - Countersunk Drive Pins, Aluminum Body/Stainless Pin

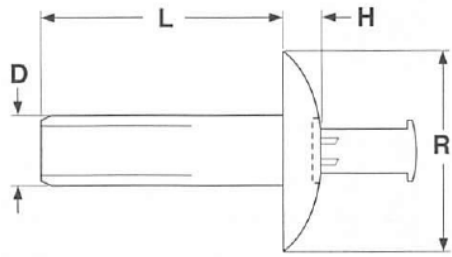
Catalog	Indux	Southco®	Catalog	Indux	Southco®
05094ACSS	35-04-03	38-504-03-13	07125ACSS	35-05-04	38-505-04-13
05125ACSS	35-04-04	38-504-04-13	07156ACSS	35-05-05	38-505-05-13
05156ACSS	35-04-05	38-504-05-13	07188ACSS	35-05-06	38-505-06-13
05188ACSS	35-04-06	38-504-06-13	07219ACSS	35-05-07	38-505-07-13
05219ACSS	35-04-07	38-504-07-13	07250ACSS	35-05-08	38-505-08-13
05250ACSS	35-04-08	38-504-08-13	07281ACSS	35-05-09	38-505-09-13
05281ACSS	35-04-09	38-504-09-13	07312ACSS	35-05-10	38-505-10-13
05312ACSS	35-04-10	38-504-10-13	07344ACSS	35-05-11	38-505-11-13
05344ACSS	35-04-11	38-504-11-13	07375ACSS	35-05-12	38-505-12-13
05375ACSS	35-04-12	38-504-12-13	07406ACSS	35-05-13	38-505-13-13
05406ACSS	35-04-13	38-504-13-13			

Part Number Comparison - Countersunk Head Drive Pin Rivets, Aluminum

Catalog	Indux	Southco®	Catalog	Indux	Southco®
10188ACA	35-06-06	38-506-06-16	14375ACA	35-08-12	38-508-12-16
10250ACA	35-06-08	38-506-08-16	14438ACA	35-08-14	38-508-14-16
10313ACA	35-06-10	38-506-10-16	14500ACA	35-08-16	38-508-16-16
10375ACA	35-06-12	38-506-12-16	14563ACA	35-08-18	38-508-18-16
10438ACA	35-06-14	38-506-14-16	14625ACA	35-08-20	38-508-20-16
10500ACA	35-06-16	38-506-16-16	14688ACA	35-08-22	38-508-22-16
10563ACA	35-06-18	38-506-18-16	14750ACA	35-08-24	38-508-24-16
10625ACA	35-06-20	38-506-20-16	14813ACA	35-08-26	38-508-26-16
14188ACA	35-08-06	38-508-06-16	14875ACA	35-08-28	38-508-28-16
14250ACA	35-08-08	38-508-08-16	14938ACA	35-08-30	38-508-30-16
14313ACA	35-08-10	38-508-10-16	141000ACA	35-08-32	38-508-32-16

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DRIVE PIN, TAMPER-RESISTANT



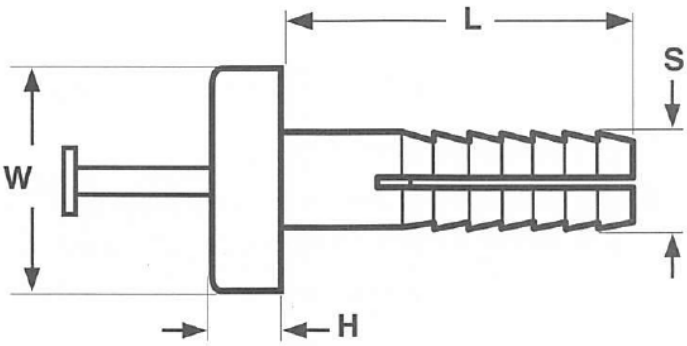
Tamper-Resistant Drive Pin Rivets

Part Number	D	L	Grip Range		R	H	Part Number	D	L	Grip Range		R	H
	Shank Diameter (± .001)	Length (+.010, -.005)	Min	Max	Head Diameter (+.005, -.015)	Head Height (± .005)		Shank Diameter (± .001)	Length (+.010, -.005)	Min	Max	Head Diameter (+.005, -.015)	Head Height (± .005)
10125ATA	.188	.281	.076	.175	.468	.110	11125ATA	.188	.281	.076	.175	.615	.110
10219ATA		.391	.176	.275			11219ATA		.391	.176	.275		
10312ATA		.484	.276	.375			11312ATA		.484	.276	.375		
10406ATA		.578	.376	.475			11406ATA		.578	.376	.475		

Description	A two-piece fastening system consisting of (1) a self-contained pin within (2) the body of a tubular-shaped rivet with a dome-shaped head. The head is approximately 2-1/2 times as wide as the shank diameter. The top of the rivet has an opening through which the pin protrudes and a recessed area into which the top of the pin fits when installation is complete. The opposite end of the rivet is enclosed but with two cross-wise slits cut into the body extending from the tip, up the shank a limited distance.
Applications/ Advantages	Drive pin rivets can join two or more pieces of low-density metal without the use of special installation tools. The rivet is inserted into pre-drilled, aligned holes and is set in place by striking the top of the pin with a hammer so that the pin is flush with the top of the head. This action causes the pin to drive through the opposite end and flare out in four directions creating a head on the blind side of the fastening. Drive pins have superior shear strength to standard break stem rivets because the pin remains inside of the installed rivet for its entire length. The tamper-resistant variety resists being removed by drilling.
Material	***Body:*** Aluminum alloy 2117 H15 or equivalent alloy ***Pin:*** Aluminum alloy 2024 T4 or equivalent alloy"
Shear Strength (approximate)	***3/16 diameter:*** 650 lbs. minimum
Tensile Strength (approximate)	***3/16 diameter:*** 460 lbs. minimum

All Nylon
Nylon / Steel

ROUND HD DRIVE PIN ANCHOR RIVET

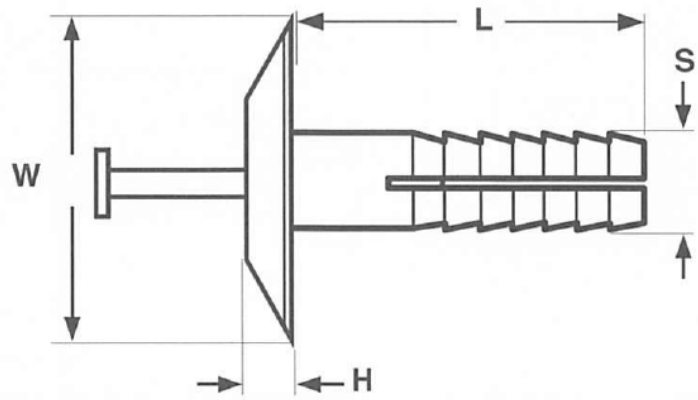


TWO PIECE DRIVE PIN ANCHOR RIVETS, ROUND HEAD						
Nominal Diameter	W		H		S	
	Head Width		Head Height		Shank Diameter	
	Max	Min	Max	Min	Max	Min
10	.442	.432	.130	.120	.203	.173
1/4	.442	.432	.130	.120	.255	.215
Tolerance on Length			+/- .015			

Description	A fastening system which consists of two parts: (1) a nylon component which has a cylindrical shank split on two sides, 180 apart, extending from the bottom of the shank up most of the distance to the head. The shank has several ribs extending completely around its circumference. Pan head styles has a gently rounded top surface, a cylindrical side and a flat bearing surface that meets the shank at a 90° angle. (2) a pin expander (which may be steel or nylon) which passes through a concentric channel extending from an opening in the top of the head of the nylon piece down into the shank to a point just below the spot where the split ends below the head. The steel pin has a slot across the top of its head, a chiseled point similar to a nail, and threads on its own shank which helps to lock the anchor in place upon installation. The nylon pin has a smooth, flat top and smooth shank.
Applications/ Advantages	An economical multipurpose blind fastener for use in predrilled hole and installed with a hammer. Provides resistance to electrical conductivity, vibration and corrosion. Can be used in floor plates, truck trailers, plumbing fixtures, window/drapery hardware and storage shelves. Steel pin variety offers greater pull-out strength.
Material	**All Plastic style:** Nylon 6/6 impact modified **Plastic Rivet/Steel Pin style:** Rivet- Nylon 6/6 impact modified, Pin- Carbon Steel w/ Zinc Plate
Melting Point	500 F

TRUSS HD DRIVE PIN ANCHOR RIVET

All Nylon
Nylon / Steel

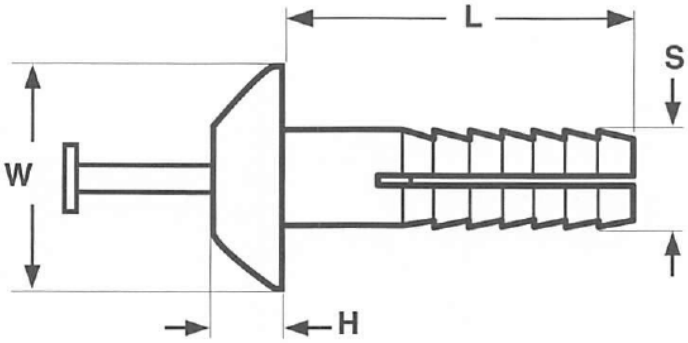


TWO PIECE DRIVE PIN ANCHOR RIVETS, TRUSS HEAD						
Nominal Diameter	W		H		S	
	Head Width		Head Height		Shank Diameter	
	Max	Min	Max	Min	Max	Min
10	.630	.620	.115	.105	.203	.173
1/4	.630	.620	.115	.105	.265	.235
Tolerance on Length			+/- .015			

Description	A fastening system which consists of two parts: (1) a nylon component which has a cylindrical shank split on two sides, 180 apart, extending from the bottom of the shank up most of the distance to the head. The shank has several ribs extending completely around its circumference. Truss head style has a low profile, trapezoidal-shaped head and is approximately 2.5 to 3.3 times the diameter of the shank. (2) a pin expander (which may be steel or nylon) which passes through a concentric channel extending from an opening in the top of the head of the nylon piece down into the shank to a point just below the spot where the split ends below the head. The steel pin has a slot across the top of its head, a chiseled point similar to a nail, and threads on its own shank which helps to lock the anchor in place upon installation. The nylon pin has a smooth, flat top and smooth shank.
Applications/ Advantages	An economical multipurpose blind fastener for use in predrilled hole and installed with a hammer. Provides resistance to electrical conductivity, vibration and corrosion. Can be used in floor plates, truck trailers, plumbing fixtures, window/drapery hardware and storage shelves. The truss head variety is preferred where minimal clearance exists above the head. Steel pin variety offers greater pull-out strength.
Material	**All Plastic style**: Nylon 6/6 impact modified **Plastic Rivet/Steel Pin style**: Rivet- Nylon 6/6 impact modified, Pin- Carbon Steel w/ Zinc Plate
Melting Point	500 F

All Nylon
Nylon / Steel

MUSHROOM HD DRIVE PIN ANCHOR RIVET

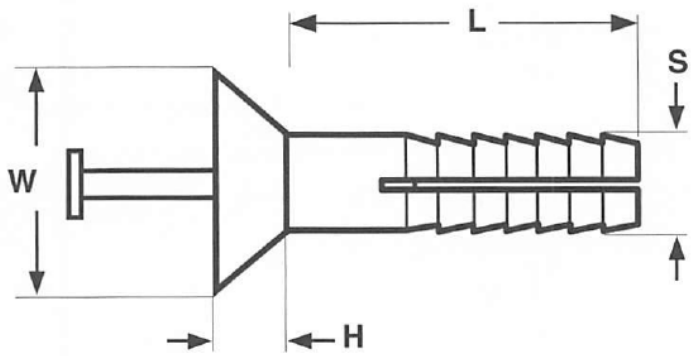


TWO PIECE DRIVE PIN ANCHOR RIVETS, MUSHROOM HEAD						
Nominal Diameter	W		H		S	
	Head Width		Head Height		Shank Diameter	
	Max	Min	Max	Min	Max	Min
10	.568	.558	.115	.105	.203	.173
1/4	.568	.558	.115	.105	.265	.235
Tolerance on Length			+/- .062			

Description	A fastening system which consists of two parts: (1) a nylon component which has a cylindrical shank split on two sides, 180 apart, extending from the bottom of the shank up most of the distance to the head. The shank has several ribs extending completely around its circumference. Mushroom head style has a gently rounded top surface and flat bearing surface. (2) a pin expander (which may be steel or nylon) which passes through a concentric channel extending from an opening in the top of the head of the nylon piece down into the shank to a point just below the spot where the split ends below the head. The steel pin has a slot across the top of its head, a chiseled point similar to a nail, and threads on its own shank which helps to lock the anchor in place upon installation. The nylon pin has a smooth, flat top and smooth shank.
Applications/ Advantages	An economical multipurpose blind fastener for use in predrilled hole and installed with a hammer. Provides resistance to electrical conductivity, vibration and corrosion. Can be used in floor plates, truck trailers, plumbing fixtures, window/drapery hardware and storage shelves. The mushroom head variety can be used in most applications. Steel pin variety offers greater pull-out strength.
Material	**All Plastic style**: Nylon 6/6 impact modified **Plastic Rivet/Steel Pin style**: Rivet- Nylon 6/6 impact modified, Pin- Carbon Steel w/ Zinc Plate
Melting Point	500 F

FLAT HD DRIVE PIN ANCHOR RIVET

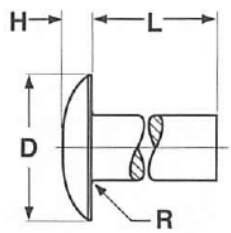
All Nylon



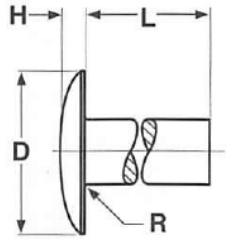
Two Piece Drive Pin Anchor Rivets, Flat Head						
Nominal Diameter	W		H		S	
	Head Width		Head Height		Shank Diameter	
	Max	Min	Max	Min	Max	Min
1/4	.443	.433	.113	.103	.265	.235
Tolerance on Length			+/- .015			

Description	A fastening system which consists of two parts: (1) a nylon component which has a cylindrical shank split on two sides, 180 apart, extending from the bottom of the shank up most of the distance to the head. The shank has several ribs extending completely around its circumference. Flat head style is countersunk. (2) a pin expander (which may be steel or nylon) which passes through a concentric channel extending from an opening in the top of the head of the nylon piece down into the shank to a point just below the spot where the split ends below the head. The steel pin has a slot across the top of its head, a chiseled point similar to a nail, and threads on its own shank which helps to lock the anchor in place upon installation. The nylon pin has a smooth, flat top and smooth shank.
Applications/ Advantages	An economical multipurpose blind fastener for use in predrilled hole and installed with a hammer. Provides resistance to electrical conductivity, vibration and corrosion. Can be used in floor plates, truck trailers, plumbing fixtures, window/drapery hardware and storage shelves. The flat head style provides a smooth offside surface with sufficient clearance for moving parts that pass over the rivet head.
Material	**All Plastic style:** Nylon 6/6 impact modified **Plastic Rivet/Steel Pin style:** Rivet- Nylon 6/6 impact modified, Pin- Carbon Steel w/ Zinc Plate
Melting Point	500 F

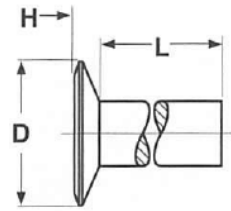
FULL-TUBULAR: OVAL, TRUSS, FLAT & COUNTERSUNK



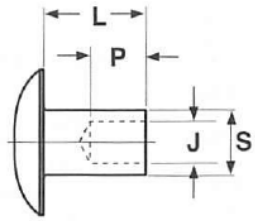
Oval Head

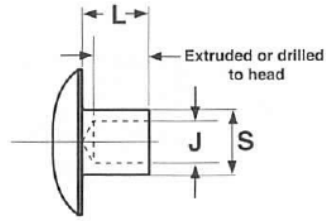


Truss Head



Flat Countersunk Head





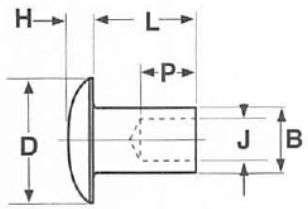
FULL-TUBULAR RIVETS

ASME B18.7 (2012)

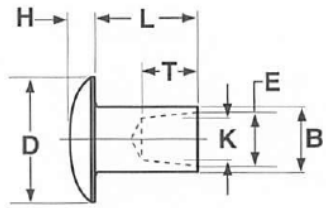
Head Style	Nominal Size	S		D		H		J		P		R	Tolerance on Length		
		Shank Diameter		Head Diameter		Head Thickness		Diameter of Hole		Depth of Hole		Fillet Radius	Up to and including 4 times shank dia.	Over 4 times shank dia. and up to and including 8 times shank dia.	Over 8 times shank dia.
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max			
Oval	0.146	0.146	0.141	0.239	0.229	0.045	0.035	0.107	0.100	To Head	0.375	0.020	±0.010	±0.012	±0.015
Truss	0.146 0.188	0.146 0.188	0.141 0.182	0.318 0.381	0.306 0.369	0.045 0.065	0.035 0.055	0.107 0.141	0.100 0.134		0.375 0.375	0.020 0.025	±0.010 ±0.010	±0.012 ±0.012	±0.015 ±0.015
Flat Countersunk	0.146 0.188	0.146 0.188	0.141 0.182	0.317 0.364	0.307 0.352	0.050 0.060	0.040 0.048	0.107 0.141	0.100 0.134		0.375 0.375	....	±0.010 ±0.010	±0.012 ±0.012	±0.015 ±0.015

Description	A small, headed metal fastener having a coaxial cylindrical hole in the end opposite the head which exceeds 112% of the mean shank diameter.
Applications/ Advantages	Can punch its own hole in some plastics, leather and fabrics and be clinched all in one step. The fastener is installed with a riveting hammer.
Material	***Steel:*** Low carbon steel (containing 0.1% carbon or less) ***Aluminum:*** Grade A95052 or equivalent

SEMI-TUBULAR, OVAL HEAD



Type S



Type T

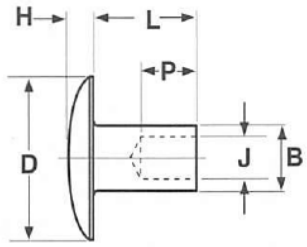
Semi-Tubular Oval Head Rivets

ASME B18.7 (2012)

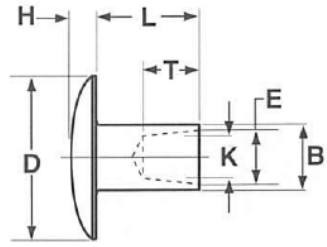
Nominal Size	B		D		H		E		K	T	J		P	Tolerance on Lengths		
	Shank Diameter		Head Diameter		Head Thickness		Type T Taper Hole Rivets				Type S Straight Hole Rivets			Up to and including 4 times shank dia.	Over 4 times shank dia. and up to and including 8 times shank dia.	Over 8 times shank dia.
							Hole Dia. at End of Rivet		Hole Dia. at Bottom of Hole	Hole Depth to Start of Apex	Hole Dia. at End of Rivet		Hole Depth to Start of Apex			
	Max	Min	Max	Min	Max	Min	Max	Min	Min	Min	Max	Min	Nom			
0.061	0.061	0.058	0.114	0.104	0.019	0.015	0.046	0.042	0.032	0.042	0.044	0.039	0.046	±0.007	±0.008	±0.010
0.089	0.089	0.085	0.152	0.142	0.026	0.020	0.068	0.064	0.050	0.057	0.068	0.062	0.064	±0.007	±0.008	±0.010
0.099	0.099	0.095	0.192	0.182	0.032	0.026	0.076	0.072	0.057	0.065	0.076	0.070	0.077	±0.007	±0.008	±0.010
0.123	0.123	0.118	0.223	0.213	0.038	0.030	0.095	0.091	0.079	0.082	0.090	0.084	0.094	±0.007	±0.010	±0.015
0.146	0.146	0.141	0.239	0.229	0.045	0.035	0.112	0.106	0.085	0.104	0.107	0.100	0.126	±0.010	±0.012	±0.015
0.188	0.188	0.182	0.318	0.306	0.065	0.055	0.145	0.139	0.110	0.135	0.141	0.134	0.155	±0.010	±0.012	±0.015
0.217	0.217	0.210	0.444	0.430	0.075	0.061	0.166	0.158	0.136	0.151	0.163	0.155	0.189	±0.010	±0.015	±0.020
0.252	0.252	0.244	0.507	0.493	0.085	0.071	0.191	0.181	0.150	0.183	0.184	0.176	0.219	±0.010	±0.015	±0.020
0.310	0.310	0.302	0.570	0.554	0.100	0.086	0.235	0.225	0.190	0.214	0.219	0.211	0.243	±0.010	±0.015	±0.020

Description	A small, headed metal fastener having a coaxial cylindrical or tapered hole which does not exceed 112% of the mean shank diameter in the end opposite a slightly rounded head. The head is approximately 50% wider than the diameter of the rivet body.
Applications/ Advantages	Easier to clinch than solid rivets. The hole reduces riveting forces for riveting tooling while the remaining clinched solid shank can provide comparable shear strengths to other common riveting products. The oval head style is popular because of its low profile head and neat, finished appearance. The fastener is installed with a riveting hammer.
Material	***Steel:*** Low carbon steel (containing 0.1% carbon or less) ***Aluminum:*** Grade A95052 or equivalent

SEMI-TUBULAR, TRUSS HEAD



Type S



Type T

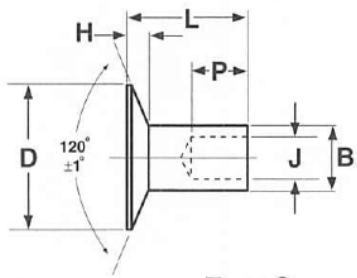
SEMI-TUBULAR TRUSS HEAD RIVETS

ASME B18.7 (2012)

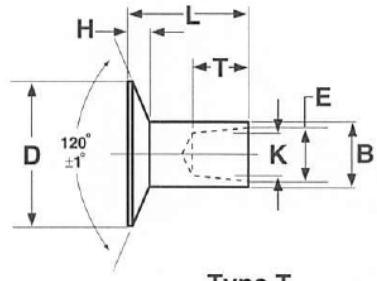
Nominal Size	B		D		H		E		K	T	J		P	Tolerance on Lengths		
	Shank Diameter		Head Diameter		Head Thickness		Type T Taper Hole Rivets				Type S Straight Hole Rivets			Up to and including 4 times shank dia.	Over 4 times shank dia. and up to and including 8 times shank dia.	Over 8 times shank dia.
							Hole Dia. at End of Rivet		Hole Dia. at Bottom of Hole	Hole Depth to Start of Apex	Hole Dia. at End of Rivet		Hole Depth to Start of Apex			
	Max	Min	Max	Min	Max	Min	Max	Min	Min	Min	Max	Min	Nom			
0.061	0.061	0.058	0.130	0.120	0.019	0.015	0.046	0.042	0.032	0.042	0.044	0.039	0.046	±0.007	±0.008	±0.010
0.089	0.089	0.085	0.192	0.182	0.026	0.020	0.068	0.064	0.050	0.057	0.068	0.062	0.064	±0.007	±0.008	±0.010
0.123	0.123	0.118	0.286	0.276	0.038	0.030	0.095	0.091	0.079	0.082	0.090	0.084	0.094	±0.007	±0.010	±0.015
0.146	0.146	0.141	0.318	0.306	0.045	0.035	0.112	0.106	0.085	0.104	0.107	0.100	0.126	±0.010	±0.012	±0.015
0.188	0.188	0.182	0.381	0.369	0.065	0.055	0.145	0.139	0.110	0.135	0.141	0.134	0.155	±0.010	±0.012	±0.015

Description	A small headed metal fastener having a coaxial cylindrical or tapered hole which does not exceed 112% of the mean shank diameter in the end opposite a slightly rounded head. The head is approximately 50% wider than the diameter of the rivet body.
Applications/ Advantages	Easier to clinch than solid rivets. The hole reduces riveting forces for riveting tooling while the remaining clinched solid shank can provide comparable shear strengths to other common riveting products. The truss head style is chosen when the rivet is seated in soft material to prevent it from pulling through. The fastner is installed with a riveting hammer.
Material	***Steel:*** Low carbon steel (containing 0.1% carbon or less) ***Aluminum:*** Grade A95052 or equivalent

SEMI-TUBULAR, 120° COUNTERSUNK FLAT HEAD



Type S



Type T

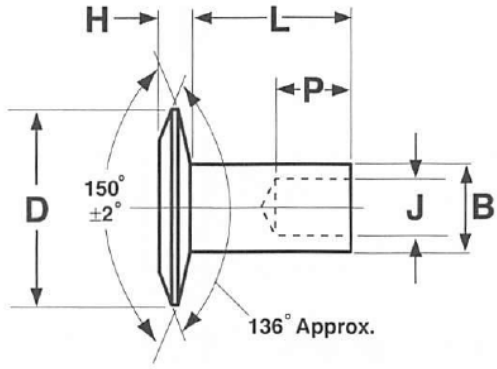
SEMI-TUBULAR RIVETS, 120° COUNTERSUNK HEAD

ASME B18.7 (2012)

Nominal Size	B		D		H	E		K	T	J		P	Tolerance on Length		
	Shank Diameter		Head Diameter		Head Thick-ness	Type T Taper Hole Rivets				Type S Straight Hole Rivets			Up to and including 4 times shank dia.	Over 4 times shank dia. and up to and including 8 times shank dia.	Over 8 times shank dia.
			Max, Edge Sharp	Min, Edge Rounded or Flat		Hole Dia. at End of Rivet		Hole Dia. at Bottom of Hole	Hole Depth to Start of Apex	Hole Dia. at End of Rivet		Hole Depth to Start of Apex			
	Max	Min			Ref	Max	Min	Min	Min	Max	Min	Nom			
0.089	0.089	0.085	0.223	0.203	0.039	0.068	0.064	0.050	0.057	0.068	0.062	0.064	±0.007	±0.008	±0.010
0.123	0.123	0.118	0.271	0.245	0.043	0.095	0.091	0.079	0.082	0.090	0.084	0.094	±0.007	±0.010	±0.015
0.146	0.146	0.141	0.337	0.307	0.056	0.112	0.106	0.085	0.104	0.107	0.100	0.126	±0.010	±0.012	±0.015
0.188	0.188	0.182	0.404	0.369	0.063	0.145	0.139	0.110	0.135	0.141	0.134	0.155	±0.010	±0.012	±0.015
0.217	0.217	0.210	0.472	0.430	0.075	0.166	0.158	0.136	0.151	0.163	0.155	0.189	±0.010	±0.015	±0.020
0.252	0.252	0.244	0.540	0.493	0.084	0.191	0.181	0.150	0.183	0.184	0.176	0.219	±0.010	±0.015	±0.020

Description	A small, headed metal fastener having a coaxial cylindrical or tapered hole which does not exceed 112% of the mean shank diameter in the end opposite the countersunk head. The head is approximately 50% wider than the diameter of the rivet body.
Applications/ Advantages	Easier to clinch than solid rivets. The hole reduces riveting forces for riveting tooling while the remaining clinched solid shank can provide comparable shear strengths to other common riveting products. The 120° countersunk head provides a smooth offiside surface and sufficient clearance for moving parts which pass over the rivet head. The fastener is installed with a riveting hammer.
Material	***Steel:*** Low carbon steel (containing 0.1% carbon or less) ***Aluminum:*** Grade A95052 or equivalent

SEMI-TUBULAR, 150° COUNTERSUNK FLAT HEAD



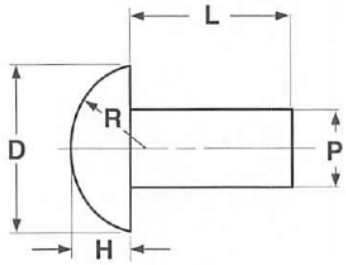
SEMI-TUBULAR RIVETS, 150° COUNTERSUNK HEAD

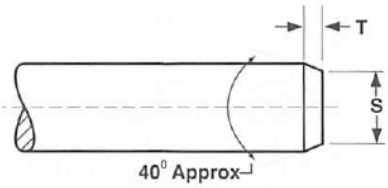
ASME B18.7 (2012)

Nominal Size	B		D				H				J		P	Tolerance on Length		
	Shank Diameter		Head Diameter				Head Thickness				Hole Dia. at End of Rivet		Hole Depth to Start of Apex	Up to and including 4 times shank dia.	Over 4 times shank dia. and up to and including 8 times shank dia.	Over 8 times shank dia.
			Standard Head		Large Head		Standard Head		Large Head							
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Ref			
0.146	0.146	0.141	0.303	0.289	0.367	0.351	0.045	0.035	0.051	0.041	0.105	0.099	0.141	±0.010	0.012	0.015
0.188	0.188	0.182	0.367	0.351	0.478	0.458	0.051	0.041	0.067	0.053	0.139	0.133	0.188	±0.010	±0.012	±0.015
0.252	0.252	0.244	0.478	0.458	....	....	0.067	0.053	....	....	0.183	0.173	0.250	±0.010	±0.015	±0.020

Description	A small, headed metal fastener having a coaxial cylindrical or tapered hole which does not exceed 112% of the mean shank diameter in the end opposite the countersunk head with a slightly rounded top surface. The head is approximately 50% wider than the diameter of the rivet body.
Applications/ Advantages	Easier to clinch than solid rivets. The hole reduces riveting forces for riveting tooling while the remaining clinched solid shank can provide comparable shear strengths to other common riveting products. The 150 countersunk head is often chosen for decorative purposes. The fastener is installed with a riveting hammer.
Material	***Steel:*** Low carbon steel (containing 0.1% carbon or less) ***Aluminum:*** Grade A95052 or equivalent

SOLID, BUTTON HEAD





Solid Button Head Rivets

ASME B18.1.1 (2011)

Nominal Size or Basic Shank Diameter		P Shank Diameter		D Head Diameter		H Head Height		R Head Radius
		Max	Min	Max	Min	Max	Min	Approx
1/16	0.062	0.064	0.059	0.122	0.102	0.052	0.042	0.055
3/32	0.094	0.096	0.090	0.182	0.162	0.077	0.065	0.084
1/8	0.125	0.127	0.121	0.235	0.215	0.100	0.088	0.111
5/32	0.156	0.158	0.152	0.290	0.268	0.124	0.110	0.138
3/16	0.188	0.191	0.182	0.348	0.322	0.147	0.133	0.166
7/32	0.219	0.222	0.213	0.405	0.379	0.172	0.158	0.195
1/4	0.250	0.253	0.244	0.460	0.430	0.196	0.180	0.221
9/32	0.281	0.285	0.273	0.518	0.484	0.220	0.202	0.249
5/16	0.312	0.316	0.304	0.572	0.538	0.243	0.225	0.276
11/32	0.344	0.348	0.336	0.630	0.592	0.267	0.247	0.304
3/8	0.375	0.380	0.365	0.684	0.646	0.291	0.271	0.332
13/32	0.406	0.411	0.396	0.743	0.699	0.316	0.294	0.358
7/16	0.438	0.443	0.428	0.798	0.754	0.339	0.317	0.387

Tolerance on Length	Plus	Minus
	0.016	0.016

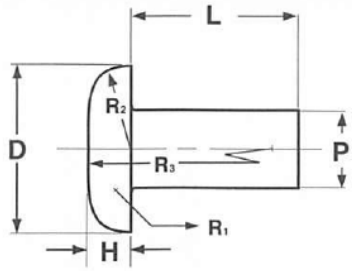
Standard Header Points for Small Solid Rivets*

ASME B18.1.1 (2011)

Nominal Size or Basic Shank Diameter		S Point Diameter	T Point Length	Nominal Shank Length
		Approx	Approx	Max
3/32	0.094	0.077	0.023	3/4
1/8	0.125	0.102	0.031	3/4
5/32	0.156	0.127	0.039	1
3/16	0.188	0.154	0.047	1
7/32	0.219	0.179	0.055	1-3/8
1/4	0.250	0.204	0.062	1-3/8
9/32	0.281	0.230	0.070	1-1/2
5/16	0.312	0.255	0.078	1-1/2
11/32	0.344	0.281	0.086	1-5/8
3/8	0.375	0.307	0.094	1-5/8
7/16	0.438	0.358	0.110	3

*Apply when pointed rivets are specified.

SOLID, PAN HEAD



Solid Pan Head Rivets

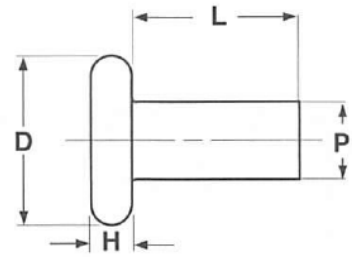
ASME B18.1.1 (2011)

Nominal Size or Basic Shank Diameter		P		D		H		R_1	R_2	R_3
		Shank Dianeter		Head Diameter		Head Height		Head Corner Radius	Head Side Radius	Head Crown Radius
		Max	Min	Max	Min	Max	Min	Approx	Approx	Approx
1/16	0.062	0.064	0.059	0.118	0.098	0.040	0.030	0.019	0.052	0.217
3/32	0.094	0.096	0.090	0.173	0.153	0.060	0.048	0.030	0.080	0.326
1/8	0.125	0.127	0.121	0.225	0.205	0.078	0.066	0.039	0.106	0.429
5/32	0.156	0.158	0.152	0.279	0.257	0.096	0.082	0.049	0.133	0.535
3/16	0.188	0.191	0.182	0.334	0.308	0.114	0.100	0.059	0.159	0.641
7/32	0.219	0.222	0.213	0.391	0.365	0.133	0.119	0.069	0.186	0.754
1/4	0.250	0.253	0.244	0.444	0.414	0.151	0.135	0.079	0.213	0.858
9/32	0.281	0.285	0.273	0.499	0.465	0.170	0.152	0.088	0.239	0.963
5/16	0.312	0.316	0.304	0.552	0.518	0.187	0.169	0.098	0.266	1.070
11/32	0.344	0.348	0.336	0.608	0.570	0.206	0.186	0.108	0.292	1.176
3/8	0.375	0.380	0.365	0.663	0.625	0.225	0.205	0.118	0.319	1.286
13/32	0.406	0.411	0.396	0.719	0.675	0.243	0.221	0.127	0.345	1.392
7/16	0.438	0.443	0.428	0.772	0.728	0.261	0.239	0.137	0.372	1.500

Tolerance on Length	Plus	Minus
	0.016	0.016

Description	A small, pan-head metal fastener having no internal cavity, made of a malleable material.
Applications/ Advantages	Designed to permanently join two or more pieces of metal with pre-drilled holes.
Material	Grade 0 solid rivets shall be made from steel which conforms to the following chemical composition ladle analysis: ***Phosphorous***: 0.040% maximum; ***Sulfur***: 0.050% maximum
Hardness	Rockwell B 65 maximum
Tensile Strength	40,000 - 55,000 psi.
Yield Point	23,000 psi., minimum
Elongation in 8 in.	27%, minimum

SOLID, FLAT HEAD



Solid Rivets, Flat Head

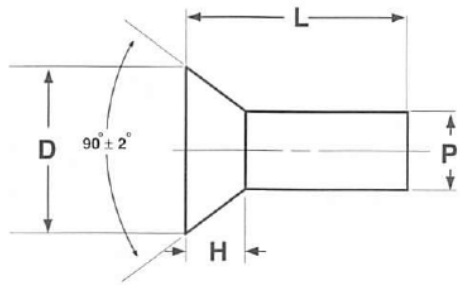
ASME B18.1.1 (2011)

Nominal Size or Basic Shank Diameter		P		D		H	
		Shank Dianeter		Head Diameter		Head Height	
		Max	Min	Max	Min	Max	Min
1/16	0.062	0.064	0.059	0.140	0.120	0.027	0.017
3/32	0.094	0.096	0.090	0.200	0.180	0.038	0.026
1/8	0.125	0.127	0.121	0.260	0.240	0.048	0.036
5/32	0.156	0.158	0.152	0.323	0.301	0.059	0.045
3/16	0.188	0.191	0.182	0.387	0.361	0.069	0.055
7/32	0.219	0.222	0.213	0.453	0.427	0.080	0.065
1/4	0.250	0.253	0.244	0.515	0.485	0.091	0.075
9/32	0.281	0.285	0.273	0.579	0.545	0.103	0.085
5/16	0.312	0.316	0.304	0.641	0.607	0.113	0.095
11/32	0.344	0.348	0.336	0.705	0.667	0.124	0.104
3/8	0.375	0.380	0.365	0.769	0.731	0.135	0.115
13/32	0.406	0.411	0.396	0.834	0.790	0.146	0.124
7/16	0.438	0.443	0.428	0.896	0.852	0.157	0.135

Tolerance on Length	Plus	Minus
	0.016	0.016

Description	A small, flat-head metal fastener having no internal cavity, made of a malleable material.
Applications/ Advantages	Designed to permanently join two or more pieces of metal with pre-drilled holes.
Material	Grade 0 solid rivets shall be made from steel which conforms to the following chemical composition ladle analysis: ***Phosphorous***: 0.040% maximum; ***Sulfur***: 0.050% maximum
Hardness	Rockwell B 65 maximum
Tensile Strength	40,000 - 55,000 psi.
Yield Point	23,000 psi., minimum
Elongation in 8 in.	27%, minimum

SOLID, FLAT COUNTERSUNK HEAD



SOLID RIVETS, FLAT COUNTERSUNK HEAD

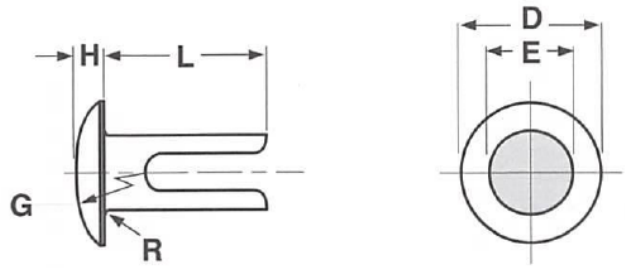
ASME B18.1.1 (2011)

Nominal Size or Basic Shank Diameter		P		D		H
		Shank Dianeter		Head Diameter		Head Height
		Max	Min	Max	Min	Ref
1/16	0.062	0.064	0.059	0.118	0.110	0.027
3/32	0.094	0.096	0.090	0.176	0.163	0.040
1/8	0.125	0.127	0.121	0.235	0.217	0.053
5/32	0.156	0.158	0.152	0.293	0.272	0.066
3/16	0.188	0.191	0.182	0.351	0.326	0.079
7/32	0.219	0.222	0.213	0.413	0.384	0.094
1/4	0.250	0.253	0.244	0.469	0.437	0.106
9/32	0.281	0.285	0.273	0.528	0.491	0.119
5/16	0.312	0.316	0.304	0.588	0.547	0.133
11/32	0.344	0.348	0.336	0.646	0.602	0.146
3/8	0.375	0.380	0.365	0.704	0.656	0.159
13/32	0.406	0.411	0.396	0.763	0.710	0.172
7/16	0.438	0.443	0.428	0.823	0.765	0.186

Tolerance on Length	Plus	Minus
	0.016	0.016

Description	A small, countersunk, flat-headed fastener having no internal cavity, made of a malleable material.
Applications/ Advantages	Designed to permanently join two or more pieces of metal with pre-drilled holes. Countersunk head design is preferred when moving parts must pass over the fastened area.
Material	Grade 0 solid rivets shall be made from steel which conforms to the following chemical composition ladle analysis: ***Phosphorous***: 0.040% maximum; ***Sulfur***: 0.050% maximum
Hardness	Rockwell B 65 maximum
Tensile Strength	40,000 - 55,000 psi.
Yield Point	23,000 psi., minimum
Elongation in 8 in.	27%, minimum

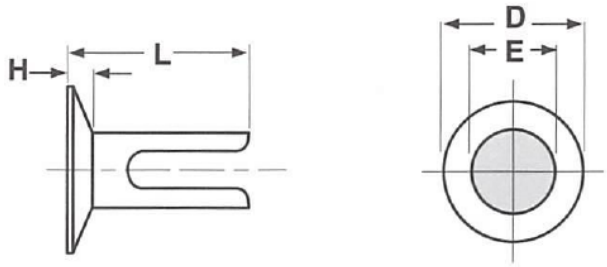
SPLIT, OVAL HEAD



SPLIT RIVETS, OVAL HEAD									ASME B18.7 (2012)
Nominal Size	E		D		H		G	R	Tolerance on Length
	Shank Diameter		Head Diameter		Head Thickness		Radius of Head	Fillet Radius	
	Max	Min	Max	Min	Max	Min	Approx	Max	
0.092	0.092	0.085	0.152	0.142	0.026	0.020	0.22	0.012	±0.010
0.125	0.125	0.113	0.223	0.213	0.035	0.027	0.31	0.016	±0.015
0.152	0.152	0.144	0.318	0.306	0.045	0.035	0.27	0.020	±0.015
0.190	0.190	0.180	0.349	0.337	0.055	0.045	0.25	0.025	±0.015

Description	A small, round headed metal fastener with a split end for clinching by spreading the ends.
Applications/ Advantages	Designed to permanently join soft materials such as rubber, leather, canvas, wood and soft plastics. It eliminates cost of pre-drilling holes while preserving the strength of the assembly by not having material removed from the objects being joined. The rivet is installed with anvils that spread the prongs against the material.
Material	***Steel:*** Low carbon steel (containing 0.1% carbon or less)

SPLIT, FLAT COUNTERSUNK HEAD

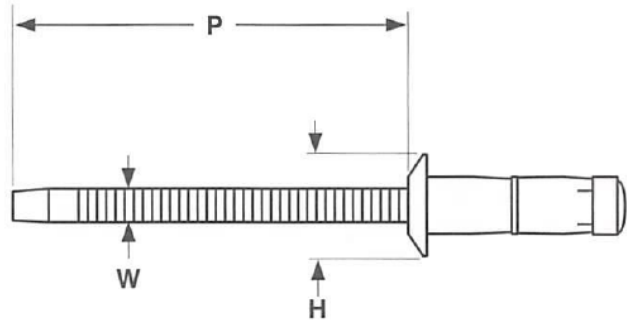


SPLIT RIVETS, FLAT COUNTERSUNK HEAD							ASME B18.7 (2012)
Nominal Size	E		D		H		Tolerance on Length
	Shank Diameter		Head Diameter		Head Thickness		
	Max	Min	Max	Min	Max	Min	
0.125	0.125	0.113	0.223	0.213	0.036	0.026	±0.015
0.152	0.152	0.144	0.317	0.307	0.053	0.043	±0.015
0.152	0.152	0.144	0.380*	0.370*	0.062*	0.052*	±0.015
0.190	0.190	0.180	0.443	0.431	0.061	0.051	±0.015
*Rivets in 0.152 in., size having these head proportions shall be designated "Large Flat Countersunk Head."							

Description	A small, countersunk headed metal fastener with a split end for clinching by spreading the ends.
Applications/ Advantages	Designed to permanently join soft materials such as rubber, leather, canvas, wood and soft plastics. It eliminates cost of pre-drilling holes while preserving the strength of the assembly by not having material removed from the objects being joined. The rivet is installed with anvils that spread the prongs against the material.
Material	***Steel:*** Low carbon steel (containing 0.1% carbon or less)

ORLOCK®, DOME HEAD

High Strength Double Locking

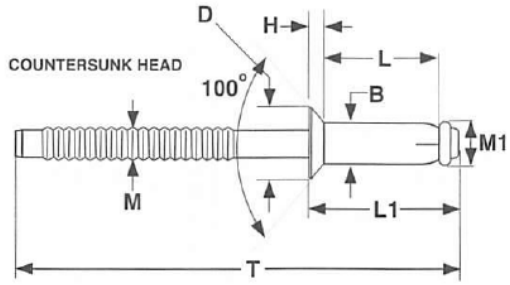


DOME ORLOCK® HIGH STRENGTH BLIND RIVETS									Ornit
Nominal Rivet Diameter & Material	Part Number	L Rivet Length (±.012)	Grip Range	W Mandrel Nail Diameter (+.003, -.002)	B Body Diameter (±.002)	Recommended Hole Size	H Head Height (±.008)	D Head Diameter (±.012)	Typical Shear Strength (lbs.)
3/16 Steel/Steel	L48090P	0.354	.059 - .138	0.119	0.189	0.192 - 0.200	0.087	0.386	1012
	L48115P	0.453	.138 - .236						1342
	L48140P	0.551	.236 - .335						1410
1/4 Alum/Alum	LH64105P	0.413	.110 - .189	0.164	0.250	0.259 - 0.267	0.118	0.512	946
	LH64125P	0.492	.189 - .268						1012
	LH64145P	0.571	.268 - .346						1100
1/4 Steel/Steel	LS65105P	0.413	.079 - .177	0.164	0.256	0.260 - 0.268	0.118	0.512	2315
	LS65125P	0.492	.118 - .256						2426
	LS65145P	0.571	.197 - .335						2867
	LS65165P	0.650	.276 - .413						3043
	LS65185P	0.728	.354 - .492						3263

Description	A blind fastener with a self-contained mandrel. The body of the rivet has a dome-shaped head and a shank which tapers slightly where it meets the mandrel head. The mandrel is designed with two sets of longitudinal grooves that provides internal friction at both ends of the fastening. The section of the mandrel that protrudes above the head of the rivet has circumferential serrations that helps the tool to grip the mandrel during installation. This top portion of the mandrel ultimately breaks away once the rivet has been installed.	
Applications/ Advantages	The double-locking system ensures that the mandrel remains tightly fitted within the rivet body, rendering it highly resistant to vibration and water. The internal friction system with differential force load provides maximum clamp-up without deforming the materials being gripped. This rivet is designed for heavy industrial use, including automotive, commercial vehicles, buses, railway cars, farm equipment and electrical engineering.	
Material	*All Aluminum variety:*	*All Steel variety:*
	Rivet Body: Aluminum 5052 ***Mandrel:*** Aluminum Almg 6.0 or equivalent	***Rivet Body:*** Low carbon steel with zinc yellow chromate; ***Mandrel:*** Carbon steel with zinc yellow chromate
Shear Strength	Typical shear strengths are listed in the above table.	Typical shear strengths are listed in the above table.
Tensile Strength	*1/4 nominal rivet diameter:* 772 lbs.	*3/16 nominal rivet diameter:* 661 lbs. *1/4 nom inal rivet diameter:* 1654 lbs.

Orlock® is a registered trademark owned by Ornit.

High Strength Double Locking ORLOCK®, COUNTERSUNK HEAD



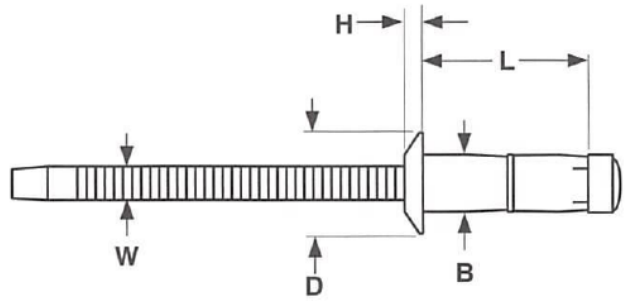
COUNTERSUNK ORLOCK® HIGH SRENGTH BLIND RIVET										Ornit
Nominal Rivet Diam. & Material	Part Number	L Rivet Length (±.012)	Grip Range	M Mandrel Nail Diameter (+.003, -.002)	B Body Diam. (±.002)	Recommended Hole Size	H Head Height (±.008)	D Head Diam. (±.012)	L1 Rivet Length (±.032)	Typical Shear Strength (lbs.)
1/4 Alum/ Alum	LH64115K	0.453	.150 - .228	.164	0.250	0.260 - 0.268	0.079	0.394	.453	616
	LH64125K	0.492	.189 - .268						.492	-
	LH64175K	0.689	.386 - .465						.689	1100
1/4 Steel/ Steel	L64175K	0.689	.386 - .465	.164	0.250	0.260 - 0.268	0.079	0.394	.689	2310
	L64195K	0.768	.465 - .543						.768	

Description	A blind fastener with a self-contained mandrel. The body of the rivet has a countersunk flat head and a shank which tapers slightly where it meets the mandrel head. The mandrel is designed with two sets of longitudinal grooves that provides internal friction at both ends of the fastening. The section of the mandrel that protrudes above the head of the rivet has circumferential serrations that helps the tool to grip the mandrel during installation. This top portion of the mandrel ultimately breaks away once the rivet has been installed.	
Applications/ Advantages	The double-locking system ensures that the mandrel remains tightly fitted within the rivet body, rendering it highly resistant to vibration and water. The internal friction system with differential force load provides maximum clamp-up without deforming the materials being gripped. This rivet is designed for heavy industrial use, including automotive, commercial vehicles, buses, railway cars, farm equipment and electrical engineering.	
Material	***All Aluminum variety:***	***All Steel variety:***
	Rivet Body: Aluminum 5052 ***Mandrel:*** Aluminum Almg 6.0 or equivalent	***Rivet Body:*** Low carbon steel with zinc yellow chromate; ***Mandrel:*** Carbon steel with zinc yellow chromate
Shear Strength	Typical shear strengths are listed in the above table.	Typical shear strengths are listed in the above table.
Tensile Strength	772 lbs.	1213 lbs.

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ORLOCK®, DOME HEAD

Stainless, High Strength



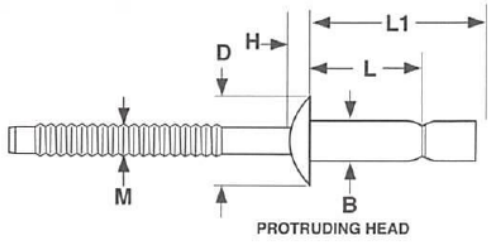
DOME ORLOCK® STAINLESS HIGH STRENGTH BLIND RIVETS — Ornit

Nominal Rivet Diameter & Material	Part Number	L Rivet Length (±.012)	Grip Range	W Mandrel Nail Diameter (+.003, -.002)	B Body Diameter (±.002)	Recommended Hole Size	H Head Height (±.008)	D Head Diameter (±.012)	Typical Tensile Strength (Kgf.)	Typical Shear Strength (Kgf.)
1/4 Stainless/ Stainless	LN64105P	.413	.079 - .189	0.164	0.251	0.259 - 0.263	0.118	0.512	850	1440
	LN64125P	.492	.157 - .260							1480
	LN64145P	.571	.197 - .335							
	LN64165P	.650	.276 - .413							
	LN64185P	.728	.354 - .492							

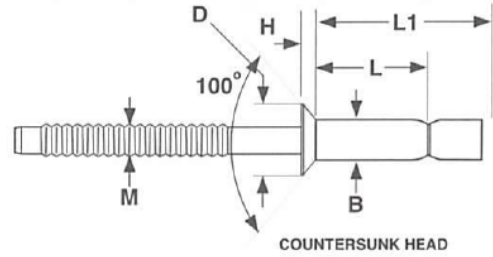
Description	A blind fastener with a self-contained mandrel. The body of the rivet has a dome-shaped head and a shank which tapers slightly where it meets the mandrel head. The mandrel is designed with two sets of longitudinal grooves that provides internal friction at both ends of the fastening. The section of the mandrel that protrudes above the head of the rivet has circumferential serrations that helps the tool to grip the mandrel during installation. This top portion of the mandrel ultimately breaks away once the rivet has been installed.
Applications/ Advantages	The double-locking system ensures that the mandrel remains tightly fitted within the rivet body, rendering it highly resistant to vibration and water. The internal friction system with differential force load provides maximum clamp-up without deforming the materials being gripped. This rivet is designed for environments where a balance of resistance to corrosion and vibration exists.
Material	***All Stainless***
	Rivet Body: Austenitic Stainless AISI 304 Cu ***Mandrel:*** Austenitic Stainless AISI 304 Cu
Shear Strength	Typical shear strengths are listed in the above table.
Tensile Strength	Typical tensile strengths are listed in the above table.

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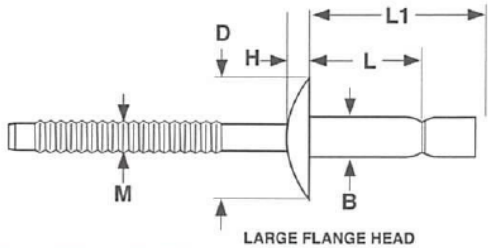
MONOBOLT®/STRUCTURAL PROTRUDING, LARGE FLANGE & COUNTERSUNK HEADS



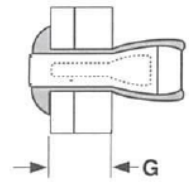
PROTRUDING HEAD



COUNTERSUNK HEAD



LARGE FLANGE HEAD



MONOBOLT® STRUCTURAL RIVETS

Avdel*

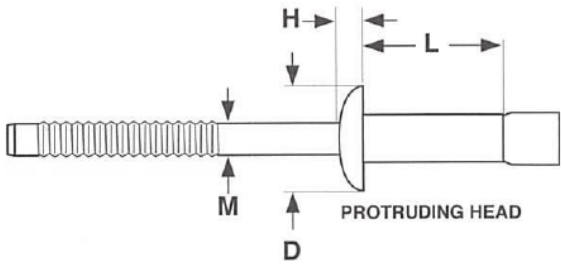
Nominal Rivet Diameter	Hole Size		Drill Number	M	B	D	H	D	H	D	H	G	L	L1
				Mandrel Diameter	Rivet Diameter	Protruding Head		Large Flange Head		Countersunk Head		Grip Range	Rivet Length	Rivet Length (Incl. Mandrel Head)
						Head Diameter	Head Thick-ness	Head Diameter	Head Thick-ness	Head Diameter	Head Thick-ness			
	Max	Min		Nom	Nom	Nom	Nom	Nom	Nom	Nom	Nom		Max	Max
3/16	.201	.191	#11	.118	.187	.375	.085	.515	.100	.335	.070	.062-.270	.416	.727
												.125-.331	.486	.800
												.214-.420	.537	.855
1/4	.276	.261	17/64	.157	.257	.500	.112	-	-	.405	.079	.080-.375	.556	.924
												.125-.475	.660	1.028
												.350-.625	.810	1.174

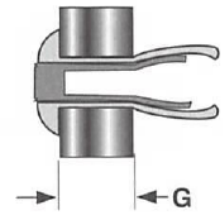
Description	A two-piece blind fastener consisting of (1) a mandrel with a flared, hollowed-out head and a serrated stem; and (2) a self contained tubular body with a head which has one of several shapes. The protruding head has a dome shape; the large-flange has a similar shape and is 30-40% wider than the protruding head; the countersunk head has a cone shaped bearing surface with a head angle of approximately 100 .
Applications/ Advantages	This structural rivet has greater tensile strength, greater shear strength and is more resistant to vibration than a standard break-stem blind rivet. The way the mandrel expands radially when pulling through the rivet body enables it to completely fill holes that are out-of-round, and when the mandrel breaks it leaves a flush finish with the top of the rivet giving it greater weather-resistance than a standard blind rivet.
Material	***Aluminum Rivet:*** 5056 Aluminum; ***Aluminum Mandrel:*** 7178 Aluminum ***Steel Rivet:*** Low carbon steel; ***Steel Mandrel:*** Carbon steel ***Stainless Steel Rivet:*** 300 series stainless; ***Stainless Steel Mandrel:*** 300 series stainless
Shear Strength	***Aluminum Rivet/Aluminum Mandrel:*** 3/16" Diam- 675 lbs., minimum; 1/4" Diam- 1350 lbs., minimum ***Steel Rivet/Steel Mandrel:*** 3/16" Diam- 1500 lbs., minimum; 1/4" Diam- 2750 lbs., minimum ***Stainless Steel Rivet/Stainless Steel Mandrel:*** 3/16" Diam- 1450 lbs., minimum; 1/4" Diam- 2650 lbs., minimum
Tensile Strength	***Aluminum Rivet/Aluminum Mandrel:*** 3/16" Diam- 600 lbs., minimum; 1/4" Diam- 1000 lbs., minimum ***Steel Rivet/Steel Mandrel:*** 3/16" Diam- 1350 lbs., minimum; 1/4" Diam- 2400 lbs., minimum ***Stainless Steel Rivet/Stainless Steel Mandrel:*** 3/16" Diam- 1150 lbs., minimum; 1/4" Diam- 2350 lbs., minimum
Mandrel Push Out	***Aluminum Rivet/Aluminum Mandrel:*** 3/16" Diam- 50 lbs.; 1/4" Diam- 100 lbs. ***Steel Rivet/Steel Mandrel:*** 3/16" Diam- 300 lbs.; 1/4" Diam- 500 lbs. ***Stainless Steel Rivet/Stainless Steel Mandrel:*** 3/16" Diam- 100 lbs.; 1/4" Diam- 250 lbs.

Monobolt® is a registered trademark of Avdel UK Limited. Kanebridge's rivets are not manufactured by or connected with the producers of Monobolt® rivets.

STRUCTURAL, PROTRUDING HEAD

All Aluminum / All Steel / All Stainless





Structural Rivets with Protruding Heads

Part Numbers			Nominal Rivet Diameter	Hole Size		M		D	H	G	L
All Aluminum	All Steel	All Stainless				Mandrel Diameter		Head Diameter	Head Height	Grip Range	Body Length
				Max	Min	Max	Min	Nom	Nom		Max
PA64	PS64	-	3/16	.201	.191	.122	.114	.385	.085	.062-.270	.415
PA67	-	-								.214-.437	.572
-	PS67M	-								.062-.437	.572
PA86	PS86	PSS86	1/4	.272	.261	.162	.153	.525	.117	.080-.375	.560
-	*PS810M	-								.080-.625	.810
PA810	PS810	PSS810								.350-.625	.810

*Replaces part number PS86M.

Description	A two-piece blind fastener consisting of (1) a mandrel with a flared, hollowed-out head and a serrated stem; and (2) a self contained tubular body with a head which has a dome shape.
Applications/ Advantages	This structural rivet has greater tensile strength and shear strength than a standard break-stem blind rivet. The way the mandrel expands radially when pulling through the rivet body enables it to completely fill holes that are out-of-round. Can be used to join two metals or a metal to a plastic. Structural rivets are used in automotive manufacturing, home appliances, cabinetry and HVAC applications. Unlike Monobolts, generic structural rivets do not require a special nosepiece to be used when seating the rivets.
Material	***Aluminum Rivet:*** 5056 Aluminum or equivalent; ***Aluminum Mandrel:*** 7178 Aluminum or equivalent ***Steel Rivet:*** 1038 steel or equivalent; ***Steel Mandrel:*** 1038 steel or equivalent ***Stainless Rivet:*** 300 series; ***Stainless Mandrel:*** 300 series
Shear Strength	***Aluminum Rivet/Aluminum Mandrel:*** 3/16" Diam- 550 lbs., minimum; 1/4" Diam- 1270 lbs., minimum ***Steel Rivet/Steel Mandrel:*** 3/16" Diam- 1300 lbs., minimum; 1/4" Diam- 2400 lbs., minimum ***Stainless Rivet/Stainless Mandrel:*** 1/4" Diam- 2360 lbs., minimum (10,500 N. min)
Tensile Strength	***Aluminum Rivet/Aluminum Mandrel:*** 3/16" Diam- 450 lbs., minimum; 1/4" Diam- 830 lbs., minimum ***Steel Rivet/Steel Mandrel:*** 3/16" Diam- 1000 lbs., minimum; 1/4" Diam- 1850 lbs., minimum ***Stainless Rivet/Stainless Mandrel:*** 1/4" Diam- 1843 lbs., minimum (8200 N. min.)

STRUCTURAL, PROTRUDING HEAD

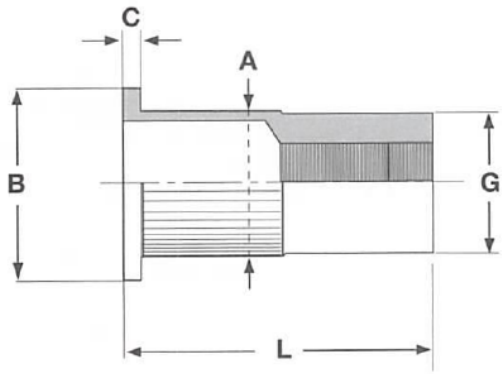
PART NUMBER COMPARISON - PROTRUDING HEAD STRUCTURAL RIVETS, *ALL ALUMINUM*					
Kanebridge	**Avdel/Cherry**	**3 Star Rivets USA**	**Marson®**	**Huck**	**Gesipa®**
PA64	BAPI-06-04	AAN-4810	AB6-4AKL	MGLP-B6-4	RV6900-6-4
PA67	BAPI-06-07	AAN-4814	AB6-7AKL	MGLP-B6-7	RV6900-6-7XG
PA86	BAPI-08-06	AAN-6414	AB8-6AKL	MGLP-B8-6	RV6900-8-6
PA810	BAPI-08-10	AAN-6429	AB8-10AKL	MGLP-B8-10	RV6900-8-10XG

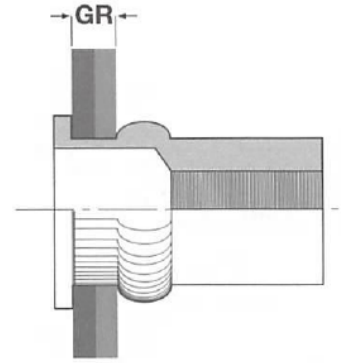
PART NUMBER COMPARISON - PROTRUDING HEAD STRUCTURAL RIVETS, *ALL STEEL*					
Kanebridge	**Avdel/Cherry**	**3 Star Rivets USA**	**Marson®**	**Huck**	**Gesipa®**
PS64	SSPI-06-04	SSN-4810	SB6-4KL	MGLP-R6-4	RV6977-6-4
PS67M	-	-	SB6-EKL	-	-
PS86	SSPI-08-06	SSN-6414	SB8-6KL	MGLP-R8-6	RV6977-8-6
* PS810M	-	-	SB8-EKL	MGLP-R8-E	RV6977-8-10XG
PS810	SSPI-08-10	SSN-6419	SB8-10KL	MGLP-R8-10	-

*Replaces part number PS86M.

PART NUMBER COMPARISON - PROTRUDING HEAD STRUCTURAL RIVETS, *ALL STAINLESS*					
Kanebridge Part #	**Avdel/Cherry**	**3 Star Rivets USA**	**Marson®**	**Huck**	**Gesipa®**
PSS86	CCPI-08-06	-	SSB8-6SKL	MGLP-U8-6	-
PSS810	CCPI-08-10	-	SSB8-10SKL	MGLP-U8-10	-

RIVET NUTS (Blind Threaded Inserts) — Ribbed Body, Flat Hd, Large Flange





Ribbed Body, Flat Head, Large Flange Blind Threaded Inserts

Thread Size-Ultimate Grip	L		A		B		C		G		F		Hole Size		Grip Range
	Body Length		Ribbed Body Diameter		Head Diameter		Head Height		Reduced Body Diameter		Ribbed Length				
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
6-32-.080	.475	.445	.265	.261	.375	.365	. 037	.027	.252	.249	.220	.190	.2716	.2656	.020-.080
6-32-.130	.525	.495	.265	.261	.375	.365	.037	.027	.252	.249	.270	.240	.2716	.2656	.080-.130
8-32-.080	.475	.445	.265	.261	.375	.365	.037	.027	.252	.249	.220	.190	.2716	.2656	.020-.080
8-32-.130	.525	.495	.265	.261	.375	.365	.037	.027	.252	.249	.270	.240	.2716	.2656	.080-.130
10-24-.130	.530	.500	.296	.292	.400	.390	.042	.032	.283	.280	.270	.240	.3029	.2969	.020-.130
10-24-.225	.640	.610	.296	.292	.400	.390	.042	.032	.283	.280	.365	.335	.3029	.2969	.130-.225
10-32-.130	.530	.500	.296	.292	.400	.390	.042	.032	.283	.280	.270	.240	.3029	.2969	.020-.130
10-32-.225	.640	.610	.296	.292	.400	.390	.042	.032	.283	.280	.365	.335	.3029	.2969	.130-.225
1/4-20-.165	.635	.605	.390	.386	.500	.490	.042	.032	.378	.375	.298	.268	.3966	.3906	.027-.165
1/4-20-.260	.735	.705	.390	.386	.500	.490	.042	.032	.378	.375	.390	.360	.3966	.3906	.165-.260
5/16-18-.150	.750	.720	.530	.526	.670	.660	.047	.037	.518	.515	.326	.296	.5372	.5312	.027-.150
5/16-18-.312	.865	.835	.530	.526	.670	.660	.047	.037	.518	.515	.488	.458	.5372	.5312	.150-.312
3/8-16-.150	.750	.720	.530	.526	.670	.660	.047	.037	.518	.515	.326	.296	.5372	.5312	.027-.150
3/8-16-.312	.865	.835	.530	.526	.670	.660	.047	.037	.518	.515	.488	.458	.5372	.5312	.150-.312

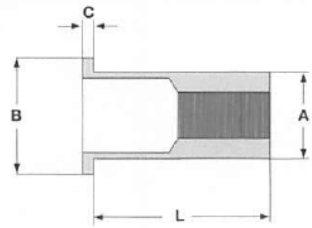
Description	A cylindrical internally threaded fastener, open at both ends with a large flange at one end that can be installed into a prepared hole from the blind side of the ultimate fastening. The outer surface of the insert has ribs (or splines) that extend from under the flange toward the opposite end. The insert is threaded onto mandrel of installation tool and positioned into hole. As mandrel is pulled back, the insert is expanded into the base material it is now gripping. Installation is complete when the mandrel of the tool is removed from the set insert.
Applications / Advantages	Ease of installation makes blind threaded inserts a low-cost way to provde threaded holes in thin sheet metal. Large flange design enhances push-out strength. Ribbed contour of the body provides resistance to turning.
Material	**Aluminum**: 5056 Aluminum or ALMG 3 alloy **Steel**: 1006 - 1008 low carbon steel

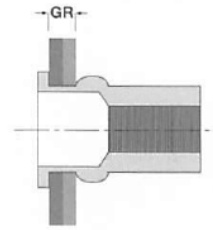
Ribbed Body, Flat Hd, Large Flange RIVET NUTS (Blind Threaded Inserts)

Thread Size-Ultimate Grip	Minimum Performance for *STEEL* Large Flange Ribbed Body Blind Threaded Inserts			
	Torque to Turn	Pull Out	Push Out	Torque Out
	Foot Pounds/ Inch	Foot Pounds	Foot Pounds	Foot Pounds/ Inch
6-32-.080	10	520	180	47
6-32-.130	10	520	180	47
8-32-.080	10	520	180	65
8-32-.130	10	520	180	65
10-24-.130	12	630	335	95
10-24-.225	12	630	335	95
10-32-.130	12	630	335	95
10-32-.225	12	630	335	95
1/4-20-.165	12	685	320	235
1/4-20-.260	12	685	320	235
1/4-28-.165	12	685	320	-
1/4-28-.260	12	685	320	-
5/16-18-.150	24	1115	510	-
5/16-18-.312	24	1115	510	-
3/8-16-.150	24	1115	510	-
3/8-16-.312	24	1115	510	-

RIVET NUTS (Blind Threaded Inserts)

Flat Head, Large Flange



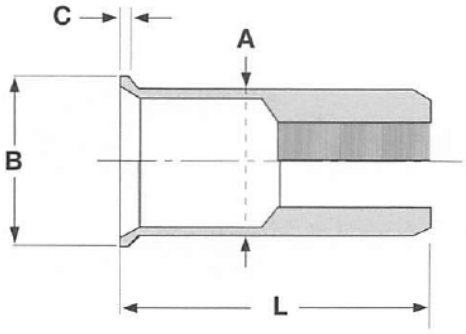


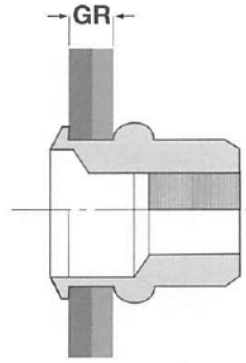
Flat Head, Large Flange Blind Threaded Insert

Thread Size - Ultimate Grip	L		A		B		C		Hole Size		Drill Size	GR
	Body Length		Body Diameter		Head Diameter		Head Height					Grip Range
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		
6-32-.075	.453	.423	.189	.185	.325	.315	.037	.027	.193	.189	#12	.010-.075
6-32-.120	.515	.485	.189	.185	.325	.315	.037	.027	.193	.189	#12	.075-.120
6-32-.160	.515	.485	.189	.185	.325	.315	.037	.027	.193	.189	#12	.120-.160
8-32-.075	.453	.423	.221	.217	.357	.347	.037	.027	.226	.221	#2	.010-.075
8-32-.120	.515	.485	.221	.217	.357	.347	.037	.027	.226	.221	#2	.075-.120
8-32-.160	.515	.485	.221	.217	.357	.347	.037	.027	.226	.221	#2	.120-.160
10-24-.080	.546	.516	.250	.246	.406	.396	.043	.033	.256	.250	#E	.010-.080
10-24-.130	.609	.579	.250	.246	.406	.396	.043	.033	.256	.250	#E	.080-.130
10-24-.180	.656	.626	.250	.246	.406	.396	.043	.033	.256	.250	#E	.130-.180
10-32-.080	.546	.516	.250	.246	.406	.396	.043	.033	.256	.250	#E	.010-.080
10-32-.130	.609	.579	.250	.246	.406	.396	.043	.033	.256	.250	#E	.080-.130
10-32-.180	.656	.626	.250	.246	.406	.396	.043	.033	.256	.250	#E	.130-.180
1/4-20-.080	.640	.610	.332	.328	.475	.465	.063	.053	.338	.332	#Q	.020-.080
1/4-20-.140	.702	.672	.332	.328	.475	.465	.063	.053	.338	.332	#Q	.080-.140
1/4-20-.200	.765	.735	.332	.328	.475	.465	.063	.053	.338	.332	#Q	.140-.200
1/4-20-.260	.827	.797	.332	.328	.475	.465	.063	.053	.338	.332	#Q	.200-.260
5/16-18-.125	.765	.735	.413	.409	.665	.655	.067	.057	.423	.413	#Z	.030-.125
5/16-18-.200	.890	.860	.413	.409	.665	.655	.067	.057	.423	.413	#Z	.125-.200
5/16-18-.275	.952	.922	.413	.409	.665	.655	.067	.057	.423	.413	#Z	.200-.275
3/8-16-.115	.859	.829	.480	.476	.781	.771	.093	.083	.500	.490	12.5mm	.030-.115
3/8-16-.200	.953	.923	.490	.486	.781	.771	.093	.083	.500	.490	12.5mm	.115-.200
3/8-16-.285	1.046	1.016	.490	.486	.781	.771	.093	.083	.500	.490	12.5mm	.200-.285

Description	A cylindrical internally threaded fastener, open at both ends with a large flange at one end that can be installed into a prepared hole from the blind side of the ultimate fastening. Insert is threaded onto mandrel of installation tool and positioned into hole. As mandrel is pulled back, the insert is expanded into the base material it is now gripping. Installation is complete when the mandrel of the tool is removed from the set insert.
Applications / Advantages	Ease of installation makes blind threaded inserts a low-cost way to provde threaded holes in thin sheet metal. Large flange design enhances push-out strength.
Material	**Aluminum**: 5056 Aluminum or ALMG 3 alloy **Steel**: 1006 - 1008 low carbon steel

Smooth Body, Small Head RIVET NUTS (Blind Threaded Inserts)





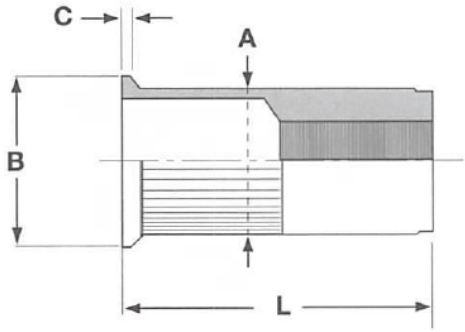
Small Head, Low Profile Blind Threaded Inserts

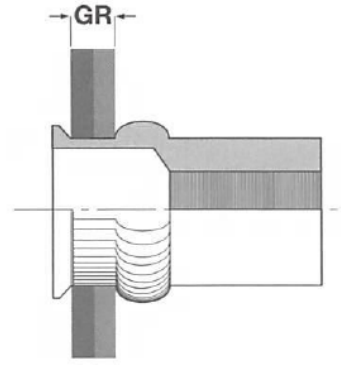
Thread Size-Ultimate Grip	L		A	B		Hole Size		Grip Range
	Body Length		Body Diameter	Head Diameter				
	Max	Min	Max	Max	Min	Max	Min	
6-32-.080	.415	.385	.249	.287	.267	.254	.250	.020-.080
8-32-.080	.415	.385	.249	.287	.267	.254	.250	.020-.080
10-24-.130	.465	.435	.280	.320	.300	.285	.281	.020-.130
10-24-.225	.575	.545	.280	.320	.300	.285	.281	.125-.225
10-32-.130	.465	.435	.280	.320	.300	.285	.281	.020-.130
10-32-.225	.575	.545	.280	.320	.300	.285	.281	.125-.225
1/4-20-.130	.610	.580	.374	.415	.395	.379	.375	.030-.130
1/4-20-.165	.610	.580	.374	.415	.395	.379	.375	.030-.165
1/4-28-.165	.610	.580	.374	.415	.395	.379	.375	.030-.165
5/16-18-.200	.720	.690	.499	.540	.510	.504	.500	.040-.200
5/16-18-.312	.835	.805	.499	.540	.510	.504	.500	.185-.312
3/8-16-.200	.720	.690	.499	.540	.510	.504	.500	.040-.200

Description	A cylindrical internally threaded fastener, open at both ends with a low profile head at one end and a short, chamfered lead at the opposite end. It can be installed into a prepared hole from the blind side of the ultimate fastening. The outer surface of the insert is smooth. The insert is threaded onto mandrel of installation tool and positioned into hole. As mandrel is pulled back, the insert is expanded into the base material it is now gripping. Installation is complete when the mandrel of the tool is removed from the set insert.
Applications / Advantages	Ease of installation makes blind threaded inserts a low-cost way to provde threaded holes in thin sheet metal. Low profile head design enables insert to be nearly flush once it is set in place.
Material	**Aluminum**: 5056 Aluminum or ALMG 3 alloy **Steel**: 1006 - 1008 low carbon steel **Stainless**: Type 303 Stainless Steel

RIVET NUTS (Blind Threaded Inserts)

Ribbed Body, Small Flange





Ribbed Body, Small Flange Blind Threaded Inserts

Thread Size-Ultimate Grip	L		A	B		C		Hole Diameter		Grip Range
	Body Length		Ribbed Body Diameter	Head Diameter		Head Height				
	Max	Min	Max	Max	Min	Max	Min	Max	Min	
6-32-.080	.450	.430	.265	.320	.300	.019	.015	.2716	.2656	.020-.080
8-32-.080	.450	.430	.265	.320	.300	.019	.015	.2716	.2656	.020-.080
10-24-.130	.505	.485	.296	.350	.330	.020	.016	.3029	.2969	.020-.130
10-24-.225	.615	.595	.296	.350	.330	.020	.016	.3029	.2969	.130-.225
10-32-.130	.505	.485	.296	.350	.330	.020	.016	.3029	.2969	.020-.130
10-32-.225	.615	.595	.296	.350	.330	.020	.016	.3029	.2969	.130-.225
1/4-20-.165	.610	.590	.390	.465	.445	.021	.017	.3966	.3906	.027-.165
1/4-20-.260	.710	.690	.390	.465	.445	.021	.017	.3966	.3906	.165-.260
1/4-28-.165	.610	.590	.390	.465	.445	.021	.017	.3966	.3906	.027-.165
1/4-28-.260	.710	.690	.390	.465	.445	.021	.017	.3966	.3906	.165-.260
5/16-18-.150	.720	.700	.530	.610	.580	.023	.019	.5372	.5312	.027-.150
5/16-18-.312	.835	.815	.530	.610	.580	.023	.019	.5372	.5312	.150-.312
3/8-16-.150	.720	.700	.530	.610	.580	.023	.019	.5372	.5312	.027-.150

Description	A cylindrical internally threaded fastener, open at both ends with a low profile head at one end and a short, chamfered lead at the opposite end. It can be installed into a prepared hole from the blind side of the ultimate fastening. The outer surface of the insert has ribs (or splines) that extend from under the head toward the opposite end. The insert is threaded onto mandrel of installation tool and positioned into hole. As mandrel is pulled back, the insert is expanded into the base material it is now gripping. Installation is complete when the mandrel of the tool is removed from the set insert.
Applications / Advantages	Ease of installation makes blind threaded inserts a low-cost way to provde threaded holes in thin sheet metal. Low profile head design enables insert to be nearly flush once it is set in place. Ribbed contour of the body provides resistance to turning.
Material	**Aluminum**: 5056 Aluminum or ALMG 3 alloy **Steel**: 1006 - 1008 low carbon steel

Ribbed Body, Small Flange RIVET NUTS (Blind Threaded Inserts)

MINIMUM PERFORMANCE FOR *STEEL* SMALL FLANGE RIBBED BODY BLIND THREADED INSERTS				
Thread Size-Ultimate Grip	Torque to Turn	Pull Out	Push Out	Torque Out
	Foot Pounds/ Inch	Foot Pounds	Foot Pounds	Foot Pounds/ Inch
6-32-.080	10	520	180	47
8-32-.080	10	520	180	65
10-24-.130	12	630	335	95
10-24-.225	12	630	335	95
10-32-.130	12	630	335	95
10-32-.225	12	630	335	95
1/4-20-.165	12	685	320	235
1/4-20-.260	12	685	320	235
1/4-28-.165	12	685	320	-
1/4-28-.260	12	685	320	-
5/16-18-.150	24	1115	510	-
5/16-18-.312	24	1115	510	-
3/8-16-.150	24	1115	510	-
3/8-16-.312	24	1115	510	-

SOCKETS & PIPE PLUGS

Dimensions, Mechanical and Performance Requirements

Socket Head Cap Screws 335

Body & Grip Lengths-Socket Cap Screws 338

Low Head Socket Cap Screws 340

Button Head Socket Cap Screws 341

Flat Head Socket Cap Screws 342-343

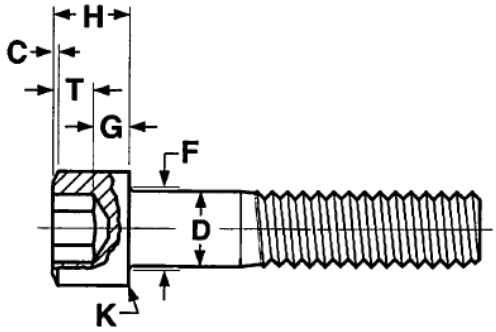
Socket Set Screws
- Flat Point 344-345
- Oval Point 344-345
- Half-Dog Point 344-345
- Cone Point 344-345
- Cup Point 344-345

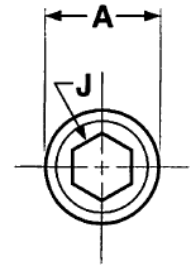
Socket Shoulder Screws 346-347

Pipe Plugs
- Socket, Dry Seal 348
- Socket, Flush Seating 349
- Phillips, with NPT Thread 350
- Slotted, with NPT Thread 351

Hex Keys, Short & Long Arm 352-353

External Threads Class 3A 354





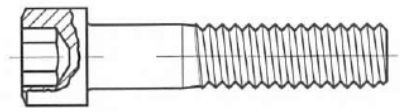
Socket Head Cap Screws

ASME B18.3-2012

Basic Screw Diam.	D		A		H		C	J	F		T	G	K
	Body Diameter		Head Diameter		Head Height		Top Chamfer or Radius	Hex Socket Size	Fillet Juncture Diameter at Bearing Surface		Key Egage-ment	Wall Thick-ness	Bottom Chamfer or Radius
	Max	Min	Max	Min	Max	Min	Max	Nom	Max	Min	Min	Min	Max
0	0.0600	0.0568	0.096	0.091	0.060	0.057	0.004	0.050	0.074	0.062	0.025	0.020	0.007
1	0.0730	0.0695	0.118	0.112	0.073	0.070	0.005	1/16	0.087	0.075	0.031	0.025	0.007
2	0.0860	0.0822	0.140	0.134	0.086	0.083	0.008	5/64	0.102	0.090	0.038	0.029	0.007
3	0.0990	0.0949	0.161	0.154	0.099	0.095	0.008	5/64	0.115	0.102	0.044	0.034	0.007
4	0.1120	0.1075	0.183	0.176	0.112	0.108	0.009	3/32	0.130	0.117	0.051	0.038	0.008
5	0.1250	0.1202	0.205	0.198	0.125	0.121	0.012	3/32	0.145	0.132	0.057	0.043	0.008
6	0.1380	0.1329	0.226	0.218	0.138	0.134	0.013	7/64	0.158	0.144	0.064	0.047	0.008
8	0.1640	0.1585	0.270	0.262	0.164	0.159	0.014	9/64	0.188	0.172	0.077	0.056	0.008
10	0.1900	0.1840	0.312	0.303	0.190	0.185	0.018	5/32	0.218	0.202	0.090	0.065	0.008
1/4	0.2500	0.2435	0.375	0.365	0.250	0.244	0.025	3/16	0.278	0.261	0.120	0.095	0.010
5/16	0.3125	0.3053	0.469	0.457	0.312	0.306	0.033	1/4	0.347	0.329	0.151	0.119	0.010
3/8	0.3750	0.3678	0.562	0.550	0.375	0.368	0.040	5/16	0.415	0.397	0.182	0.143	0.010
7/16	0.4375	0.4294	0.656	0.642	0.438	0.430	0.047	3/8	0.484	0.465	0.213	0.166	0.015
1/2	0.5000	0.4919	0.750	0.735	0.500	0.492	0.055	3/8	0.552	0.531	0.245	0.190	0.015
5/8	0.6250	0.6163	0.938	0.921	0.625	0.616	0.070	1/2	0.689	0.664	0.307	0.238	0.015
3/4	0.7500	0.7406	1.125	1.107	0.750	0.740	0.085	5/8	0.828	0.800	0.370	0.285	0.015
7/8	0.8750	0.8647	1.312	1.293	0.875	0.864	0.100	3/4	0.963	0.932	0.432	0.333	0.020
1	1.0000	0.9886	1.500	1.479	1.000	0.988	0.114	3/4	1.100	1.068	0.495	0.380	0.020
1 1/4	1.2500	1.2336	1.875	1.852	1.250	1.236	0.144	7/8	1.370	1.333	0.620	0.475	0.020
1 1/2	1.5000	1.4818	2.250	2.224	1.500	1.485	0.176	1	1.640	1.601	0.745	0.570	0.020

Tolerance on Length	Nominal Screw Size	Nominal Screw Length			
		Up to 1 in., Incl.	Over 1 in. to 2-1/2 in., Incl.	Over 2-1/2 to 6 in., Incl.	Over 6 in.
	0 thru 3/8, Incl.	-0.03	-0.04	-0.06	-0.12
	7/16 thru 3/4, Incl.	-0.03	-0.06	-0.08	-0.12
	7/8 thru 1-1/2, Incl.	-0.05	-0.10	-0.14	-0.20

SOCKET CAP SCREWS — Alloy Steel



Mechanical Properties of Alloy Steel Socket Cap Screws — Blue Devil®

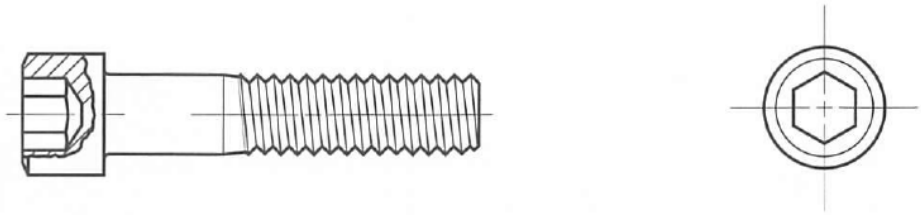
Nominal Size	Tensile Strength (lbs., min.)		Yield Strength (lbs., min.)		Body Section	Tightening Torque (In.-Lbs.)	
	UNRC	UNRF	UNRC	UNRF	Single Shear Strength (lbs., min.)	UNRC	UNRF
0	-	320	-	290	305	-	2.6
1	475	500	425	450	450	4.5	4.8
2	665	710	600	635	625	7.5	8.0
3	875	940	790	845	830	11.0	12.0
4	1,090	1,190	975	1,070	1,060	16.0	18.0
5	1,430	1,490	1,290	1,345	1,325	24.0	24.0
6	1,640	1,825	1,470	1,645	1,615	30.0	34.0
8	2,520	2,650	2,270	2,385	2,280	55.0	58.0
10	3,150	3,600	2,835	3,240	3,060	79.0	90.0
1/4	5,725	6,550	5,150	5,900	5,295	200.0	230.0
5/16	9,430	10,440	8,490	9,395	8,285	415.0	460.0
3/8	13,950	15,805	12,555	14,225	11,910	740.0	845.0
7/16	19,135	21,365	17,220	19,230	16,200	1190.0	1305.0
1/2	25,540	28,780	22,990	25,905	21,175	1800.0	2065.0
5/8	38,400	43,500	34,550	39,150	31,300	3,400.0	3,800.0
3/4	56,750	63,400	51,100	57,050	45,050	6,000.0	6,750.0
7/8	78,500	86,500	70,700	77,850	61,350	8250.0	9,200.0
1	103,000	112,700	92,700	101,450	80,100	12,500.0	13,000.0
1 1/4	164,700	182,400	148,250	164,150	125,100	25,000.0	27,750.0
1 1/2	238,800	268,800	215,950	241,900	180,200	43,500.0	49,000.0

Description	An externally threaded fastener with unified threads, a cylindrical head with a flat chamfered top surface, knurled cylindrical sides and hexagonal recess, made from alloy steel.
Applications/ Advantages	Ideal for precision assembly work with close tolerances and applications needing a well tooled appearance. Supplies greater tensile strength than equivalent sizes of Grade-5 or Grade-8 hex head cap screws while requiring less surface area or counterbore since the fastener is internally wrenched.
Material	Cap screws shall be made from an alloy steel which conforms to the following chemical composition requirements (per product analysis)-- ***Carbon***: 0.31% minimum; ***Phosphorus***: 0.040% maximum; ***Sulfur***: 0.045% maximum. Also, one or more of the following elements shall be present in sufficient quantity to meet the strength requirements listed below: chromium, nickel, molybdenum or vanadium.
Heat Treatment	Cap screws shall be heat treated by oil quenching from above the transformation temperature and then tempered at a temperature not lower than 650°F.
Hardness	***0 through 1/2 diameters:*** Rockwell C39 minimum; 5/8" diameter & larger: Rockwell C37 minimum
Cap screws of a length 3D or greater, where D equals the nominal diameter of the screw, are subject to tensile strength, yield strength, elongation and reduction of area testing.	
Tensile Strength	***0 through 1/2 diameters:*** 180,000 psi. minimum; 5/8" diameter & larger: 170,000 psi. minimum
Yield Strength	***0 through 1/2 diameters:*** 162,000 psi. minimum; 5/8" diameter & larger: 153,000 psi. minimum
Elongation	10% minimum (applies to machined specimens of length at least 4D where D equals the nominal diameter of the screw)
Reduction of Area	33% minimum (applies to machined specimens)
Plating	See Appendix-A for information on the plating of alloy steel socket cap screws.

Blue Devil® is a registered trademark of the Safety Socket Screw Corporation.

Stainless Steel

SOCKET CAP SCREWS



MECHANICAL PROPERTIES OF *STAINLESS STEEL* SOCKET CAP SCREWS							Blue Devil®
Nominal Size	Tensile Strength (lbs., min.)		Yield Strength (lbs., min.)		Body Section	Tightening Torque (In.-Lbs.)	
	UNRC	UNRF	UNRC	UNRF	Single Shear Strength (lbs., min.)	UNRC	UNRF
0	-	145	-	72	130	-	1.4
1	-	220	-	111	190	-	2.3
2	295	-	185	-	260	3.8	-
4	480	-	240	-	350	6.0	-
6	725	-	363	-	375	15.0	-
8	1,120	-	560	-	670	28.0	-
10	1,400	1,600	701	800	950	40.0	46.0
1/4	2,550	2,910	1,273	1,455	2,200	95.0	109.0
5/16	4,200	4,645	2,100	2,320	3,450	170.0	188.0
3/8	6,100	7,025	3,100	3,510	4,970	301.0	341.0
1/2	11,350	-	5,675	-	8,840	750.0	-

Description	An externally threaded fastener with unified threads, a cylindrical head with a flat chamfered top surface, knurled cylindrical sides and hexagonal recess. It is made from austenitic **stainless steel**.
Applications/ Advantages	Although **stainless** socket cap screws have significantly less tensile and yield strength than alloy sockets, they have superior resistance to corrosion. They retain their mechanical and performance capabilities at higher than ambient temperatures.
Material	***Cap screws shall be made from one of the following stainless alloys:*** 302, 303, 304, 305, 384, XM1 or XM7.
Heat Treatment	The austenitic alloys develop their strength through work hardening during the fastener manufacturing process, as seen from the hardness properties below. The only heat treatment normally available on austenitic **stainless** alloys is annealing, which is done at approximately 1900°F to a dead soft condition and is not normally thermally reversible.
Hardness	Rockwell B80 minimum
Cap screws of a length 3D or greater, where D equals the nominal diameter of the screw, are subject to tensile strength, yield strength, elongation and reduction of area testing.	
Tensile Strength	80,000 psi. minimum
Yield Strength	30,000 psi. minimum
Elongation	10% minimum (applies to machined specimens of lengths at least 4D where D equals the nominal diameter of the screw)
Reduction of Area	30% minimum (applies to machined specimens)

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SOCKET CAP SCREWS — Length Specifications

Body and Grip Lengths of Socket Head Cap Screws

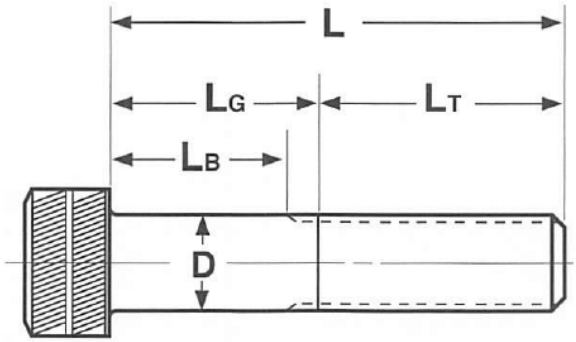
ASME B18.3-2012

Nom. Size D	0		1		2		3		4		5		6		8		10	
Basic Thread Length L_T	0.500		0.625		0.625		0.625		0.750		0.750		0.750		0.875		0.875	
Nominal Length L	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB
1.00	0.50	0.44	0.25	0.17	0.25	0.16	0.25	0.15	0.25	0.12	0.25	0.12						
1.25	0.75	0.69	0.62	0.55	0.62	0.54	0.62	0.52	0.25	0.12	0.25	0.12	0.50	0.34	0.38	0.22	0.38	0.17
1.50			0.88	0.80	0.88	0.79	0.88	0.77	0.75	0.62	0.75	0.62	0.50	0.34	0.38	0.22	0.38	0.17
1.75					1.12	1.04	1.12	1.02	0.75	0.62	0.75	0.62	1.00	0.84	0.88	0.72	0.88	0.67
2.00							1.38	1.27	1.25	1.12	1.25	1.12	1.00	0.84	0.88	0.72	0.88	0.67
2.25									1.25	1.12	1.25	1.12	1.50	1.34	1.38	1.22	1.38	1.17
2.50											1.75	1.62	1.50	1.34	1.38	1.22	1.38	1.17
2.75													2.00	1.84	1.88	1.72	1.88	1.67
3.00															1.88	1.72	1.88	1.67
3.50																	2.38	2.17

Nom. Size D	1/4		5/16		3/8		7/16		1/2		5/8		3/4		7/8		1	
Basic Thread Length L_T	1.000		1.125		1.250		1.375		1.500		1.750		2.000		2.250		2.500	
Nominal Length L	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB	LG	LB
1.50	0.50	0.25																
1.75	0.50	0.25	0.62	0.35	0.50	0.19												
2.00	1.00	0.75	0.62	0.35	0.50	0.19	0.62	0.27										
2.25	1.00	0.75	1.12	0.85	1.00	0.69	0.62	0.27	0.75	0.36								
2.50	1.50	1.25	1.12	0.85	1.00	0.69	1.12	0.77	0.75	0.36	0.75	0.30						
2.75	1.50	1.25	1.62	1.35	1.50	1.19	1.12	0.77	0.75	0.36	0.75	0.30						
3.00	2.00	1.75	1.62	1.35	1.50	1.19	1.62	1.27	1.50	1.12	0.75	0.30	1.00	0.50				
3.25	2.00	1.75	2.12	1.85	2.00	1.69	1.62	1.27	1.50	1.12	1.50	1.04	1.00	0.50	1.00	0.44		
3.50	2.50	2.25	2.12	1.85	2.00	1.69	2.12	1.77	1.50	1.12	1.50	1.04	1.00	0.50	1.00	0.44	1.00	0.38
4.00	3.00	2.75	2.62	2.35	2.50	2.19	2.62	2.27	2.25	1.86	2.25	1.80	2.00	1.50	1.00	0.44	1.00	0.38
4.50	3.50	3.25	3.12	2.85	3.00	2.69	3.12	2.77	3.00	2.62	2.25	1.80	2.00	1.50	2.00	1.44	2.00	1.38
5.00	4.00	3.75	3.62	3.35	3.50	3.19	3.62	3.27	3.00	2.62	3.00	2.54	3.00	2.50	2.00	1.44	2.00	1.38
5.50			4.12	3.85	4.00	3.69	4.12	3.77	3.75	3.36	3.75	3.30	3.00	2.50	3.00	2.44	3.00	2.38
6.00			4.62	4.35	4.50	4.19	4.62	4.27	4.50	4.12	3.75	3.30	4.00	3.50	3.00	2.44	3.00	2.38
6.50					5.00	4.69	5.12	4.77	4.50	4.12	4.50	4.04	4.00	3.50	4.00	3.44	4.00	3.38
7.00					5.50	5.19	5.62	5.27	5.25	4.86	5.25	4.80	5.00	4.50	4.00	3.44	4.00	3.38
8.00							6.62	6.27	6.00	5.62	6.00	5.54	6.00	5.50	5.00	4.44	5.00	4.38
9.00							7.62	7.27	7.00	6.62	6.75	6.30	7.00	6.50	6.00	5.44	6.00	5.38
10.00									8.00	7.62	7.75	7.30	8.00	7.50	7.00	6.44	7.00	6.38
11.00											9.25	8.80	9.00	8.50	8.00	7.44	8.00	7.38
12.00											10.25	9.80	10.00	9.50	9.00	8.44	9.00	8.38

Length Specifications

SOCKET CAP SCREWS



Notes Regarding the Thread Length of Socket Head Cap Screws

•The basic thread lengths (L_T) listed directly below the nominal sizes in the table on the previous page represents the nominal length up to which all screws of that diameter shall be fully threaded.

• To determine the threaded portion of the screws with a nominal length greater than L_T, subtract the minimum design grip length (L_G) from the nominal length (L).

•For screws over 1 in. in diameter and of nominal lengths longer than LT, the maximum grip gaging length (L_G) and the minimum body length (L_B) of the screws shall be determined as follows:

$$L_G = L - L_T$$
$$L_B = L - L_{TT}$$

Where L: = Nominal length

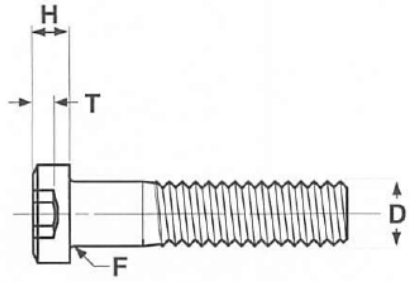
L_T = Minimum thread length tabulated below

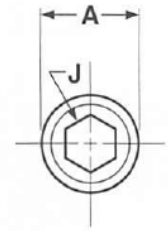
L_{TT} = Maximum total thread length tabulated below

Nominal Size	Min Thread Length (L_T)	Max Total Thread Length (L_{TT})
1 - 1/4	3.12	5.09
1 - 1/2	3.75	6.08

LOW HEAD CAP SCREWS

Alloy Steel





Low Head Socket Cap Screws - Alloy Steel

ASME B18.3 2012
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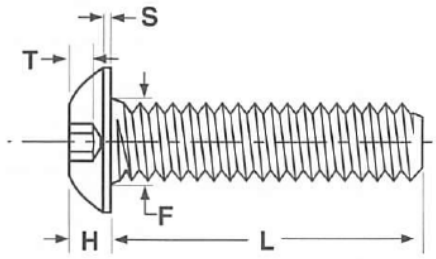
Nominal Size	D	F		A		H		J	T	Tensile Strength Pounds Min.		Tightening Torque Inch Pounds
	Basic Screw Diameter	Body Diameter		Head Diameter		Head Height		Hex Socket Size	Key Engagement			
		Max	Min	Max	Min	Max	Min		Min	UNRC	UNRF	
8	0.1640	.1640	.1585	.270	.265	.085	.079	.078	.060	2,310	2,440	19.4
10	0.1900	.1900	.1840	.312	.307	.098	.092	.094	.072	2,890	3,300	33.5
1/4	0.2500	.2500	.2435	.375	.369	.127	.121	.125	.094	5,250	6,000	77.9
5/16	0.3125	.3125	.3053	.437	.431	.158	.152	.156	.110	8,650	9,550	156.0
3/8	0.3750	.3750	.3678	.562	.556	.192	.182	.188	.115	12,800	14,450	273.0
1/2	0.5000	.5000	.4919	.750	.743	.254	.244	.250	.151	23,400	26,350	615.0

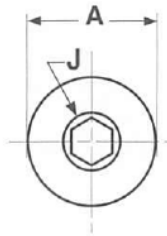
Tolerance on Length	Nominal Screw Size	Nominal Screw Length	
		Up to 1 in., Incl.	Over 1 in. to 2-1/2 in., Incl.
	0 thru 3/8	-0.03	-0.04
	1/2	-0.03	-0.06

Description	Similar to a standard alloy socket cap screw except the head height is 50% of the standard's and the socket size is smaller. The low-head style is supplied only in plain steel.
Applications/ Advantages	Used in applications where the limited clearance would not accomodate the head height of a standard socket cap screw. Also used in counterbored holes of material too thin for a regular socket cap screw. However, because of their design, they cannot withstand the same preloads as a standard socket head.
Material	Cap screws shall be made from an alloy steel which conforms to the following chemical composition requirements (per product analysis)-- ***Carbon***: 0.31% minimum; ***Phosphorus***: 0.040% maximum; ***Sulfur***: 0.045% maximum. Also, one or more of the following elements shall be present in sufficient quantity to meet the performance requirements listed below: chromium, nickel, molybdenum or vanadium.
Heat Treatment	Cap screws shall be heat treated by oil quenching from above the transformation temperature and then tempered at a temperature not lower than 650°F.
Hardness	Rockwell C38 minimum
Tensile Strength	170,000 psi. minimum
Yield Strength	150,000 psi. minimum
Elongation	10% minimum (applies to machined specimens of lengths at least 4D where D equals the nominal diameter of the screw)
Reduction of Area	33% minimum (applies to machined specimens)

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Alloy Steel BUTTON HEAD CAP SCREWS





Socket Button Head Cap Screws - Alloy Steel

ASME B18.3-2012, Blue Devil®

Nominal Size	A		H		S	J	T	F		L	Tensile Test Load	Single Shear Strength of Body	Seating Torques in./lbs.	
	Head Diameter		Head Height		Head Side Height	Hex Socket Size	Key Engage-ment	Fillet Transition Diameter		Max Standard Length				
	Max	Min	Max	Min	Ref	Nom	Min	Max	Min	Nom	Lb.	Lbs., Min.	Coarse Thread	Fine Thread
4	0.213	0.201	0.059	0.051	0.015	1/16	0.035	0.132	0.122	0.50	840	950	7.0	8.
6	0.262	0.250	0.073	0.063	0.015	5/64	0.044	0.158	0.148	0.63	1,260	1,400	13.	15.
8	0.312	0.298	0.087	0.077	0.015	3/32	0.052	0.194	0.184	0.75	1,940	2,000	25.	26.
10	0.361	0.347	0.101	0.091	0.020	1/8	0.070	0.220	0.210	1.00	2,440	2,700	45.	48.
1/4	0.437	0.419	0.132	0.122	0.031	5/32	0.087	0.290	0.280	1.00	4,430	4,700	95.	110.
5/16	0.547	0.527	0.166	0.152	0.031	3/16	0.105	0.353	0.343	1.00	7,300	7,300	190.	210.
3/8	0.656	0.636	0.199	0.185	0.031	7/32	0.122	0.415	0.405	1.25	10,800	10,600	300.	300.
1/2	0.875	0.851	0.265	0.245	0.046	5/16	0.175	0.560	0.540	2.00	19,800	18,800	900.	960.
5/8	1.000	0.970	0.331	0.311	0.062	3/8	0.210	0.685	0.665	2.00	31,500	29,400	1,700.	1,900.

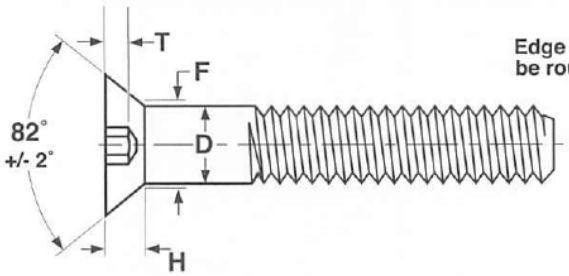
Tolerance on Length	Nominal Screw Size	Nominal Screw Length	
		Up to 1 in., Inclusive	Over 1 in. to 2-1/2 in., Inclusive
	0 thru 3/8, Inclusive	-0.03	-0.04
	1/2 and 5/8, Inclusive	-0.03	-0.06

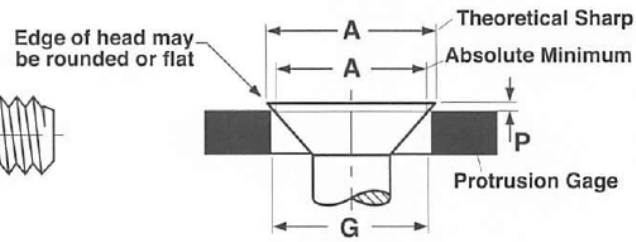
Description	Has a similar thread design as a socket cap screw. The dome-shaped head is wider and has a lower profile than a socket cap screw.
Applications/ Advantages	Used when a wider bearing surface or a smoother, more finished appearance is desired. Button head cap screws do not afford the strength of socket head cap screws and are designed for light fastening applications. They are not recommended for critical, high-strength applications.
Material	Screws shall be made from an alloy steel which conforms to the following chemical composition requirements (per product analysis)- ***Carbon***: 0.28 to 0.50%; ***Phosphorus***: 0.045% maximum; ***Sulfur***: 0.035% maximum. Also, one or more of the following elements shall be present in sufficient quantity to meet the performance requirements listed below: chromium, nickel, molybdenum or vanadium.
Heat Treatment	Screws shall be heat treated by oil quenching from above the transformation temperature and then tempered at a temperature not lower than 650°F.
Hardness	***Thru 1/2" diam.:*** Rockwell C39 - 44; ***Over 1/2" diam.***: Rockwell C37 - 44
Tensile Strength*	***Thru 1/2 diam.:*** 145,000 psi. minimum; ***Over 1/2" diam.***: 135,000 psi. minimum
Elongation	8% minimum (applies to machined specimens of lengths at least 4D where D equals the nominal diameter of the screw)
Reduction of Area	35% minimum (applies to machined specimens)
Finish	Screws are supplied plain.

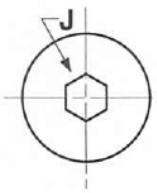
* Screws must be of a length equal to or greater than 3 diameters to be subject to tensile testing.

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FLAT HEAD CAP SCREWS — Alloy Steel







Socket Flat Head Cap Screws - Alloy Steel

ASME B18.3-2012, Blue Devil®

Nominal Size	D		A		H	G		P		J	T	F	Tensile Strength, Lbs.	Single Shear Strength of Body	Recommended Seating Torques, in./lbs.	
	Body Diameter		Head Diameter		Head Height	Protrusion Gage Diameter		Protrusion		Hex Socket Size	Key Engagement	Fillet Transition Diam.				
	Max	Min	Theoretical Sharp Max	Abs. Min	Ref	Max	Min	Max	Min	Nom	Min	Max	Min	lbs., Min	Coarse Thread	Fine Thread
4	0.1120	0.1075	0.255	0.218	0.083	0.172	0.171	0.057	0.036	1/16	0.055	0.136	880	950	8.	8.
5	0.1250	0.1202	0.281	0.240	0.090	0.196	0.195	0.059	0.037	5/64	0.061	0.153	1150	1,150	12.	13.
6	0.1380	0.1329	0.307	0.263	0.097	0.220	0.219	0.060	0.037	5/64	0.066	0.168	1320	1,400	15.	17.
8	0.1640	0.1585	0.359	0.311	0.112	0.267	0.266	0.063	0.039	3/32	0.076	0.194	2030	2,000	30.	31.
10	0.1900	0.1840	0.411	0.359	0.127	0.313	0.312	0.066	0.041	1/8	0.087	0.220	2540	2,700	40.	45.
1/4	0.2500	0.2435	0.531	0.480	0.161	0.424	0.423	0.072	0.043	5/32	0.111	0.280	4610	4,700	100.	110.
5/16	0.3125	0.3053	0.656	0.600	0.198	0.539	0.538	0.078	0.047	3/16	0.135	0.343	7600	7,360	200.	220.
3/8	0.3750	0.3678	0.781	0.720	0.234	0.653	0.652	0.088	0.050	7/32	0.159	0.405	11,200	10,600	350.	400.
7/16	0.4375	0.4294	0.844	0.781	0.234	0.690	0.689	0.104	0.063	1/4	0.159	0.468	15,400	14,400	560.	625.
1/2	0.5000	0.4919	0.938	0.872	0.251	0.739	0.738	0.131	0.087	5/16	0.172	0.530	20,600	18,850	850.	1,000.
5/8	0.6250	0.6163	1.188	1.112	0.324	0.962	0.961	0.146	0.096	3/8	0.220	0.655	30,500	29,450	1,700.	1,900.
3/4	0.7500	0.7406	1.438	1.355	0.396	1.186	1.185	0.170	0.105	1/2	0.220	0.780	45,100	42,400	3,000	3,200.

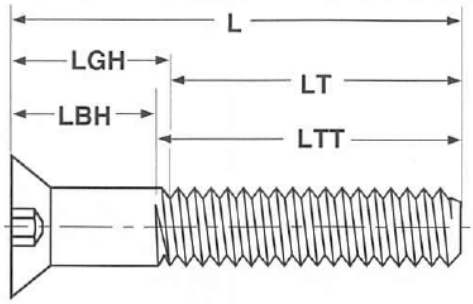
Tolerance on Length	Nominal Screw Size	Nominal Screw Length		
		Up to 1 in., Incl.	Over 1 in. to 2-1/2 in., Incl.	Over 2-1/2 in. to 6 in., Incl.
	0 thru 3/8, Inclusive	-0.03	-0.04	-0.06
	7/16 thru 3/4, Inclusive	-0.03	-0.06	-0.08

Description	Similar in design to a socket button head cap screw but with an 82° countersunk flat head.
Applications/ Advantages	Used when a flush mounting, high strength screw is required. Commonly used in tools and dies where moving parts pass over the fastened area.
Material	Screws shall be made from an alloy steel which conforms to the following chemical composition requirements (per product analysis)-- ***Carbon***: 0.28 to 0.50%; ***Phosphorus***: 0.040% maximum; ***Sulfur***: 0.045% maximum. Also, one or more of the following elements shall be present in sufficient quantity to meet the performance requirements listed below: chromium, nickel, molybdenum or vanadium.
Heat Treatment	Screws shall be heat treated by oil quenching from above the transformation temperature and then tempered at a temperature not lower than 650°F.
Hardness	***Thru 1/2 diam.:*** Rockwell C 39 - 44; ***Over 1/2 diam.:*** Rockwell C 37 - 44
Tensile Strength	***Thru 1/2 diam.:*** 145,000 psi. minimum; ***Over 1/2 diam.:*** 135,000 psi. minimum
Yield Strength	153,000 psi. minimum (over 1/2" diam.)
Elongation	8% minimum (applies to machined specimens over 1/2" diam., of length at least 4D where D equals the nominal diameter of the screw)"
Reduction of Area	35% minimum (applies to machined specimens over 1/2" diam.)
Finish	Screws are supplied plain.

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Body & Grip Lengths

FLAT HEAD CAP SCREWS



For screws of nominal lengths longer than those for which L_{GH} and L_{BH} values tabulated in this table and for screws over 1 inch in diameter, the maximum grip gaging length L_{GH} and the minimum body length L_{BH} of the screws shall be determined as follows:

$$L_{GH} = L - L_T$$
$$L_{BH} = L - L_{TT}$$

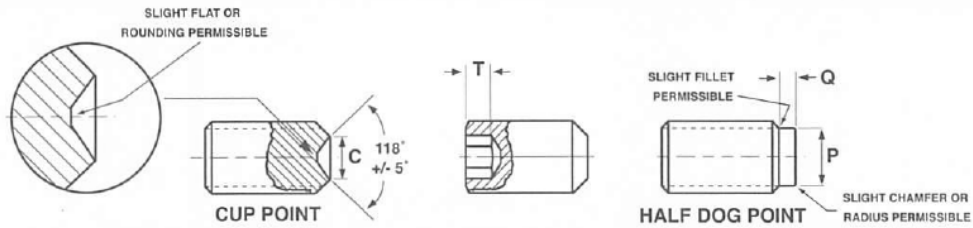
where L = nominal length, L_T = minimum thread length, and L_{TT} = maximum total thread length.

BODY AND GRIP LENGTHS OF FLAT HEAD SOCKET CAP SCREWS — ASME B18.3-2012

Nominal Size	4		5		6		8		10		1/4	
L_T MIN.	.750		.750		.750		.875		.875		1.000	
L_{TT} MAX	0.99		1.00		1.05		1.19		1.27		1.50	
Nominal Length	LGH	LBH	LGH	LBH	LGH	LBH	LGH	LBH	LGH	LBH	LGH	LBH
1.25	0.50	0.38	0.50	0.38	0.50	0.34	0.38	0.22				
1.50	0.50	0.38	0.50	0.38	0.50	0.34	0.38	0.22	0.62	0.42		
1.75	1.00	0.88	1.00	0.88	1.00	0.84	0.88	0.72	0.62	0.42	0.75	0.50
2.00	1.00	0.88	1.00	0.88	1.00	0.84	0.88	0.72	1.12	0.92	0.75	0.50
2.50					1.50	1.34	1.38	1.22	1.62	1.42	1.25	1.00
3.00							1.88	1.72	2.12	1.92	1.75	1.50
3.50									2.62	2.42	2.25	2.00

Nominal Size	5/16		3/8		7/16		1/2		5/8		3/4	
L_T MIN.	1.125		1.250		1.375		1.500		1.750		2.000	
L_{TT} MAX	1.71		1.94		2.17		2.38		2.82		3.25	
Nominal Length	LGH	LBH	LGH	LBH	LGH	LBH	LGH	LBH	LGH	LBH	LGH	LBH
2.00	0.88	0.60										
2.25	0.88	0.60	1.00	0.69								
2.50	1.38	1.10	1.00	0.69	1.12	0.77	1.00	0.62				
3.00	1.88	1.60	1.50	1.19	1.62	1.27	1.00	0.62				
3.50	2.38	2.10	2.00	1.69	2.12	1.77	1.75	1.36	1.50	1.04	1.50	1.00
4.00	2.88	2.60	2.50	2.19	2.62	2.27	2.50	2.12	2.25	1.80	1.50	1.00
4.50	3.38	3.10	3.00	2.69	3.12	2.77	2.50	2.12	2.25	1.80	2.50	2.00
5.00	3.88	3.60	3.50	3.19	3.62	3.27	3.25	2.86	3.00	2.54	2.50	2.00
5.50	4.38	4.10	4.00	3.69	4.12	3.77	4.00	3.62	3.75	3.30	3.50	3.00
6.00	4.88	4.60	4.50	4.19	4.62	4.27	4.00	3.62	3.75	3.30	3.50	3.00

SOCKET SET SCREWS — Alloy Steel



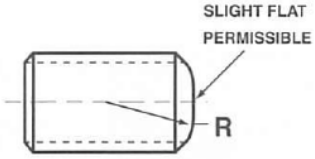
Socket Set Screws - Alloy Steel

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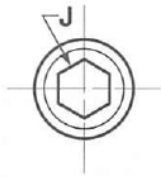
Nominal Size	Shortest Nominal Length To Which Column T Applies			J	Tightening Torque (Inch-Lbs.)
	Cup & Flat Point	Cone & Oval Point	Half Dog Point	Hex Key Size	
0	0.13	0.13	0.13	.028	.86
1	0.13	0.19	0.13	.035	1.8
2	0.13	0.19	0.19	.035	1.8
3	0.19	0.19	0.19	.050	5.
4	0.19	0.19	0.19	.050	5.
5	0.19	0.19	0.19	1/16	9.5
6	0.19	0.25	0.19	1/16	9.5
8	0.19	0.25	0.25	5/64	19.4
10	0.19	0.25	0.25	3/32	33.5
1/4	0.25	0.31	0.31	1/8	77.9
5/16	0.31	0.44	0.38	5/32	156
3/8	0.38	0.44	0.44	3/16	273
7/16	0.44	0.63	0.50	7/32	428
1/2	0.50	0.63	0.63	1/4	615
5/8	0.63	0.88	0.88	5/16	1315
3/4	0.75	1.00	1.00	3/8	2150
7/8	0.88	1.00	1.00	1/2	5130
1	1.00	1.25	1.25	9/16	7010

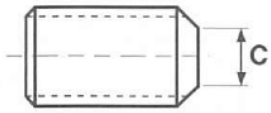
Description	***Cup point:*** A headless screw threaded the entire length. It has a hexagonal drive at one end and a cup-shaped indentation at the other end. ***Half-Dog point:*** A set screw with a protruding tip with a flat surface at the end opposite that of the hexagonal drive. ***Oval point:*** A set screw with an oval-shaped point at the end opposite that of the hexagonal drive. ***Flat point:*** A set screw with a flat surface at the end opposite that of the hexagonal drive. ***Cone point:*** A set screw with a sharp conical-shaped point at the opposite end from the hexagonal drive.
Applications/ Advantages	***Cup point:*** The cup point is the most used style set screw. Designed for fast, permanent and semi-permanent location of parts on shafts with hardness differential of 10-15 Rockwell C points and where cutting in of cup edge on the shaft is acceptable. ***Half-Dog point:*** Intended for permanent setting. The point should fit closely to the diameter of the drilled hole or against the flat. Often used instead of a dowel pin. ***Oval point:*** Preferred style for frequent reset on soft or hard shafts with minimum deforming. Also chosen for permanent setting on shafts spotted, splined or grooved, and for applications where point meets shaft on an angle. Sometimes substituted for the cup point style. ***Flat point:*** Designed for frequent resetting or relocating on hard steel shafts and where minimal damage to shafts is necessary. Ground flats on the shaft improves the contacts. ***Cone point:*** For permanent setting on soft or hardened shafts. The deep penetration it offers gives this style set screw the highest torsional & axial holding power. For shafts of Rockwell hardness C15 or over, spot point half its depth. Can also be used as a pivot or hanger. When two set screws are used in a set screw collar, their holding power is determined by their location with respect to each other.
Material	Screws shall be made from an alloy steel which conforms to the following chemical composition requirements (per product analysis)-- *Carbon*: 0.28 to 0.50%; *Phosphorus*: 0.040% maximum; *Sulfur*: 0.045% maximum. Also, one or more of the following elements shall be present in sufficient quantity to meet the strength requirements listed below: chromium, nickel, molybdenum or vanadium.
Heat Treatment	Screws shall be heat treated by oil quenching from above the transformation temperature and then tempered at a temperature sufficient to meet the hardness requirements listed below.
Hardness	Rockwell C45 - 53
Torsional Strength	Socket set screws of a sufficient length to be tested (as listed in the above table) shall withstand application of the test torque specified in said table without evidence of the socket reaming or the screw bursting.
Finish	Screws are usually supplied plain.

Alloy Steel SOCKET SET SCREWS

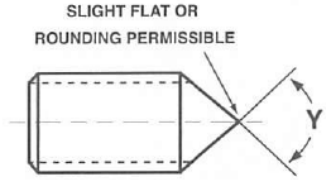


OVAL POINT





FLAT POINT



CONE POINT

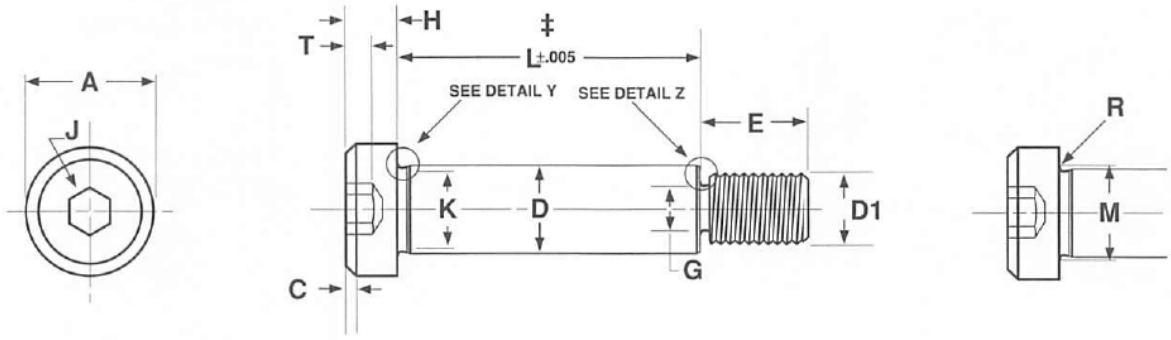
Socket Set Screws - Alloy Steel

ASME B18.3-2012

Nominal Size	J	T	C		R	Y	P		Q	
	Hexagon Socket Size	Key Engage-ment	Cup & Flat Point Diameter		Oval Point Radius	Cone Pt. Angle 90° ±2° for these Nominal lengths and over; 118° ± 2° for shorter Nominal lengths	Half Dog Point			
							Diameter		Length	
	Nom	Min	Max	Min	Basic		Max	Min	Max	Min
0	0.028	0.050	0.033	0.027	0.045	0.09	0.040	0.037	0.017	0.013
1	0.028	0.060	0.040	0.033	0.055	0.09	0.049	0.045	0.021	0.017
2	0.035	0.060	0.047	0.039	0.064	0.13	0.057	0.053	0.024	0.020
3	0.050	0.070	0.054	0.045	0.074	0.13	0.066	0.062	0.027	0.023
4	0.050	0.070	0.061	0.051	0.084	0.19	0.075	0.070	0.030	0.026
5	0.062	0.080	0.067	0.057	0.094	0.19	0.083	0.078	0.033	0.027
6	0.062	0.080	0.074	0.064	0.104	0.19	0.092	0.087	0.038	0.032
8	0.078	0.090	0.087	0.076	0.123	0.25	0.109	0.103	0.043	0.037
10	0.094	0.100	0.102	0.088	0.142	0.25	0.127	0.120	0.049	0.041
1/4	0.125	0.125	0.132	0.118	0.188	0.31	0.156	0.149	0.067	0.059
5/16	0.156	0.156	0.172	0.156	0.234	0.38	0.203	0.195	0.082	0.074
3/8	0.188	0.188	0.212	0.194	0.281	0.44	0.250	0.241	0.099	0.089
7/16	0.219	0.219	0.252	0.232	0.328	0.50	0.297	0.287	0.114	0.104
1/2	0.250	0.250	0.291	0.270	0.375	0.57	0.344	0.334	0.130	0.120
5/8	0.312	0.312	0.371	0.347	0.469	0.75	0.469	0.456	0.164	0.148
3/4	0.375	0.375	0.450	0.425	0.562	0.88	0.562	0.549	0.196	0.180
7/8	0.500	0.500	0.530	0.502	0.656	1.00	0.656	0.642	0.227	0.211
1	0.562	0.562	0.609	0.579	0.750	1.13	0.750	0.734	0.260	0.240

Tolerance on Length	Nominal Screw Length		
	Up to 0.63 in., Incl.	Over 0.63 to 2.00 in., Incl.	Over 2.00 to 6.00 in., Incl.
	±0.01	±0.02	±0.03

SOCKET SHOULDER SCREWS — Alloy Steel



‡Length of a shoulder screw is measured from the underhead bearing surface to the plane of the shoulder at the threaded end.

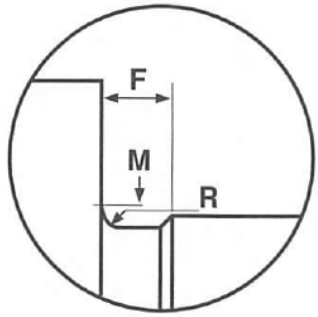
SOCKET HEAD SHOULDER SCREWS - ALLOY STEEL

ASME B18.3-2012

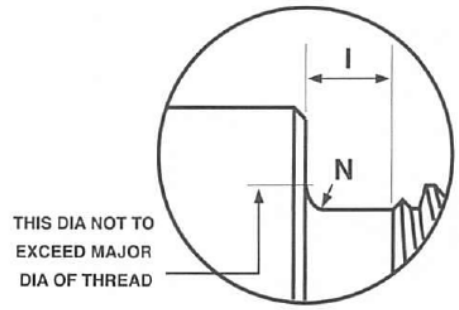
Nominal Size	D		A		H		C	J	T	M	R	K	F
	Shoulder Diameter		Head Diameter		Head Height		Chamfer or Radius	Hex Socket Size	Key Engagement	Fillet Transition Diameter	Head Fillet Radius	Shoulder Neck Diameter	Shoulder Neck Width
	Max	Min	Max	Min	Max	Min	Max	Nom	Min	Max	Min	Min	Max
1/4	0.2480	0.2460	0.375	0.357	0.188	0.177	0.020	1/8	0.094	0.276	0.009	0.227	0.093
5/16	0.3105	0.3085	0.438	0.419	0.219	0.209	0.026	5/32	0.117	0.345	0.012	0.289	0.093
3/8	0.3730	0.3710	0.562	0.543	0.250	0.240	0.031	3/16	0.141	0.413	0.015	0.352	0.093
1/2	0.4980	0.4960	0.750	0.729	0.312	0.302	0.040	1/4	0.188	0.550	0.020	0.477	0.093
5/8	0.6230	0.6210	0.875	0.853	0.375	0.365	0.050	5/16	0.234	0.687	0.024	0.602	0.093
3/4	0.7480	0.7460	1.000	0.977	0.500	0.490	0.069	3/8	0.281	0.826	0.030	0.727	0.093

Description	A hex socket head screw with an enlarged, unthreaded, cylindrical shoulder under the head, the diameter of which serves as the basis for the derivation of the nominal size.
Applications/ Advantages	For rotation or sliding applications, such as pulley shafts, in punch and die work, or for use as a bearing pin. Shoulder screws are also referred to as "stripper bolts".
Material	Shoulder screws shall be made fabricated from an alloy steel having one or more of the following elements: chromium, nickel, molybdenum or vanadium, in sufficient quantity to assure the hardness specified below.
Heat Treatment	Shoulder screws shall be heat-treated by oil quenching from above the transformation temperature and then tempered at a temperature not lower than 650°F.
Hardness	Rockwell C32 - 43
Tensile Strength	140,000 psi. minimum (material only)
Yield Strength	120,000 psi. minimum (material only)
Elongation	15% minimum (applies to all machined specimens of length at least 4D where D equals the nominal diameter of the screw)
Reduction of Area	45% minimum (applies to all machined specimens)
Plating	Shoulder screws are usually supplied plain.

Alloy Steel SOCKET SHOULDER SCREWS



ENLARGED DETAIL Y



ENLARGED DETAIL Z

Socket Head Shoulder Screws - Alloy Steel (continued)

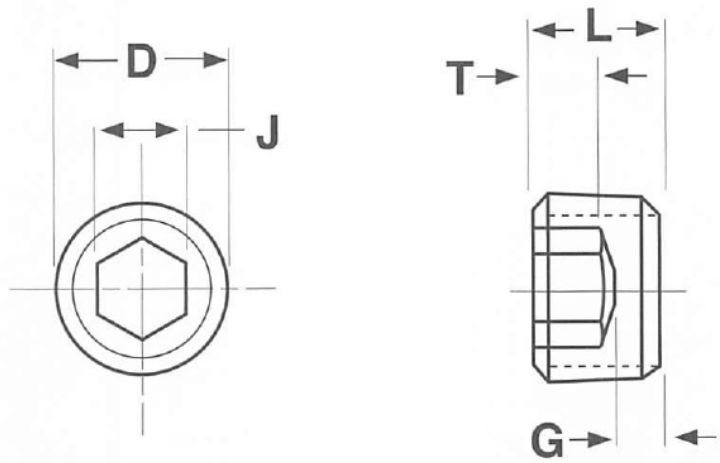
ASME B18.3-2012, Blue Devil®

Nominal Size	D1 Nominal Thread Size	Threads Per Inch	G Thread Neck Diameter Max	G Thread Neck Diameter Min	I Thread Neck Width	N Thread Neck Fillet Max	N Thread Neck Fillet Min	E Thread Length Basic	Thread Section Tensile Strength (Lbs) Min	Single Shear Strength (Lbs) Shoulder Min	Single Shear Strength (Lbs) Thread Neck Min	Seating Torque (Inch Lbs)
1/4	10	24	0.142	0.133	0.083	0.023	0.017	0.375	2,540	4,515	1,250	50
5/16	1/4	20	0.193	0.182	0.100	0.028	0.022	0.438	4,610	7,100	2,340	125
3/8	5/16	18	0.249	0.237	0.111	0.031	0.025	0.500	7,600	10,280	3,970	265
1/2	3/8	16	0.304	0.291	0.125	0.035	0.029	0.625	11,240	18,350	5,985	470
5/8	1/2	13	0.414	0.397	0.154	0.042	0.036	0.750	20,570	28,785	11,140	1,150
3/4	5/8	11	0.521	0.502	0.182	0.051	0.045	0.875	32,770	41,515	17,800	2,000

Tolerance on Thread Length	Nominal Screw Sizes	
	Up to 3/8 in., Inclusive	Over 3/8 in.
	-0.020	-0.030

Blue Devil® is a registered trademark of the Safety Socket Screw Corporation.

PIPE PLUGS — Dry Seal



Socket Pipe Plugs - Dry Seal

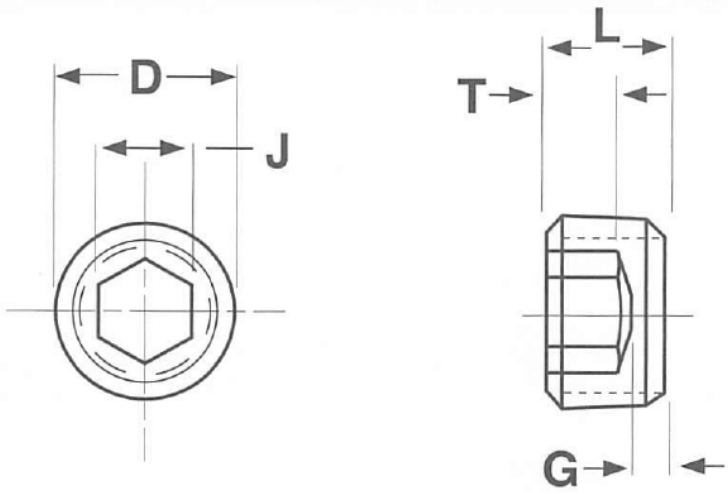
ANSI B1.20.3

Nominal Size	D	Threads Per Inch	J	T	G	L		Tightening Torque (Inch - Lbs)	Tap Drill Size*
	Nominal Outside Diameter		Hex Socket Size	Key Engagement	Wall Thickness	Overall Length			
				Min	Min	Max	Min		
1/16	0.3120	27	5/32	.1400	.0620	.3240	.3000	150	15/64
1/8	0.4050	27	3/16	.1400	.0620	.3240	.3000	250	21/64
1/4	0.5400	18	1/4	.2180	.0730	.4570	.4170	600	27/64
3/8	0.6750	18	5/16	.2500	.0840	.5200	.4800	1200	9/16
1/2	0.8400	14	3/8	.3120	.0950	.5820	.5420	1800	11/16
3/4	1.0500	14	9/16	.3120	.1250	.6450	.6050	3000	57/64
1	1.3150	11-1/2	5/8	.3750	.1250	.7700	.7300	4200	1-1/8
1-1/4	1.6600	11-1/2	3/4	.4370	.1560	.8320	.7920	5400	37.5MM

*Taper reaming after drilling is recommended for tapping ease and to give fully formed, uniform threads.

Description	A dry seal plug is one having a tapered (0.750" diametral per 12") thread extending its entire length and designed to have its threads mesh tightly with those of a taper-threaded hole. Both ends of the plug shall be flat and chamfered approximately 45°. The chamfer shall extend slightly below the root of the thread, and the edge between flat and chamfer shall be slightly rounded.	
Applications/ Advantages	The thread truncation is closely controlled at root and crest to assure metal to metal contact, preventing spiral leakage and forming a positive seal without the use of sealing compounds. Dry seal plugs can be used in American Standard Taper Dryseal Pipe Thread (NPT) tapped holes, but for fullest protection against leakage, should be used in dryseal tapped holes which are taper reamed before tapping.	
Material	High grade alloy steel	Commercial brass
Heat Treatment	Pipe plugs shall be heat-treated by quenching in oil from above the hardening temperature and tempered to achieve the hardness requirement listed below.	-
Hardness	Rockwell C36 - 43	-
Finish	Plugs are supplied with a standard black finish.	Plugs are supplied plain.

Flush Seating PIPE PLUGS



Socket Pipe Plugs - Flush Type

ANSI B1.20.3

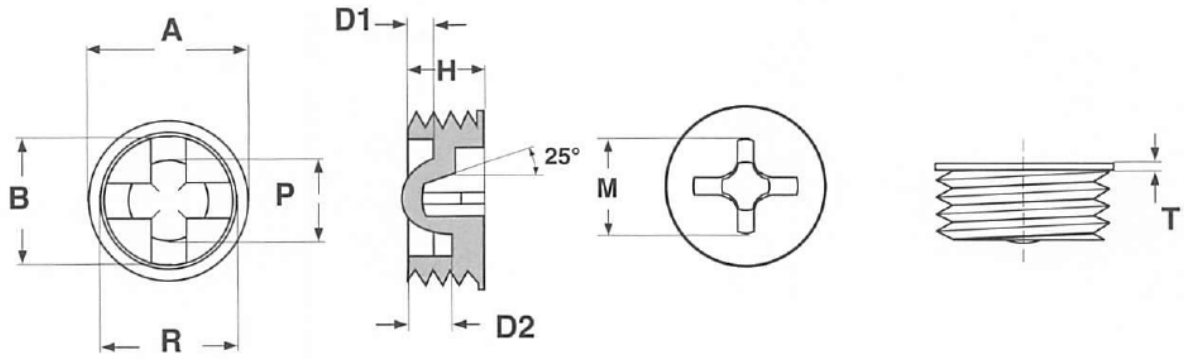
Nominal Size	D Nominal Outside Diameter	Threads Per Inch	J Hex Socket Size	T Key Engagement	G Wall Thickness	L Overall Length		Tightening Torque (Inch - Lbs)	Tap Drill Size*
				Min	Min	Max	Min		
1/16	0.307	27	5/32	.140	.052	.250	.235	150	15/64
1/8	0.401	27	3/16	.140	.049	.250	.235	250	21/64
1/4	0.529	18	1/4	.218	.045	.406	.391	600	27/64
3/8	0.667	18	5/16	.250	.040	.406	.391	1200	9/16
1/2	0.830	14	3/8	.312	.067	.531	.516	1800	11/16
3/4	1.041	14	9/16	.312	.054	.531	.516	3000	57/64
1	1.302	11-1/2	5/8	.375	.112	.656	.641	4200	1-1/8
1-1/4	1.647	11-1/2	3/4	.437	.102	.656	.641	5400	37.5MM

*Taper reaming after drilling is recommended for tapping ease and to give fully formed, uniform threads.

Description	A flush type plug is one having a tapered (0.875"diametral per 12") thread extending its entire length and designed to provide a flush condition with a standard tapped hole (0.750" diameter per 12"). Both ends of the plug shall be flat and chamfered approximately 45°. The chamfer shall extend slightly below the root of the thread, and the edge between flat and chamfer shall be slightly rounded. Six equally spaced identification grooves are located equidistant between corners of the hex socket and edge of the chamfer (Note: On the 1/16-27 plug, 3 identification grooves are permitted because of limited space).	
Applications/ Advantages	A high pressure seal is achieved through the difference in taper, with dimensions precalculated to provide a higher sealing load near the large end of the plug and the threads near the top of the tapped hole. The flush type plug is preferred where high pressures are encountered and where protursion in undesirable.	
Material	High grade alloy steel	Commercial brass
Heat Treatment	Pipe plugs shall be heat-treated by quenching in oil from above the hardening temperature and tempered to achieve the hardness requirement listed below.	-
Hardness	Rockwell C36 - 43	-
Finish	Plugs are supplied with a standard black finish.	Plugs are supplied plain.

PIPE PLUGS

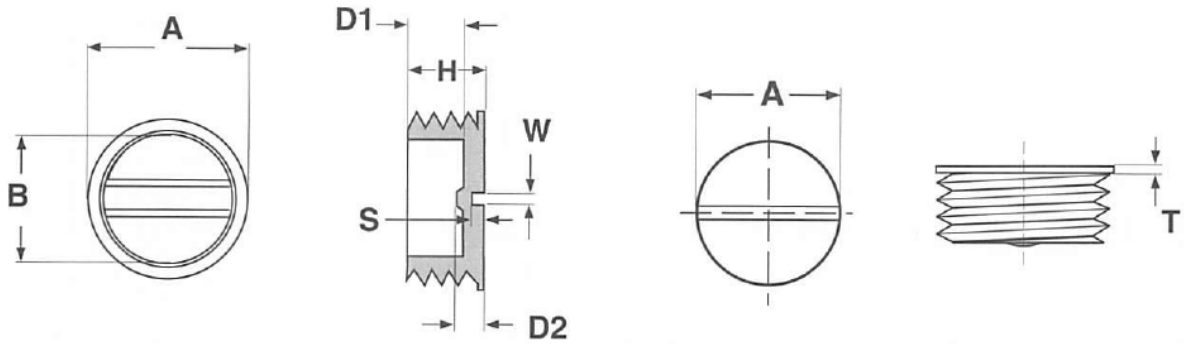
Phillips with NPT Thread



PHILLIPS PIPE PLUGS WITH NPT THREAD																
Nominal Diam & Thread Pitch	A		R	B		P		D1		D2		H		M		T
	Outside Diameter		Root Diam.	Bottom Internal Diameter		Bulb Diameter		Depth to Cross Recess (Underside)		Total Underside Depth		Total Thickness		Recess Diameter		Thread Stop Thickness
	Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Nom
1/2-14	.823	.813	.700	.630	.620	.395	.385	.114	.104	.180	.170	.266	.234	.546	.516	1/32

Slotted with NPT Thread

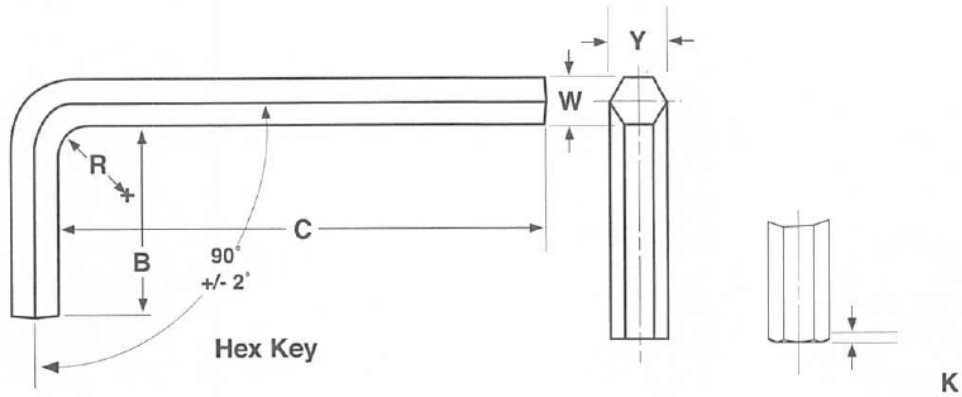
PIPE PLUGS



SLOTTED PIPE PLUGS WITH NPT THREAD																
Nominal Diam & Thread Pitch	A		B		D1		D2		H		W		S		T	
	Outside Diameter		Bottom Internal Diameter		Total Underside Depth		Depth to Underside of Recess		Total Thickness		Slot Width		Slot Depth		Thread Stop Thickness	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1/2-14	.795	.785	.635	.625	.235	.225	.095	.085	.297	.287	.075	.065	.055	.045	.050	.040

HEX KEYS & BITS

Alloy Steel



HEX KEYS, LONG AND SHORT ARM

ASME B18.3-2012

Nominal Key and Socket Size		W		Y		B		C				R	K
		Hex Width Across the Flats		Hex Width Across the Corners		Length of Short Section		Length of Long Section				Radius of Bend	Chamfer
								Short Arm Series		Long Arm Series			
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Min	Max
-	0.028	0.0280	0.0275	0.0314	0.0300	0.312	0.125	1.312	1.125	2.688	2.500	0.062	0.003
-	0.035	0.0350	0.0345	0.0393	0.0378	0.438	0.250	1.312	1.125	2.766	2.578	0.062	0.004
-	0.050	0.0500	0.0490	0.0560	0.0540	0.625	0.438	1.750	1.562	2.938	2.750	0.062	0.006
1/16	0.062	0.0625	0.0615	0.0701	0.0680	0.656	0.469	1.844	1.656	3.094	2.906	0.062	0.008
5/64	0.078	0.0781	0.0771	0.0880	0.0859	0.703	0.516	1.969	1.781	3.281	3.094	0.078	0.008
3/32	0.094	0.0937	0.0927	0.1058	0.1035	0.750	0.562	2.094	1.906	3.469	3.281	0.094	0.009
7/64	0.109	0.1094	0.1079	0.1238	0.1210	0.797	0.609	2.219	2.031	3.656	3.469	0.109	0.014
1/8	0.125	0.1250	0.1235	0.1418	0.1390	0.844	0.656	2.344	2.156	3.844	3.656	0.125	0.015
9/64	0.141	0.1406	0.1391	0.1593	0.1566	0.891	0.703	2.469	2.281	4.031	3.844	0.141	0.016
5/32	0.156	0.1562	0.1547	0.1774	0.1745	0.938	0.750	2.594	2.406	4.219	4.031	0.156	0.016
3/16	0.188	0.1875	0.1860	0.2135	0.2105	1.031	0.844	2.844	2.656	4.594	4.406	0.188	0.022
7/32	0.219	0.2187	0.2172	0.2490	0.2460	1.125	0.938	3.094	2.906	4.969	4.781	0.219	0.024
1/4	0.250	0.2500	0.2485	0.2845	0.2815	1.219	1.031	3.344	3.156	5.344	5.156	0.250	0.030
5/16	0.312	0.3125	0.3110	0.3570	0.3531	1.344	1.156	3.844	3.656	6.094	5.906	0.312	0.032
3/8	0.375	0.3750	0.3735	0.4285	0.4238	1.469	1.281	4.344	4.156	6.844	6.656	0.375	0.044
7/16	0.438	0.4375	0.4355	0.5005	0.4944	1.594	1.406	4.844	4.656	7.594	7.406	0.438	0.047
1/2	0.500	0.5000	0.4975	0.5715	0.5650	1.719	1.531	5.344	5.156	8.344	8.156	0.500	0.050
9/16	0.562	0.5625	0.5600	0.6420	0.6356	1.844	1.656	5.844	5.656	9.094	8.906	0.562	0.053
5/8	0.625	0.6250	0.6225	0.7146	0.7080	1.969	1.781	6.344	6.156	9.844	9.656	0.625	0.055
3/4	0.750	0.7500	0.7470	0.8580	0.8512	2.219	2.031	7.344	7.156	11.344	11.156	0.750	0.070
7/8	0.875	0.8750	0.8720	1.0020	0.9931	2.469	2.281	8.344	8.156	12.844	12.656	0.875	0.076
1	1.000	1.0000	0.9970	1.1470	1.1350	2.719	2.531	9.344	9.156	14.344	14.156	1.000	0.081

Tolerance on Length of Key Bits	±0.062

Alloy Steel

HEX KEYS & BITS

HEX KEYS AND BITS		Blue Devil®
Nominal Size	Torsional Shear Average (Inch-Pounds)	Torque Rating (Inch-Pounds)
.028	1.1	.86
.035	2.3	1.80
.050	6.5	5.00
1/16	11.9	9.50
5/64	25.0	19.40
3/32	43.0	33.50
7/64	68.0	52.90
1/8	98.0	77.90
9/64	146.0	117.00
5/32	195.0	156.00
3/16	342.0	273.00
7/32	535.0	428.00
1/4	770.0	615.00
5/16	1,600.0	1,315.00
3/8	2,500.0	2,150.00
7/16	4,500.0	3,665.00
1/2	6,300.0	5,130.00
9/16	8,750.0	7,010.00
5/8	12,000.0	9,810.00
3/4	19,500.0	15,570.00
7/8	29,000.0	23,400.00
1	43,500.0	35,100.00

Description	A hex key is a six-sided shaped bar bent at a 90° angle at one end. A hex bit is an unbent piece of such a bar.
Applications/ Advantages	Designed to be inserted into a like-sized, hollow recess of a socket screw to manually tighten or loosen the fastener.
Material	Alloy steel containing at least two of the following elements: chromium, nickel, molybdenum or vanadium, in sufficient quantity to assure that the minimum surface hardness meets the standards listed below.
Heat Treatment	Hex keys are hardened by quenching from the austenitizing temperature and tempered.
Surface Hardness	***Sizes through 3/8*** : Rockwell C 48 minimum ***Sizes over 3/8*** : Rockwell C 45 minimum
Torsional Shear Strength	The average torsional shear strength as listed above is the average maximum torque which standard keys and bits will transmit when tested to destruction. When tested this way, failure will occur by a clean, square shear fracture.
Torque Rating	Keys cut into bits for use in torque wrenches will transmit the above torques. These values are 90% of average torque required to develop a permanent visible twist in bits which have one inch of hexagon exposed between the torque wrench and the socket. These are also the torque values which keys transmit when the short arm is inserted in a socket and the long arm is deflected or bent through an angle of 25-30° by the application of force near the end of the long arm.

Blue Devil® is a registered trademark of the Safety Socket Screw Corporation.

THREAD DIMENSIONS — Class 3A

External Threads - Class 3A							ANSI B1.1
Screw Size	Major Diameter			Pitch Diameter			Minor Diameter
	Basic	Max	Min	Basic	Max	Min	Max
0-80	.0600	.0600	.0568	.0519	.0519	.0506	.0447
1-72	.0730	.0730	.0695	.0640	.0640	.0626	.0560
2-56	.0860	.0860	.0819	.0744	.0744	.0728	.0641
3-48	.0990	.0990	.0945	.0855	.0855	.0838	.0734
4-40	.1120	.1120	.1069	.0958	.0958	.0939	.0822
4-48	.1120	.1120	.1075	.0985	.0985	.0967	.0864
5-40	.1250	.1250	.1199	.1088	.1088	.1069	.0943
6-32	.1380	.1380	.1320	.1177	.1177	.1156	.0997
6-40	.1380	.1380	.1329	.1218	.1218	.1198	.1073
8-32	.1640	.1640	.1580	.1437	.1437	.1415	.1257
8-36	.1640	.1640	.1585	.1460	.1460	.1439	.1299
10-24	.1900	.1900	.1828	.1629	.1629	.1604	.1389
10-32	.1900	.1900	.1840	.1697	.1697	.1674	.1517
1/4-20	.2500	.2500	.2419	.2175	.2175	.2147	.1887
1/4-28	.2500	.2500	.2435	.2268	.2268	.2243	.2062
5/16-18	.3125	.3125	.3038	.2764	.2764	.2734	.2443
5/16-24	.3125	.3125	.3053	.2854	.2854	.2827	.2614
3/8-16	.3750	.3750	.3656	.3344	.3344	.3311	.2983
3/8-24	.3750	.3750	.3678	.3479	.3479	.3450	.3239
7/16-14	.4375	.4375	.4272	.3911	.3911	.3876	.3499
7/16-20	.4375	.4375	.4294	.4050	.4050	.4019	.3762
1/2-13	.5000	.5000	.4891	.4500	.4500	.4463	.4056
1/2-20	.5000	.5000	.4919	.4675	.4675	.4643	.4387
5/8-11	.6250	.6250	.6129	.5660	.5660	.5619	.5135
5/8-18	.6250	.6250	.6163	.5889	.5889	.5854	.5568
3/4-10	.7500	.7500	.7371	.6850	.6850	.6806	.6273
7/8-9	.8750	.8750	.8611	.8028	.8028	.7981	.7387
1-8	1.0000	1.0000	.9850	.9188	.9188	.9137	.8466
*Class 3A threads over 1" diameter screws are Class 2A threads.							
* 1 1/4-7	1.2500	1.2478	1.2314	1.1572	1.1550	1.1476	1.0725
* 1 1/2-6	1.5000	1.4976	1.4794	1.3917	1.3893	1.3812	1.2931

RETAINING RINGS

Head Body & Thread Dimensions
Mechanical and Performance Requirements

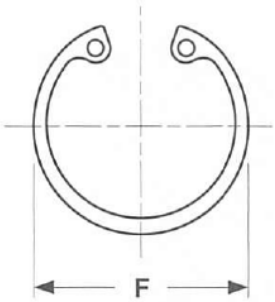
Internal Type, Steel & Stainless 356

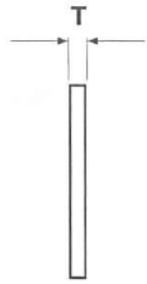
External Type, Steel & Stainless..... 358

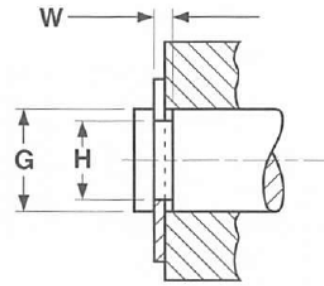
E Rings, Steel & Stainless..... 360

INTERNAL TYPE

Carbon Spring Steel & Stainless Steel







INTERNAL TYPE RETAINING RINGS

Carbon Spring Steel		Stainless Steel		H	G	W	F	T
Kanebridge Part Number	Waldes Part Number	Kanebridge Part Number	Waldes Part Number	Housing Diameter	Groove Diameter	Groove Width	Free Diameter	Thickness
25RIBP	N5000-25STPP	25RISS	N5000-25H	0.250	0.268	0.020	0.280	0.015
31RIBP	N5000-31STPP	31RISS	N5000-31H	0.312	0.330	0.020	0.346	0.015
37RIBP	N5000-37STPP	37RISS	N5000-37H	0.375	0.397	0.029	0.415	0.025
43RIBP	N5000-43STPP	43RISS	N5000-43H	0.438	0.461	0.029	0.482	0.025
50RIBP	N5000-50STPP	50RISS	N5000-50H	0.500	.0530	0.039	0.548	0.035
56RIBP	N5000-56STPP	56RISS	N5000-56H	0.562	0.596	0.039	0.620	0.035
62RIBP	N5000-62STPP	62RISS	N5000-62H	0.625	0.665	0.039	0.694	0.035
68RIBP	N5000-68STPP	68RISS	N5000-68H	0.688	0.732	0.039	0.763	0.035
75RIBP	N5000-75STPP	75RISS	N5000-75H	0.750	0.796	0.039	0.831	0.035
81RIBP	N5000-81STPP	81RISS	N5000-81H	0.812	0.862	0.046	0.901	0.042
87RIBP	N5000-87STPP	87RISS	N5000-87H	0.875	0.931	0.046	0.971	0.042
93RIBP	N5000-93STPP	93RISS	N5000-93H	0.938	1.000	0.046	1.041	0.042
100RIBP	N5000-100STPP	100RISS	N5000-100H	1.000	1.066	0.046	1.111	0.042
106RIBP	N5000-287STPP	106RISS	N5000-106H	1.062	1.130	0.056	1.180	0.050
112RIBP	N5000-112STPP	112RISS	N5000-112H	1.125	1.197	0.056	1.249	0.050
118RIBP	N5000-118STPP	118RISS	N5000-118H	1.181	1.255	0.056	1.319	0.050
125RIBP	N5000-125STPP	125RISS	N5000-125H	1.250	1.330	0.056	1.388	0.050
131RIBP	N5000-131STPP	131RISS	N5000-131H	1.312	1.461	0.056	1.456	0.050
137RIBP	N5000-137STPP	137RISS	N5000-137H	1.375	1.461	0.056	1.526	0.050
143RIBP	N5000-143STPP	143RISS	N5000-143H	1.438	1.528	0.056	1.596	0.050
150RIBP	N5000-150STPP	150RISS	N5000-150H	1.500	1.594	0.056	1.660	0.050
156RIBP	N5000-156STPP	156RISS	N5000-156H	1.562	1.658	0.068	1.734	0.062
162RIBP	N5000-162STPP	162RISS	N5000-162H	1.625	1.725	0.068	1.804	0.062
168RIBP	N5000-168STPP	168RISS	N5000-168H	1.688	1.792	0.068	1.874	0.062
175RIBP	N5000-175STPP	175RISS	N5000-175H	1.750	1.858	0.068	1.942	0.062
181RIBP	N5000-181STPP	181RISS	N5000-181H	1.812	1.922	0.068	2.012	0.062
187RIBP	N5000-187STPP	187RISS	N5000-187H	1.875	1.989	0.068	2.072	0.062
193RIBP	N5000-193STPP	193RISS	N5000-193H	1.938	2.056	0.068	2.141	0.062
200RIBP	N5000-200STPP	200RISS	N5000-200H	2.000	2.122	0.068	2.210	0.062

Carbon Spring Steel & Stainless Steel
INTERNAL TYPE

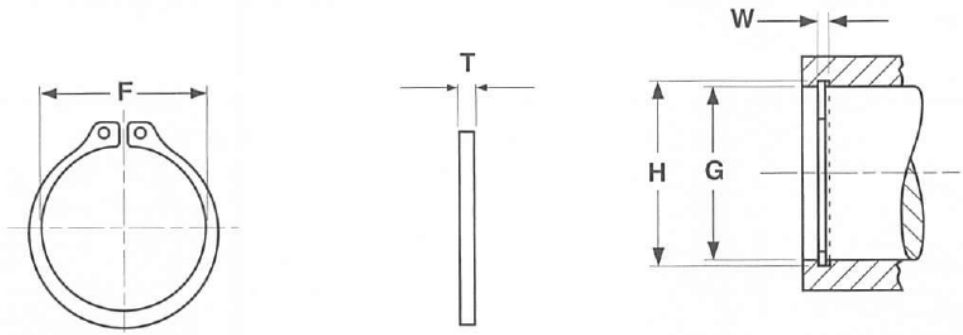
Internal Type Retaining Rings (continued)

Carbon Spring Steel		Stainless Steel		H	G	W	F	T
Kanebridge Part Number	Waldes Part Number	Kanebridge Part Number	Waldes Part Number	Housing Diameter	Groove Diameter	Groove Width	Free Diameter	Thickness
206RIBP	N5000-206STPP	-	N5000-206H	2.062	2.186	0.086	2.280	0.078
212RIBP	N5000-212STPP	-	N5000-212H	2.125	2.251	0.086	2.350	0.078
218RIBP	N5000-218STPP	-	N5000-218H	2.188	2.318	0.086	2.415	0.078
225RIBP	N5000-225STPP	-	N5000-225H	2.250	2.382	0.086	2.490	0.078
231RIBP	N5000-231STPP	-	N5000-231H	2.312	2.450	0.086	2.560	0.078
237RIBP	N5000-237STPP	-	N5000-237H	2.375	2.517	0.086	2.630	0.078
244RIBP	N5000-244STPP	-	N5000-244H	2.440	2.584	0.086	2.702	0.078
250RIBP	N5000-250STPP	-	N5000-250H	2.500	2.648	0.086	2.775	0.078
256RIBP	N5000-256STPP	-	N5000-256H	2.562	2.714	0.103	2.844	0.093
262RIBP	N5000-262STPP	-	N5000-262H	2.625	2.781	0.103	2.910	0.093
268RIBP	N5000-268STPP	-	N5000-268H	2.688	2.848	0.103	2.980	0.093
275RIBP	N5000-275STPP	-	N5000-275H	2.750	2.914	0.103	3.050	0.093
281RIBP	N5000-281STPP	-	N5000-281H	2.812	2.980	0.103	3.121	0.093
287RIBP	N5000-287STPP	-	N5000-287H	2.875	3.051	0.103	3.191	0.093
300RIBP	N5000-300STPP	-	N5000-300H	3.000	3.182	0.103	3.325	0.093

Description	A ring-shaped stamping with one opening on the circumference. The two ends at the opening are called lugs and flare slightly into the groove. When the lugs are released, contact is made with the grooved housing.	
Applications/ Advantages	The internal retaining ring design is for axial installation into machined grooves in housings and bores. The tapered section design assures uniform circular deformation, allowing for complete contact and tightness in groove. Steel rings can be safely used within a temperature range of -100°F to 500°F. Stainless steel rings are corrosion resistant & can be used in higher heat applications from -100°F to 900°F.	
Material	*Steel*	*Stainless*
	Carbon spring steel SAE 1060 - 1090	Precipitation Hardened Alloy 15% Chromium, 7% Nickel, 2% Molybdenum
Heat Treatment	Retaining rings are heat treated using the austempering method. Rings are uniformly heated to temperatures over 1500° F. They are then isothermally quenched in a molten salt bath at 600° F for 35 minutes. This results in parts with a bainite structure characterized by good mechanical properties.	
Hardness	***Sizes 25 & 31:*** Rockwell 15N 86 - 88 ***Sizes 37 - 51:*** Rockwell 30N 69.5 - 73 ***Sizes 56 - 77:*** Rockwell 30N 67.5 - 72 ***Sizes 81 - 102:*** Rockwell 30N 66 - 71 ***Sizes 106 - 347:*** Rockwell C 47 - 52	***Sizes 25 & 31:*** Rockwell 15N 82.5 - 86 ***Sizes 37 - 102:*** Rockwell 30N 63 - 69.5 ***Sizes 106 & over:*** Rockwell C 44 - 51
Tensile Strength	-	225,000 psi. minimum
Finish	See Appendix-A for information on the coating of retaining rings.	

EXTERNAL TYPE

Carbon Spring Steel & Stainless Steel



External Type Retaining Rings								
Carbon Spring Steel		Stainless Steel		H	G	W	F	T
Kanebridge Part Number	Waldes Part Number	Kanebridge Part Number	Waldes Part Number	Shaft	Groove Diameter	Groove Width	Free Diameter	Thickness
25REXBP	5100-25STPP	25REXSS	5100-25H	0.250	0.230	0.029	0.225	0.025
28REXBP	5100-28STPP	28REXSS	5100-28H	0.281	0.261	0.029	0.256	0.025
31REXBP	5100-31STPP	31REXSS	5100-31H	0.312	0.290	0.029	0.281	0.025
34REXBP	5100-34STPP	-	5100-34H	0.344	0.321	0.029	0.309	0.025
37REXBP	5100-37STPP	37REXSS	5100-37H	0.375	0.352	0.029	0.338	0.025
40REXBP	5100-40STPP	-	5100-40H	0.406	0.382	0.029	0.366	0.025
43REXBP	5100-43STPP	43REXSS	5100-43H	0.438	0.412	0.029	0.395	0.025
50REXBP	5100-50STPP	50REXSS	5100-50H	0.500	0.468	0.039	0.461	0.035
56REXBP	5100-56STPP	56REXSS	5100-56H	0.562	0.530	0.039	0.521	0.035
59REXBP	5100-59STPP	59REXSS	5100-59H	0.594	0.559	0.039	0.550	0.035
62REXBP	5100-62STPP	62REXSS	5100-62H	0.625	0.588	0.039	0.579	0.035
68REXBP	5100-68STPP	68REXSS	5100-68H	0.688	0.646	0.046	0.635	0.042
75REXBP	5100-75STPP	75REXSS	5100-75H	0.750	0.704	0.046	0.693	0.042
81REXBP	5100-81STPP	81REXSS	5100-81H	0.812	0.762	0.046	0.751	0.042
87REXBP	5100-87STPP	87REXSS	5100-87H	0.875	0.821	0.046	0.810	0.042
93REXBP	5100-93STPP	93REXSS	5100-93H	0.938	0.882	0.046	0.867	0.042
100REXBP	5100-100STPP	100REXSS	5100-100H	1.000	0.940	0.046	0.925	0.042
106REXBP	5100-106STPP	106REXSS	5100-106H	1.062	0.998	0.056	0.982	0.050
112REXBP	5100-112STPP	112REXSS	5100-112H	1.125	1.059	0.056	1.041	0.050
118REXBP	5100-118STPP	118REXSS	5100-118H	1.188	1.118	0.056	1.098	0.050
125REXBP	5100-125STPP	125REXSS	5100-125H	1.250	1.176	0.056	1.156	0.050
131REXBP	5100-131STPP	131REXSS	5100-131H	1.312	1.232	0.056	1.214	0.050
137REXBP	5100-137STPP	137REXSS	5100-137H	1.375	1.291	0.056	1.272	0.050
143REXBP	5100-143STPP	-	5100-143H	1.438	1.350	0.056	1.333	0.050
150REXBP	5100-150STPP	150REXSS	5100-150H	1.500	1.406	0.056	1.387	0.050
156REXBP	5100-156STPP	-	5100-156H	1.562	1.468	0.068	1.446	0.062
162REXBP	5100-162STPP	162REXSS	5100-162H	1.625	1.529	0.068	1.503	0.062
168REXBP	5100-168STPP	-	5100-168H	1.688	1.589	0.068	1.560	0.062
175REXBP	5100-175STPP	175REXSS	5100-175H	1.750	1.650	0.068	1.618	0.062

Carbon Spring Steel & Stainless Steel
EXTERNAL TYPE

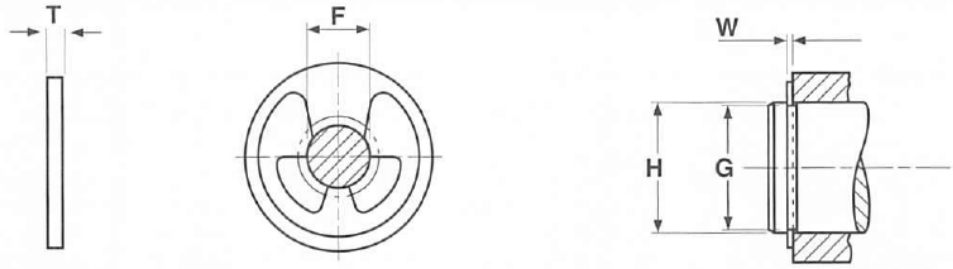
External Type Retaining Rings (continued)

Carbon Spring Steel		Stainless Steel		H	G	W	F	T
Kanebridge Part Number	Waldes Part Number	Kanebridge Part Number	Waldes Part Number	Shaft	Groove Diameter	Groove Width	Free Diameter	Thickness
181REXBP	5100-181STPP	-	5100-181H	1.812	1.708	0.068	1.675	0.062
187REXBP	5100-187STPP	-	5100-187H	1.875	1.769	0.068	1.735	0.062
200REXBP	5100-200STPP	200REXSS	5100-200H	2.000	1.886	0.068	1.850	0.062
206REXBP	5100-206STPP	-	5100-206H	2.062	1.946	0.086	1.906	0.078
212REXBP	5100-212STPP	-	5100-212H	2.125	2.003	0.086	1.964	0.078
225REXBP	5100-225STPP	-	5100-225H	2.250	2.120	0.086	2.081	0.078
231REXBP	5100-231STPP	-	5100-231H	2.312	2.178	0.086	2.139	0.078
237REXBP	5100-237STPP	-	5100-237H	2.375	2.239	0.086	2.197	0.078
243REXBP	5100-243STPP	-	5100-243H	2.438	2.299	0.086	2.255	0.078
250REXBP	5100-250STPP	-	5100-250H	2.500	2.360	0.086	2.313	0.078
262REXBP	5100-262STPP	-	5100-262H	2.625	2.481	0.086	2.428	0.078
268REXBP	5100-268STPP	-	5100-268H	2.688	2.541	0.086	2.485	0.078
275REXBP	5100-275STPP	-	5100-275H	2.750	2.602	0.103	2.543	0.093
287REXBP	5100-287STPP	-	5100-287H	2.875	2.721	0.103	2.659	0.093
300REXBP	5100-300STPP	-	5100-300H	3.000	2.838	0.103	2.775	0.093

Description	A ring-shaped stamping with one opening on the circumference. The two ends at the opening are called lugs and flare out slightly allowing for easier installation onto shafts.	
Applications/ Advantages	The external retaining ring is for axial assembly into machined grooves on shafts. Tapered section design assures uniform circular deformation allowing for complete contact and tightness in groove. Steel rings can be safely used within a temperature range of -100°F to 500°F. Stainless steel rings are corrosion resistant & can be used in higher heat applications from -100°F to 900°F.	
Material	*Steel*	*Stainless*
	Carbon spring steel SAE 1060 - 1090	Precipitation Hardened Alloy 15% Chromium, 7% Nickel, 2% Molybdenum
Heat Treatment	Retaining rings are heat treated using the austempering method. Rings are uniformly heated to temperatures over 1500° F. They are then isothermally quenched in a molten salt bath at 600° F for 35 minutes. This results in parts with a bainite structure characterized by good mechanical properties.	
Hardness	***Sizes 25 & 46:*** Rockwell 30N 69.5 - 73 ***Sizes 50 - 81:*** Rockwell 30N 66 - 71 ***Sizes 87 - 102:*** Rockwell C 47 - 53 ***Sizes 106 - 343:*** Rockwell C 47 - 52	***Sizes 25 - 31:*** Rockwell 30N 63 - 69.5 ***Sizes 87 & over:*** Rockwell C 44 - 51
Tensile Strength	-	225,000 psi. minimum
Finish	See Appendix-A for information about the coating of retaining rings.	

E RINGS

Carbon Spring Steel & Stainless Steel



Type E Retaining Rings

Carbon Spring Steel		Stainless Steel		H	G	W	F	T
Kanebridge Part Number	Waldes Part Number	Kanebridge Part Number	Waldes Part Number	Shaft	Groove Diameter	Groove Width	Free Diameter	Thickness
6REBP	5133-6STPP	6RESS	5133-6H	0.062	0.052	0.012	0.051	0.010
9REBP	5133-9STPP	9RESS	5133-9H	0.094	0.074	0.020	0.073	0.015
12REBP	5133-12STPP	12RESS	5133-12H	0.125	0.095	0.020	0.094	0.015
-	-	14RESS	5133-14H	0.140	0.105	0.029	0.102	0.025
14RSEBP	X5133-14STPP	14RSESS	X5133-14H	0.140	0.102	0.020	0.100	0.015
15REBP	5133-15STPP	15RESS	5133-15H	0.156	0.116	0.029	0.114	0.025
17RSEBP	X5133-17STPP	17RSESS	X5133-17H	0.172	0.127	0.029	0.125	0.025
18REBP	5133-18STPP	18RESS	5133-18H	0.188	0.147	0.029	0.145	0.025
-	-	18RSESS	X5133-18H	0.188	0.125	0.029	0.122	0.025
21RSEBP	X5133-21STPP	21RSESS	X5133-21H	0.219	0.188	0.029	0.185	0.025
25REBP	5133-25STPP	25RESS	5133-25H	0.250	0.210	0.029	0.207	0.025
31RSEBP	X5133-31STPP	31RSESS	X5133-31H	0.312	0.250	0.029	0.243	0.025
37REBP	5133-37STPP	37RESS	5133-37H	0.375	0.303	0.039	0.300	0.035
43REBP	5133-43STPP	43RESS	5133-43H	0.438	0.343	0.039	0.337	0.035
50REBP	5133-50STPP	50RESS	5133-50H	0.500	0.396	0.046	0.392	0.042
62REBP	5133-62STPP	62RESS	5133-62H	0.625	0.485	0.046	0.480	0.042
74RSEBP	X5133-74STPP	74RSESS	X5133-74H	0.750	0.625	0.056	0.616	0.050
-	-	75RESS	5133-75H	0.750	0.580	0.056	0.574	0.050
87REBP	5133-87STPP	87RESS	5133-87H	0.875	0.675	0.056	0.668	0.050
98RSEBP	X5133-98STPP	98RSESS	X5133-98H	0.984	0.835	0.056	0.822	0.050
118RSEBP	X5133-118STPP	-	X5133-118H	1.188	1.079	0.068	1.066	0.062

Description	A semi-circular stamping with two ends which are set further apart than both internal and external rings. The two ends have flared "prongs" which are substantially wider than the other parts of the ring. A center prong extends from the inside perimeter of the ring, halfway between the two ends. The three prongs, when radially installed, make contact with the bottom of the groove.	
Applications/ Advantages	Designed for radial (vertical) installation into machined grooves on shafts of varying diameter. E-rings require a deeper groove, but provide exceptional thrust loadings when compared to fasteners of the same size and weight. Steel rings can be safely used within a temperature range of -100°F to 500°F. Stainless steel rings are corrosion resistant & can be used in higher heat applications from -100°F to 900°F.	
Material	*Steel*	*Stainless*
	Carbon spring steel SAE 1060 - 1090	Precipitation Hardened Alloy 15% Chromium, 7% Nickel, 2% Molybdenum
Heat Treatment	Retaining rings are heat treated using the austempering method. Rings are uniformly heated to temperatures over 1500° F. They are then isothermally quenched in a molten salt bath at 600° F for 35 minutes. This results in parts with a bainite structure characterized by good mechanical properties.	
Hardness	Size 6: Rockwell 15N 84.5 - 87 (Hardness cannot be checked with any degree of accuracy on this size) ***Sizes 9 - S14:*** Rockwell 15N 84.5 - 87 ***Sizes 14 - S31:*** Rockwell 30N 66.5 - 71 ***Sizes 37 & over:*** Rockwell C 47 - 52	Size 6: Rockwell 15N 82.5 - 86 (Hardness cannot be checked with any degree of accuracy on this size) ***Sizes 9 - S14:*** Rockwell 15N 82.5 - 86 ***Sizes 14 - S31:*** Rockwell 30N 63 - 69.5 ***Sizes 37 & over:*** Rockwell C 44 - 51
Tensile Strength	-	225,000 psi. minimum
Finish	See Appendix-A for information on the coating of retaining rings.	

PINS

Head Body & Thread Dimensions
Mechanical and Performance Requirements

Cotter Pins, Extended Prong 362

Spring Pins, Slotted Type, Steel & Stainless ... 363

Spring Pins, Coiled Type 364

Clevis Pins 365

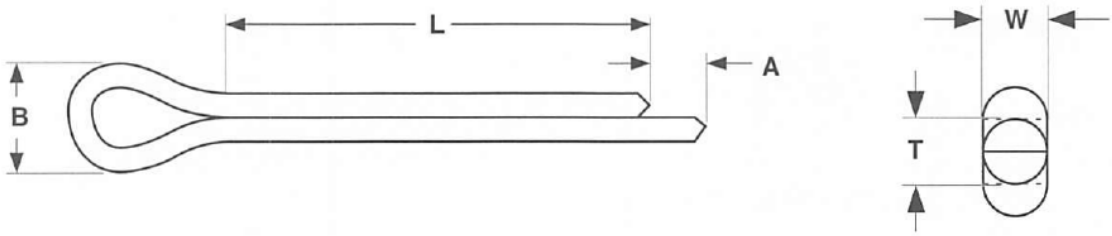
Dowel Pins 366

Grooved Pins, Steel & Stainless 367

Hitch Pin Clips 368

Taper Pins 369

COTTER PINS — Extended Prong

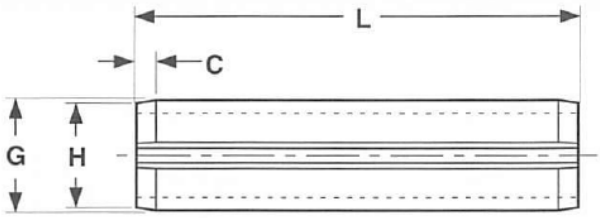


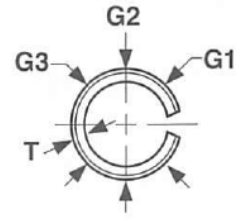
COTTER PINS - EXTENDED PRONG, CHISEL POINT								ASME B18.8.1-2014
Nominal Size	Basic Pin Diameter	T		W		B	A	Gage Hole Diameter (± 0.001)
		Total Shank Diameter		Wire Width		Head Diameter	Extended Prong Length	
		Max.	Min.	Max.	Min.	Min.	Min.	
1/16	0.062	0.063	0.056	0.060	0.044	0.12	0.03	0.078
3/32	0.094	0.093	0.086	0.090	0.069	0.19	0.04	0.109
1/8	0.125	0.124	0.116	0.120	0.093	0.25	0.06	0.141
5/32	0.156	0.154	0.146	0.150	0.116	0.31	0.07	0.172
3/16	0.188	0.180	0.172	0.176	0.137	0.38	0.09	0.207
7/32	0.219	0.212	0.202	0.207	0.161	0.44	0.10	0.241
1/4	0.250	0.230	0.220	0.225	0.176	0.50	0.11	0.275
5/16	0.312	0.286	0.275	0.280	0.220	0.62	0.14	0.343
3/8	0.375	0.341	0.329	0.335	0.263	0.75	0.16	0.413
1/2	0.500	0.480	0.467	0.473	0.373	1.00	0.23	0.550

Tolerance on Length	Nominal Pin Length	
	Up to 1 in.	1 in. and longer
	±0.03	±0.06

Description	A double bodied pin formed from half-round wire, a loop at one end of which provides a head. The finished part has one end of the wire extending beyond the other end, with a chiseled point.
Applications/ Advantages	Used to anchor various assemblies by insertion into a drilled hole of a shaft or pin and spreading the points to hold the assembly in position. When used with castle or slotted nuts, it becomes a safety locking device.
Material	1005 - 1010 or equivalent low carbon steel
Ductility	Each prong of the cotter pin shall be capable of withstanding being bent back upon itself once with no visible indication of fracture occurring at the point of the bend.
Plating	See Appendix-A for plating information.

Slotted Type SPRING PINS





Spring Pins, Slotted Type

ASME B18.8.2-2000

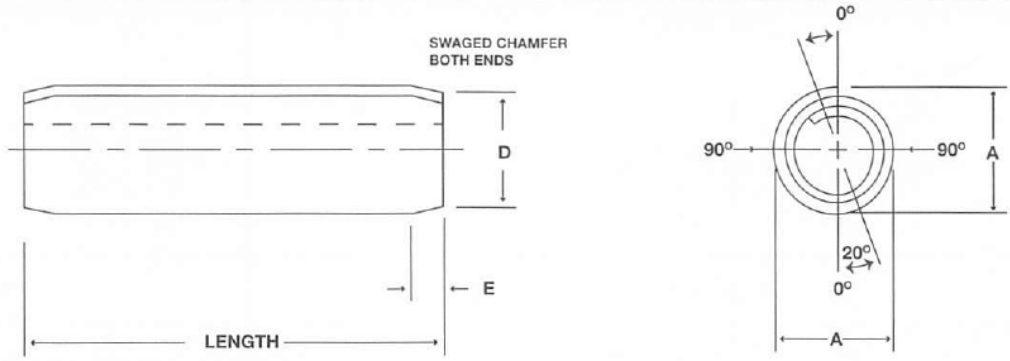
Nominal Size or Basic Pin Diameter		G Pin Diameter		H Chamfer Diameter	C Chamfer Length		T Stock Thickness	Recommended Hole Size		Double Shear Load, Min, lbs.	
		Max*	Min**	Max	Max	Min	Basic	Max	Min	SAE 1070-1095 steel & 420 Stainless	300 series Stainless
1/16	.062	0.069	0.066	0.059	0.028	0.007	0.012	0.065	0.062	430	250
5/64	.078	0.086	0.083	0.075	0.032	0.008	0.018	0.081	0.078	800	460
3/32	.094	0.103	0.099	0.091	0.038	0.008	0.022	0.097	0.094	1,150	670
1/8	.125	0.135	0.131	0.122	0.044	0.008	0.028	0.129	0.125	1,875	1,090
5/32	.156	0.167	0.162	0.151	0.048	0.010	0.032	0.160	0.156	2,750	1,600
3/16	.188	0.199	0.194	0.182	0.055	0.011	0.040	0.192	0.187	4,150	2,425
7/32	.219	0.232	0.226	0.214	0.065	0.011	0.048	0.224	0.219	5,850	3,400
1/4	.250	0.264	0.258	0.245	0.065	0.012	0.048	0.256	0.250	7,050	4,100
5/16	.312	0.330	0.321	0.306	0.080	0.014	0.062	0.318	0.312	10,800	6,300
3/8	.375	0.395	0.385	0.368	0.095	0.016	0.077	0.382	0.375	16,300	9,500
7/16	.438	0.459	0.448	0.430	0.095	0.017	0.077	0.445	0.437	19,800	11,500
1/2	.500	0.524	0.513	0.485	0.110	0.025	0.094	0.510	0.500	27,100	15,800

Tolerance on Length	Nominal Pin Length				
	Up to 1 in., Incl.	Over 1 to 2 in., Incl.	Over 2 to 3 in., Incl.	Over 3 to 4 in., Incl.	Over 4 in.
	±0.015	±0.020	±0.025	±0.030	±0.035

*Maximum diameter shall be checked using a "GO" ring guage.
**Minimum diameter shall be equal to average of three diameters measured at points as illustrated above: G min = $\frac{G1 + G2 + G3}{3}$

	Steel	*Stainless*
Description	A hollow, headless pin, slit longitudinally, having controlled length with chamfered ends, formed to a diameter somewhat greater than that of the hole into which it is to be assembled.	
Applications/ Advantages	Will hold its position in an assembly by a predetermined spring tension. Spring pins are economical because they can simplify product design by replacing more expensive fasteners such as taper pins, set screws and straight pins.	Stainless spring pins are commonly used in electronics and food industries. Type 420 stainless is magnetic and is more corrosion resistant than steel spring pins, but will rust before non-magnetic type 300 stainless pins.
Material	SAE 1070 - 1095 carbon steel	Type 420 stainless steel (magnetic) Type 300 stainless steel (non-magnetic)
Hardness	*1/16 diameter:* Vickers 458 - 560 *5/64 through 3/32 diameters:* Rockwell 15N 83.5 - 86.9 *1/8 through 1/4 diameters:* Rockwell A 73.6 - 77.4 *5/16 through 1/2 diameters:* Rockwell C 46 - 53	*Type 420 Stainless:* *1/16 diameter:* Vickers 423 - 544 *5/64 through 3/32 diameters:* Rockwell 15N 82.0 - 86.4 *1/8 through 1/4 diameters:* Rockwell A 72.0 - 76.8 *Type 300 Stainless:* (work-hardened only)
Shear Load	Spring pins shall be capable of withstanding the minimum double shear loads specified in the above table.	
Finish	See Appendix-A for information about the coating of spring pins.	Stainless pins are usually supplied uncoated.

SPRING PINS — Coiled Type



Coiled Spring Pins — Standard Duty

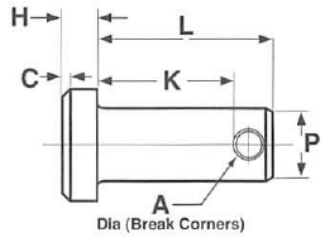
ASME B18.8.2 (2010)

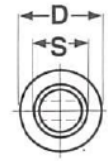
Nominal Size or Basic Pin Diameter		A Pin Diameter		D Chamfer Diam.	E Chamfer Length	Recommended Hole Size		Double Shear Load	
		Max	Min	Max	Ref	Max	Min	SAE 1070-1095 & SAE 51420 Steel	303 Stainless
1/16	0.062	0.072	0.067	0.059	0.028	0.065	0.061	330	265
5/64	0.078	0.088	0.083	0.075	0.032	0.081	0.077	550	425
3/32	0.094	0.105	0.099	0.091	0.038	0.097	0.093	775	600
1/8	0.125	0.138	0.131	0.121	0.044	0.129	0.124	1,400	1,100
5/32	0.156	0.171	0.163	0.152	0.048	0.160	0.155	2,200	1,700
3/16	0.188	0.205	0.196	0.182	0.055	0.192	0.185	3,150	2,400
7/32	0.219	0.238	0.228	0.214	0.065	0.224	0.217	4,200	3,300
1/4	0.250	0.271	0.260	0.243	0.065	0.256	0.247	5,500	4,300
5/16	0.312	0.337	0.324	0.304	0.080	0.319	0.308	8,700	6,700
3/8	0.375	0.403	0.388	0.366	0.095	0.383	0.370	12,600	9,600

Tolerance on Length	Nominal Pin Size	Nominal Pin Length		
		Up to 2", incl.	Over 2 to 3", incl	Over 3"
	1/16 thru 3/8	± 0.010	± 0.015	± 0.025

Description	A hollow, headless pin with chamfered ends, formed or wrapped from steel sheet to a diameter slightly greater than the basic. It is distinguishable from the slotted pin variety in that it has multiple walls.
Applications/ Advantages	Upon installation, the pin diameters contract and press against the sides of the hole. This outward pressure holds the pin in place. The coiled pin is more flexible than the slotted variety making it preferable when used in softer materials. Coiled pins are easier to install than slotted pins and are superior in their ability to withstand vibration following installation.
Material	1070 - 1095 Steel
Hardness	Stock Thickness Range: Over 0.001 thru 0.010: Vickers 420 - 545 Over 0.010 thru 0.025: Rockwell 15N 82 - 86.4 Over 0.025 thru 0.050: Rockwell A 72 - 76.8 Over 0.050 thru 0.094: Rockwell C 43 - 52
Shear Load	Spring pins shall be capable of withstanding the minimum double shear loads specified in the above table.
Plating	See Appendix-A for plating information.

CLEVIS PINS





CLEVIS PINS

ASME B18.8.1 (2014)

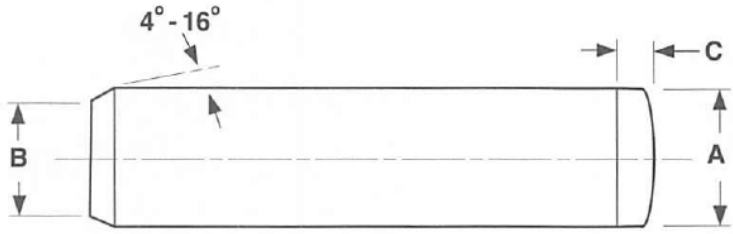
Nominal Size	S		D		H		C	A	P		K	Reference Cotter Pin Nominal Size
	Shank Diameter		Head Diameter		Head Height		Head Chamfer	Cotter Pin Hole Size	Point Diameter		Effective Length	
	Max	Min	Max	Min	Max	Min	±0.01	Ref	Max	Min	+ 3/64 / -0	
3/16	0.186	0.181	0.32	0.30	0.07	0.05	0.02	3/32	0.15	0.14	K = L - 9/64	3/32
1/4	0.248	0.243	0.38	0.36	0.10	0.08	0.03	3/32	0.21	0.20	K = L - 9/64	3/32
5/16	0.311	0.306	0.44	0.42	0.10	0.08	0.03	5/32	0.26	0.25	K = L - 7/32	5/32
3/8	0.373	0.368	0.51	0.49	0.13	0.11	0.03	5/32	0.33	0.32	K = L - 7/32	5/32
7/16	0.436	0.431	0.57	0.55	0.16	0.14	0.04	5/32	0.39	0.38	K = L - 7/32	5/32
1/2	0.496	0.491	0.63	0.61	0.16	0.14	0.04	5/32	0.44	0.43	K = L - 7/32	5/32
5/8	0.621	0.616	0.82	0.80	0.21	0.19	0.06	5/32	0.56	0.55	K = L - 7/32	5/32
3/4	0.746	0.741	0.94	0.92	0.26	0.24	0.07	5/32	0.68	0.67	K = L - 7/32	5/32
7/8	0.871	0.866	1.04	1.02	0.32	0.30	0.09	7/32	0.80	0.79	K = L - 5/16	7/32
1	0.996	0.991	1.19	1.17	0.35	0.33	0.10	7/32	0.93	0.92	K = L - 5/16	7/32

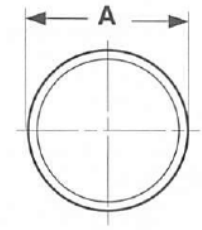
Description	A solid pin with a cylindrical head, chamfered point, and drilled hole through the side of the pin, slightly above the end.
Applications/ Advantages	Designed to be used with a cotter pin to connect two forked ends of one object to another structural member, such as attaching a pipe hanger to a support beam.
Material	1010 or 1018 low carbon steel
Case Depth*	.010 - .016 in.
Hardness*	Rockwell C 57 minimum. Case hardened pins are marked with a "H" on top of the head and can withstand a #58 file without incurring damage.
Plating	See Appendix-A for plating information.

*Applies to case-hardened pins only.

DOWEL PINS

Alloy Steel





DOWEL PINS, STANDARD SERIES

ASME B18.8.2-2010

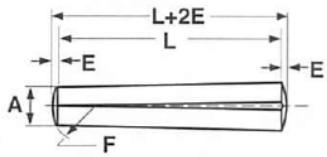
Nominal Size or Nominal Pin Diameter		A Pin Diameter			B Point Diameter		C Crown Height	R Crown Radius	Single Shear Load - Carbon or Alloy Steel	Suggested Hole Diameter	
		Basic	Max	Min	Max	Min	Max	Min	lb.	Max	Min
1/8	.1250	0.1252	0.1253	0.1251	0.120	0.110	0.041	0.016	1,600	0.1250	0.1245
3/16	.1875	0.1877	0.1878	0.1876	0.180	0.170	0.062	0.023	3,600	0.1875	0.1870
1/4	.2500	0.2502	0.2503	0.2501	0.240	0.230	0.083	0.031	6,400	0.2500	0.2495
5/16	.3125	0.3127	0.3128	0.3126	0.302	0.290	0.104	0.039	10,000	0.3125	0.3120
3/8	.3750	0.3752	0.3753	0.3751	0.365	0.350	0.125	0.047	14,350	0.3750	0.3745
7/16	.4375	0.4377	0.4378	0.4376	0.424	0.409	0.146	0.055	19,550	0.4375	0.4370
1/2	.5000	0.5002	0.5003	0.5001	0.486	0.471	0.167	0.063	25,500	0.5000	0.4995
5/8	.6250	0.6252	0.6253	0.6251	0.611	0.595	0.208	0.078	39,900	0.6250	0.6245
3/4	.7500	0.7502	0.7503	0.7501	0.735	0.715	0.250	0.094	57,000	0.7500	0.7495
7/8	.8750	0.8752	0.8753	0.8751	0.860	0.840	0.293	0.109	78,000	0.8750	0.8745
1	1.0000	1.0002	1.0003	1.0001	0.980	0.960	0.333	0.125	102,000	1.0000	0.9995

Tolerance on Length	±0.010 in. (all sizes and lengths)

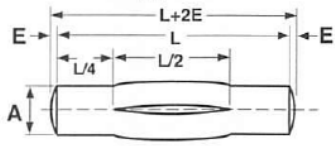
Description	A solid headless straight pin with a closely controlled diameter. One end is chamfered with the other end radiused to form a crown.
Applications/ Advantages	Wide variety of uses, including as a plug gage, hinge or shaft. Precise tolerances of dowel pins make them excellent for achieving proper alignment of parts in high-speed assemblies, or as roller bearings in bus/truck wheel housings. ***Important Note***: Dowel pins should be installed by being pressed in, ***not*** struck with an impact force.
Material	Pins shall be made from any alloy steel capable of achieving the proper hardness requirements listed herein, having sulfur content of 0.05% maximum, and phosphorus content of 0.04% maximum.
Heat Treatment	Pins shall be hardened by quenching in oil from austenitizing temperature and tempering to meet the proper Rockwell hardness and case depth.
Core Hardness	Rockwell C 47 - 58
Case Hardness	Rockwell C 60 minimum
Case Depth	***5/32 diameter & smaller:*** 0.010 in., minimum. ***3/16 diameter and larger:*** 0.015 in. minimum.
Finish	See Appendix-A for information about the various finishes for dowel pins.

Low Carbon, Alloy Steel & Stainless Steel GROOVED PINS

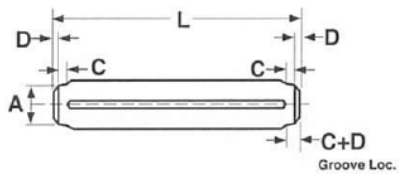
Type A



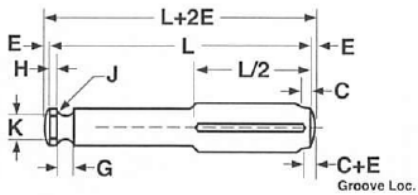
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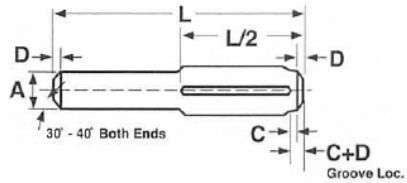
Type F



Type G



Type H



GROOVED PINS

ASME B18.8.2-2010

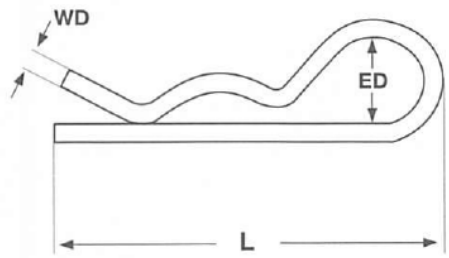
Nominal Size or Basic Pin Diameter		A Pin Diameter		C Pilot Length	D Chamfer Length	E Crown Height	F Crown Radius		G Neck Width		H Shoulder Length		J Neck Radius	K Neck Diameter		Double Shear Load, Min., lb. Material		
		Max	Min	Ref	Min	Nom	Max	Min	Max	Min	Max	Min	Ref	Max	Min	Low Carbon Steel	Alloy Steel	Stainless Steel
1/32	0.0312	0.0312	0.0297	0.015	....	....	....	....	....	....	....	....	....	....	....	100	180	140
3/64	0.0469	0.0469	0.0454	0.031	....	....	....	....	....	....	....	....	....	....	....	220	400	300
1/16	0.0625	0.0625	0.0610	0.031	0.005	0.0065	0.088	0.068	....	....	....	....	....	....	....	410	720	540
5/64	0.0781	0.0781	0.0766	0.031	0.005	0.0087	0.104	0.084	....	....	....	....	....	....	....	620	1120	860
3/32	0.0938	0.0938	0.0923	0.031	0.005	0.0091	0.135	0.115	0.038	0.028	0.041	0.031	0.016	0.067	0.057	890	1600	1240
7/64	0.1094	0.1094	0.1074	0.031	0.005	0.0110	0.150	0.130	0.038	0.028	0.041	0.031	0.016	0.082	0.072	1220	2180	1680
1/8	0.1250	0.1250	0.1230	0.031	0.005	0.0130	0.166	0.146	0.069	0.059	0.041	0.031	0.031	0.088	0.078	1600	2820	2200
5/32	0.1563	0.1563	0.1543	0.062	0.005	0.0170	0.198	0.178	0.069	0.059	0.057	0.047	0.031	0.109	0.099	2300	4520	3310
3/16	0.1875	0.1875	0.1855	0.062	0.016	0.0180	0.260	0.240	0.069	0.059	0.057	0.047	0.031	0.130	0.120	3310	6440	4760
7/32	0.2188	0.2188	0.2168	0.062	0.016	0.0220	0.291	0.271	0.101	0.091	0.072	0.062	0.047	0.151	0.141	4510	8770	6480
1/4	0.2500	0.2500	0.2480	0.062	0.016	0.0260	0.322	0.302	0.101	0.091	0.072	0.062	0.047	0.172	0.162	5880	11,500	8460
5/16	0.3125	0.3125	0.3105	0.094	0.031	0.0340	0.385	0.365	0.132	0.122	0.104	0.094	0.062	0.214	0.204	7660	17,900	12,700
3/8	0.3750	0.3750	0.3730	0.094	0.031	0.0390	0.479	0.459	0.132	0.122	0.135	0.125	0.062	0.255	0.245	11,000	26,000	18,200
7/16	0.4375	0.4375	0.4355	0.094	0.031	0.0470	0.541	0.521	0.195	0.185	0.135	0.125	0.094	0.298	0.288	15,000	35,200	24,800
1/2	0.5000	0.5000	0.4980	0.094	0.031	0.0520	0.635	0.615	0.195	0.185	0.135	0.125	0.094	0.317	0.307	19,600	46,000	32,400

Tolerance on Length	±0.010

Description	A solid, headless pin of fixed diameter and length, with crowned ends and longitudinal channels rolled or pressed into the body causing displacement of the pin material.
Applications/ Advantages	For temporary fastenings achieved by inserting the pin into a specifically sized hole, causing the pin stock to compress and become constrained against the hole wall. Can be preferable to a threaded fastener because hole need only be drilled, not tapped.
Material	***Low Carbon Steel:*** AISI 1006-1018; ***Alloy Steel:*** AISI 4037, 4130, 8630; ***Stainless Steel:*** 18-8 Stainless
Shear Load	Groove pins shall be capable of withstanding minimum double shear loads as listed in the above table.
Plating	See Appendix-A for plating information.

HITCH PIN CLIPS-BRIDGE PIN

Spring Steel



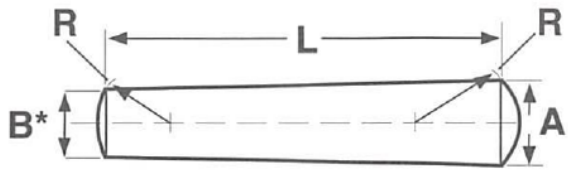
Hitch Pin Clips

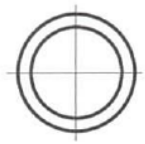
Kanebridge Part Number	WD	L	Drill Hole Size	Shaft Diameter		ED
	Wire Diameter	Length		Max	Min	Inside Diameter of Eye
02810PH	0.028	0.60	1/32	5/32	1/8	.093
03207PH	0.032	7/16	.040	9/64	7/64	.078
04216PH	0.042	1	3/64	1/4	3/16	1/4
0479.5PH	0.047	19/32	1/16	3/16	1/8	1/8
05412PH	0.054	3/4	1/16	1/4	3/16	1/8
06221PH	0.062	1 5/16	5/64	1/2	1/4	5/16
06225PH	0.062	1 9/16	5/64	1/2	3/8	3/8
07230PH	0.072	1 7/8	5/64	1/2	3/8	5/8
0721.5PH	0.072	1 3/32	5/64	3/8	5/16	9/64
08025PH	0.080	1 9/16	3/32	1/2	3/8	3/8
08019PH	0.080	1 3/16	3/32	3/8	1/4	1/4
09326PH	0.093	1 5/8	7/64	1/2	1/4	3/8
09332PH	0.093	2	7/64	1/2	5/16	5/8
09337PH	0.093	2 5/16	7/64	5/8	3/8	5/8
09340PH	0.093	2 1/2	7/64	3/4	1/2	9/16
12541PH	0.125	2 9/16	9/64	3/4	7/16	9/16
12531PH	0.125	1 15/16	9/64	3/4	1/2	7/16
14853PF	0.148	3 5/16	5/32	1 1/8	3/4	3/4
14847PH	0.148	2 15/16	5/32	1	5/8	3/4
17760PH	0.177	3 3/4	3/16	1 1/4	7/8	15/16
17752PH	0.177	3 1/4	3/16	1	5/8	15/16
24364PH	0.243	4	17/64	1	3/4	15/16
24382PH	0.243	5 1/8	17/64	1 1/2	1 1/4	1 1/2

Description	A double-bodied pin formed from round wire. The pin is formed in a way so one end is bent approximately 180° so that the two resulting sides meet or come close to meeting. The finished pin has one straight side and an opposite side with one or more turns permanently formed into it.
Applications/ Advantages	Hitch Pin Clips are designed to serve as a mating part to several other pins. The Bridge Pin variety is commonly used as a locking device with Clevis Pins. Bridge Pins are reusable.
Material	***Low Carbon Steel:*** MB Spring Wire
Plating	See Appendix-A for plating information.

Commerical & Precision Classes

TAPER PINS





***B = Nominal Diameter - (Length x .02083)**

TAPER PINS							ASME B18.8.2-2010
Pin Size Number and Basic Pin Diameter		A				R	
		Major Diameter (Large End)				End Crown Radius	
		Commercial Class		Precision Class			
		Max	Min	Max	Min	Max	Min
7/0	0.0625	0.0638	0.0618	0.0635	0.0625	0.072	0.052
6/0	0.0780	0.0793	0.0773	0.0790	0.0780	0.088	0.068
5/0	0.0940	0.0953	0.0933	0.0950	0.0940	0.104	0.084
4/0	0.1090	0.1103	0.1083	0.1100	0.1090	0.119	0.099
3/0	0.1250	0.1263	0.1243	0.1260	0.1250	0.135	0.115
2/0	0.1410	0.1423	0.1403	0.1420	0.1410	0.151	0.131
0	0.1560	0.1573	0.1553	0.1570	0.1560	0.166	0.146
1	0.1720	0.1733	0.1713	0.1730	0.1720	0.182	0.162
2	0.1930	0.1943	0.1923	0.1940	0.1930	0.203	0.183
3	0.2190	0.2203	0.2183	0.2200	0.2190	0.229	0.209
4	0.2500	0.2513	0.2493	0.2510	0.2500	0.260	0.240
5	0.2890	0.2903	0.2883	0.2900	0.2890	0.299	0.279
6	0.3410	0.3423	0.3403	0.3420	0.3410	0.351	0.331
7	0.4090	0.4103	0.4083	0.4100	0.4090	0.419	0.399
8	0.4920	0.4933	0.4913	0.4930	0.4920	0.502	0.482
9	0.5910	0.5923	0.5903	0.5920	0.5910	0.601	0.581
10	0.7060	0.7073	0.7053	0.7070	0.7060	0.716	0.696
11	0.8600	0.8613	0.8593	....	....	0.870	0.850
12	1.0320	1.0333	1.0313	....	....	1.042	1.022
13	1.2410	1.2423	1.2403	....	....	1.251	1.231
14	1.5230	1.5243	1.5223	....	....	1.533	1.513
Tolerance on Length		±0.010					

Description	A solid headless pin which has a controlled diameter, length and taper, with crowned ends.
Applications/ Advantages	Preferable style of pin when removal of the pin is expected since the tapered design allows for it to be driven out of its hole.
Material	SAE 1211 steel or SAE 1212 - 1213 or equivalent steel
Taper	***Commercial Class***: 0.250 per foot of length (± 0.006 in.); ***Precision Class***: 0.250 per foot of length (± 0.004 in.)
Concavity & Convexity	***Commercial Class***: *Pins up to 2 in., incl.*: 0.001; *Pins over 2 to 4 in., incl.*: 0.002; *Pins over 4 in.*: 0.004 ***Precision Class***: *Pins up to 2 in., incl.*: 0.0005; *Pins over 2 to 4 in., incl.*: 0.001; *Pins over 4 in.*: 0.002
Plating	Taper pins are usually supplied with a natural, uncoated finish.

THUMB & WING SCREWS

Head Body & Thread Dimensions
Mechanical and Performance Requirements

Thumb Screws, Plain Pattern..... 371

Thumb Screws, Shoulder Pattern..... 371

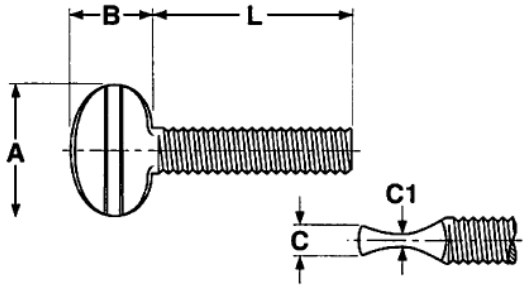
Thumb Screws, Knurled..... 372

Thumb Screws, Knurled w/Washer Face..... 373

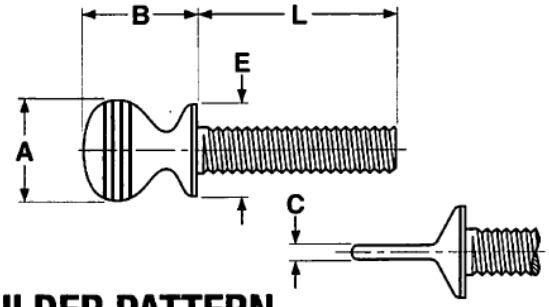
Wing Screws, Cold-Formed Type A..... 374

Wing Screws, Stamped..... 375

THUMB SCREWS



PLAIN PATTERN



SHOULDER PATTERN

THUMB SCREWS, PLAIN PATTERN (NO SHOULDER)

Nominal Size or Basic Screw Diameter		Threads per Inch	A	B	C	C1	L	
			Head Width	Head Height	Head Thickness	Head Thickness (mid-setion)	Practical Screw Lengths	
			Ref	Ref	Ref	Ref	Max	Min
6	0.138	32	0.41	0.29	0.08	0.03	1.00	0.25
8	0.164	32	0.44	0.30	0.10	0.05	1.00	0.38
10	0.190	24	0.55	0.43	0.12	0.06	2.00	0.38
12	0.216	24	0.47	0.53	0.13	0.06	2.00	0.38
1/4	0.250	20	0.81	0.55	0.16	0.07	2.50	0.50
5/16	0.312	18	0.87	0.67	0.19	0.09	3.00	0.50
3/8	0.375	16	1.02	0.75	0.24	0.11	3.00	0.75
1/2	0.500	13	1.75	1.22	0.39	0.13	3.00	1.00

THUMB SCREWS WITH SHOULDER

Nominal Size or Basic Screw Diameter		Threads per Inch	A	B	C	E	L	
			Head Width	Head Height	Head Thickness	Shoulder Diameter	Practical Screw Lengths	
			Ref	Ref	Ref	Ref	Max	Min
6	0.138	32	0.28	0.30	0.05	0.24	0.75	0.25
8	0.164	32	0.33	0.39	0.05	0.27	0.75	0.38
10	0.190	24 & 32	0.39	0.49	0.07	0.33	1.00	0.38
12	0.216	24	0.47	0.53	0.13	0.39	2.00	0.38
1/4	0.250	20	0.48	0.57	0.10	0.43	1.50	0.50
5/16	0.312	18	0.57	0.73	0.13	0.57	1.50	0.50
3/8	0.375	16	0.71	0.88	0.21	0.71	2.00	0.75
1/2	0.500	13	0.90	1.18	0.13	0.84	2.00	1.00

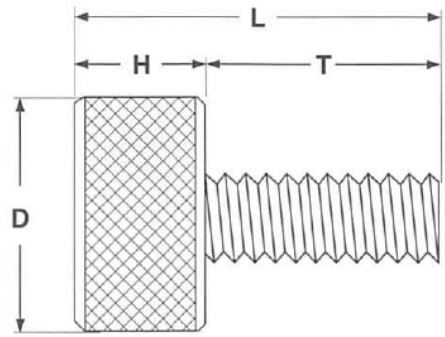
Due to the variation in head dimensions from different manufacturers, thumb screws may not always conform to the listed specifications.

Tolerance on Length	Nominal Screw Length		
	Up to 1 in., Incl.	Over 1 to 2 in., Incl.	Over 2 in.
	±0.03	±0.06	±0.09

Description	A cold headed, one-piece screw with rolled threads and a flattened head designed for manual turning without a driver or wrench. They are available in two varieties—with and without a shoulder under the head. The shoulder flares to a circular shape of a diameter slightly less than the head diameter of the screw.	
Applications/ Advantages	For use in applications where the fastener is frequently adjusted and where tightening torque greater than that achieved with finger pressure is not required. A shoulder-pattern allows the head of the screw to seat flush against the mating surface and helps avoid over-tightening of the fastener which could result in stripped mating threads.	
Material	*Steel*	*Stainless*
	Commercial quality carbon steel.	18-8 Stainless
Tensile Strength	48,000 psi. minimum	-
Plating	See Appendix-A for plating information.	Stainless thumb screws are typically supplied without secondary finishes.

THUMB SCREWS

Knurled

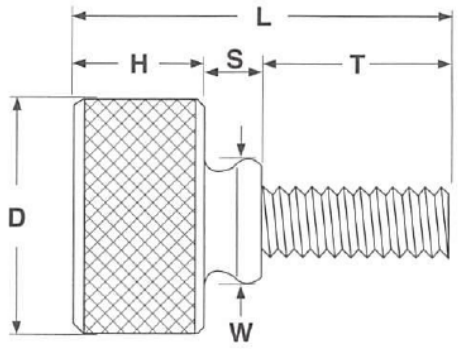


KNURLED THUMB SCREWS								
Thread Size x Thread Length	D		H		L		T	
	Head Diameter		Head Height		Overall Length		Thread Length	
	Max	Min	Max	Min	Max	Min	Max	Min
4-40 x 5/16	.332	.312	.203	.173	.515	.485	.322	.302
4-40 x 3/8	.332	.312	.203	.173	.577	.547	.385	.365
4-40 x 7/16	.332	.312	.203	.173	.640	.610	.448	.428
4-40 x 1/2	.332	.312	.203	.173	.703	.673	.510	.490
6-32 x 5/16	.332	.312	.203	.173	.515	.485	.322	.302
6-32 x 3/8	.332	.312	.203	.173	.577	.547	.385	.365
6-32 x 7/16	.332	.312	.203	.173	.640	.610	.448	.428
6-32 x 1/2	.332	.312	.203	.173	.703	.673	.510	.490
8-32 x 3/8	.395	.375	.203	.173	.577	.547	.385	.365
8-32 x 7/16	.395	.375	.203	.173	.640	.610	.448	.428
8-32 x 1/2	.395	.375	.203	.173	.703	.673	.510	.490
8-32 x 9/16	.395	.375	.203	.173	.765	.735	.572	.552
8-32 x 5/8	.395	.375	.203	.173	.827	.797	.635	.615
10-32 x 3/8	.458	.437	.203	.173	.577	.547	.385	.365
10-32 x 7/16	.458	.437	.203	.173	.640	.610	.448	.428
10-32 x 1/2	.458	.437	.203	.173	.703	.673	.510	.490
10-32 x 9/16	.458	.437	.203	.173	.765	.735	.572	.552
10-32 x 5/8	.458	.437	.203	.173	.827	.797	.635	.615

Description	A one-piece screw with a cylindrically-shaped head and a fully-threaded shank with a unified thread pitch. The head has a smooth, flat top and a roughened surface around its full circumference.	
Applications / Advantages	For use in applications where periodic manual adjustment is required and where finger pressure can supply sufficient tightening torque.	
Material	303 Stainless Steel	Aluminum Alloy 6061 T6
Plating	Parts are typically supplied without any additional coating or finish.	

Knurled with Washer Face

THUMB SCREWS

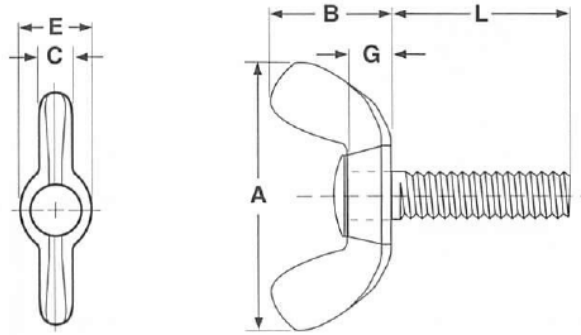


Knurled Thumb Screws with Washer Face

Thread Size x Thread Length	D		H		L		T		S	W	
	Head Diameter		Head Height		Overall Length		Thread Length		Shoulder Length	Washer Face Width	
	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Max	Min
4-40 x 5/16	.395	.375	.203	.173	.640	.610	.322	.302	.125	.406	.344
4-40 x 3/8	.395	.375	.203	.173	.703	.672	.385	.365			
4-40 x 7/16	.395	.375	.203	.173	.765	.735	.448	.428			
6-32 x 3/8	.395	.375	.203	.173	.703	.672	.385	.365			
6-32 x 7/16	.395	.375	.203	.173	.765	.735	.448	.428			
6-32 x 1/2	.395	.375	.203	.173	.828	.797	.510	.490			
8-32 x 3/8	.458	.437	.203	.173	.703	.672	.385	.365			
8-32 x 1/2	.458	.437	.203	.173	.703	.673	.510	.490			
8-32 x 5/8	.458	.437	.203	.173	.953	.922	.635	.615			
10-32 x 3/8	.520	.500	.203	.173	.577	.547	.385	.365			
10-32 x 1/2	.520	.500	.203	.173	.828	.797	.510	.490			
10-32 x 5/8	.520	.500	.203	.173	.953	.922	.635	.615			

Description	A one-piece screw with a cylindrically-shaped head, a fully-threaded shank with a unified thread pitch, and a shoulder section that separates the two. The head has a smooth, flat top and a roughened surface around its full circumference. The shoulder has two sections, the wider of the two which serves as a washer face directly above the threaded shank.	
Applications / Advantages	For use in applications where periodic manual adjustment is required and where finger pressure can supply sufficient tightening torque. The washer face-design allows the head of the screw to seat flush against the mating surface and guards against over-tightening the screw which could strip the mating threads.	
Material	303 Stainless Steel	Aluminum Alloy 6061 T6
Plating	Parts are typically supplied without any additional coating or finish.	

WING SCREWS — Type A



Cold-Formed Wing Screws, Type A

ASME B18.6.8-2010

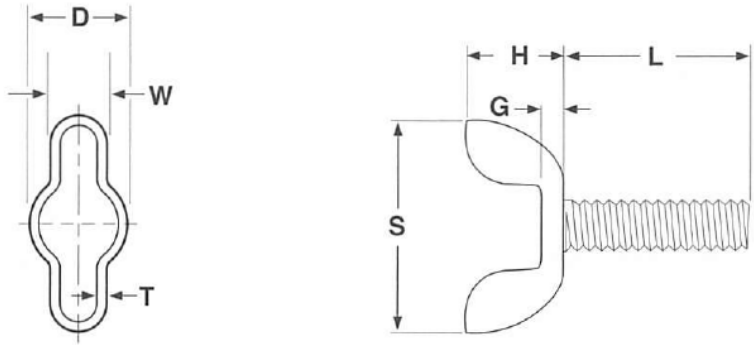
Nominal Size	Threads per Inch	A		B		C		E		G	
		Wing Spread		Wing Height		Wing Thickness		Boss Diameter		Boss Height	
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
8	32	0.91	0.78	0.47	0.34	0.14	0.10	0.43	0.39	0.18	0.14
10	24 & 32	0.91	0.78	0.47	0.34	0.14	0.10	0.43	0.39	0.18	0.14
1/4	20	1.10	0.97	0.57	0.43	0.18	0.14	0.50	0.45	0.22	0.17
5/16	18	1.25	1.12	0.66	0.53	0.21	0.17	0.58	0.51	0.25	0.20
3/8	16	1.44	1.31	0.79	0.65	0.24	0.20	0.70	0.64	0.30	0.26

Tolerance on Length	Nominal Screw Lengths		
	Up to 1 inch, incl.	over 1 inch to 2 inch, incl.	over 2 inch
	± 0.03	± 0.06	± 0.09

Description	A screw having a wing-shaped head designed for manual turning without a driver or wrench. The type-A style is manufactured in two pieces with the cold-formed, winged head portion installed permanently to the shank.
Applications/ Advantages	For use in applications where the fastener is frequently adjusted and where tightening torque greater than that achieved with finger pressure is not required. Greater torque can be applied manually turning a wing screw than a thumb screw because of the wider head. The case-hardened shank of the Type-A wing screw gives the threads greater resistance to abrasion than other low carbon wing screws.
Material	Carbon steel (the shank is case-hardened)
Plating	See Appendix-A for plating information.

Stamped Style

WING SCREWS



WING SCREWS - STAMPED STYLE

Basic Screw Diam.	Threads per Inch	S		H		W		D		G		T		L	
		Wing Spread		Wing Height		Wing Thickness		Wing Minor Diameter		Height		Stock Thickness		Practcal Screw Length	
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
6	32	0.78	0.72	0.40	0.34	0.18	0.12	0.40	0.34	0.21	0.14	0.04	0.03	0.75	0.25
8	32	0.78	0.72	0.40	0.34	0.18	0.12	0.40	0.34	0.21	0.14	0.04	0.03	0.75	0.38
10	24 & 32	0.90	0.84	0.46	0.40	0.21	0.15	0.53	0.47	0.22	0.16	0.04	0.03	1.00	0.38
1/4	20	1.09	1.03	0.46	0.40	0.26	0.20	0.61	0.55	0.24	0.18	0.04	0.03	1.50	0.50
5/16	18	1.31	1.25	0.62	0.56	0.29	0.23	0.68	0.62	0.29	0.23	0.07	0.05	1.50	0.50

Tolerance on Length	Nominal Screw Length		
	Up to 1 in., Incl.	Over 1 in. to 2 in., Incl.	Over 2 in.
	±0.03	±0.06	±0.09

Description	A screw having a wing-shaped head designed for manual turning without a driver or wrench. The stamped style is manaufactured in two pieces with the stamped winged head portion welded to the shank.
Applications/ Advantages	For use in applications where the fastener is frequently adjusted and where tightening torque greater than that achieved with finger pressure is not required. Greater torque can be applied manually turning a wing screw than a thumb screw because of the wider head.
Material	Commercial quality carbon steel.
Plating	See Appendix-A for plating information.

WOODWORKING SCREWS

Standard Full-Body Wood Screws

Head Dimensions
- Flat Head, Phillips & Slotted 378
- Flat Head, Square Recess 378
- Round Head, Phillips & Slotted 379
- Oval Head, Phillips & Slotted 379

Thread & Body Dimensions 380

Mechanical Requirements 380

Deep Thread Style

FLAT Head

Phillips 381
Phillips with Nibs 382
Square & Square/Phillips with Nibs (#9 Diam w/#8 Hd) Type 17 Pt 383
Square/Phillips 384
Phillips Flat Undercut, Type 17 Pt 385
Phillips, No Nibs, Type 17 Pt 386
Phillips with Nibs, Type 17 Pt 387
Square/Phillips with Nibs, Type 17 Pt 388
Phillips *Large* Flat, Sharp & Type 17 Pt 389
Six-Lobe Recess, Type 17 Pt, Stainless 390
Six-Lobe Recess, Type 17 Pt, Steel 391
Square Recess 392
Square Recess with Nibs, Type 17 Pt 393

LOW PROFILE PAN Head

Phillips 394

PAN Head

Phillips Recess, Type 17 Pt 395
Phillips Recess 396
Square Recess, 17 Point 397
Square Recess 398
Square Phillips Recess, 17 Point 399

ROUND WASHER Head

Phillips Recess 400
Square Recess w/Type-17 Point 401
Square Recess 402
Square/Phillips w/Type-17 Pt 403
Square Phillips 404
Six-Lobe Recess w/Long Type 17 Pt 405

Deep Thread Style (continued)

LARGE ROUND WASHER Head

Phillips Recess....406
Phillips Recess w/Type 17 Pt....407
Square Phillips Recess w/Type 17....408

TRUSS Head

Phillips Recess....409
Phillips Recess, #8 with #6 Head....410
Phillips Recess w/Type 17 Pt....411
Square Recess w/Type 17 Pt....412
Square/Phillips Recess, #8 with #6 Head....413

Face Framing Type-17

PAN Head—#6 Diameter w/#7 Head

Phillips Recess, Fine Thread....414
Square Recess, Coarse Thread....415
Square Recess Fine Thread....416

MODIFIED PAN Head

Square Recess, Coarse Thread....417
Square Recess, Fine Thread....418
Square Recess, High/Low Thread....419

ROUND WASHER Head

Square Recess, Fine Thread....420
Square Recess, Coarse Thread....421

Hinge

Phillips Recess Flat, Coarse Thread....422
Phillips Recess Flat, Fine Thread....423
Phillips Recess Oval, Coarse Thread....424

Installation, Type 17

Phillips Round Washer, High Low Thread....425

Pole Barn, Type 17

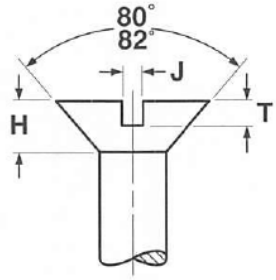
Hex Washer, High Low Thread....426

Type-A Tapping, Type 17

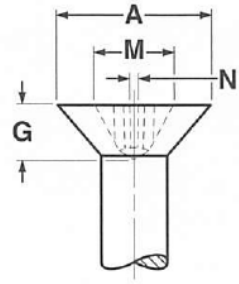
Phillips Truss....427

HEAD DIMENSIONS

Slotted & Phillips Flat
Square Flat



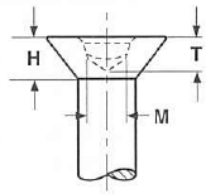
Slotted

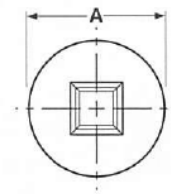


Phillips

PHILLIPS & SLOTTED FLAT HEADS FOR WOOD SCREWS — ASME B18.6.1

Nominal Size	A		H	J		T		M		G		N	Phillips Driver Size
	Head Diameter		Head Height	Width of Slot		Depth of Slot		Dimensions of Recess					
								Diameter		Depth		Width	
	Max	Min	Ref	Max	Min	Max	Min	Max	Min	Max	Min	Min	
2	.172	.147	.051	.031	.023	.023	.015	.102	.089	.063	.047	.017	1
3	.199	.171	.059	.035	.027	.027	.017	.107	.094	.068	.052	.018	1
4	.225	.195	.067	.039	.031	.030	.020	.128	.115	.089	.073	.018	1
5	.252	.220	.075	.043	.035	.034	.022	.154	.141	.086	.063	.027	2
6	.279	.244	.083	.048	.039	.038	.024	.174	.161	.106	.083	.029	2
7	.305	.268	.091	.048	.039	.041	.027	.189	.176	.121	.098	.030	2
8	.332	.292	.100	.054	.045	.045	.029	.204	.191	.136	.113	.032	2
9	.358	.316	.108	.054	.045	.049	.032	.214	.201	.146	.123	.033	2
10	.385	.340	.116	.060	.050	.053	.034	.258	.245	.146	.123	.034	3
12	.438	.389	.132	.067	.056	.060	.039	.283	.270	.171	.148	.036	3
14	.507	.452	.153	.075	.064	.070	.046	.283	.270	.171	.148	.036	3
16	.544	.485	.164	.075	.064	,075	.049	.303	.290	.191	.168	.039	3

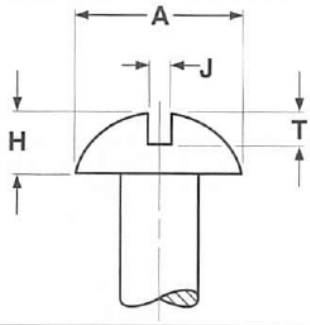


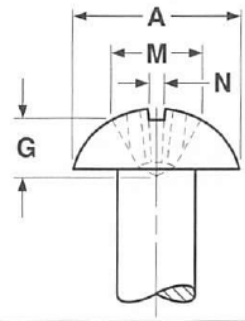


SQUARE FLAT HEADS FOR WOOD SCREWS

Nominal Size	A		H	M	T		Driver Size
	Head Diameter		Head Height	Recess Square	Recess Penetration Gaging Depth		
	Max	Min	Ref	Ref	Max	Min	
6	.279	.244	.083	.091	.055	.040	1
8	.332	.292	.100	.112	.063	.048	2
9	.358	.316	.108	.112	.075	.060	2
10	.385	.340	.116	.112	.075	.060	2
12	.438	.389	.132	.133	.095	.080	3

Round Head
Oval Head
HEAD DIMENSIONS

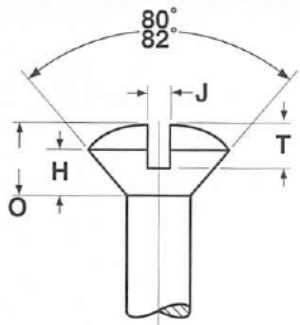


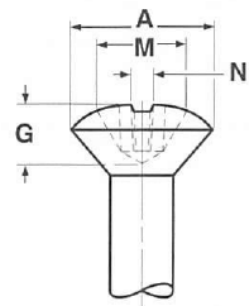


Round Heads for Wood Screws

ASME B18.6.1

Nominal Size	A		H		J		T		M		G		N	Phillips Driver Size
	Head Diameter		Height of Head		Width of Slot		Depth of Slot		Dimensions of Recess					
									Diameter		Depth		Width	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Min	
2	.162	.146	.069	.059	.031	.023	.048	.037	.114	.101	.064	.042	.018	1
4	.211	.193	.086	.075	.039	.031	.058	.044	.130	.117	.083	.063	.019	1
5	.236	.217	.095	.083	.043	.035	.063	.047	.154	.141	.074	.046	.027	2
6	.260	.240	.103	.091	.048	.039	.068	.051	.162	.149	.084	.056	.027	2
7	.285	.264	.111	.099	.048	.039	.072	.055	.170	.157	.092	.066	.028	2
8	.309	.287	.120	.107	.054	.045	.077	.058	.178	.165	.101	.075	.030	2
9	.334	.311	.128	.115	.054	.045	.082	.062	.186	.173	.110	.084	.030	2
10	.359	.334	.137	.123	.060	.050	.087	.065	.195	.182	.119	.093	.031	2
12	.408	.382	.153	.139	.067	.056	.096	.073	.249	.236	.125	.099	.032	3
14	.457	.429	.170	.155	.075	.064	.106	.080	.265	.252	.142	.116	.034	3



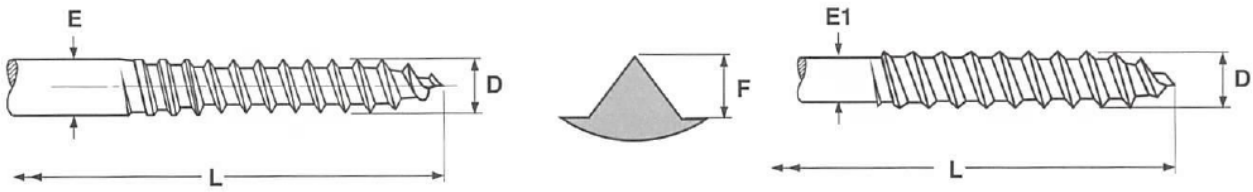


Oval Heads for Wood Screws

ASME B18.6.1

Nominal Size	A		H	O		J		T		M		G		N	Phillips Driver Size
	Head Diameter		Height of Head			Width of Slot		Depth of Slot		Dimensions of Recess					
			Side Height	Total Height						Diameter		Depth		Width	
	Max	Min	Ref	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Min	
4	.225	.195	.067	.104	.084	.039	.031	.059	.049	.136	.123	.094	.077	.019	1
5	.252	.220	.075	.116	.095	.043	.035	.067	.055	.158	.145	.085	.061	.028	2
6	.279	.244	.083	.128	.105	.048	.039	.074	.060	.178	.165	.105	.080	.030	2
8	.332	.292	.100	.152	.126	.054	.045	.088	.072	.205	.192	.131	.106	.033	2
9	.358	.316	.108	.164	.137	.054	.045	.095	.078	.216	.203	.144	.119	.034	2
10	.385	.340	.116	.176	.148	.060	.050	.103	.084	.261	.248	.142	.118	.037	3
12	.438	.389	.132	.200	.169	.067	.056	.117	.096	.283	.270	.165	.140	.040	3

MECHANICAL REQUIREMENTS — Cut & Rolled Threads



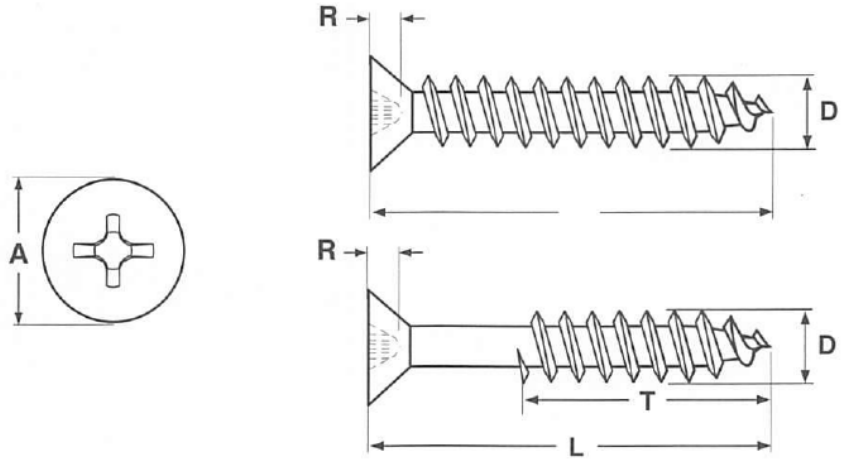
Thread & Body Diameters for Wood Screws • Cut & Rolled Thread Types — ASME B18.6.1

Nominal Size or Basic Screw Diameter		Threads per Inch (±10%)	D		E		E1		F
			Major Thread Diameter		Body Diameter (Cut Thread)		Body Diameter (Rolled Thread)		Thread Depth
			Max	Min	Max	Min	Max	Min	Min
2	.086	26	.090	.079	.090	.079	.075	.064	.010
3	.099	24	.103	.092	.103	.092	.086	.075	.014
4	.112	22	.116	.105	.116	.105	.095	.084	.016
5	.125	20	.129	.118	.129	.118	.107	.096	.018
6	.138	18	.142	.131	.142	.131	.118	.107	.020
7	.151	16	.155	.144	.155	.144	.127	.116	.022
8	.164	15	.168	.157	.168	.157	.136	.125	.023
9	.177	14	.181	.170	.181	.170	.147	.136	.026
10	.190	13	.194	.183	.194	.183	.157	.146	.030
12	.216	11	.220	.209	.220	.209	.176	.165	.031
14	.242	10	.246	.235	.246	.235	.201	.190	.035
16	.268	9	.272	.261	.272	.261	.214	.203	.038

Tolerance on Length	Nominal Screw Length			
	Up to 5/8 in., Incl.	Over 5/8 to 1-1/2 in., Incl.	Over 1-1/2 to 2-3/4 in., Incl.	Over 2-3/4 in.
	+0, -0.03	+0, -0.05	+0, -0.06	+0, -0.09

Description	A thread forming screw having a gimlet point, and a sharp crested, coarse pitch thread. Wood screws are produced two ways: Cut thread screws have a tapered shank; Rolled thread screws have a constant shank diameter.
Applications/ Advantages	Will produce a mating thread when assembled into wood or other resilient materials.
Material	Carbon steel
Length of Thread	***Cut thread screws:*** Approximately two-thirds of the nominal length of the screw. ***Rolled thread screws:*** At least four times the basic screw diameter or two-thirds of the nominal screw length, whichever is greater. Screws of nominal lengths too short to accomodate the minimum thread length shall have threads extending as close to the underside of the head as practicable.
Plating	See Appendix-A for plating information.

Flat Head w/ Phillips Recess DEEP THREAD



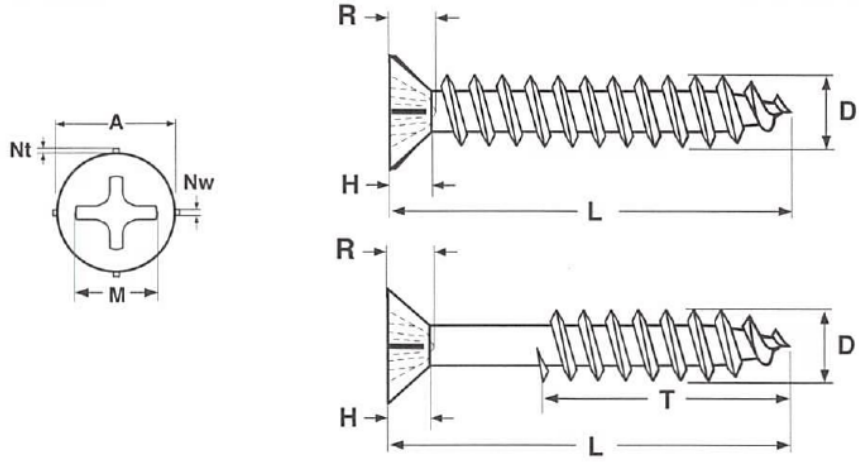
FLAT PHILLIPS DEEP THREAD WOOD SCREW									
Nominal Diameter	A		R		D		T		Phillips Driver Size
	Head Diameter		Recess Depth		Major Diameter		Threaded Length		
	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	
5	0.237	0.215	0.075	0.052	0.133	0.122	Full thread	2/3 thread	2
6	0.262	0.238	0.095	0.072	0.141	0.135	Full thread	2/3 thread	2
7	0.295	0.267	0.103	0.080	0.154	0.148	Full thread	2/3 thread	2
8	0.332	0.292	0.110	0.087	0.174	0.164	Full thread	2/3 thread	2

Tolerance on Length	Up to 5/8"	+0 / -0.03
	Over 5/8 to 1.5"	+0 / -0.05
	Over 1.5 to 2.75"	+0 / -0.06
	Over 2.75 to 5"	+0 / -0.09

Description	An externally threaded fastener with a countersunk head, crossed recess, a single lead thread and a shank with a reduced diameter.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimim
Case Depth	0.004" - 0.009"
Torque	**#5**: 15 kg/cm minimum; **#6**: 21 kg/cm minimum; **#7**: 26 kg/cm minimum; **#8**: 35 kg/cm minimum
Plating	See Appendix-A for plating information

DEEP THREAD

Flat Head w/Nibs & Phillips Recess



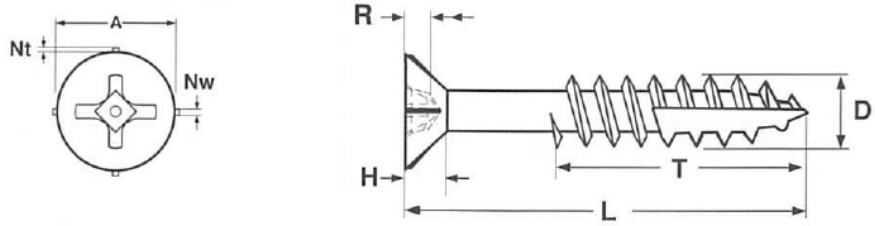
FLAT PHILLIPS DEEP THREAD WOOD SCREW WITH NIBS												
Nominal Diameter	A		H	Nw	Nt	R		D		T		Phillips Driver Size
	Head Diameter		Head Height	Nib Width	Nib Thickness	Recess Depth		Major Diameter		Threaded Length		
	Max	Min	Ref	Ref	Ref	Max	Min	Max	Min	L ≤ 1"	L > 1"	
8	0.332	0.292	0.100	0.022	0.013	0.110	0.087	0.174	0.164	Full thread	2/3 thread	2
9	0.358	0.316	0.108	-	-	0.125	0.102	0.184	0.173	Full thread	2/3 thread	2

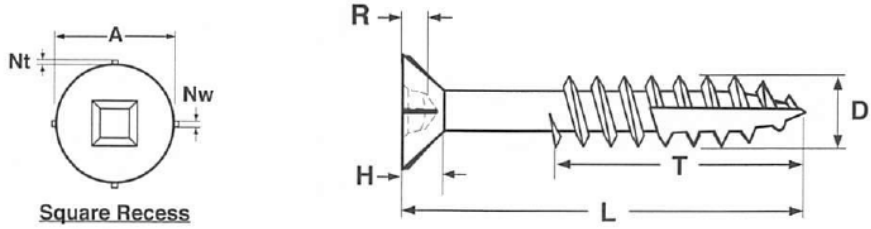
Tolerance on Length	Up to 5/8"	+0 / -0.03
	Over 5/8 to 1.5"	+0 / -0.05
	Over 1.5 to 2.75"	+0 / -0.06
	Over 2.75 to 5"	+0 / -0.09

Description	An externally threaded fastener with a countersunk head, crossed recess, a single lead thread and a shank with a reduced diameter.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The nibs on the bearing surface of the head helps the screw seat flush.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimim
Case Depth	0.004" - 0.009"
Torque	#8: 35 kg/cm minimum
Plating	See Appendix-A for plating information

#9 Screw w/ #8 Flat Head w/ Combo Phillips/Square Recess — TYPE-17 DEEP THREAD

Square-Phillips Combo Recess





Square Recess

#9 Deep Thread Wood Screw—Type-17 with #8 Flat Head with Nibs

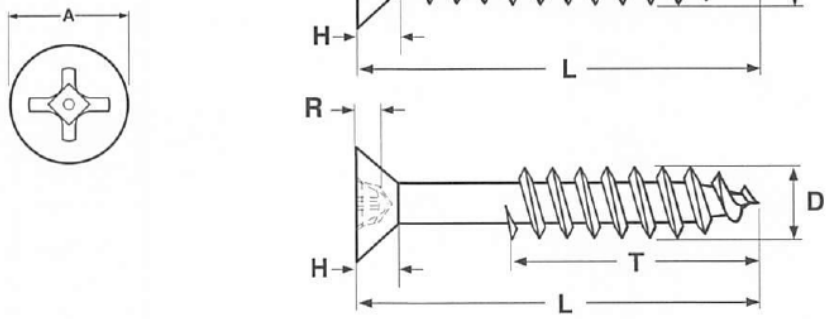
Nominal Diameter	A		H	Nw	Nt	R		D		T		Phillips & Square Driver Size
	Head Diameter		Head Height	Nib Width	Nib Thickness	Square Recess Penetration Depth		Major Diameter		Threaded Length		
	Max	Min	Ref	Ref	Ref	Max	Min	Max	Min	L ≤ 1"	L > 1"	
9	0.312	0.285	0.100	0.022	0.013	0.080	0.048	0.181	0.174	Full thread	2/3 thread	# 2

Tolerance on Length	Up to 5/8"	+0 / -0.03
	Over 5/8 to 1.5"	+0 / -0.05
	Over 1.5 to 2.75"	+0 / -0.06
	Over 2.75 to 5"	+0 / -0.09

Description	An externally threaded fastener with a countersunk head, crossed recess that will also accept a square driver bit, a single lead thread and a shank with a reduced diameter. The head diameter is 90% its normal size. The nibs on the underside of the head aid in the countersinking process by removing additional material. The shank has a reduced diameter and a chip cavity cut out where the final several threads end at the tip.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The nibs on the bearing surface of the head helps the screw seat flush. The type-17 point enables faster starting. The recess design allows for multiple drive tools. Popular use is in cabinet assembly.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimim
Case Depth	0.004" - 0.009"
Torque	
Plating	See Appendix-A for plating information

DEEP THREAD

Flat Head w/ Square/Phillips Combo Recess

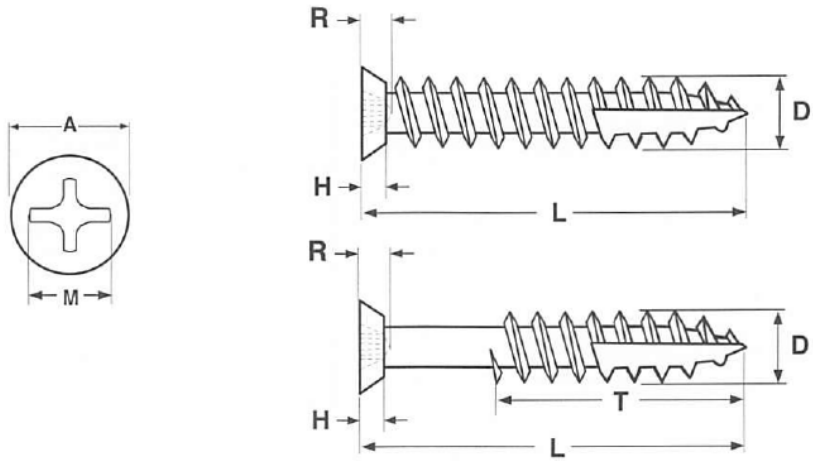


FLAT COMBINATION SQUARE/PHILLIPS RECESS DEEP THREAD WOOD SCREW										
Nominal Diameter	A		H	R		D		T		Recess Size
	Head Diameter		Head Height	Recess Depth		Major Diameter		Threaded Length		
	Max	Min	Ref	Max	Min	Max	Min	L ≤ 1"	L > 1"	
6	0.262	0.238	0.083	0.058	0.041	0.141	0.135	Full thread	2/3 thread	#2
8	0.312	0.285	0.100	0.075	0.048	0.169	0.159	Full thread	2/3 thread	#2

Tolerance on Length	Up to 5/8"	+0 / -0.03
	Over 5/8 to 1.5"	+0 / -0.05
	Over 1.5 to 2.75"	+0 / -0.06
	Over 2.75 to 5"	+0 / -0.09

Description	An externally threaded fastener with a countersunk head; a recess that accepts both a Phillips drive or a square socket; a single lead thread and a shank with a reduced diameter.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The combo drive increases productivity by reducing tool changes.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimim
Case Depth	0.004" - 0.009"
Torque	#6 Diameter: 21 kg/cm minimum; #8 Diameter: 35 kg/cm minimum
Plating	See Appendix-A for plating information

Undercut Flat Head w/ Phillips Recess — TYPE-17 DEEP THREAD



Undercut Flat Phillips Deep Thread Wood Screw

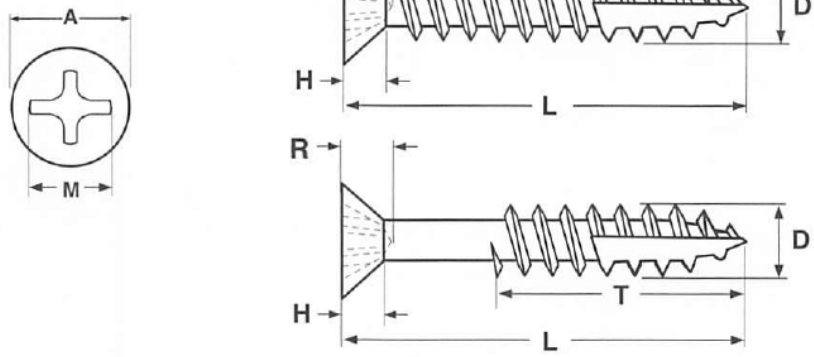
Nominal Diameter	A		H		R		M	D		T		Recess Driver Size
	Head Diameter		Head Height		Recess Depth		Recess Width	Major Diameter		Threaded Length		
	Max	Min	Max	Min	Max	Min	Ref	Max	Min	L ≤ 1"	L > 1"	
6	0.262	0.238	0.059	0.048	0.067	0.044	0.140	0.141	0.135	Full thread	2/3 thread	2
7	0.287	0.262	0.064	0.053	0.075	0.052	0.148	0.154	0.148	Full thread	2/3 thread	2

Tolerance on Length	Up to 5/8"	± 0.03
	Over 5/8 to 1.5"	± 0.05
	Over 1.5 to 2.75"	± 0.06
	Over 2.75 to 5"	± 0.09

Description	An externally threaded fastener with a countersunk head that is undercut to approximately 70% of its normal height, crossed recess, a single lead thread and a shank with a reduced diameter.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. Undercut head design is ideal for applications requiring shorter length fasteners as the truncated head allows for greater thread engagement.
Material	C1018 - C1022 case-hardened steel
Surface Hardness	550 HV minimim
Case Depth	#6 & #7 diameters: 0.002" - 0.007"
Core Hardness	240 - 450 HV
Torque	#6: 21 Kg/cm minimum; #7: 28 Kg/cm minimum
Plating	See Appendix-A for plating information

TYPE-17 DEEP THREAD

Flat Head, No Nibs w/ Phillips Recess



Flat Phillips Recess Deep Thread Wood Screw with Type-17 Point

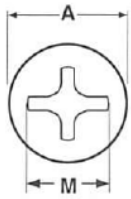
Nominal Diameter	A		H	R		M	D		T		Recess Size
	Head Diameter		Head Height	Recess Depth		Recess Diam.	Major Diameter		Threaded Length		
	Max	Min	Ref	Max	Min	Ref	Max	Min	L ≤ 1"	L > 1"	
5	0.237	0.215	0.075	0.075	0.052	0.148	0.133	0.122	Full thread	2/3 thread	#2
6	0.262	0.238	0.083	0.095	0.072	0.168	0.142	0.131	Full thread	2/3 thread	#2
8	0.312	0.285	0.100	0.110	0.087	0.182	0.169	0.159	Full thread	2/3 thread	#2
9	0.358	0.316	0.108	0.125	0.102	0.198	0.184	0.173	Full thread	2/3 thread	#2

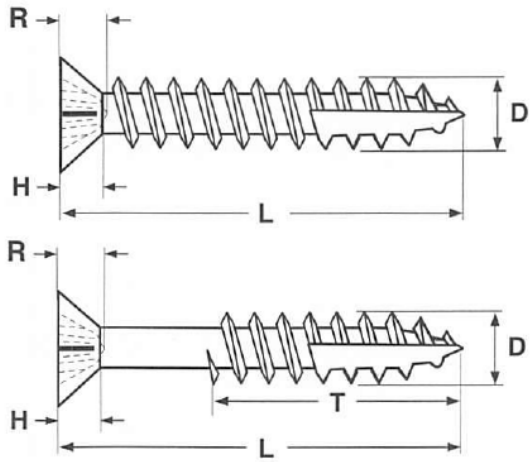
Tolerance on Length	
Up to 5/8"	±0.03
Over 5/8 to 1.5"	± 0.05
Over 1.5 to 2.75"	± 0.06
Over 2.75"	± 0.09

Description	An externally threaded fastener with a countersunk head, a crossed recess and a single lead thread. The shank has a reduced diameter and a chip cavity cut out where the final several threads end at the tip.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The chip cavity (or auger point) enables the fastener to drive—especially in denser woods—without pre-drilling a pilot hole.
Material	C1018 - C1022 case-hardened steel
Surface Hardness	Vickers HV 450 minimim
Case Depth	0.004" - 0.009"
Torque (Minimum)	#5: 15 kg/cm #6: 21 kg/cm #8: 37 kg/cm #9: 45 kg/cm
Plating	See Appendix-A for plating information

Flat Head with Nibs w/ Phillips Recess

TYPE-17 DEEP THREAD





Flat Hd with Nibs Phillips Recess Deep Thread Wood Screw with Type-17 Point

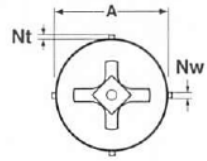
Nominal Diameter	A		H	R		M	D		T		Recess Size
	Head Diameter		Head Height	Recess Depth		Recess Diam.	Major Diameter		Threaded Length		
	Max	Min	Ref	Max	Min	Ref	Max	Min	L ≤ 1"	L > 1"	
6	0.262	0.238	0.083	0.095	0.072	0.168	0.142	0.131	Full thread	2/3 thread	#2
7	0.305	0.268	0.091	0.103	0.080	0.176	0.154	0.148	Full thread	2/3 thread	#2
8	0.312	0.285	0.100	0.110	0.087	0.182	0.169	0.159	Full thread	2/3 thread	#2
9	0.358	0.316	0.108	0.125	0.102	0.198	0.184	0.173	Full thread	2/3 thread	#2
10	0.385	0.340	0.116	0.126	0.101		0.194	0.187	Full thread	2/3 thread	#2

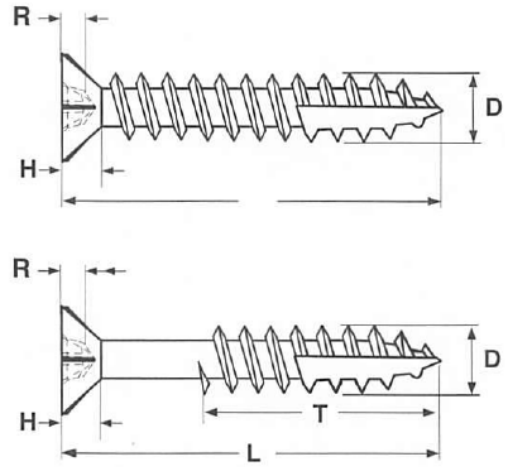
Tolerance on Length	Up to 5/8"	±0.03
	Over 5/8 to 1.5"	± 0.05
	Over 1.5 to 2.75"	± 0.06
	Over 2.75"	± 0.09

Description	An externally threaded fastener with a countersunk head, a crossed recess and a single lead thread. The nibs on the underside of the head aid in the countersinking process by removing additional material. The shank has a reduced diameter and a chip cavity cut out where the final several threads end at the tip.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The chip cavity (or auger point) enables the fastener to drive—especially in denser woods—without pre-drilling a pilot hole.
Material	C1018 - C1022 case-hardened steel
Surface Hardness	Vickers HV 550 minimim
Case Depth	0.004" - 0.009"
Torque (Minimum)	#6: 21 kg/cm #8: 37 kg/cm #9: 45 kg/cm #10: 55 kg/cm
Plating	See Appendix-A for plating information

TYPE-17 DEEP THREAD

Flat Head with Nibs & Square-Phillips Recess





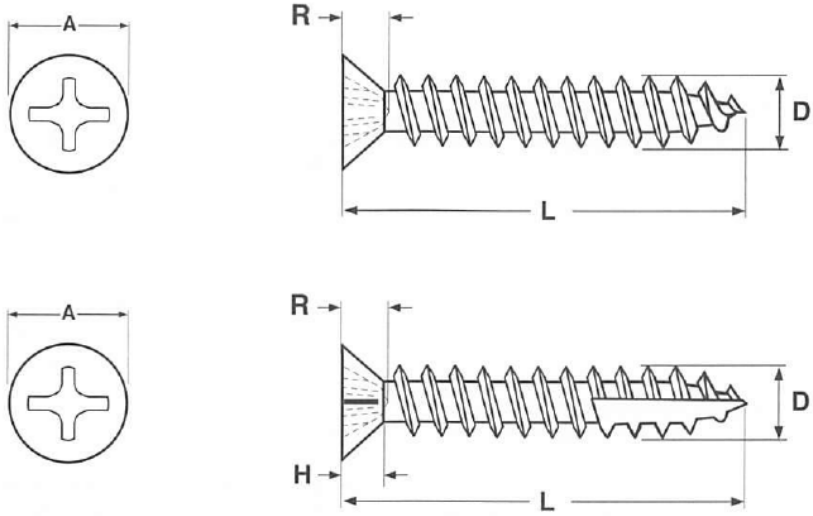
SQUARE-PHILLIPS COMBO FLAT HEAD DEEP THREAD WOOD SCREW—TYPE-17 WITH NIBS

Nominal Diameter	A		H	Nw	Nt	R		D		T		Phillips & Square Driver Size
	Head Diameter		Head Height	Nib Width	Nib Thickness	Square Recess Penetration Depth		Major Diameter		Threaded Length		
	Max	Min	Ref	Ref	Ref	Max	Min	Max	Min	L ≤ 1"	L > 1"	
6	0.262	0.238	0.083	0.022	0.013	0.065	0.057	0.142	0.131	Full thread	2/3 thread	# 1
8	0.312	0.285	0.100	0.022	0.013	0.080	0.048	0.168	0.161	Full thread	2/3 thread	# 2
9	0.337	0.295	0.108	0.022	0.013	0.080	0.055	0.181	0.174	Full thread	2/3 thread	# 2
10	0.385	0.340	0.116	0.022	0.013	0.083	0.064	0.194	0.187	Full thread	2/3 thread	# 2

Tolerance on Length	Up to 5/8"	+0 / -0.03
	Over 5/8 to 1.5"	+0 / -0.05
	Over 1.5 to 2.75"	+0 / -0.06
	Over 2.75 to 5"	+0 / -0.09

Description	An externally threaded fastener with a countersunk head, crossed recess that will also accept a square driver bit, a single lead thread and a shank with a reduced diameter. The nibs on the underside of the head aid in the countersinking process by removing additional material. The shank has a reduced diameter and a chip cavity cut out where the final several threads end at the tip.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The nibs on the bearing surface of the head helps the screw seat flush. The type-17 point enables faster starting. The recess design allows for multiple drive tools. Popular use is in cabinet assembly.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimim
Case Depth	0.004" - 0.009"
Torque (Minimum)	#6: 21 kg/cm #8: 37 kg/cm #9: 45 kg/cm #10: 55 kg/cm
Plating	See Appendix-A for plating information

Large Flat Head w/ Phillips Recess DEEP THREAD



LARGE FLAT PHILLIPS RECESS DEEP THREAD WOOD SCREW

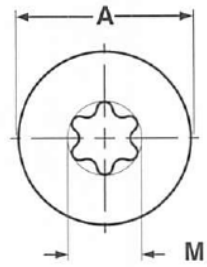
Nominal Diameter	A		R		D		T		Recess Size
	Head Diameter		Recess Depth		Major Diameter		Threaded Length		
	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	
6	0.279	0.260	0.095	0.072	0.141	0.135	Full thread	2/3 thread	#2

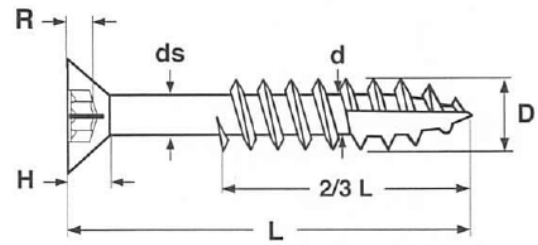
Tolerance on Length	Up to 5/8"	+0 / -0.03
	Over 5/8 to 1.5"	+0 / -0.05
	Over 1.5 to 2.75"	+0 / -0.06
	Over 2.75 to 5"	+0 / -0.09

Description	An externally threaded fastener with an oversized countersunk head, crossed recess, a single lead thread and a shank with a reduced diameter.
Applications / Advantages	The larger head size is ideal for fitting drawer slides and hinge plates in how they compensate for pre-drilled holes that run large. The deeper thread design offers greater resistance to pull-out forces. The type-17 chip cavity reduces the chances of splitting the wood.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimim
Case Depth	0.004" - 0.009"
Torque	#6: 22 kg/cm minimum
Plating	See Appendix-A for plating information

TYPE-17 EXTERIOR—STAINLESS

Flat Head w/ Six-Lobe Recess





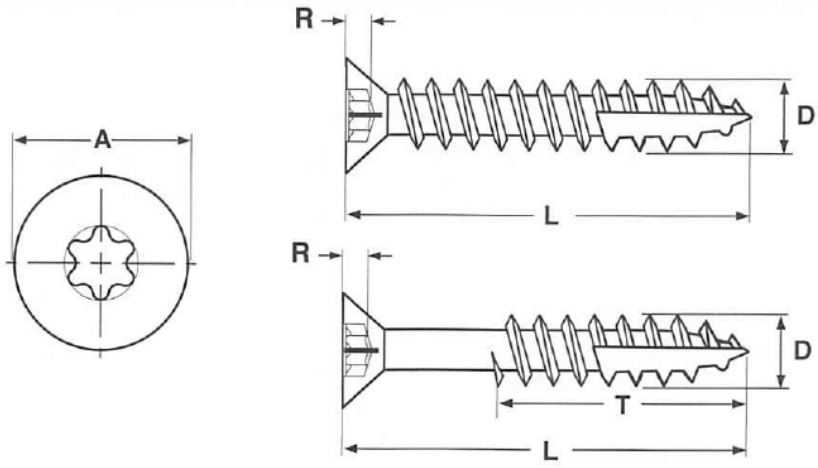
FLAT SIX-LOBE RECESS EXTERIOR SCREW WITH TYPE-17 POINT—STAINLESS

Nominal Diameter	A		H	R		M	D		d		ds	Recess Size
	Head Diameter		Head Height	Recess Depth		Recess Diameter	Major Diameter		Minor Diameter		Upper Shank Diameter	
	Max	Min	Ref	Max	Min	Ref	Max	Min	Max	Min	Ref	
6	0.275	0.247	0.083	0.059	0.051	0.132	0.162	0.153	0.101	0.092	0.114	T-15
8	0.328	0.295	0.100	0.075	0.062	0.155	0.181	0.172	0.112	0.104	0.126	T-20
10	0.381	0.335	0.116	0,087	0,074	0.178	0.203	0.190	0.128	0.119	0.141	T-25
12	0.433	0.392	0.131	0.102	0.082	0.195	0.238	0.225	0.154	0.145	0.169	T-27

Tolerance on Length		
	Up to 1.25"	+0 / -0.05"
	Over 1.25 to 2.5"	+0 / -0.06"
	Over 2.5 to 4"	+0 / -0.09"

Description	An externally threaded fastener with a countersunk head, six-lobed recess, a single lead thread. The shank has a reduced diameter and a chip cavity cut out where the final several threads end at the tip.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The six-lobe recess transmits drive torque with less required downward pressure.
Material	18-8 Stainless
Plating	Stainless Exterior screws typically are provided without any additional supplemental finish.

Flat Head w/ Six-Lobe Recess TYPE-17 EXTERIOR—STEEL



FLAT SIX-LOBE RECESS EXTERIOR SCREW WITH TYPE-17 POINT—STEEL

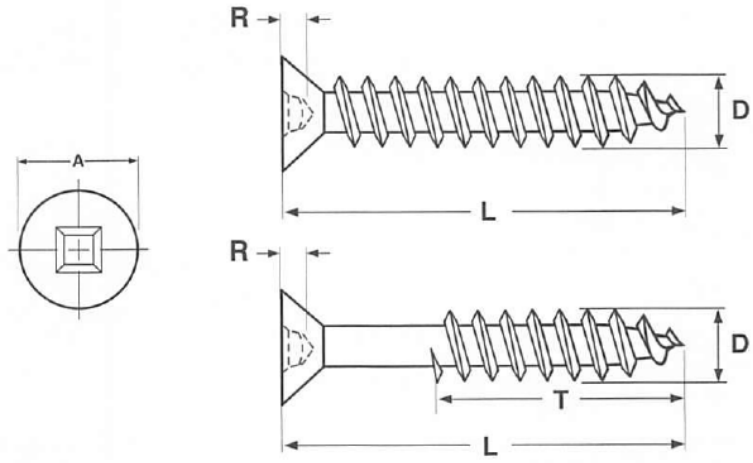
Nominal Diameter	A		R	D		T		Recess Size
	Head Diameter		Recess Depth	Major Diameter		Threaded Length		
	Max	Min	Min	Max	Min	L ≤ 1"	L > 1"	
6	0.262	0.232	0.035	0.142	0.131	Full thread	2/3 thread	T-10
8	0.332	0.285	0.039	0.175	0.159	Full thread	2/3 thread	T-15
9	0.354	0.316	0.051	0.193	0.183	Full thread	2/3 thread	T-20
10	0.385	0.333	0.050	0.209	0.193	Full thread	2/3 thread	T-20

Tolerance on Length	Up to 5/8"	±0.03
	Over 5/8 to 1.5"	±0.05
	Over 1.5 to 2.75"	±0.06
	Over 2.75 to 5"	±0.09

Description	An externally threaded fastener with a countersunk head, six-lobed recess, a single lead thread. The shank has a reduced diameter and a chip cavity cut out where the final several threads end at the tip.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The six-lobe recess transmits drive torque with less required downward pressure.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimim
Case Depth	0.004" - 0.009"
Torque	#8 Diameter: 35 kg/cm minimum; #9 Diameter: 50 kg/cm minimum; #10 Diameter: 50 kg/cm minimum
Plating	See Appendix-A for plating information

DEEP THREAD

Flat Head w/ Square Recess



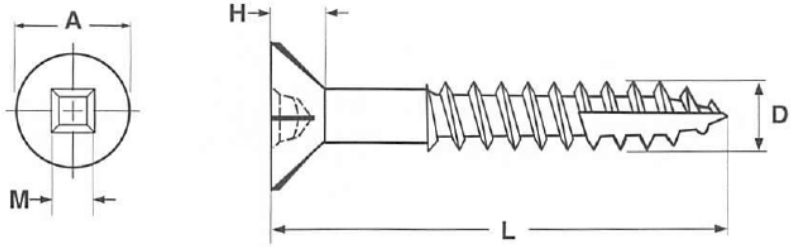
FLAT SQUARE RECESS DEEP THREAD WOOD SCREW									
Nominal Diameter	A		R		D		T		Recess Size
	Head Diameter		Recess Depth		Major Diameter		Threaded Length		
	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	
6	0.279	0.244	0.065	0.057	0.152	0.142	Full thread	2/3 thread	#2
8	0.332	0.292	0.075	0.065	0.174	0.164	Full thread	2/3 thread	#2

Tolerance on Length	Up to 5/8"	+0 / -0.03
	Over 5/8 to 1.5"	+0 / -0.05
	Over 1.5 to 2.75"	+0 / -0.06
	Over 2.75 to 5"	+0 / -0.09

Description	An externally threaded fastener with a countersunk head, square socket recess, a single lead thread. The shank has a reduced diameter.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. Square recess is preferred in many overhead installations.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimim
Case Depth	0.004" - 0.009"
Torque	#6 Diameter: 21 kg/cm minimum; #8 Diameter: 35 kg/cm minimum
Plating	See Appendix-A for plating information

Flat Square Recess w/Nibs

TYPE-17 DECK



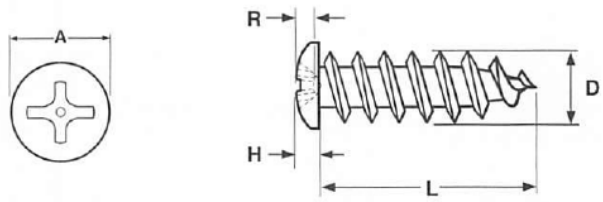
FLAT HD WITH NIBS SQUARE RECESS DECK SCREW WITH TYPE-17 POINT							
Nominal Diameter	A		H	M	D		Recess Size
	Head Diameter		Head Height	Recess Diam.	Major Diameter		
	Max	Min	Ref	Ref	Max	Min	
8	0.312	0.285	0.150	0.112	0.177	0.157	#2
9	0.336	0.309	0.150	0.112	0.198	0.187	#2
10	0.377	0.342	0.172	0.112	0.215	0.204	#2

Tolerance on Length	Up to 1.5"	± 0.05
	Over 1.5 to 2.75"	± 0.06
	Over 2.75"	± 0.09

Description	An externally threaded fastener with a countersunk head, square socket recess, a single lead thread. The screw has a chip cavity cut out where the final several threads end at the tip.
Applications / Advantages	Designed for outdoor use with decks, spas, siding, fences and docks. Colored Ruspert coating is rated to resist environmental corrossion without streaking the treated lumber.
Material	Low Carbon Steel
Surface Hardness	Rockwell C 45 minimim
Plating	Available in green, tan and red Ruspert ceramic finishes rated as salt spray resistant for over 1,200 hours.

DEEP THREAD

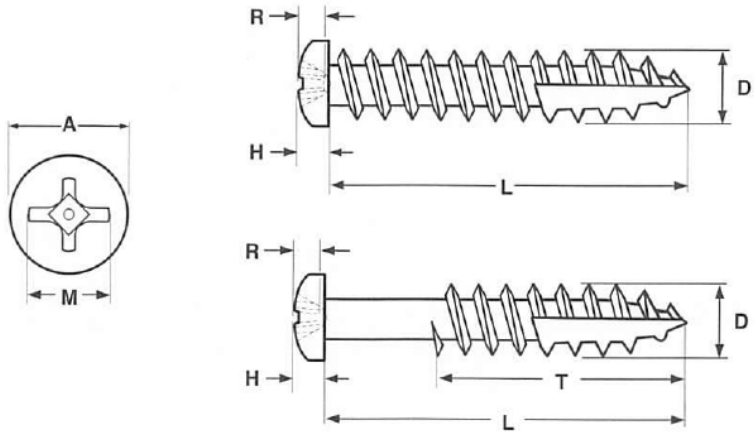
Low-Profile Pan Head w/ Phillips Recess



Low Profile Pan Phillips Recess Deep Thread Wood Screw									
Nominal Diameter & Threads per Inch	A		H		D		T		Recess Size
	Head Diameter		Head Height		Major Diameter		Threaded Length		
	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	
6-13	0.270	0.256	0.082	0.074	0.141	0.135	Full thread	2/3 thread	#2
Tolerance on Length	Up to 5/8"				± 0.03				

Description	An externally threaded fastener with a dome-shaped head, cross recess and a single lead thread. The shank has a reduced diameter and a chip cavity cut out where the final several threads end at the tip.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The low-profile head design enables moving sections to pass over each other without interference.
Material	C1018 - 1022 case-hardened steel
Surface Hardness	Vickers 450 HV minimum
Case Depth	0.004" - 0.009"
Plating	See Appendix-A for plating information

Pan Head w/ Phillips Recess — TYPE-17 DEEP THREAD



PAN PHILLIPS RECESS DEEP THREAD WOOD SCREW WITH TYPE-17 POINT

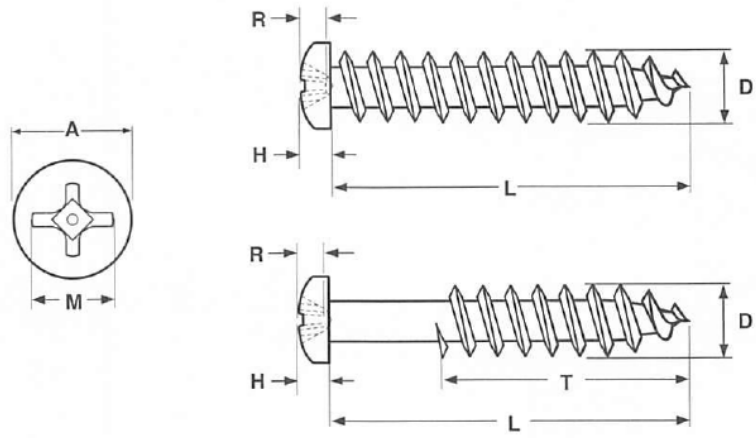
Nominal Diameter & Threads per Inch	A		H		R		M	D		T		Torque Kg/cm (Steel screws)	Recess Size
	Head Diameter		Head Height		Recess Penetration Depth		Recess Diameter	Major Diameter		Threaded Length			
	Max	Min	Max	Min	Max	Min	Ref	Max	Min	L ≤ 1"	L > 1"	Min	
6-13	0.270	0.256	0.097	0.087	0.080	0.055	0.159	0.142	0.131	Full thread	2/3 thread	21	#2
7-12	0.296	0.281	0.106	0.096	0.089	0.064	0.170	0.158	0.147	Full thread	2/3 thread	28	#2
8-11	0.322	0.306	0.115	0.105	0.097	0.071	0.175	0.169	0.159	Full thread	2/3 thread	37	#2
10-9	0.373	0.357	0.133	0.122	0.113	0.089	0.192	0.194	0.185	Full thread	2/3 thread	55	#2
12-8	0.425	0.407	0.151	0.139	0.124	0.098	0.252	0.230	0.213	Full thread	2/3 thread	64	#3

Tolerance on Length	Up to 5/8"	± 0.03
	Over 5/8 to 1.5"	± 0.05
	Over 1.5 to 2.75"	± 0.06
	Over 2.75"	± 0.09

Description	An externally threaded fastener with a dome-shaped head, cross recess and a single lead thread. The shank has a reduced diameter and a chip cavity cut out where the final several threads end at the tip.	
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. Popular in fastening cabinet hardware in locations that do not require the head to countersink. The chip cavity (or auger point) are designed to attach hinges to the edge of hardwood face frames.	Used in environments where corrossion resistance is neccesary. The type-17 point enables the screw to more easily penetrate the material into which it's fastened. Can be used in particle board, wood and some plastics.
Material	C1018 - 1022 case-hardened steel	18-8 Stainless Steel
Surface Hardness	Vickers 450 HV minimum	-
Case Depth	0.004" - 0.009"	-
Torque	See values in above table	-
Plating	See Appendix-A for plating information	Stainless deep thread screws are usually supplied without additional finish.

DEEP THREAD

Pan Head w/ Phillips Recess

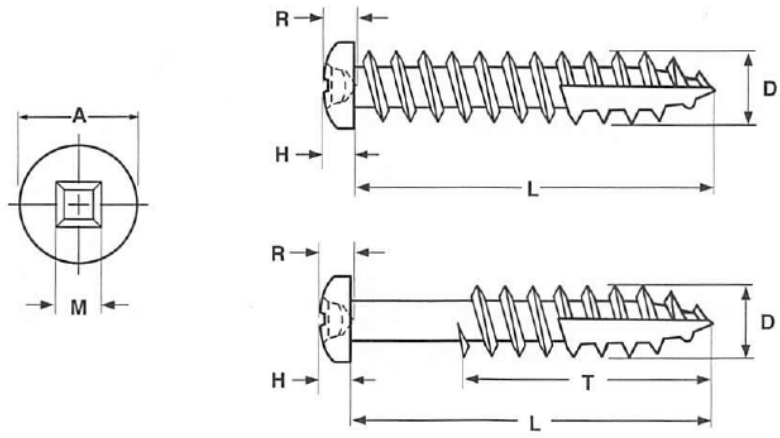


PAN PHILLIPS RECESS DEEP THREAD WOOD SCREW													
Nominal Diameter & Threads per Inch	A		H		R		M	D		T		Torque Kg/cm	Recess Size
	Head Diameter		Head Height		Recess Penetration Depth		Recess Diameter	Major Diameter		Threaded Length			
	Max	Min	Max	Min	Max	Min	Ref	Max	Min	L ≤ 1"	L > 1"	Min	
6-13	0.270	0.256	0.097	0.087	0.080	0.055	0.159	0.141	0.135	Full thread	2/3 thread	21	#2
7-12	0.296	0.281	0.106	0.096	0.089	0.064	0.170	0.154	0.148	Full thread	2/3 thread	28	#2
8-11	0.322	0.306	0.115	0.105	0.097	0.071	0.175	0.168	0.161	Full thread	2/3 thread	37	#2
10-9	0.373	0.357	0.133	0.122	0.113	0.089	0.192	0.194	0.187	Full thread	2/3 thread	55	#2

Tolerance on Length	Up to 5/8"	± 0.03
	Over 5/8 to 1.5"	± 0.05
	Over 1.5 to 2.75"	± 0.06
	Over 2.75"	± 0.09

Description	An externally threaded fastener with a dome-shaped head, cross recess and a single lead thread. The shank has a reduced diameter and a single lead thread.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces as compared to standard wood screws. Popular in fastening cabinet hardware in locations that do not require the head to countersink.
Material	C1018 - 1022 case-hardened steel
Surface Hardness	Vickers 450 HV minimum
Case Depth	0.004" - 0.009"
Torque	See values in above table
Plating	See Appendix-A for plating information

Pan Head w/ Square Recess
TYPE-17 DEEP THREAD



Pan Square Recess Deep Thread Wood Screw with Type-17 Point

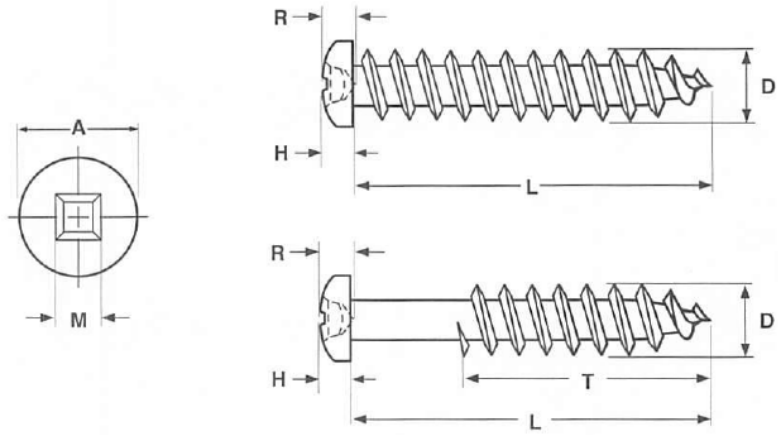
Nominal Diameter	A		H		R		M	D		T		Recess Size
	Head Diameter		Head Height		Recess Depth		Recess Diameter	Major Diameter		Threaded Length		
	Max	Min	Max	Min	Max	Min	Ref	Max	Min	L ≤ 1"	L > 1"	
6	0.270	0.256	0.108	0.093	0.065	0.050	0.091	0.142	0.131	Full thread	2/3 thread	#1
7	0.296	0.281	0.111	0.099	0.065	0.050	0.091	0.158	0.147	Full thread	2/3 thread	#1
8	0.322	0.306	0.124	0.110	0.075	0.060	0.112	0.169	0.159	Full thread	2/3 thread	#2

Tolerance on Length	Up to 5/8"	+0 / -0.03
	Over 5/8 to 1.5"	+0 / -0.05
	Over 1.5 to 2.75"	+0 / -0.06
	Over 2.75 to 5"	+0 / -0.09

Description	An externally threaded fastener with a dome-shaped head, square recess and a single lead thread. The shank has a reduced diameter and a chip cavity cut out where the final several threads, ending at the tip. Square recess is preferred in many overhead installations.	
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces as compared to standard wood screws. Popular in fastening cabinet hardware.	Used in environments where corrossion resistance is neccesary. The type-17 point enables the screw to more easily penetrate the material into which it's fastened. Can be used in particle board, wood and some plastics.
Material	C1018 - 1022 case-hardened steel	18-8 Stainless Steel
Surface Hardness	Vickers 450 HV minimum	-
Case Depth	0.004" - 0.009"	-
Plating	See Appendix-A for plating information	Stainless deep thread screws are usually supplied without additional finish.

DEEP THREAD

Pan Head w/ Square Recess



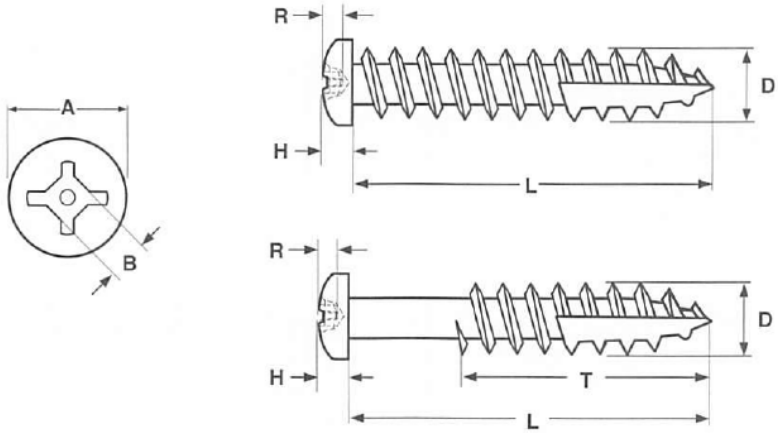
Pan Square Recess Deep Thread Wood Screw

Nominal Diameter	A		H		R		M	D		T		Torque (kg/cm)	Recess Size
	Head Diameter		Head Height		Recess Depth		Recess Diameter	Major Diameter		Threaded Length			
	Max	Min	Max	Min	Max	Min	Ref	Max	Min	L ≤ 1"	L > 1"	Min	
6	0.270	0.256	0.097	0.087	0.065	0.050	0.091	0.141	0.135	Full thread	2/3 thread	21	#1
7	0.296	0.281	0.106	0.096	0.065	0.050	0.091	0.154	0.148	Full thread	2/3 thread	28	#1
8	0.322	0.306	0.115	0.105	0.075	0.060	0.112	0.168	0.161	Full thread	2/3 thread	37	#2
10	0.373	0.357	0.133	0.122	0.075	0.060	0.112	0.194	0.187	Full thread	2/3 thread	55	#2

Tolerance on Length	Up to 5/8"	± 0.03
	Over 5/8 to 1.5"	± 0.05
	Over 1.5 to 2.75"	± 0.06
	Over 2.75"	± 0.09

Description	An externally threaded fastener with a dome-shaped head, square recess and a single lead thread. The shank has a reduced diameter.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces as compared to standard wood screws. Popular in fastening cabinet hardware in locations that do not require the head to countersink. Square recess is preferred in many overhead installations.
Material	C1018 - 1022 case-hardened steel
Surface Hardness	Vickers 450 HV minimum
Case Depth	0.004" - 0.009"
Torque	See values in above table
Plating	See Appendix-A for plating information

Pan Head w/ Square-Phillips Recess — TYPE-17 DEEP THREAD



Pan Square-Phillips Recess Deep Thread Wood Screw with Type-17 Point

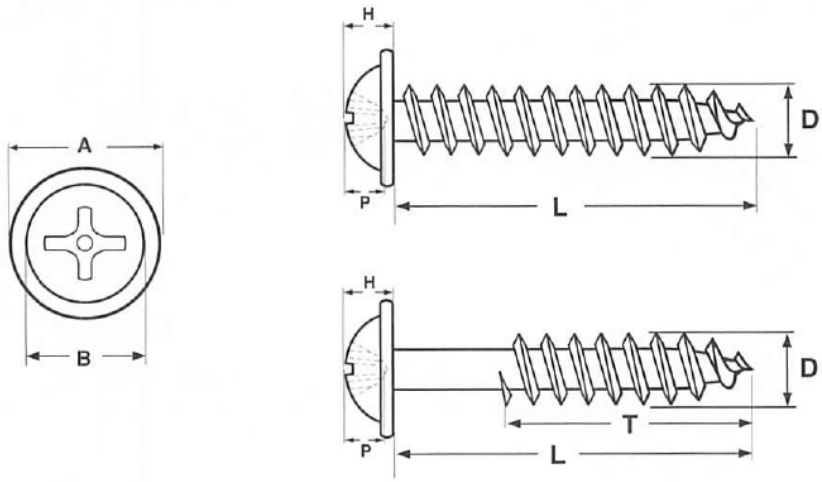
Nominal Diameter	A		H		R		B	D		T		Breaking Torque (kg-cm)	Recess Size	
	Head Diameter		Head Height		Recess Depth		Recess Diameter	Major Diameter		Threaded Length				
	Max	Min	Max	Min	Max	Min	Ref	Max	Min	L ≤ 1"	L > 1"	Min	Square	Phillips
6	0.270	0.256	0.103	0.093	0.065	0.050	-	0.141	0.135	Full thread	2/3 thread	21	#1	#2
8	0.322	0.306	0.115	0.105	0.080	0.060	0.112	0.169	0.159	Full thread	2/3 thread	37	#2	#2
10	0.373	0.357	0.133	0.122	0.087	0.065	0.112	0.194	0.185	Full thread	2/3 thread	55	#2	#2

Tolerance on Length	Up to 5/8"	± 0.03
	Over 5/8 to 1.5"	± 0.05
	Over 1.5 to 2.75"	± 0.06
	Over 2.75"	± 0.09

Description	An externally threaded fastener with a dome-shaped head, crossed recess that will also accept a square driver bit and a single lead thread. The shank has a reduced diameter.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces as compared to standard wood screws. Popular in fastening cabinet hardware in locations that do not require the head to countersink. The recess design allows for multiple drive tools.
Material	C1018 - 1022 case-hardened steel
Surface Hardness	Vickers 450 HV minimum
Case Depth	0.004" - 0.009"
Torque	See values in above table
Plating	See Appendix-A for plating information

DEEP THREAD

Round Washer Head w/ Phillips Recess

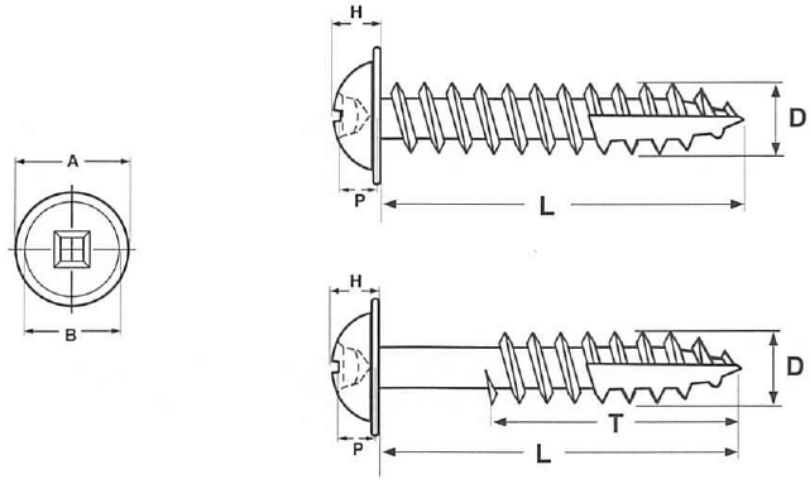


ROUND WASHER PHILLIPS RECESS DEEP THREAD WOOD SCREW												
Nominal Diameter	A		B	H		P		D		T		Recess Size
	Washer Diameter		Head Diameter	Total Head Height		Recess Depth		Major Diameter		Threaded Length		
	Max	Min	Ref	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	
8	0.380	0.358	0.259	0.113	0.101	0.076	0.048	0.169	0.159	Full thread	2/3 thread	#2

Tolerance on Length	Up to 5/8"	+0 / -0.03
	Over 5/8 to 1.5"	+0 / -0.05
	Over 1.5 to 2.75"	+0 / -0.06
	Over 2.75 to 5"	+0 / -0.09

Description	An externally threaded fastener with a dome-shaped head and an integrally formed washer; a recess that can accomodate a Phillips screwdriver; and a single lead thread. The shank has a reduced diameter.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The round washer head is preferable in softer woods and offers a greater bearing surface than a countersunk design. It is superior to countersunk or pan heads at pulling material together.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimum
Case Depth	0.004" - 0.009"
Torque	#8 Diameter: 35 kg/cm minimum #10 Diameter: 50 kg/cm minimum
Plating	See Appendix-A for plating information

Round Washer Head w/ Square Recess — TYPE-17 DEEP THREAD



Round Washer Square Recess Deep Thread Wood Screw with Type-17 Point

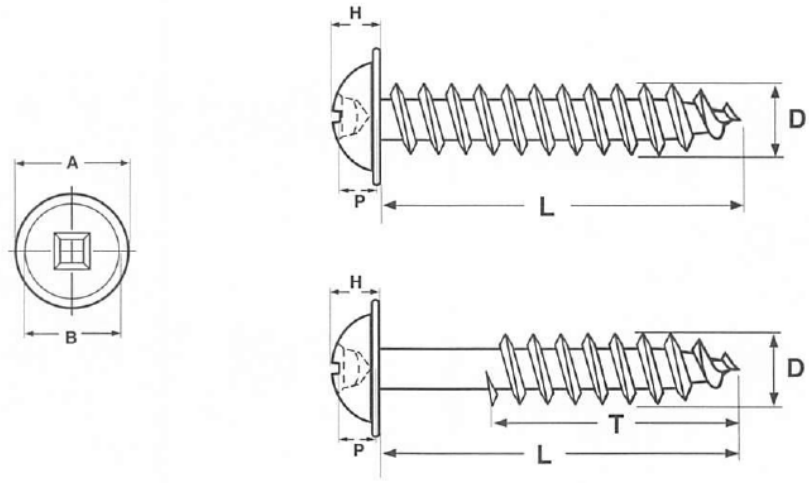
Nominal Diameter	A		B	H		P		D		T		Recess Size
	Washer Diameter		Head Diameter	Total Head Height		Recess Depth		Major Diameter		Threaded Length		
	Max	Min	Ref	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	
8	0.384	0.364	0.315	0.130	0.119	0.075	0.048	0.169	0.159	Full thread	2/3 thread	#2
10	0.439	0.416	0.311	0.130	0.118	0.075	0.060	0.205	0.194	Full thread	2/3 thread	#2

Tolerance on Length	Up to 5/8"	+0 / -0.03
	Over 5/8 to 1.5"	+0 / -0.05
	Over 1.5 to 2.75"	+0 / -0.06
	Over 2.75 to 5"	+0 / -0.09

Description	An externally threaded fastener with a dome-shaped head and an integrally formed washer, a square socket recess and a single lead thread. The shank has a reduced diameter and a chip cavity cut out where the final several threads, ending at the tip.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The chip cavity (or auger point) enables the fastener to drive—especially in denser woods—without pre-drilling a pilot hole. The head offers a greater bearing surface than a countersunk design. Used to attach surface-mounted door hinges or master lock hasps into dense woods or when attaching two pieces of wood through a pocket hole.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimim
Case Depth	0.004" - 0.009"
Torque	#8 Diameter: 35 kg/cm minimum #10 Diameter: 50 kg/cm minimum
Plating	See Appendix-A for plating information

DEEP THREAD

Round Washer Head w/ Square Recess

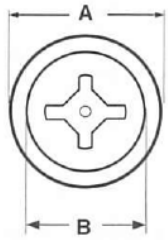


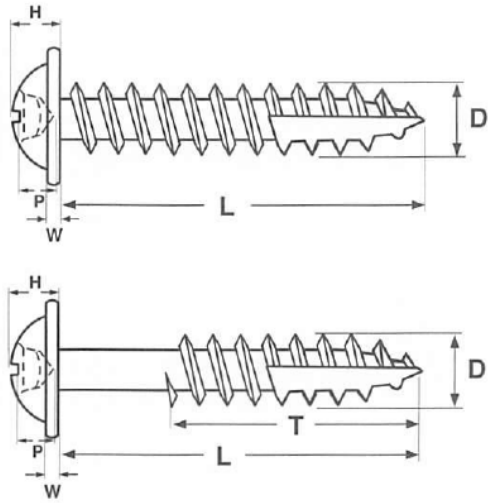
ROUND WASHER SQUARE RECESS DEEP THREAD WOOD SCREW												
Nominal Diameter	A		B	H		P		D		T		Recess Size
	Washer Diameter		Head Diameter	Total Head Height		Recess Depth		Major Diameter		Threaded Length		
	Max	Min	Ref	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	
8	0.376	0.352	0.305	0.120	0.110	0.080	0.065	0.174	0.164	Full thread	2/3 thread	#2
10	0.439	0.416	0.311	0.130	0.118	0.075	0.060	0.205	0.194	Full thread	2/3 thread	#2

Tolerance on Length	Up to 5/8"	+0 / -0.03
	Over 5/8 to 1.5"	+0 / -0.05
	Over 1.5 to 2.75"	+0 / -0.06
	Over 2.75 to 5"	+0 / -0.09

Description	An externally threaded fastener with a dome-shaped head and an integrally formed washer, a square socket recess, a shank with a reduced diameter and a single lead thread.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The head offers a greater bearing surface than a countersunk design. Used to attach surface-mounted door hinges or master lock hasps into dense woods or when attaching two pieces of wood through a pocket hole.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimim
Case Depth	0.004" - 0.009"
Torque	#8 Diameter: 35 kg/cm minimum #10 Diameter: 50 kg/cm minimum
Plating	See Appendix-A for plating information

Round Washer Head w/ Square/Phillips Combo Recess — TYPE-17 DEEP THREAD





Round Washer Square/Phillips Recess Deep Thread Wood Screw w/ Type-17 Point

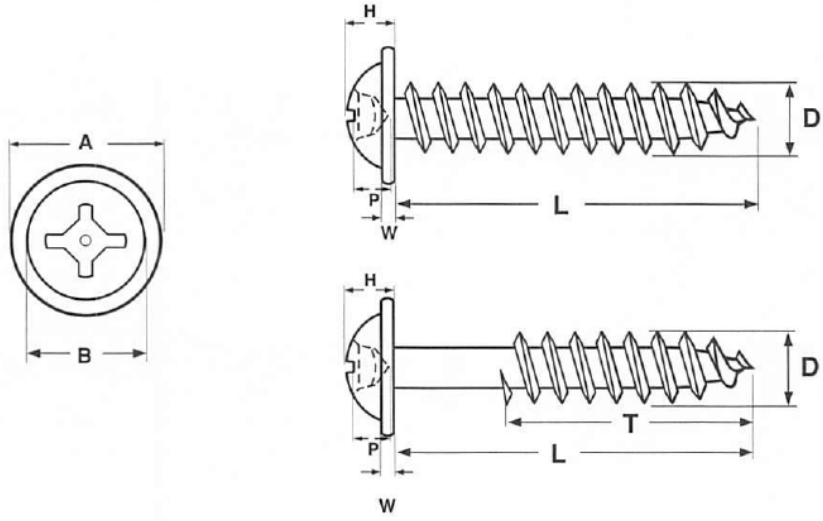
Nominal Diameter	A		B	H		P		W		D		T		Recess Size (Square & Phillips)
	Washer Diameter		Head Diameter	Total Head Height		Recess Depth		Washer Thickness		Major Diameter		Threaded Length		
	Max	Min	Ref	Max	Min	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	
8	0.376	0.352	0.305	0.120	0.110	0.080	0.065	0.050	0.030	0.174	0.164	Full thread	2/3 thread	#2
10	0.500	0.472	0.300	0.130	0.118	0.073	0.049	0.060	0.040	0.197	0.183	Full thread	2/3 thread	#2

Tolerance on Length	Up to 5/8"	+0 / -0.03
	Over 5/8 to 1.5"	+0 / -0.05
	Over 1.5 to 2.75"	+0 / -0.06
	Over 2.75 to 5"	+0 / -0.09

Description	An externally threaded fastener with a dome-shaped head and an integrally formed washer; a recess that can accomodate either a Phillips or Square screwdriver; and a single lead thread. The shank has a reduced diameter and a chip cavity cut out where the final several threads, ending at the tip.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The chip cavity (or auger point) enables the fastener to drive—especially in denser woods—without pre-drilling a pilot hole. The head offers a greater bearing surface than a countersunk design. Used to attach surface-mounted door hinges or master lock hasps into dense woods or when attaching two pieces of wood through a pocket hole.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimum
Case Depth	0.004" - 0.009"
Torque	#8 Diameter: 35 kg/cm minimum #10 Diameter: 50 kg/cm minimum
Plating	See Appendix-A for plating information

DEEP THREAD

Round Washer Head w/ Square-Phillips Recess

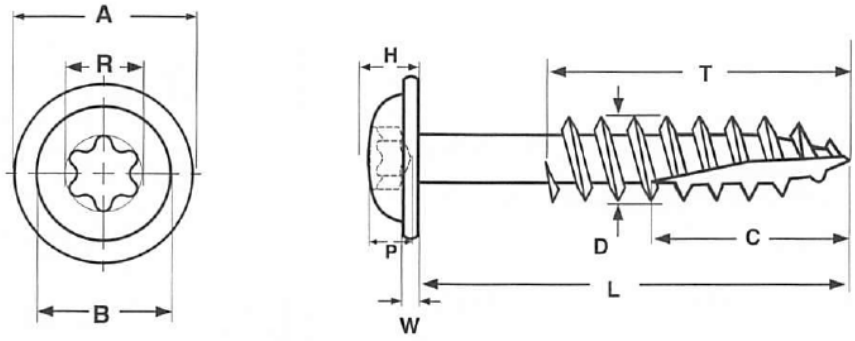


ROUND WASHER SQUARE/PHILLIPS RECESS DEEP THREAD WOOD SCREW														
Nominal Diameter	A		B	H		P		W		D		T		Recess Size (Square & Phillips)
	Washer Diameter		Head Diameter	Total Head Height		Recess Depth		Washer Thickness		Major Diameter		Threaded Length		
	Max	Min	Ref	Max	Min	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	
8	0.376	0.352	0.305	0.120	0.110	0.080	0.065	0.050	0.030	0.174	0.164	Full thread	2/3 thread	#2

Tolerance on Length	
Up to 5/8"	+0 / -0.03
Over 5/8 to 1.5"	+0 / -0.05
Over 1.5 to 2.75"	+0 / -0.06
Over 2.75 to 5"	+0 / -0.09

Description	An externally threaded fastener with a dome-shaped head and an integrally formed washer; a recess that can accomodate either a Phillips or Square screwdriver; and a single lead thread. The shank has a reduced diameter.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The round washer head is preferable in softer woods and offers a greater bearing surface than a countersunk design. Used to attach surface-mounted door hinges or master lock hasps into dense woods or when attaching two pieces of wood through a pocket hole.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimum
Case Depth	0.004" - 0.009"
Torque	35 kg/cm minimum
Plating	See Appendix-A for plating information

Round Washer Head w/ Six-Lobe Recess — LONG TYPE-17 DEEP THREAD



ROUND WASHER SIX-LOBE RECESS DEEP THREAD WOOD SCREW W/ LONG TYPE-17 PT.

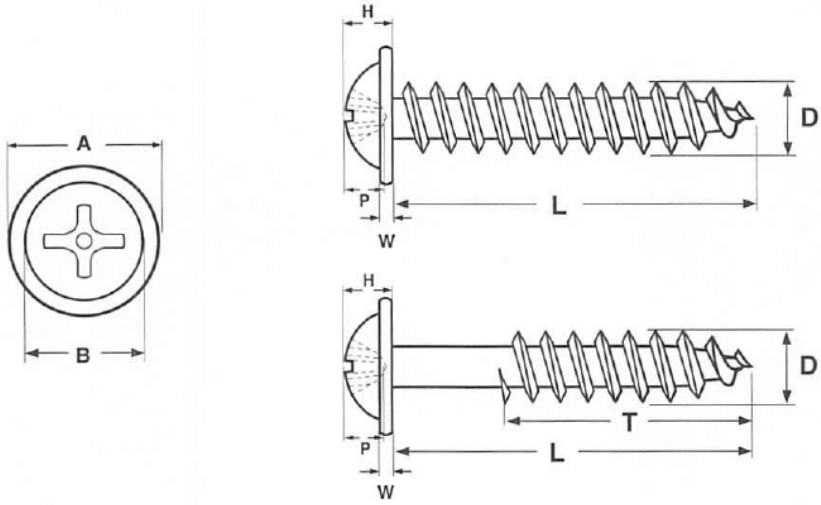
Nominal Diameter	A		W		B	H		P	R	D		C	T		Recess Size
	Washer Diameter		Washer Thickness		Crown Diam.	Total Head Height		Recess Depth	Recess Diam.	Major Diameter		Cut Point Length	Threaded Length		
	Max	Min	Max	Min	Ref	Max	Min	Min	Ref	Max	Min	Ref	L ≤ 1"	L > 1"	
10	0.500	0.472	0.045	0.033	0.300	0.115	0.095	0.050	0.179	0.194	0.185	0.472	Full Thread	Partial Thread	T25

Tolerance on Length	
Up to 5/8"	± 0.03
Over 5/8 to 1.5"	± 0.05
Over 1.5 to 2.75"	± 0.06
Over 2.75 to 5"	± 0.09

Description	An externally threaded fastener with a dome-shaped head and an integrally formed washer; a recess that can accomodate a Six-lobe screwdriver; and a single lead thread. The shank has a reduced diameter and a chip cavity cut out where the final several threads, ending at the tip that is 30% to 50% longer than a normal Type-17 point.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The round washer head is preferable in softer woods and offers a greater bearing surface than a countersunk design. The extra long chip cavity is preferable for use in thicker woods when a greater amount of material will be displaced.
Material	C1018 - C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimum
Case Depth	0.004" - 0.009"
Torque	45 kg/cm minimum
Plating	See Appendix-A for plating information

DEEP THREAD

Large Round Washer Head w/ Phillips Recess

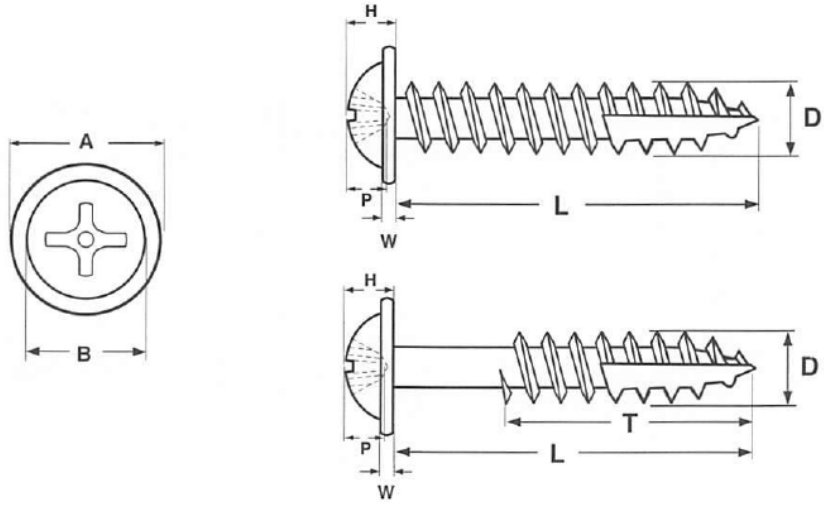


LARGE ROUND WASHER PHILLIPS RECESS DEEP THREAD WOOD SCREW												
Nominal Diameter	A		B	H		P		D		T		Recess Size
	Washer Diameter		Head Diameter	Total Head Height		Recess Depth		Major Diameter		Threaded Length		
	Max	Min	Ref	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	
8	0.500	0.472	0.300	0.130	0.118	0.093	0.066	0.168	0.161	Full thread	2/3 thread	#2

Tolerance on Length	
Up to 5/8"	+0 / -0.03
Over 5/8 to 1.5"	+0 / -0.05
Over 1.5 to 2.75"	+0 / -0.06
Over 2.75 to 5"	+0 / -0.09

Description	An externally threaded fastener with a dome-shaped head and an integrally formed washer; a recess that can accomodate a Phillips screwdriver; and a single lead thread. The head is approximately 33% larger than that of a typical round washer screw of the same nominal diameter. The shank has a reduced diameter.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The extra large head (a) allows for precise adjustment when aligning multiple drawer fronts to one another, and (b) offers a greater bearing surface than a countersunk design.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimum
Case Depth	0.004" - 0.009"
Torque	35 kg/cm minimum
Plating	See Appendix-A for plating information

Large Round Washer Head w/ Phillips Recess — TYPE-17 DEEP THREAD



LARGE ROUND WASHER PHILLIPS RECESS DEEP THREAD WOOD SCREW W/ TYPE-17 POINT

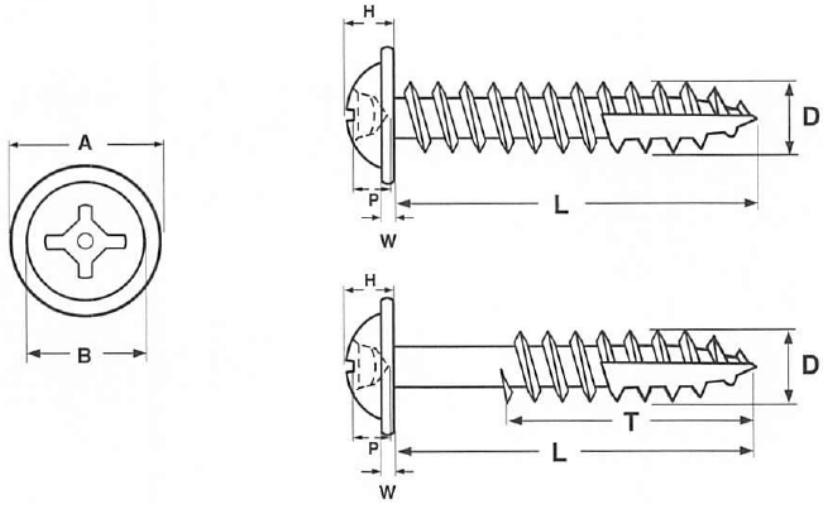
Nominal Diameter	A		B	H		P		D		T		Recess Size
	Washer Diameter		Head Diameter	Total Head Height		Recess Depth		Major Diameter		Threaded Length		
	Max	Min	Ref	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	
8	0.500	0.472	0.300	0.130	0.118	0.093	0.066	0.168	0.161	Full thread	2/3 thread	#2

Tolerance on Length	
Up to 5/8"	+0 / -0.03
Over 5/8 to 1.5"	+0 / -0.05
Over 1.5 to 2.75"	+0 / -0.06
Over 2.75 to 5"	+0 / -0.09

Description	An externally threaded fastener with a dome-shaped head and an integrally formed washer; a recess that can accomodate a Phillips screwdriver; and a single lead thread. The head is approximately 33% larger than that of a typical round washer screw of the same nominal diameter. The shank has a reduced diameter and a chip cavity cut out where the final several threads, ending at the tip.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The chip cavity (or auger point) enables the fastener to drive—especially in denser woods—without pre-drilling a pilot hole. The extra large head (a) allows for precise adjustment when aligning multiple drawer fronts to one another, and (b) offers a greater bearing surface than a countersunk design.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimum
Case Depth	0.004" - 0.009"
Torque	35 kg/cm minimum
Plating	See Appendix-A for plating information

TYPE-17 DEEP THREAD

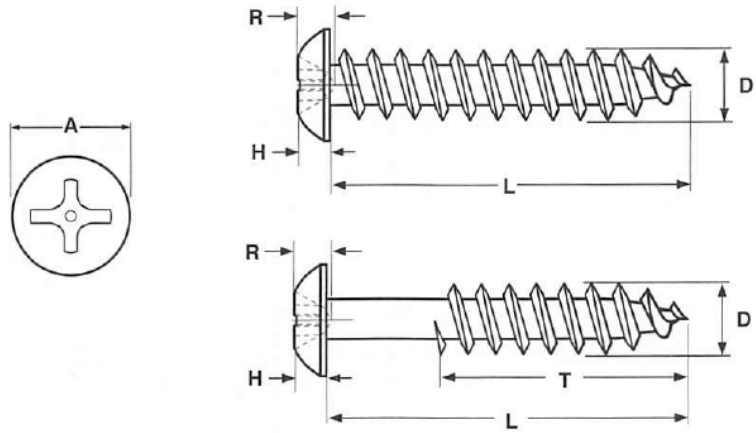
Large Round Washer Head w/ Square-Phillips Recess



LARGE ROUND WASHER SQUARE-PHILLIPS RECESS DEEP THREAD WOOD SCREW W/TYPE-17 PT.													
Nominal Diameter	A		W	B	H		P		D		T		Recess Size (Phillips & Square)
	Washer Diameter		Washer Thickness	Head Diameter	Total Head Height		Recess Depth		Major Diameter		Threaded Length		
	Max	Min	Ref	Ref	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	
8	0.500	0.472	0.050	0.300	0.130	0.118	0.080	0.065	0.168	0.161	Full thread	2/3 thread	#2
Tolerance on Length	Up to 1"						+0 / -0.05						

Description	An externally threaded fastener with a dome-shaped head and an integrally formed washer, a square socket recess that will also accomodate a standard Phillips driver, a shank with a reduced diameter and a single lead thread. The head is approximately 33% larger than that of a typical round washer screw of the same nominal diameter. The shank has a reduced diameter and a chip cavity cut out where the final several threads, ending at the tip.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The chip cavity (or auger point) enables the fastener to drive—especially in denser woods—without pre-drilling a pilot hole. The extra large head (a) allows for precise adjustment when aligning multiple drawer fronts to one another, and (b) offers a greater bearing surface than a countersunk design.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimim
Case Depth	0.004" - 0.009"
Torque	#8 Diameter: 35 kg/cm minimum
Plating	See Appendix-A for plating information

Truss Head w/ Phillips Recess — DEEP THREAD



Truss Phillips Recess Deep Thread Wood Screw

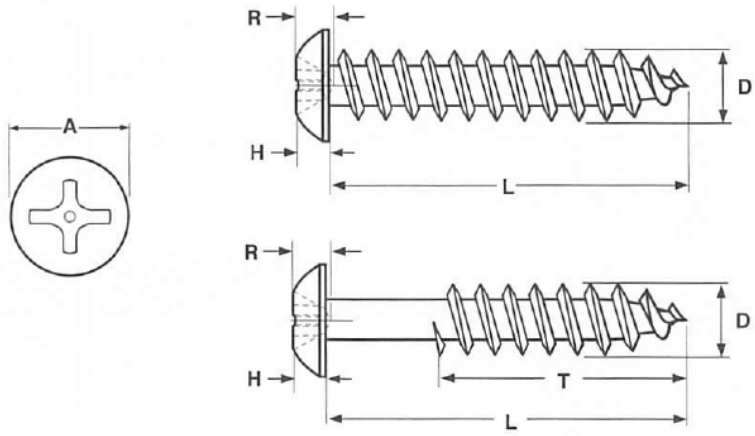
Nominal Diameter	A Head Diameter		H Head Height		R Recess Depth		D Major Diameter		T Threaded Length		Torque (kg/cm)	Recess Size
	Max	Min	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	Min	
6	0.321	0.303	0.086	0.074	0.073	0.048	0.141	0.135	Full thread	2/3 thread	21	2
8	0.384	0.364	0.102	0.088	0.088	0.063	0.168	0.161	Full thread	2/3 thread	35	2

Tolerance on Length		
	Up to 5/8"	+0; - 0.03
	Over 5/8 to 1.5"	+0; - 0.05

Description	An externally threaded fastener with a head having a low rounded top, a cross recess and a single lead thread. The shank has a reduced diameter.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces as compared to standard wood screws. Popular use is in construction of drawer slides.
Material	C1018 - 1022 case-hardened steel
Surface Hardness	Vickers 450 HV minimum
Case Depth	0.004" - 0.009"
Torque	See values in above table
Plating	See Appendix-A for plating information

DEEP THREAD

#8 Truss w/#6 Head Phillips Recess



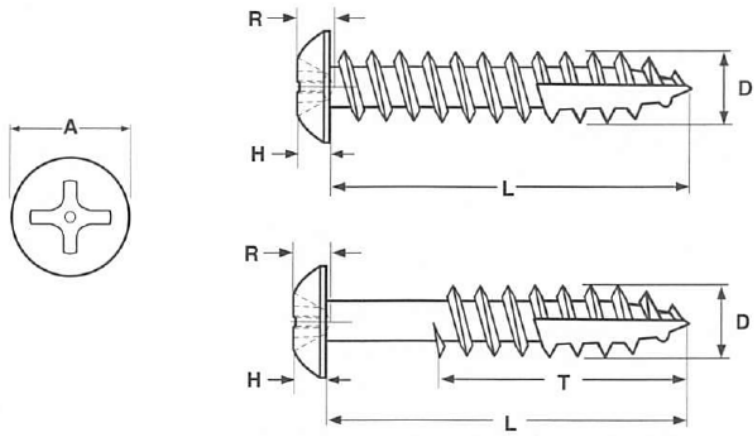
#8 Truss Phillips Recess Deep Thread Wood Screw with a #6 Head

Nominal Diameter	A		H		R		D		T		Torque (kg/cm)	Recess Size
	Head Diameter		Head Height		Recess Depth		Major Diameter		Threaded Length			
	Max	Min	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	Min	
8	0.321	0.303	0.086	0.074	0.073	0.048	0.168	0.161	Full thread	2/3 thread	37	2

Tolerance on Length		
	Up to 5/8"	± 0.03
	Over 5/8 to 1.5"	± 0.05

Description	An externally threaded fastener with a head having a low rounded top, a cross recess and a single lead thread. The shank has a reduced diameter.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces as compared to standard wood screws. Popular use is in construction of drawer slides.
Material	C1018 - 1022 case-hardened steel
Surface Hardness	Vickers 450 HV minimum
Case Depth	0.004" - 0.009"
Torque	See values in above table
Plating	See Appendix-A for plating information

Truss Head w/ Phillips Recess TYPE-17 DEEP THREAD



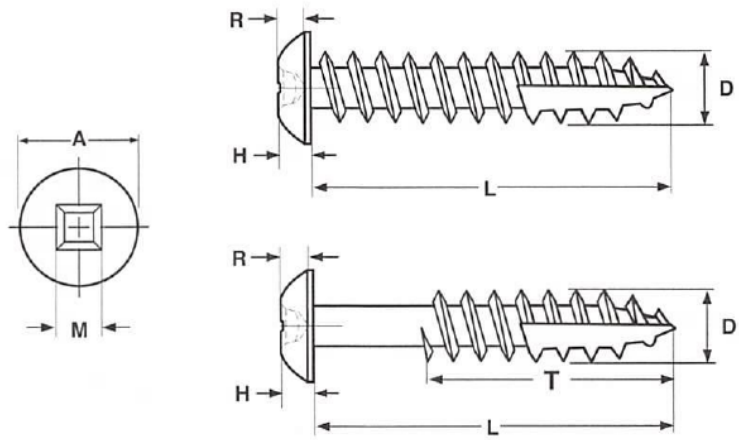
TRUSS PHILLIPS RECESS DEEP THREAD WOOD SCREW W/TYPE-17 POINT												
Nominal Diameter	A Head Diameter		H Head Height		R Recess Depth		D Major Diameter		T Threaded Length		Torque (kg/cm)	Recess Size
	Max	Min	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	Min	
6	0.321	0.303	0.086	0.074	0.073	0.048	0.141	0.135	Full thread	2/3 thread	21	2
8	0.384	0.364	0.102	0.088	0.088	0.063	0.168	0.161	Full thread	2/3 thread	35	2

Tolerance on Length	Up to 5/8"	+0; - 0.03
	Over 5/8 to 1.5"	+0; - 0.05

Description	An externally threaded fastener with a head having a low rounded top, a cross recess and a single lead thread. The shank has a reduced diameter. The shank has a reduced diameter and a chip cavity cut out where the final several threads.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces as compared to standard wood screws. Popular use is in construction of drawer slides. The chip cavity (or auger point) enables the fastener to drive—especially in denser woods—without pre-drilling a pilot hole.
Material	C1018 - 1022 case-hardened steel
Surface Hardness	Vickers 450 HV minimum
Case Depth	0.004" - 0.009"
Torque	See values in above table
Plating	See Appendix-A for plating information

TYPE-17 DEEP THREAD

Truss w/ Square Recess

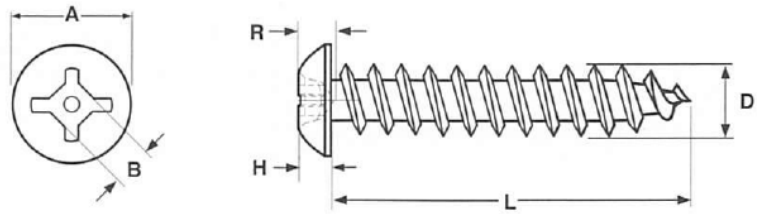


TRUSS SQUARE RECESS DEEP THREAD WOOD SCREW WITH TYPE-17 POINT												
Nominal Diameter	A		M	H		R		D		T		Recess Size
	Head Diameter		Recess Diameter	Head Height		Recess Penetration Depth		Major Diameter		Threaded Length		
	Max	Min	Ref	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	
8	0.384	0.364	0.112	0.102	0.088	0.063	0.048	0.169	0.159	Full thread	2/3 thread	#2S

Tolerance on Length	Up to 5/8"	+0 / -0.03
	Over 5/8 to 1.5"	+0 / -0.05
	Over 1.5 to 2.75"	+0 / -0.06
	Over 2.75 to 5"	+0 / -0.09

Description	An externally threaded fastener with a head having a low rounded top, a square recess and a single lead thread. The shank has a reduced diameter and a chip cavity cut out where the final several threads.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces as compared to standard wood screws. Popular use is in construction of drawer slides. The chip cavity (or auger point) enables the fastener to drive—especially in denser woods—without pre-drilling a pilot hole.
Material	C1018 - 1022 case-hardened steel
Surface Hardness	Vickers 450 HV minimum
Case Depth	0.004" - 0.009"
Torque	37 kg/cm minimum
Plating	See Appendix-A for plating information

#8 Truss w/ #6 Head w/ Square/Phillips Recess DEEP THREAD



#8 Truss w/ #6 Head Square-Phillips Recess Deep Thread Wood Screw

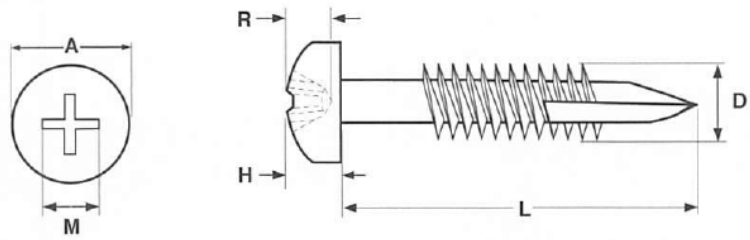
Nominal Diameter	A		H		R		B	D		T		Torque (kg/cm)	Phillips Recess Size
	Head Diameter		Head Height		Recess Depth (Square)		Recess Diam. (Square)	Major Diameter		Threaded Length			
	Max	Min	Max	Min	Max	Min	Ref	Max	Min	L ≤ 1"	L > 1"	Min	
8	0.321	0.303	0.086	0.074	0.058	0.040	0.091	0.169	0.159	Full thread	2/3 thread	37	2

Tolerance on Length	Up to 5/8"	+0; - 0.03
	Over 5/8 to 1.5"	+0; - 0.05

Description	An externally threaded fastener with a head having a low rounded top, a recess that accomodates a cross or square recess, and a single lead thread. The shank has a reduced diameter.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces as compared to standard wood screws. Popular use is in construction of drawer slides.
Material	C1018 - 1022 case-hardened steel
Surface Hardness	Vickers 450 HV minimum
Case Depth	0.004" - 0.009"
Torque	See values in above table
Plating	See Appendix-A for plating information

TYPE-17 FACE FRAMING

Pan Phillips #7 Head Fine Thread



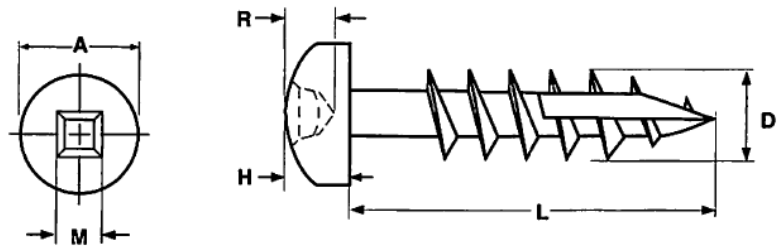
FACE FRAMING SCREWS - PAN PHILLIPS #7 HEAD, FINE THREAD										
Nominal Diameter & Threads per Inch	A		H		R		M	D		Driver Size
	Head Diameter		Head Height		Recess Penetration Gaging Depth		Recess Diameter	Major Diameter		
	Max	Min	Max	Min	Max	Min	Ref	Max	Min	
6-20	0.296	0.280	0.106	0.095	0.089	0.064	0.170	0.139	0.131	2

Tolerance on Length		
	Up to 1", Incl.	± 0.03
	Over 1"	± 0.05

Description	An externally threaded fastener with a dome-shaped head with a cross recess. The shank has an unthreaded section directly below the head, a fine thread pitch and a chip cavity cut out where the final several threads, ending at the tip.
Applications / Advantages	Designed for use in hardwoods for attaching a frame to the front of a cabinet structure to cover the edges of the cabinet. These are also referred to as "pocket hole" screws due to the type of hole into which the fastener is inserted. Such holes are drilled at an angle of approximately 15° into one workpiece and joined to the other piece by the screw. Such fastening methods don't require access to the inside of the joint to make repairs or adjustments.
Material	C1022 (or equivalent) case-hardened steel
Surface Hardness	Rockwell C45 minimum
Core Hardness	Rockwell C 28-38
Torque	28 kg/cm minimum
Plating	See Appendix-A for plating information

Pan Square Recess #7
Head, Coarse Thread

TYPE-17 FACE FRAMING



FACE FRAMING SCREWS - PAN SQUARE RECESS #7 HEAD, COARSE THREAD

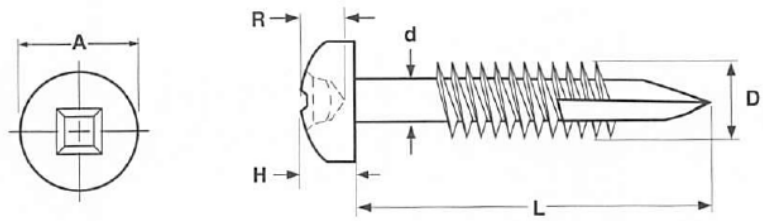
Nominal Diameter & Threads per Inch	A		H		R		M	D		Driver Size
	Head Diameter		Head Height		Recess Penetration Gaging Depth		Recess Diameter	Major Diameter		
	Max	Min	Max	Min	Max	Min	Ref	Max	Min	
#6-9	0.296	0.280	0.115	0.104	0.079	0.064	0.112	0.152	0.137	2

Tolerance on Length	All lengths	± 0.06

Description	An externally threaded fastener with a dome-shaped head with a square recess. Items of nominal length of 2 inches or less are fully threaded. For longer sizes, the shank has an unthreaded section directly below the head. Screws have a coarse thread pitch and a chip cavity cut out where the final several threads, ending at the tip.
Applications / Advantages	Designed for use in softer woods such as particle board, for attaching a frame to the front of a cabinet structure to cover the edges of the cabinet. These are also referred to as "pocket hole" screws due to the type of hole into which the fastener is inserted. Such holes are drilled at an angle of approximately 15° into one workpiece and joined to the other piece by the screw. Such fastening methods don't require access to the inside of the joint to make repairs or adjustments.
Material	C1022 (or equivalent) case-hardened steel
Surface Hardness	Vickers HV 450 minimum
Core Hardness	Vickers HV 240 - 450
Torque	21 kg/cm minimum
Plating	See Appendix-A for plating information

TYPE-17 FACE FRAMING

Pan Square Recess #7 Head, Fine Thread

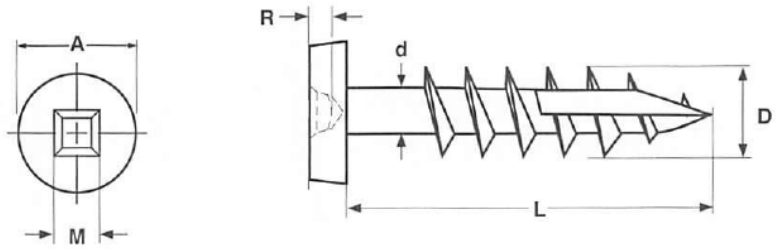


FACE FRAMING SCREWS - PAN SQUARE RECESS #7 HEAD, FINE THREAD											
Nominal Diameter & Threads per Inch	A		H		R		d		D		Driver Size
	Head Diameter		Head Height		Recess Penetration Gaging Depth		Minor Diameter		Major Diameter		
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
6-20	0.296	0.280	0.106	0.095	0.065	0.056	0.104	0.099	0.139	0.131	# 2

Tolerance on Length	Up to 1", Incl.	± 0.03
	Over 1"	± 0.05

Description	An externally threaded fastener with a dome-shaped head with a square recess. The shank has an unthreaded section directly below the head, a fine thread pitch and a chip cavity cut out where the final several threads, ending at the tip.
Applications / Advantages	Designed for use in hardwoods for attaching a frame to the front of a cabinet structure to cover the edges of the cabinet. These are also referred to as "pocket hole" screws due to the type of hole into which the fastener is inserted. Such holes are drilled at an angle of approximately 15° into one workpiece and joined to the other piece by the screw. Such fastening methods don't require access to the inside of the joint to make repairs or adjustments.
Material	C1022 (or equivalent) case-hardened steel
Surface Hardness	Vickers HV 450 minimum
Torque	28 kg/cm minimum
Plating	See Appendix-A for plating information

Modified Pan Square Recess, Coarse Thread — TYPE-17 FACE FRAMING



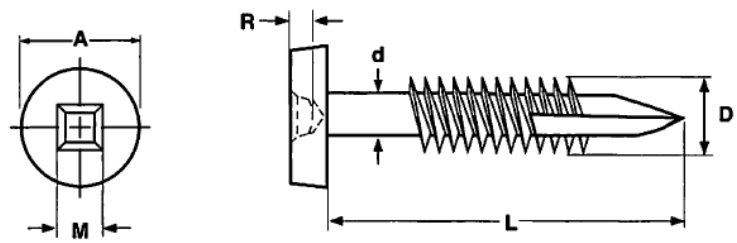
FACE FRAMING SCREWS - MODIFIED PAN SQUARE RECESS, COARSE THREAD

Nominal Diameter & Threads per Inch	A		R		M		D		d		Driver Size
	Head Diameter		Recess Penetration Gaging Depth		Recess Diameter		Major Diameter		Minor Diameter		
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
7-12	0.289	0.282	0.075	0.065	0.120	0.106	0.154	0.148	0.095	0.087	#2
Tolerance on Length			All Lengths		± 0.06						

Description	An externally threaded fastener with a rectangular-shaped head with a square recess. The shank has an unthreaded section directly below the head. Screws have a coarse thread pitch and a chip cavity cut out where the final several threads, ending with a piercing point. The long Type-17 point is 30% to 45% longer than the standard Type-17 point.
Applications / Advantages	Designed for use in softer woods such as particle board, for attaching a frame to the front of a cabinet structure to cover the edges of the cabinet. These are also referred to as "pocket hole" screws due to the type of hole into which the fastener is inserted. Such holes are drilled at an angle of approximately 15° into one workpiece and joined to the other piece by the screw. Such fastening methods don't require access to the inside of the joint to make repairs or adjustments. The long Type-17 point reduces the torque needed to install the fastener.
Material	C1022 (or equivalent) case-hardened steel
Surface Hardness	Vickers HV 450 minimum
Core Hardness	Vickers HV 240 - 450
Plating	See Appendix-A for plating information

TYPE-17 FACE FRAMING

Modified Pan Square Recess, Fine Thread

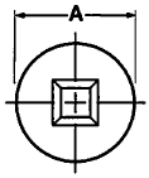


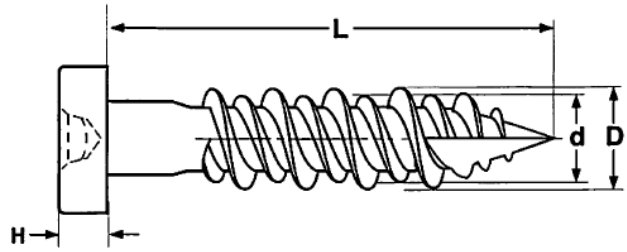
FACE FRAMING SCREWS - MODIFIED PAN SQUARE RECESS, FINE THREAD											
Nominal Diameter & Threads per Inch	A		R		M		D		d		Driver Size
	Head Diameter		Recess Penetration Gaging Depth		Recess Diameter		Major Diameter		Minor Diameter		
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
6-20	0.289	0.282	0.075	0.065	0.120	0.106	0.139	0.132	0.095	0.086	#2
Tolerance on Length			All Lengths		± 0.06						

Description	An externally threaded fastener with a rectangular-shaped head with a square recess. The shank has an unthreaded section directly below the head, a fine thread pitch and a chip cavity cut out where the final several threads, ending at the tip.
Applications / Advantages	Designed for use in hardwoods for attaching a frame to the front of a cabinet structure to cover the edges of the cabinet. The modified pan head design when using a pocket cutter machine to prepare the hole. These are also referred to as "pocket hole" screws due to the type of hole into which the fastener is inserted. Such holes are drilled at an angle of approximately 15° into one workpiece and joined to the other piece by the screw. Such fastening methods don't require access to the inside of the joint to make repairs or adjustments.
Material	C1022 (or equivalent) case-hardened steel
Surface Hardness	Vickers HV 450 minimum
Torque	28 kg/cm minimum
Plating	See Appendix-A for plating information

Modified Pan Square Recess, High-Low Thread

TYPE-17 FACE FRAMING





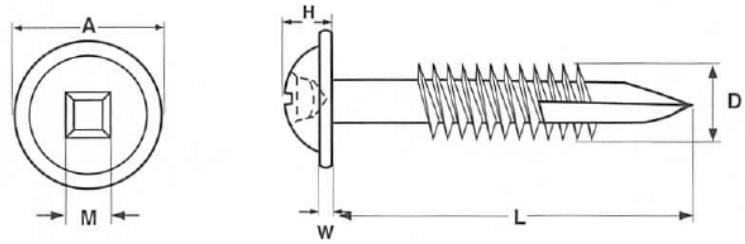
FACE FRAMING SCREWS - MODIFIED PAN SQUARE RECESS, HIGH-LOW THREAD								
Nominal Diameter & Threads per Inch	A		H		D		d	Driver Size
	Head Diameter		Head Height		High Thread Major Diameter		Low Thread Major Diameter	
	Max	Min	Max	Min	Max	Min	Ref	
7 - 15	0.289	0.282	0.120	0.106	0.154	0.147	0.130	#2
7 - 15	0.303	0.283	0.135	0.120	0.158	0.148	0.130	#2
Tolerance on Length			All Lengths		± 0.05			

There are multiple acceptable configurations for Face Framing screws with high-low thread. Two such sets of dimensions are listed here.

Description	An externally threaded fastener with a rectangular-shaped head with a square recess. The shank has an unthreaded section directly below the head. The screw's thread pattern has a double-lead, consisting of a high and low thread. The lower thread diameter is approximately 80% that of the higher thread, which is sharper and flatter than a standard thread. The tip of the screw has a piercing point and chip cavity.
Applications / Advantages	The high-low thread offers superior holding power across a wide range of woods and is less likely to split the material in which it is used. These are also referred to as "pocket hole" screws due to the type of hole into which the fastener is inserted. Such holes are drilled at an angle of approximately 15° into one workpiece and joined to the other piece by the screw. Such fastening methods don't require access to the inside of the joint to make repairs or adjustments.
Material	C1022 (or equivalent) case-hardened steel
Surface Hardness	Vickers HV 450 minimum
Torque	21 in.-lbs. minimum
Plating	See Appendix-A for plating information

TYPE-17 FACE FRAMING

Round Washer Square Recess, Fine Thread

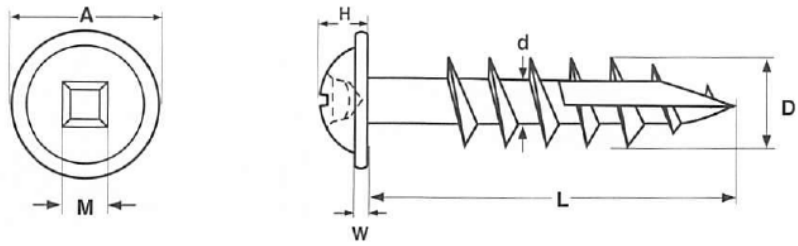


ROUND WASHER SQUARE RECESS FINE THREAD FACE FRAMING SCREW										
Nominal Diameter and Approximate # of Threads per Inch	A		H		W	D		M		Recess Size
	Washer Diameter		Total Head Height		Washer Thickness	Major Diameter		Recess Width		
	Max	Min	Max	Min	Ref	Max	Min	Max	Min	
7 - 18	0.385	0.355	0.133	0.108	0.035	0.154	0.148	0.120	0.106	#2

Tolerance on Length	Nominal Length	Tolerance
	1.25"	±0.05

Description	An externally threaded fastener with a dome-shaped head with a square recess and an integrally formed washer. The shank has an unthreaded section directly below the head, a fine thread pitch and a chip cavity cut out where the final several threads, ending at the tip.
Applications / Advantages	The fine thread variety is designed for use in hardwoods such as cherry or oak. The round washer head provides the maximum bearing surface to fasten it tightly into the pocket. These are also referred to as "pocket hole" screws due to the type of hole into which the fastener is inserted. Such holes are drilled at an angle of approximately 15° into one workpiece and joined to the other piece by the screw. Such fastening methods don't require access to the inside of the joint to make repairs or adjustments.
Material	C1022 (or equivalent) case-hardened steel
Surface Hardness	Vickers HV 450 minimum
Torque	25 in.-lbs. minimum
Plating	See Appendix-A for plating information

Round Washer Square Recess, Coarse Thread — TYPE-17 FACE FRAMING



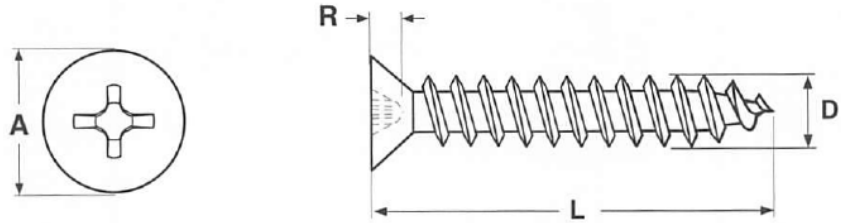
ROUND WASHER SQUARE RECESS COARSE THREAD FACE FRAMING SCREW												
Nominal Diameter and Approximate # of Threads per Inch	A		H		W	D		d		M		Recess Size
	Washer Diameter		Total Head Height		Washer Thickness	Major Diameter		Minor Diameter		Recess Width		
	Max	Min	Max	Min	Ref	Max	Min	Max	Min	Max	Min	
8 - 9	0.385	0.355	0.133	0.108	0.035	0.181	0.165	0.110	0.094	0.099	0.65	#2

Tolerance on Length	Nominal Length	Tolerance
	1.25" thru 1.5"	±0.05

Description	An externally threaded fastener with a dome-shaped head with a square recess and an integrally formed washer. The shank has an unthreaded section directly below the head, a coarse thread pitch and a chip cavity cut out where the final several threads, ending at the tip.
Applications / Advantages	The coarse thread variety is designed for use in soft woods, particle board and plywood. The round washer head provides the maximum bearing surface to fasten it tightly into the pocket. These are also referred to as "pocket hole" screws due to the type of hole into which the fastener is inserted. Such holes are drilled at an angle of approximately 15° into one workpiece and joined to the other piece by the screw. Such fastening methods don't require access to the inside of the joint to make repairs or adjustments.
Material	C1022 (or equivalent) case-hardened steel
Surface Hardness	Vickers HV 450 minimum
Torque	39 in.-lbs. minimum
Plating	See Appendix-A for plating information

HINGE—DEEP THREAD

Flat Head, Coarse Thread w/ Phillips Recess

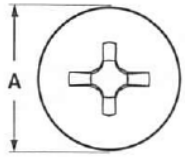


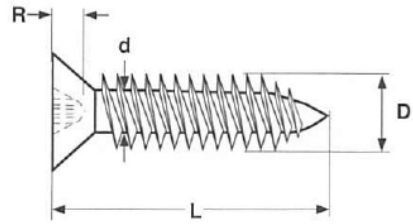
FLAT PHILLIPS COARSE THREAD HINGE SCREW							
Nominal Diameter	A		R		D		Phillips Driver Size
	Head Diameter		Recess Depth		Major Diameter		
	Max	Min	Max	Min	Max	Min	
5	0.237	0.215	0.075	0.052	0.133	0.122	2
6	0.262	0.238	0.095	0.072	0.141	0.135	2
7	0.295	0.267	0.103	0.080	0.154	0.148	2
8	0.312	0.285	0.110	0.087	0.168	0.161	2
Tolerance on Length	Up to 5/8"		+0 / -0.03				
	Over 5/8 to 1.5"		+0 / -0.05				

Description	An externally threaded fastener with a countersunk head, crossed recess, a single lead thread and a shank with a reduced diameter.
Applications / Advantages	Ideal for attaching hinges into soft woods. The deeper thread design offers greater resistance to pull-out forces.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimim
Case Depth	0.004" - 0.009"
Torque	#5: 15 kg/cm minimum; #6: 21 kg/cm minimum; #7: 26 kg/cm minimum; #8: 35 kg/cm minimum
Plating	See Appendix-A for plating information

Flat Head, Fine Thread w/ Phiillips Recess

HINGE—DEEP THREAD



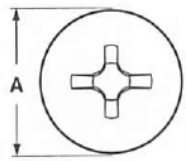


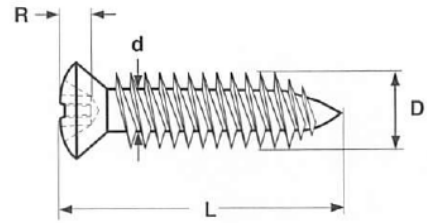
FLAT PHILLIPS FINE THREAD HINGE SCREW							
Nominal Diameter	A		R		D		Phillips Driver Size
	Head Diameter		Recess Depth		Major Diameter		
	Max	Min	Max	Min	Max	Min	
5	0.245	0.223	0.075	0.052	0.133	0.122	2
6	0.267	0.238	0.095	0.072	0.141	0.134	2
Tolerance on Length	Up to 5/8"		+0 / -0.03				
	Over 5/8 to 1.5"		+0 / -0.05				

Description	An externally threaded fastener with a countersunk head, crossed recess, a twinfast thread and a shank with a reduced diameter.
Applications / Advantages	Ideal for attaching hinges into hard woods. The twinfast thread design reduces the chance of splitting the wood.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimim
Case Depth	0.004" - 0.009"
Torque	**#5**: 15 kg/cm minimum; **#6**: 21 kg/cm minimum; **#7**: 26 kg/cm minimum; **#8**: 35 kg/cm minimum
Plating	See Appendix-A for plating information

HINGE—DEEP THREAD

Oval Head, Coarse Thread w/ Phillips Recess

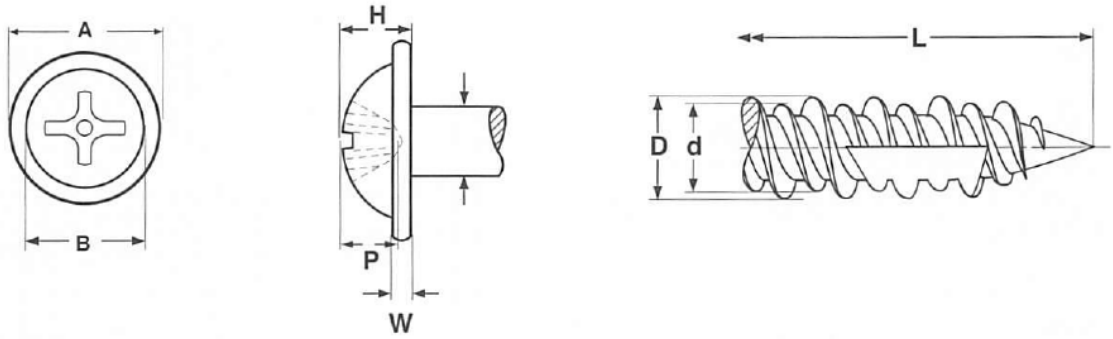




FLAT PHILLIPS FINE THREAD HINGE SCREW							
Nominal Diameter	A		R		D		Phillips Driver Size
	Head Diameter		Recess Depth		Major Diameter		
	Max	Min	Max	Min	Max	Min	
5	0.245	0.223	0.075	0.052	0.133	0.122	2
6	0.267	0.238	0.095	0.072	0.141	0.134	2
Tolerance on Length	Up to 5/8"		+0 / -0.03				
	Over 5/8 to 1.5"		+0 / -0.05				

Description	An externally threaded fastener that has a countersunk head with a rounded top surface, crossed recess, a twinfast thread and a shank with a reduced diameter.
Applications / Advantages	Ideal for attaching hinges into hard woods. The twinfast thread design reduces the chance of splitting the wood. Preferred by some when a more decorative appearance is desired.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimim
Case Depth	0.004" - 0.009"
Torque	#5: 15 kg/cm minimum; #6: 21 kg/cm minimum; #7: 26 kg/cm minimum; #8: 35 kg/cm minimum
Plating	See Appendix-A for plating information

Round Washer Phillips, High-Low Thread TYPE-17 INSTALLATION SCREW

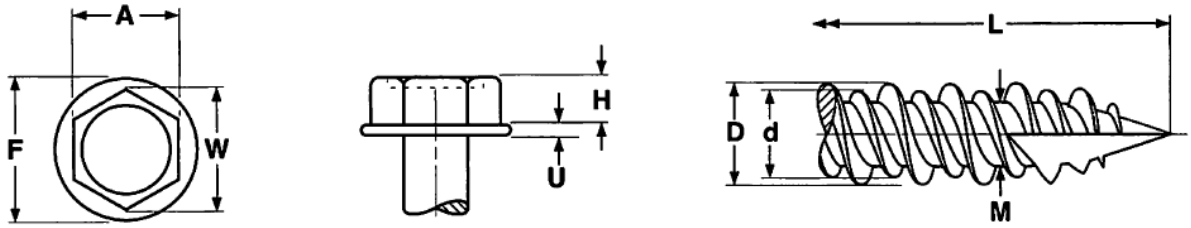


ROUND WASHER PHILLIPS HIGH-LOW INSTALLATION SCREW W/ TYPE-17 POINT												
Nominal Diameter and Threads per Inch	A		B	H		P		D		d	W	Recess Size
	Washer Diameter		Head Diameter	Total Head Height		Recess Depth		High Thread Diameter		Low Thread Diameter	Washer Thickness	
	Max	Min	Ref	Max	Min	Max	Min	Max	Min	Ref	Ref	
14-12	0.528	0.501	0.460	0.182	0.168	0.105	0.077	0.260	0.250	0.200	0.050	3
Tolerance on Length	All lengths					± 0.06"						

Description	An externally threaded fastener with a dome-shaped head and an integrally formed washer and a recess that can accomodate a Phillips screwdriver. The thread pattern has a double-lead, consisting of a high and low thread. The lower thread diameter is approximately 80% that of the higher thread, which is sharper and flatter than a standard thread. The tip of the screw has a piercing point and chip cavity.
Applications / Advantages	Can be used in wooden or metal studs.The thread pattern allows for easier movement through metal studs and increases fastening strength in wood studs. The sharp point and chip cavity reduce the torque required to install the fastener.
Material	C1022 or equivalent case-hardened steel
Surface Hardness	Rockwell C 45 minimum
Plating	See Appendix-A for plating information

TYPE-17 POLE BARN SCREW

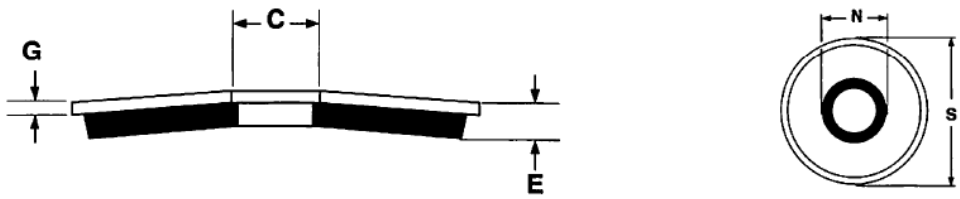
Hex Washer Head
w/ High-Low Thread



HEX WASHER TYPE-17 HIGH-LOW POLE BARN SCREW WITH NEO-EPDM WASHER

Nominal Diameter	A		W	H		F		U		D		d	M
	Width Across The Flats		Width Across Corners	Head Height		Washer Diameter		Washer Thickness		High Thread Diameter		Low Thread Diam	Minor Diam
	Max	Min	Min	Max	Min	Max	Min	Max	Min	Max	Min	Ref	Ref
10-16 (w/#8 Hd)	0.250	0.243	0.271	0.144	0.133	0.347	0.321	0.039	0.023	0.195	0.184	0.145	0.105

Tolerance on Length		
	Up to 1"	± 0.03
	Over 1"	± 0.05

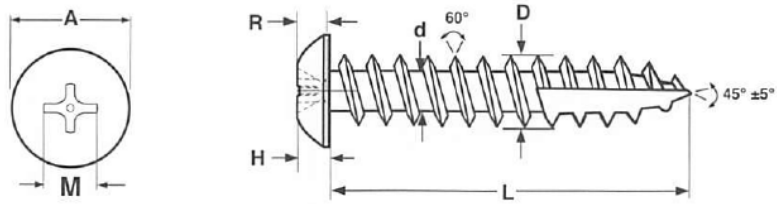


NEO-EPDM SEALING WASHERS

For Use with Screw of this Nominal Diameter	S		N		G	C		E	
	Outside Diameter of Steel Section		Inside Diameter of Steel Section		Thickness of Steel Section	Inside Diameter of EPDM Section		Thickness of EPDM Section	
	Max	Min	Max	Min	Ref	Max	Min	Max	Min
10	.638	.622	.226	.207	.031	.165	.136	.087	.071

Description	An externally threaded fastener with a six-sided head with an integrally-formed washer. Beneath the head is a free-spinning conically-shaped circular steel washer, bonded to a similarly shaped rubber-like piece which as a slightly smaller outside and inside diameter. The tapered point has a chip cavity cut out of the final incomplete threads. The thread pattern has a double-lead beginning at the point, consisting of a high and low thread. The lower thread varies in height from 1/3 to 1/2 that of the higher thread. The high thread has a somewhat sharper angle than the low thread (40° compared to 60°). The shank has a reduced diameter.	
Applications / Advantages	Primary use is to fasten corrugated steel panels to wooden structures.	
Material	Screw: C1018 - 1022 case-hardened steel	Washer: Steel section- G90 Steel; Elastic section: Style 40 EPDM sheet
Surface Hardness	Rockwell C 45 Minimum	Elastic section: Shore A 65-75 (Durometer scale)
Case Depth	0.004" - 0.009"	-
Torque	35 Kg-cm minimum	
Plating	Usually supplied with a hot-dip galvanized finish	

Truss Phillips TYPE-A SCREW W/TYPE-17 PT



TRUSS PHILLIPS SELF-TAPPING SCREWS TYPE-A WITH TYPE-17 POINT

Nominal Size or Basic Screw Diameter		Threads per Inch	D		d		A		H		M	R		Driver Size
			Major Diameter		Minor Diameter		Head Diameter		Head Height		Recess Diam.	Recess Penetration Depth		
			Max	Min	Max	Min	Max	Min	Max	Min	Ref	Max	Min	
8	.1640	15	.168	.162	.123	.116	.384	.364	.102	.088	.166	.088	.063	2
14	.2500	10	.254	.248	.185	.178	.557	.530	.146	.129	.257	.126	.101	3
Tolerance on Length			Up to 1 in., Incl.: ± 0.03"						Over 1 in.: ± 0.05"					

Description	A thread forming tapping screw with wide-spaced threads, a tapered point with a chip cavity, a head with a low rounded top and a flat bearing surface.
Applications/ Advantages	The Type-A thread pattern enables these parts to be used in metal as well as wood drawers. The #8 diameter sizes are specifically designed for fastening small hinges to the edge of hard woods. The long #14 size is designed for fastening cabinets to either metal or hard wood.
Material	AISI 1016 - 1024 or equivalent steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650° F minimum.
Surface Hardness	Steel: Rockwell C45 minimum
Case Depth	No. 8 diameter: .004 - .009 No. 14 diameter: .005 - .011
Core Hardness (after tempering)	Rockwell C28 - 38
Plating	See Appendix-A for information on plating of steel screws.

ANCHORS

Concrete Screws 429

Drop-In Style
- Anchor 431
- Setting Tool 432

Expansion
- Single 433
- Double 433

Expansion Pin Style 434

Hammer Drive, Zinc Alloy 435

Hollow Wall, Plastic
- Conical, Light Duty 436
- Fluted, Light Duty 437
- Ribbed 438

Hollow Wall, Steel
- Regular Style 439
- Drive Style 440

KapToggle® 441

Lag Screw Shields 442

Lead Wood Screw 443

Machine Screw 444

Nylon Nail-In 445

One Step 446

Sleeve
- Acorn Nut 447
- Flat Head 448
- Threshold Flat Head 448
- Hex Nut & Washer Style 449
- Rod Hanger 450
- Round Head 451
- Tie Wire 452

Split Drive 453

T-Anchors 454

Toggle, Plastic 455

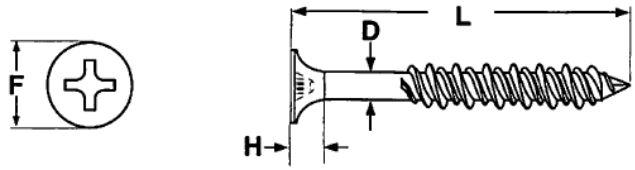
Toggle Bolt 456

Toggle Wings 457

Wedge 458

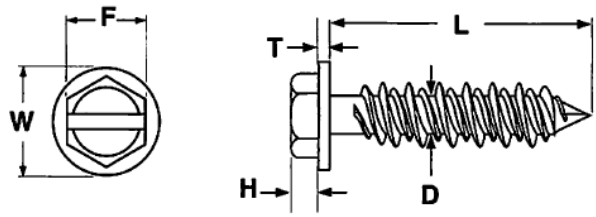
Drive Pin Anchors 460

CONCRETE SCREWS - DIMENSIONS



Flat Phillips Concrete Screws

D	Thread Size	Fixture Clearance Hole	H	F	Phillips Driver Bit Size
Nominal Diameter			Head Height	Head Diameter	
			Ref	Ref	
3/16	11-16	1/4	9/64	3/8	2
1/4	1/4-15	5/16	3/16	1/2	3



Slotted Hex Washer Concrete Screws

D	Thread Size	Fixture Clearance Hole	H	F	W	T
Nominal Diameter			Head Height	Width Across the Flats	Washer Diameter	Washer Thickness
			Ref	Ref	Ref	Ref
3/16	11-16	1/4	7/64	1/4	11/32	1/32
1/4	1/4-15	5/16	9/64	5/16	13/32	1/32

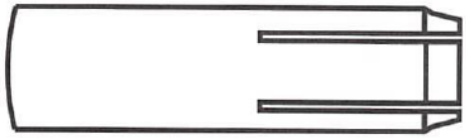
CONCRETE SCREWS - PERFORMANCE DATA

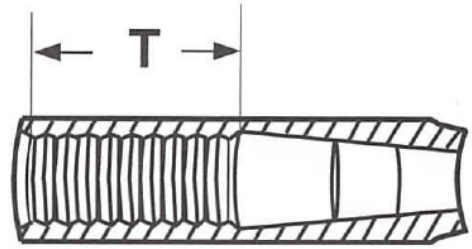
CONCRETE SCREWS								ITW Buildex*
DxL	Drill Bit	Minimum Embedment	Maximum Embedment	Maximum Fixture Thickness	Ultimate Tensile Strength (lbs.)	Ultimate Shear Strength (lbs.)	Ultimate Tensile Strength (lbs.)	Ultimate Shear Strength (lbs.)
Screw Size (Diameter x Length)					In 4000 psi. Concrete, 1-1/4" embedment		In Concrete Block, 1-1/4" embedment	
3/16 x 1-1/4	5/32 x 3-1/2	1	1-3/4	0 - 1/4"	1060	1250	760	1020
3/16 x 1-3/4	5/32 x 3-1/2			1/4 - 3/4"				
3/16 x 2-1/4	5/32 x 4-1/2			3/4 - 1-1/4"				
3/16 x 2-3/4	5/32 x 4-1/2			1-1/4 - 1-3/4"				
3/16 x 3-1/4	5/32 x 5-1/2			1-3/4 - 2-1/4"				
3/16 x 3-3/4	5/32 x 5-1/2			2-1/4 - 2-3/4"				
3/16 x 4	5/32 x 5-1/2			2-1/2 - 3"				
1/4 x 1-1/4	3/16 x 3-1/2			0 - 1/4"	1540	2150	880	1270
1/4 x 1-3/4	3/16 x 3-1/2			1/4 - 3/4"				
1/4 x 2-1/4	3/16 x 4-1/2			3/4 - 1-1/4"				
1/4 x 2-3/4	3/16 x 4-1/2			1-1/4 - 1-3/4"				
1/4 x 3-1/4	3/16 x 5-1/2			1-3/4 - 2-1/4"				
1/4 x 3-3/4	3/16 x 5-1/2			2-1/4 - 2-3/4"				
1/4 x 4	3/16 x 5-1/2			2-1/2 - 3"				
1/4 x 5	3/16 x 6-1/2			3-1/4 - 4"				
1/4 x 6	3/16 x 7-1/2			4-1/4 - 5"				

Description	An externally threaded, hardened screw with a double lead, consisting of alternating raised and lowered threads with notches cut into the raised threads, and a nail-type point.
Applications/ Advantages	Cuts its own threads and when used in concrete, block or brick. Eliminates the need for an anchor when used in light or medium-duty applications. When used in concrete, it can be removed and re-driven into the same hole. Special carbide bits are recommended for driving concrete screws into masonry. Some applications include anchoring the following to masonry: electrical junction boxes, wooden beams, plywood, exterior insulation, metal flashing, thresholds.
Material	Case hardened AISI 1022 steel
Anchor Spacing	Concrete screws should be installed a minimum of ten anchor diameters between each other. They have an advantage over most other types of masonry anchors in that they can be installed close to the edge of the material in which they are installed.
Depth of Hole	Hole should be of a depth equal to the required embedment plus 1/2"
Tensile and Shear Strength	The suggested safe working load is one-fourth the average proof test loads shown in the above table.
Plating	The most popular coating for concrete screws is a blue Ruspert finish.

*ITW Buildex is the original writer of these concrete screw specifications.

Carbon Steel & Stainless Steel
DROP-IN STYLE





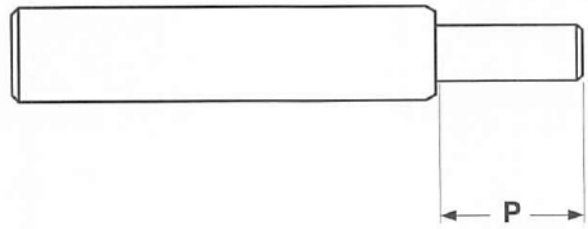
(Internal View)

DROP-IN ANCHORS					FF-S-325 Group VIII, Type 1
Anchor Size/ Bolt Size	Hole Diameter	T	Minimum Embedment	Ultimate Tensile (lbs.)	Ultimate Shear (lbs.)
		Thread Length		4000 psi. Concrete	
1/4	3/8	1/2	1	2067	1321
3/8	1/2	5/8	1 9/16	3995	3714
1/2	5/8	3/4 - 1 3/16	2	4110	5854
5/8	7/8	1 - 1 3/16	2 1/2	5750	8754
3/4	1	1 3/16 - 1 1/4	3 3/16	10,807	11,627

Description	A two-piece, internally threaded expansion anchor with four equally-spaced longitudinal slots extending from the bottom end of the outer shield, inside of which sits a pre-assembled dilating plug. The bottom lip of the anchor is tapered. It is permissible for a section of the shield to be knurled to increase the gripping action of the anchor.	
Applications/ Advantages	Intended for flush mounted, medium to heavy-duty applications in solid materials such as stone and concrete. It can be used in, but are not limited to, overhead assemblies such as duct work and pipe hangers because the internal plug holds its position. Can also be used to anchor handrails and floor-mounted door stops.	
Material	***Steel***	***18-8 Stainless***
	Anchor body: AISI 12L14 cold rolled steel ***Expander Plug:*** AISI 12L14/1215 cold rolled steel, case-hardened and tempered	***Anchor body:*** 303 Stainless steel ***Expander Plug:*** 303 Stainless steel
Anchor Spacing	Anchors should be installed a minimum of ten anchor diameters between each other and a minimum of five anchor diameters from the edge.	
Depth of Hole	Should be at least equal to the length of the anchor.	
Tensile and Shear Strengths	The suggested safe working load is one-fourth the average proof test loads shown in the above table.	

DROP-IN STYLE

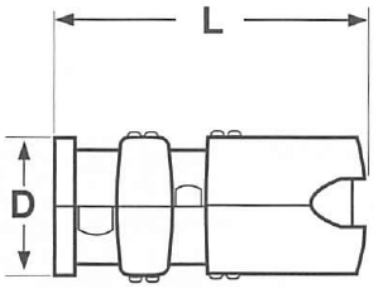
Setting Tool



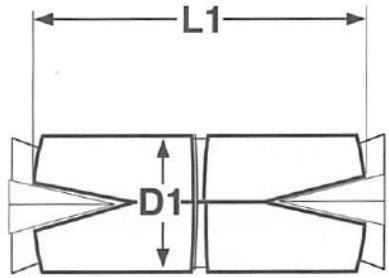
Drop In Anchor Settinng Tool	
Tool for use with Drop-In Anchor of this Diameter	P
	Length of Pin (Ref)
1/4"	.615
3/8"	.955
1/2"	1.184
5/8"	1.312
3/4"	1.950

How Tool is Used	Drill a hole into base material to the proper embedment depth. Clear away the dust from the hole and insert Drop-In anchor (slotted end at the bottom). Position anchor so top edge is flush with the surface. Using the appropriate sized setting tool, set the anchor by driving the tool into the top end until the setting tool's shoulder is seated against the anchor.

EXPANSION—SINGLE & DOUBLE



SINGLE EXPANSION



DOUBLE EXPANSION

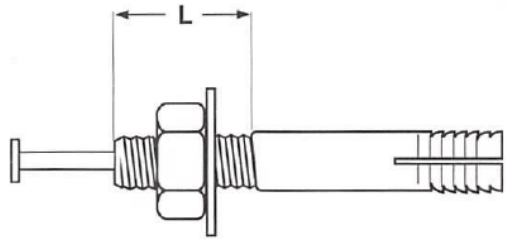
Single and Double Expansion Anchors

FF-S-325, Group II
Type 2, Class 2

Bolt Diameter	Recommended Hole Diameter	Single Expansion Anchors				Double Expansion Anchors		
		D	L		Proof Test Load (Ultimate Tensile Strength)	D1	L1	Proof Test Load (Ultimate Tensile Strength)
		Minimum Diameter of Shield Body	Minimum Length of Shield Body			Minimum Diameter of Shield Body	Minimum Length of Shield Body	
			Short	Regular	In 3000 psi. strength concrete			In 3000 psi. strength concrete
1/4	1/2	7/16	1 1/4	1 1/2	800	1/2	1 1/4	1100
5/16	5/8	1/2	1 3/8	1 5/8	1100	9/16	1 5/8	1450
3/8	3/4	11/16	1 1/2	2	1450	11/16	2	1750
1/2	7/8	7/8	2	2 1/2	1850	7/8	2 1/4	2200
5/8	1	1	2 1/2	2 3/4	2400	1	2 3/4	3250
3/4	1 1/4	1 1/8	2 3/4	3 1/4	3000	1 1/8	3 1/4	4600
7/8	1 5/8	1 1/2	-	4 1/2	3700	1 1/2	4	5850
1	1 3/4	1 5/8	-	5	4400	1 5/8	4 1/4	6700

Style	*Single Expansion*	*Double Expansion*
Description	This anchor consists of three parts-- (A) a two-piece expansion shield held together by a steel band or wire, or interlocked by ears and lugs; and (B) an expander nut. The outer surface of the shield is designed with ribs or corrugations to resist turning. The nut is either conical or eliptical in shape so as to fit within the shield body.	This anchor consists of four parts-- a two-piece tubular shield, a hollow, wedge-shaped cone and a wedge-shaped nut—brought together into a single anchor unit. The shields are connected by a pair of spring bands. At one end is the nut and at the other the cone, each designed so as to not turn during expansion.
Applications/ Advantages	Used in soft masonry with machine screws or machine bolts which are exposed to vibration or side pressure. The expander nut climbs the anchor bolt as it is tightened, expanding the shield body. The bolt can be removed and replaced without affecting the holding power of the anchor system. Can also be used in harder materials, including stone, brick or concrete.	Used in soft masonry with machine screws or machine bolts which are exposed to vibration or side pressure. As the anchor sets, the opposite ends pull towards each other causing the elongation of the anchor body. It doesn't fracture and allows for a fastening of any length. Can also be used in harder materials, including stone, brick, concrete or block.
Material	Expansion shield and nut may be made of alloy zinc, brass, malleable iron or steel.	
Anchor Spacing	Anchors should be installed a minimum of ten anchor diameters between each other and a minimum of five anchor diameters from the edge.	
Depth of Hole	Should be equal to or slightly longer than the length of the anchor.	
Tensile Strength	Expansion anchors shall not be removable or show evidence of failure when subjected to axially applied proof test loads as specified in the above table when set in concrete of 3000 psi. compressive strength.The suggested safe working load is one-fourth the average proof test loads shown in the above table.	

EXPANSION PIN

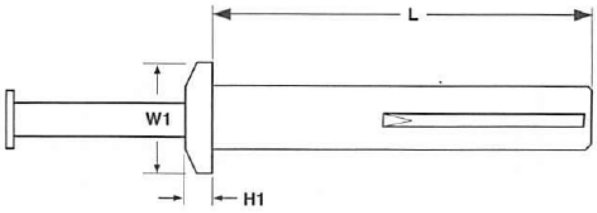


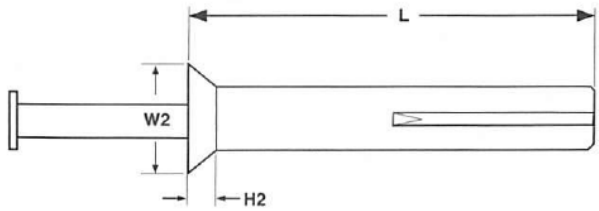
Expansion Pin Anchors

Diameter x Length	L Thread Length	Maximum Thickness Fastened	Drill Size	Pull-Out & Shear Tests in 2000 PSI Concrete					
				Tensile				Shear	
				Minimum Embedment	Tensile Strength (psi.)	Maximum Embedment	Tensile Strength (psi.)	Minimum Embedment	Shear Strength
1/4 x 1 3/4"	5/8	3/8	1/4	1"	900	1 1/2"	1000	1"	1600
1/4 x 2 3/8"	3/4	1	1/4						
5/16 x 2"	1 1/8	1/2	5/16	1 1/4"	1400	1 7/8"	1500	1 1/4"	3000
5/16 x 2 3/4"	1 1/8	1 1/4	5/16						
5/16 x 4"	1 1/8	2 1/2	5/16						
3/8 x 2 3/8"	7/8	3/4	3/8	1 1/2"	2200	2 1/4"	2800	1 1/2"	3400
3/8 x 3 1/2"	1 1/8	1 7/8	3/8						
3/8 x 5"	1 1/8	3 3/8	3/8						
1/2 x 2 3/4"	7/8	3/4	1/2	2"	3600	3"	4200	2"	7200
1/2 x 3 1/2"	1	1 1/2	1/2						
1/2 x 4 3/4"	1 3/4	2 3/4	1/2						
1/2 x 6"	1 7/8	4	1/2						
5/8 x 4"	1 1/4	1 5/8	5/8	2 1/2"	5400	3 3/4"	6600	2 1/2"	9200
5/8 x 4 3/4"	1 1/4	2 3/8	5/8						
5/8 x 6"	1 1/4	3 5/8	5/8						
3/4 x 5"	1 3/4	2 1/4	3/4	3"	7500	4 1/2"	9900	3"	13,500
3/4 x 6"	1 3/4	3 1/4	3/4						

Description	An anchoring device consisting of (A) a metal sleeve that is slit at one end and has a male thread at the opposite end; (B) a headed metal expander pin that enters the sleeve at the threaded end, and is used to set the anchor in place; (C) a washer and hex nut assembled to the threaded end of the sleeve.
Applications/ Advantages	This is an impact-expansion type of anchor works by expanding against the concrete in which it is embedded. When the pin is struck with a hammer so the pin head meets the threaded section, the opposite end expands and the anchor is set. This style of anchor is popular because it is easy to install; has relatively high pull-out and shear strength; and can be visually inspected even after it is set in place.
Material	***Sleeve:*** Carbon steel ***Pin:*** Hardened steel ***Nut:*** Carbon steel ***Washer:*** Cold rolled steel
Anchor Spacing	Anchors should be installed with a minimum of 10 anchor diameters between each other and a minimum of 5 diameters from the edge.
Tensile Strength	The suggested safe working load is one-fourth of the average proof test load shown in the above table.
Shear Strength	The suggested safe working load is one-fourth of the average proof test load shown in the above table.
Plating	Expansion Pin anchors are usually supplied plated zinc yellow.

Steel & Stainless HAMMER DRIVE





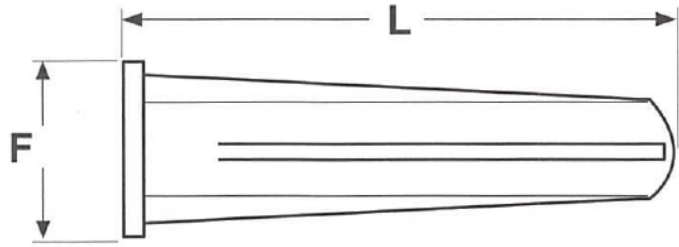
Zinc Alloy Hammer Drive Anchors

FF-S-325, Group V, Type 2, Class 3

Anchor Size	Fixture Clearance Hole	H1	W1	H2	W2	Performance Data						
		Mushroom Head		Flat Head		Embedment Depth	In 4000 psi. Concrete		In C-90 Hollow Block		In Solid Red Brick	
		Height	Width	Height	Width							
		Ref	Ref	Ref	Ref		Tensile (lbs.)	Shear (lbs.)	Tensile (lbs.)	Shear (lbs.)	Tensile (lbs.)	Shear (lbs.)
3/16	1/4	7/64	13/32	-	-	3/4	500	1000	270	860	460	920
1/4	5/16	9/64	35/64	3/16	35/64	5/8	600	1500	360	1040	570	1250
						3/4	720	1500	480	1160	790	1400
						1	820	1500	590	1320	820	1400
						1 3/8	1150	1500	800	1320	950	1400
						1 1/2	1300	1500	965	1320	1015	1400

Description	A two-piece fastener consisting of a tubular stem with a dome or flat-fillister shaped head and a nail which is driven through the hollow center of the stem of the anchor. The stem is slit longitudinally on opposite sides from the bottom of the shank to the place where the point of the nail extends into the stem.	
Applications/ Advantages	Hammer drives are considered to be light-duty anchors. They are designed for attaching termination bar to solid concrete, solid brick, block or masonry walls. Its advantages include ease of installation, its immediate loading capabilities and the tamper-resistant nature of the finished assembly.	
Material	*Steel/Zamac*	*Stainless*
	Anchor: Zinc Alloy ***Pin:*** AISI 1018 or equivalent carbon steel	***Anchor:*** Zinc Alloy ***Pin:*** Type 304 stainless steel
Proof Load	Hammer drive anchors shall not be removable when set in concrete of 3000 psi compressive strength and subjected to the test loads in an axial direction, as specified in the above table. The masonry shall show no evidence of failure attributable to the anchor.	
Plating	Pins of steel hammer drive anchors are commonly supplied with a zinc plating.	Stainless hammer drive anchors do not have additional coatings applied.

HOLLOW WALL, CONICAL — Plastic



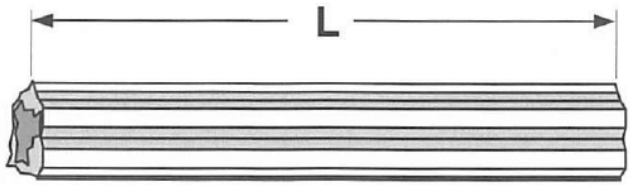
Conical Plastic Anchor

Part Number	Screw Size	L	F	Drill Size	Minimum Embedment Depth	Performance Information					
		Length of Anchor	Flange Diameter			In 4000 psi. Concrete		In Hollow Block		In Solid Red Brick	
						Tensile	Shear	Tensile	Shear	Tensile	Shear
0612PAC	6-8	3/4	19/64	3/16	3/4	210	240	180	215	100	230
0814PAC	8-10	7/8	19/64	3/16	7/8	440	280	290	235	160	260
1016PAC	10-12	1	3/8	1/4	1	550	350	350	280	280	320
1424PAC	14-16	1 1/2	7/16	5/16	1 1/2	840	575	840	530	880	500

Description	An injection-molded anchor with a flanged opening at the top end and a cone-shaped body that is cupped at the opposite end. It has three horizontal slits cut into the body which extend from the bottom tip up the shank but stop before the flange. There are also three horizontal fins extending from the flange at the top, down the shank but stop before reaching the bottom tip.
Applications/ Advantages	The conical plastic anchor is a light-duty part that can be used in drywall, concrete, hollow block or brick. It is not suited for applications where holding power is important. For use with self-tapping or wood screws.
Material	Engineered plastic
Tensile & Shear strength*	See above table. These vales should be reduced by at least 75% to determine the safe working load in each application.

*Recommended safe working load is one-fourth of the proof test load.

Plastic HOLLOW WALL, FLUTED

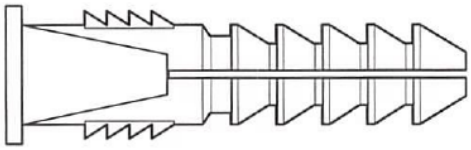


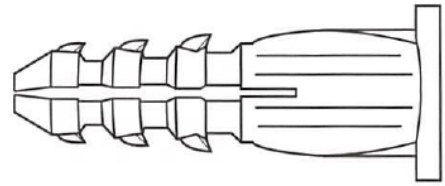
Fluted Plastic Anchor						
Part Number	Screw Size	Length of Anchor	Drill Size	Minimum Embedment Depth	Performance Information In 4000 psi. Concrete	
					Tensile	Shear
0416PAF	4-6	1	3/16	1	140	215
1016PAF	10-12	1	1/4	1	490	350
1424PAF	14	1 1/2	5/16	1 1/2	615	575

Description	An injection-molded anchor with protruding ribs that extend from end to end. The openings at either end of the anchor are identical.
Applications/ Advantages	The fluted plastic anchor is a light-duty part that can be used in stone, concrete, hollow block or brick. It is not suited for applications where holding power is important and should not be installed in overhead areas. For use with self-tapping or wood screws.
Material	Engineered plastic
Tensile & Shear strength*	See above table. These vales should be reduced by at least 75% to determine the safe working load in each application.

*Recommended safe working load is one-fourth of the proof test load.

HOLLOW WALL, RIBBED — Plastic





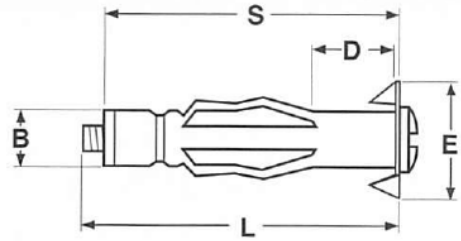
Plastic Hollow Wall Anchors			
Part Number	**Screw Size**	**Acceptable Range of Length**	**Drill Size**
08PA	6-8	3/4" - 1"	3/16
12PA	8-10	1" - 1 1/4"	1/4
16PA	10-12-14	1 5/32" - 1 1/2"	5/16
For best results, the screw should be 1/8 to 1/4" longer than the length of the anchor.			

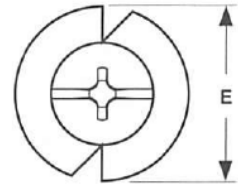
Description	An injection-molded anchor with a ribbed shank which resists "backing-out" after installation and longitudinal slits along the shaft which allows the anchor to expand when a screw is inserted.
Applications/ Advantages	Plastic anchors are a more economical, light-duty part than steel hollow wall anchors. They can be used in sheetrock, plaster, brickwork, concrete or tile. The design of the collar allows plastic anchors to also be used in hollow materials. For use with self-tapping or wood screws.
Material	Polyvinylchloride or Polyethylene plastic
Pullout Values*	50 lbs.
Color	Plastic anchors are usually, but not exclusively, supplied in white.

*Recommended safe working load is one-fourth of the proof test load.

Regular Style

HOLLOW WALL, STEEL



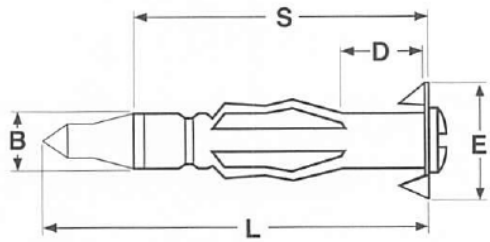


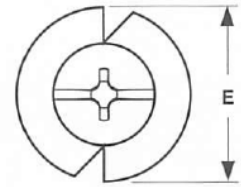
Screw Expansion Shield Hollow Wall Anchors, Steel

B notes Diam.	Screw Size		E	D	S			Performance in Plywood			Performance in Drywall		
Anchor Size	Diam x L	Hole Size	Collar Diam.	Sleeve Length	Overall Shell Length	Grip Range		Material Thickness	Pull-out	Shear	Material Thickness	Pull-out	Shear
			Ref	Ref	Ref	Max	Min	Inches	Lbs.	Lbs.	Inches	Lbs.	Lbs.
1/8 Extra Short	6-32 x 1	5/16	1/2	3/16	25/32	1/4	1/16	1/8	110	100	-	-	-
								1/4	125	450			
1/8 Short	6-32 x 1 1/2	5/16	1/2	3/8	1 1/4	1/2	1/8	1/4	65	350	1/4	25	190
								1/2	300	425	1/2	90	165
1/8 Long	6-32 x 2	5/16	1/2	3/4	1 11/16	7/8	5/8	5/8	430	450	5/8	130	205
								7/8	450	450	7/8	145	275
1/8 Extra Long	6-32 x 2-1/2	5/16	1/2	1 3/8	2 1/4	1 1/2	1 1/4	1 1/4	500	450	1 1/4	260	320
3/16 Short	10-24 x 2-1/4	3/8	5/8	3/8	2 1/16	5/8	1/8	1/4	65	550	1/4	25	230
								5/8	475	635	5/8	135	300
3/16 Long	10-24 x 2-3/4	3/8	5/8	7/8	2 9/16	1 3/16	5/8	5/8	500	640	5/8	135	305
								1 1/8	605	730	1 1/8	260	485
3/16 Extra Long	10-24 x 3-1/2	3/8	5/8	1 1/2	3 3/16	1 3/4	1 1/4	1 1/4	660	765	1 1/4	300	490
1/4 Short	1/4-20 x 2 1/4	1/2	11/16	3/8	2 1/16	5/8	1/8	1/4	65	600	1/4	25	240
								5/8	500	850	5/8	140	300
1/4 Long	1/4-20 x 2 3/4	1/2	11/16	7/8	2 9/16	1 3/16	5/8	5/8	560	900	5/8	155	330
								1 1/8	720	1000	1 1/8	165	550
1/4 Extra Long	1/4-20 x 3-1/2	1/2	11/16	1 1/2	3 3/16	1 3/4	1 1/4	1 1/4	765	1220	1 1/4	200	575

Description	A three-piece fastener consisting of (1) a cylindrical expander shell with longitudinal sections of its shank removed—this design allows the shell to be pulled toward the head and form anchoring legs on the blind side of the assembly. The shell has a threaded opening at one end and a flanged collar at the opposite end with an opening sufficiently large enough to allow a screw to pass to the threaded opening. The flange of the collar has prongs which dig into the bearing surface at the front end of the assembly; (2) a combo-drive pan head screw; (3) either a fiber or steel flat washer.
Applications/ Advantages	Steel hollow wall anchors are considered to be light-duty anchors. They require a pre-drilled hole and may be used in drywall, sheetrock, plaster or paneling. When properly installed, they will not crack or crumble the wall material and resist vibration. The machine screw may be removed and inserted multiple times to accomodate an exchange of fixtures.
Material	***Shell:*** AISI C1008 - 1010 or equivalent cold-rolled steel ***Screw:*** Carbon steel with a minimum tensile strength of 60,000 psi.
Pullout Values	Expansion sleeve hollow wall anchors shall not be removable or show evidence of failure when subjected to axially applied proof loads as specified in the above table. The safe working load is one-fourth the average pullout values listed above.
Shear Strength	The safe working load is one-fourth the average shear values listed above.
Plating	See Appendix-A for plating information.

HOLLOW WALL, STEEL — Drive Style



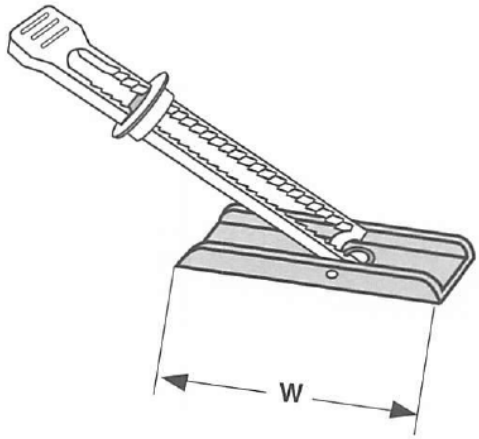


DRIVE STYLE EXPANSION SHIELD HOLLOW WALL ANCHORS--STEEL

B notes Diam.	Screw Size		E	D	S			Performance in Plywood			Performance in Drywall		
Anchor Size	Diam x L	Hole Size	Collar Diam.	Sleeve Length	Overall Shell Length	Grip Range		Material Thickness	Pullout	Shear	Material Thickness	Pullout	Shear
			Ref	Ref	Ref	Max	Min	Inches	Lbs.	Lbs.	Inches	Lbs.	Lbs.
1/8 Extra Short	6-32 x 1-11/32	5/16	1/2	3/16	25/32	1/4	1/16	1/8	110	100	-	-	-
								1/4	125	450			
1/8 Short	6-32 x 1-25/32	5/16	1/2	3/8	1 1/4	1/2	1/8	-	-	-	3/8	25	90
1/8 Long	6-32 x 2-11/32	5/16	1/2	3/4	1 11/16	7/8	5/8	5/8	430	450	5/8	130	205
								7/8	450	450	7/8	145	275
1/8 Extra Long**	6-32 x 2-11/32	5/16	1/2	3/8	1 13/16	1v3/16	1/8	-	-	-	5/8	85	175

Description	A three-piece fastener consisting of (1) a cylindrical expander shell with longitudinal sections of its shank removed--this design allows the shell to be pulled toward the head and form anchoring legs on the blind side of the assembly. The shell has a threaded opening at one end and a flanged collar at the opposite end with an opening sufficiently large enough to allow a screw to pass to the threaded opening. The flange of the collar has prongs which dig into the bearing surface at the front end of the assembly; (2) a combo-drive pan head screw; (3) either a fiber or steel flat washer.
Applications/ Advantages	Steel hollow wall anchors are considered to be light-duty anchors. They require a pre-drilled hole and may be used in drywall, sheetrock, plaster or paneling. When properly installed, they will not crack or crumble the wall material and resist vibration. The machine screw may be removed and inserted multiple times to accomodate an exchange of fixtures.
Material	***Shell:*** AISI C1008 - 1010 or equivalent cold-rolled steel ***Screw:*** Carbon steel with a minimum tensile strength of 60,000 psi.
Pullout Values	Expansion sleeve hollow wall anchors shall not be removable or show evidence of failure when subjected to axially applied proof loads as specified in the above table. The safe working load is one-fourth the average pullout values listed above.
Shear Strength	The safe working load is one-fourth the average shear values listed above.
Plating	See Appendix-A for plating information.

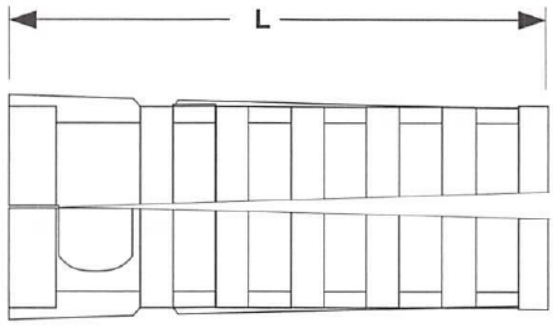
KAP TOGGLE®



KapToggle®													
Part Number	Size	For use with screws of this size	W	Required Hole Size for Base Material	Performance Test Results in various Materials							
					3/8" Drywall		1/2" Drywall		5/8" Drywall		Masonry Block	
			Toggle Length (Nominal)		Pull-Through Load	Recommended Working Load	Pull-Through Load	Recommended Working Load	Pull-Through Load	Recommended Working Load	Pull-Through Load	Recommended Working Load
					Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
348948	1/8	6-32	1.5"	13/32	68	23	111	37	124	41	307	102
348951	3/16	10-24	2"	13/32	68	23	115	38	133	44	452	150
348960	1/4	1/4-20	2"	13/32	96	32	121	40	123	41	1091	363

Description	This is a 3-piece anchor that consists of (1) a metal toggle bent at two 90° angles with an internally threaded hole at its center, (2) a serrated nylon strap that extends from both sides of the metal toggle, (3) a shoulder washer that slides down the strap and fits snug into the predrilled hole on the front side of the assembly. Upon installation, the extra length of the strap snaps off.
Applications/Advantages	May be used in hollow wall or masonry block. Can be re-used multiple times. Is easy for one person to install. Has superior pull-out load compared to other hollow wall anchors. Eliminates the need for extra long screws that are sometimes required with other hollow wall anchors.
Material	**Toggle**: Cold rolled steel **Strap And Shoulder Washer**: Nylon

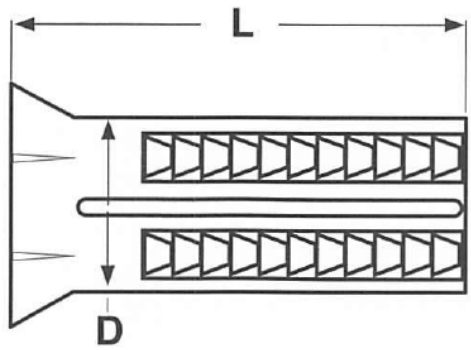
LAG SCREW SHIELD — Die-Cast Zinc



LAG SCREW EXPANSION SHIELDS				FF-S-325, Group II, Type 1
Anchor Size	L	Recommended Size of Hole		Proof Test Loads*
	Minimum Anchor Length	Diameter	Depth	Lbs.
1/4 Short	1	1/2	1	400
1/4 Long	1-1/2	1/2	1-1/2	500
5/16 Short	1	1/2	1-1/4	800
5/16 Long	1-3/4	1/2	1-3/4	1000
3/8 Short	1-3/4	5/8	1-3/4	1300
3/8 Long	2-1/2	5/8	2-1/2	1600
1/2 Short	2	3/4	2	2100
1/2 Long	3	3/4	3	2800

Description	A two-piece assembly made of two semi-cylindrical hollow sections interlocked at the top, allowing the shield to expand when in place. The bore of the shield is tapered, has an internal thread for about 2/3 of the length from the bottom and a ribbed outer surface which resists "backing out" of the hole into which it is inserted.
Applications/ Advantages	Lag Shields are medium-duty anchors which expand to fill the area of the pre-drilled hole when a lag screw is tightened into the shield. Extra-long sizes are for use in mortar or brick. Standard lengths are intended for use in concrete. They can be used in solid or hollow base materials and are more resistant to temperature fluctuations and rust than other light-duty anchors.
Material	Die-cast zinc
Pullout Values	Shields shall meet the proof test loads as noted in the above table. When tested, they shall not be removable when set in concrete of 3000 p.s.i. comprehensive strength and subjected to these specific test loads in an axial direction.
Plating	Lag shields are usually supplied without any additional finishes.

LEAD WOOD SCREW STYLE



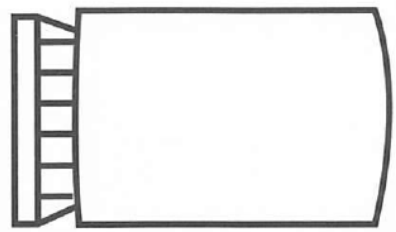
LEAD WOOD SCREW ANCHOR

FF-S-325 Group IV, Type 1

Wood Screw Size	Fractional Screw Size	D	L	Proof Test Loads (pounds)		
		Nominal Outside Diameter	Lengths	Anchor Lengths (inches)		
				3/4"	1"	1 1/2"
6	1/8 - 3/16"	1/4"	3/4, 1, 1 1/2	80	88	100
8	1/8 - 3/16"	1/4"	3/4, 1, 1 1/2	88	122	192
10	3/16 - 1/4"	5/16"	3/4, 1, 1 1/2	100	160	540
12	3/16 - 1/4"	5/16"	3/4, 1, 1 1/2	104	196	624
14	1/4 - 5/16"	3/8"	1, 1 1/2, 2	192	360	800
16	5/16"	3/8"	1, 1 1/2, 2	----	380	900
18	5/16"	3/8"	1, 1 1/2, 2	----	412	940

Description	A hollow, cylindrical anchor which is split from the bottom up for the majority of its length and has longitudinal ribs for part of its length. The diameter at the split (bottom) end is tapered; the top end is flared to a wider diameter than the remainder of the anchor's body.
Applications/ Advantages	Used with wood screws, lags and tapping screws for light duty applications in brick, block, drywall, masonry or concrete. Will conform to irregular, out-of-round holes.
Material	Lead alloy
Anchor Spacing	Anchors should be installed a minimum of ten anchor diameters between each other and a minimum of five anchor diameters from the edge.
Depth of Hole	Sould be at least 1/4" longer than the length of the anchor.
Tensile Strength	The suggested safe working load is one-fourth the average proof test loads shown in the above table.

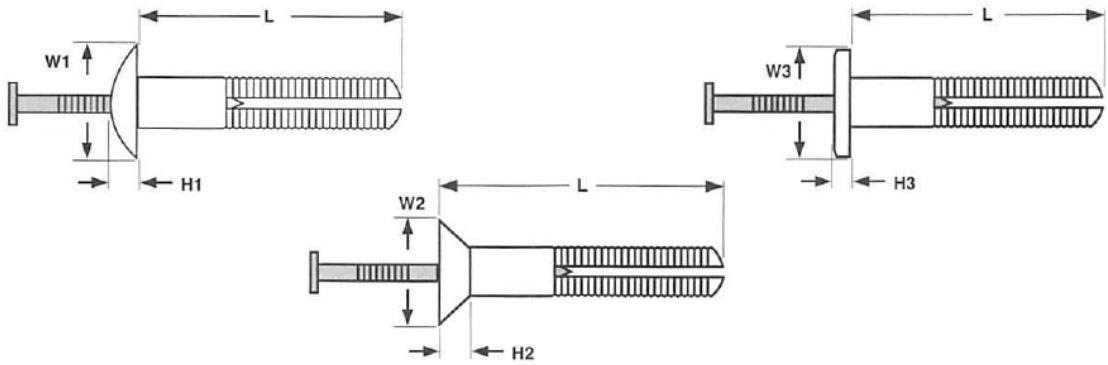
MACHINE SCREW STYLE



MACHINE SCREW ANCHORS									FF-S-325, Group I, Type 1, Class 1
Size	Drill Diameter	Installation Torque	Minimum Embedment	Performance in 4000 psi Concrete		Performance in C-90 Hollow Block		Performance in Solid Red Brick	
				Tensile	Shear	Tensile	Shear	Tensile	Shear
		Max		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
6-32	5/16	10 in. lbs.	1/2	770	220	460	180	670	220
8-32	5/16	15 in. lbs.	1/2	945	835	680	720	740	835
10-24	3/8	20 in. lbs.	5/8	1340	1200	740	1130	1050	1140
1/4-20	1/2	60 in. lbs.	7/8	2340	1800	880	1340	1460	1580
5/16-18	5/8	7 ft. lbs.	1	3020	2640	1820	1700	1730	2140
3/8-16	3/4	10 ft. lbs.	1 1/4	4810	4220	2280	2430	2200	3870
1/2-13	7/8	15 ft. lbs.	1 1/2	5930	5800	2360	3440	3270	4860

Description	An anchoring device consisting of (A) an internally threaded conical expander designed with some means (ie. ribs or knurls) to prevent it from turning during expansion; and (B) an expansion sleeve which slips over the expander. The outer walls of the sleeve can be cylindrical or tapered, and the surface either smooth or corrugated. A spherical steel lockwasher at the top of the expansion sleeve is optional.
Applications/ Advantages	A caulking type anchor which provides a quick setting in brick, concrete or stone. The lead shield's malleability enable it to fill uneven or irregular spots in the hole. When tamped, the expansion sleeve holds the expander inside the hole in the masonry, equally distributing the load around the anchor. Fixtures can be removed or replaced without sacrificing holding power.
Material	***Cone:*** May be one of the following materials: Brass, Malleable Iron, Steel or Die Cast Zinc Alloy; ***Expander Shield:*** Lead or 3-5% Antimonial Lead Alloy
Tensile and Shear Values	Machine screw anchors shall not be removable or show evidence of failure when subjected to tensile and shear test loads as specified in the above table. The suggested safe working load is one-fourth the average test proof loads shown in the above table.

Nylon NAIL-IN



Nylon Nail Anchors

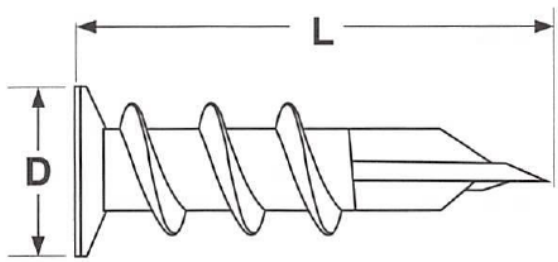
FF-S-325,Group V, Type 2, Class 4

Anchor Size	Fixture Clearance Hole	H1	W1	H2	W2	H3	W3	Performance Data						
		Mushroom Head		Flat Head		Round Head		Embedment Depth	In 4000 psi. Concrete		In C-90 Hollow Block		In Solid Red Brick	
		Height	Width	Height	Width	Height	Width							
		Ref	Ref	Ref	Ref	Ref	Ref		Tensile (lbs.)	Shear (lbs.)	Tensile (lbs.)	Shear (lbs.)	Tensile (lbs.)	Shear (lbs.)
3/16	1/4	1/8	9/16	1/8	3/8	1/8	3/8	3/4	195	320	170	280	155	320
								1	220	320	180	280	170	320
1/4	5/16	1/8	9/16	1/8	7/16	1/8	7/16	5/8	140	500	110	320	150	500
								3/4	240	500	160	320	200	500
								1	250	500	170	320	220	500
								1 1/2	270	500	200	320	240	500
								2	285	500	-	-	-	-

Description	A fastening system which consists of two parts: (1) a nylon piece similar in design to a blind rivet which has a cylindrical shank split on two sides, 180° apart, extending from the bottom of the shank up most of the distance to the head. The shank has several ribs extending completely around its circumference. Mushroom, pan and flat head styles are available; (2) a steel pin expander which passes through a concentric channel extending from an opening in the top of the head of the nylon piece down into the shank to a point just below the spot where the split ends below the head. The pin has a slot across the top of its head, a chiseled point similar to a nail, and threads on its own shank which helps to lock the anchor in place upon installation.
Applications/ Advantages	Installation is achieved by inserting the end of the nylon shank into a pre-drilled hole and hammering the head of the nail until it meets the head of the anchor body. Driving the nail through the body expands the split ends which allows the ribs to grip the wall of the prepared hole. This is a light duty anchor for use in solid materials such as concrete, brick and block, preferred when fixtures must be attached without chipping the fixture or the masonry. Can also be used like a toggle bolt in wallboard or plaster, or as a blind rivet in joining several thicknesses of material together, especially in applications subject to vibration. The nylon withstands temperatures from -40°F to 170°F.
Material	*Body:* Injection molded thermoplastic nylon *Expander Pin:* AISI 1018-1021 or equivalent cold rolled steel, zinc plated
Anchor Spacing	Anchors should be spaced 18-24 inches apart (measured from the center of the anchor)
Minimum Hole Depth	Hole should be drilled to a depth of at least 1/4" deeper than the required embedment. Likewise, the thickness of the base material should be at least 125% of the embedment to be used.
Tensile Strength	Nylon nail anchors shall not be removable or show evidence of failure when subjected to axially applied proof test loads as specified in the above table when set in concrete of 3000 psi. compressive strength. The suggested safe working load is one-fourth the loads shown in the above table.

ONE-STEP

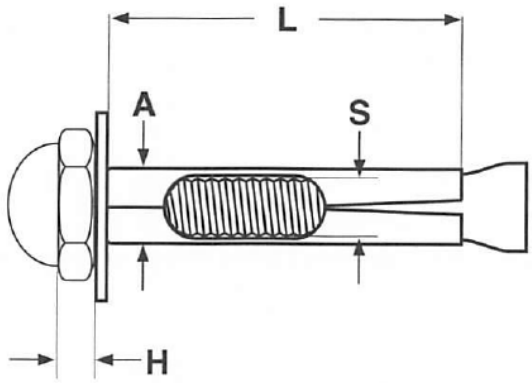
Plastic & Die-Cast Zinc



ONE-STEP WALLBOARD ANCHOR											
For use with Screws of these Nominal Diameters	D	L	Wall Thickness Range	Ultimate Tensile Strength				Ultimate Shear Strength			
	Collar Diameter	Anchor Length		Gypsum Thickness				Gypsum Thickness			
				3/8"	1/2'	5/8'	3/4'	3/8'	1/2'	5/8'	3/4'
6	15/32	1-5/16	3/8 to 5/8"	45	55	70	75	50	55	70	80
8	9/16	111/16	3/8 to 1"	50	65	80	85	60	70	100	100

Description	A tubular device, tapered from top to bottom, with a countersunk lip at the top end, a deep cutting thread around the outside fo the anchor body, and a tapered end at the bottom designed to puncture and drill a hole in drywall.
Applications/ Advantages	This anchor drills its own hole in and works in any thickness of drywall, without tearing the paper coating. It can easily be backed out of its hole with a #2 screwdriver bit. It's designed for use in lightweight applications, such as curtain hardware, small pictures and lightweight signs. It should not be used for overhead applications. The nylon variety is used when requiring a non-conductive anchor.
Material	***Metal:*** Die-cast zinc ***Plastic:*** Injection molded Nylon
Anchor Spacing	Anchors should be spaced 18-24 inches apart from each other (measured from the center of the anchor).
Tensile and Shear Strengths	The suggested safe working load is one-fourth the average test loads listed in the above table.

Acorn Nut Style SLEEVE



Sleeve Anchors, Acorn Nut

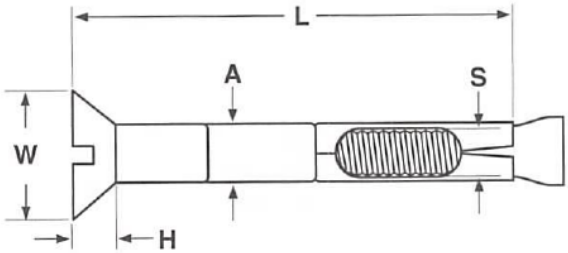
FF-S-325, Group II, Type 3, Class 3

A x L	H	F	W	Drill Diameter	Fixture Clearance Hole	Minimum Embedment	S	Required Torque to Set (Ft. Lbs.)		Tensile Strength (psi.)	Shear Strength (psi.)
Anchor Diam x Length	Nut Side Height	Head Width	Washer O.D.				Thread Size of Stud				
	Ref	Ref	Ref					Carbon Steel	Stainless Steel	4000 psi. Concrete Strength	
1/4 x 5/8	3/16	3/8	1/2	1/4	5/16	1/2	10-24	4	3	-	-
1/4 x 1 3/8						1 1/8				1440	1630
1/4 x 2 1/4											

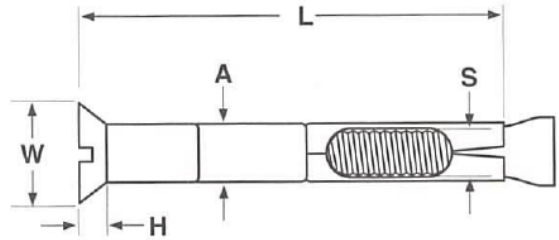
Description	A device for giving stability to one part of a structure by making it fast to another consisting of (A) a threaded stud with a conical end flared outward; (B) a hollow, cylindrical dilating sleeve assembled over the stud and positioned against the minor diameter of the cone; (C) a washer and low-crown cap nut assembled at the end opposite the cone.	
Applications/ Advantages	The anchor works by expanding against the material in which it is embedded. When the flat head is turned clockwise the conical end is pulled into the dilating sleeve pushing it outward 360° around the anchor into the masonry. They are designed to be used in solid or hollow masonry, including cinder block, brick, marble and concrete. One advantage of the sleeve anchor is that it can be removed after it's been installed. Another is that the length of the sleeve induces less stress on the substrate than does a wedge anchor. The acorn nut variety is preferred when a decorative finished look is desired (ie. attaching theater seating to the floor).	
Material	***Steel***	***Stainless***
	Acorn Nut: AISI 1010 - 1018 steel ***Washer:*** Hot-rolled, hot-rolled & pickled, or cold-rolled steel ***Threaded Bolt:*** AISI 1010 - 1018 steel ***Sleeve:*** AISI 1010 - 1020 steel	***Acorn Nut:*** Type 304 stainless steel ***Washer:*** 18-8 stainless steel ***Threaded Bolt:*** 18-8 stainless steel ***Sleeve:*** Type 304 stainless steel
Anchor Spacing	Anchors should be installed with a minimum of 10 anchor diameters between each other and a minimum of 5 diameters from the edge.	
Tensile Strength	The suggested safe working load is one-fourth of the average proof test load shown in the above table.	
Shear Strength	The suggested safe working load is one-fourth of the average proof test load shown in the above table.	
Plating	Steel sleeve anchors are usually supplied plated zinc.	Stainless sleeve anchors usually have no additional finish applied.

SLEEVE

Flat & Threshold Flat Head



Flat Head



Threshold Flat Head

Sleeve Anchors, Flat Head

FF-S-325, Group II, Type 3, Class 3

A x L	H	W	Drill Diameter	Fixture Clearance Hole	Minimum Embedment	S	Required Torque to Set (Ft. Lbs.)		Tensile Strength (psi.)	Shear Strength (psi.)
Anchor Diam x Length	Head Height	Head Width				Thread Size of Stud	Carbon Steel	Stainless Steel	4000 psi. Concrete Strength	
	Ref	Ref								
1/4 x 2	5/32	1/2	1/4	5/16	1 1/8	10-24	4	3	1440	1630
1/4 x 3										
1/4 x 4										
3/8 x 2 3/4	15/64	3/4	3/8	7/16	1 5/8	5/16-18	16	11	2700	3250
3/8 x 4										
3/8 x 5										
3/8 x 6										

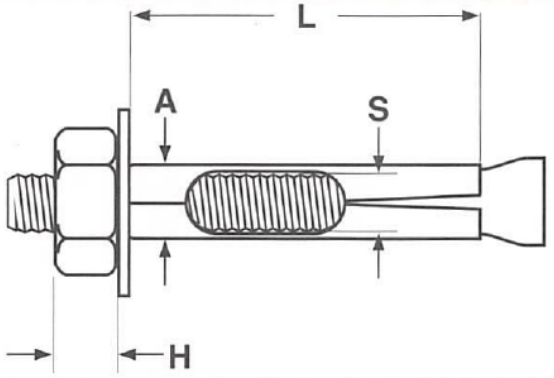
Sleeve Anchors, Threshold Flat Head

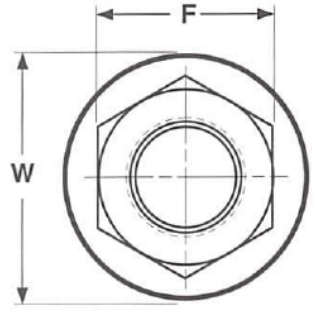
FF-S-325, Group II, Type 3, Class 3

A x L	H	W	Drill Diameter	Fixture Clearance Hole	Minimum Embedment	S	Required Torque to Set (Ft. Lbs.)	Tensile Strength (psi.)	Shear Strength (psi.)
Anchor Diam x Length	Head Height	Head Width				Thread Size of Stud	Carbon Steel	4000 psi. Concrete Strength	
	Ref	Ref							
1/4 x 2	5/64	23/64	1/4	5/16	1 1/8	10-24	4	1440	1630

Description	A device for giving stability to one part of a structure by making it fast to another consisting of (A) a threaded stud with a conical end flared outward; (B) a hollow, cylindrical dilating sleeve assembled over the stud and positioned against the minor diameter of the cone; (C) a countersunk flat head at the end opposite the cone. The head height of the threshold flat head is less than a standard flat head sleeve anchor.	
Applications/ Advantages	The anchor works by expanding against the material in which it is embedded. When the flat head is turned clockwise the conical end is pulled into the dilating sleeve pushing it outward 360° around the anchor into the masonry. They are designed to be used in solid or hollow masonry, including cinder block, brick, marble and concrete. One advantage of the sleeve anchor is that it can be removed after it's been installed. Another is that the length of the sleeve induces less stress on the substrate than does a wedge anchor. It is well-suited for anchoring windows and doorframes. The **flat** head is well-suited for anchoring windows and doorframes. The **threshold flat** head is specifically for anchoring thresholds and is only available in steel.	
Material	*Steel*	*Stainless*
	Threaded Bolt: AISI 1010 - 1018 steel *Sleeve:* AISI 1010 - 1020 steel	*Threaded Bolt:* 18-8 stainless steel *Sleeve:* Type 304 stainless steel
Anchor Spacing	Anchors should be installed with a minimum of 10 anchor diameters between each other and a minimum of 5 diameters from the edge.	
Tensile Strength	The suggested safe working load is one-fourth of the average proof test load shown in the above table.	
Shear Strength	The suggested safe working load is one-fourth of the average proof test load shown in the above table.	
Plating	See Appendix-A for plating information.	

Hex Nut & Washer Style SLEEVE





Sleeve Anchors, Hex Head

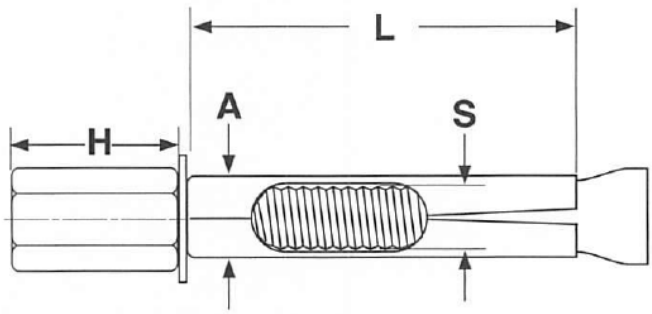
FF-S-325, Group II, Type 3, Class 3

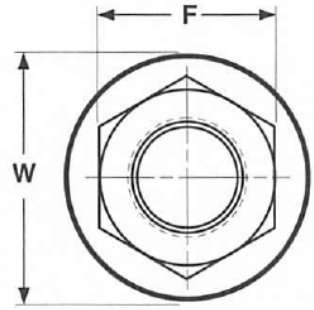
A x L Anchor Diam x Length	H Nut Height Ref	F Head Width Ref	W Washer O.D. Ref	Drill Diameter	Fixture Clearance Hole	Minimum Embedment	S Thread Size of Stud	Required Torque to Set (Ft. Lbs.) Carbon Steel	Required Torque to Set (Ft. Lbs.) Stainless Steel	Tensile Strength (psi.) 4000 psi. Concrete Strength	Shear Strength (psi.) 4000 psi. Concrete Strength
5/16 x 1 1/2	7/32	7/16	5/8	5/16	3/8	1 3/8	1/4-20	8	-	-	-
5/16 x 2 1/2						1 1/2				1750	2015
3/8 x 1 7/8	17/64	1/2	13/16	3/8	7/16	1 5/8	5/16-18	16	11	2700	3250
3/8 x 3											
3/8 x 4											
1/2 x 2 1/4	21/64	9/16	1	1/2	9/16	2 1/8	3/8-16	28	20	-	-
1/2 x 3						2 1/4				5015	6372
1/2 x 4											
1/2 x 6											
5/8 x 2 1/4	7/16	3/4	1 3/8	5/8	11/16	2 1/8	1/2-13	60	42	-	-
5/8 x 3						2 3/4				6345	10,255
5/8 x 4 1/4											
5/8 x 6											
3/4 x 2 1/2	35/64	15/16	1 3/4	3/4	15/16	2 1/8	5/8-11	90	60	-	-
3/4 x 4						3 3/8				9135	12,800
3/4 x 5 3/4											

Description	A device for giving stability to one part of a structure by making it fasten to another. It consists of (A) a threaded stud with a conical end flared outward; (B) a hollow, cylindrical dilating sleeve assembled over the stud and positioned against the minor diameter of the cone; (C) a washer and hex nut assembled at the end opposite the cone.	
Applications/ Advantages	The anchor works by expanding against the material in which it is embedded. When the hex nut is tightened the conical end is pulled into the dilating sleeve pushing it outward 360° around the anchor into the masonry. They are designed to be used in solid or hollow masonry, including cinder block, brick, marble and concrete. One advantage of the sleeve anchor is that it can be removed after it's been installed. Another is that the length of the sleeve induces less stress on the substrate than does a wedge anchor. It is well-suited for permanently anchoring heavy equipment to concrete.	
Material	***Steel***	***Stainless***
	Threaded Bolt: AISI 1010 - 1018 cold rolled steel ***Sleeve:*** AISI 1008 cold rolled steel Nut: Shall be made from a low carbon steel which conforms to the following chemical composition requirements: *Carbon*- 0.58% maximum; *Phosphorus*- 0.13% maximum; *Sulfur*- 0.23% maximum Washer: AISI 1008 - 1010 cold rolled steel	***Threaded Bolt:*** 18-8 stainless steel ***Sleeve:*** Type 304 stainless steel ***Nut:*** Type 304 stainless steel ***Washer:*** 18-8 stainless steel
Anchor Spacing	Anchors should be installed with a minimum of 10 anchor diameters between each other and a minimum of 5 diameters from the edge.	
Tensile Strength	The suggested safe working load is one-fourth of the average proof test load shown in the above table.	
Shear Strength	The suggested safe working load is one-fourth of the average proof test load shown in the above table.	
Plating	Steel sleeve anchors are usually supplied plated zinc.	Stainless sleeve anchors usually have no additional finish applied.

SLEEVE

Rod Hanger





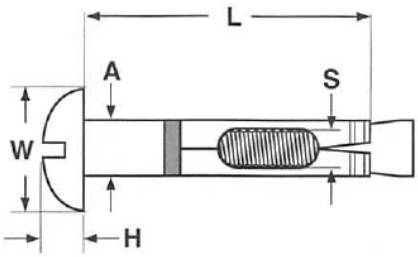
Sleeve Anchors, Rod Hanger

FF-S-325, Group II, Type 3, Class 3

A x L	H	F	W			S	Required Torque to Set (Ft. Lbs.)	Tensile Strength (psi.)	Shear Strength (psi.)
Anchor Diam x Length	Coupling Nut Height	Wrench-ing Size	Washer O.D.	Drill Diameter	Minimum Embed-ment	Thread Size of Stud			
	Ref	Ref	Ref				Carbon Steel	4000 psi. Concrete Strength	
3/8 x 1 7/8	1	1/2	13/16	3/8	1 5/8	5/16-18	16	2700	3250
1/2 x 2 1/4	1 1/4	11/16	1	1/2	2 1/4	3/8-16	28	5015	6372

Description	A device for giving stability to one part of a structure by making it fasten to another. It consists of (A) a threaded stud with a conical end flared outward; (B) a hollow, cylindrical dilating sleeve assembled over the stud and positioned against the minor diameter of the cone; (C) a washer and hex coupling nut assembled at the end opposite the cone.
Applications/ Advantages	The anchor works by expanding against the material in which it is embedded. When the hex nut is tightened, the conical end is pulled into the dilating sleeve pushing it outward 360° around the anchor into the masonry. They are used to attach threaded rod to cinder block, marble, concrete or thin wall. One advantage of the sleeve anchor is that it can be removed after it's been installed. Another is that the length of the sleeve induces less stress on the substrate than does a wedge anchor.
Material	***Threaded Bolt:*** AISI 1010 - 1018 cold rolled steel ***Sleeve:*** AISI 1008 cold rolled steel ***Rod Coupling:*** AISI 12L14 or equivalent steel ***Washer:*** AISI 1008 - 1010 cold rolled steel
Anchor Spacing	Anchors should be installed with a minimum of 10 anchor diameters between each other and a minimum of 5 diameters from the edge.
Tensile Strength	The suggested safe working load is one-fourth of the average proof test load shown in the above table.
Shear Strength	The suggested safe working load is one-fourth of the average proof test load shown in the above table.
Plating	Steel sleeve anchors are usually supplied plated zinc.

Round Head SLEEVE



Sleeve Anchors, Round Head

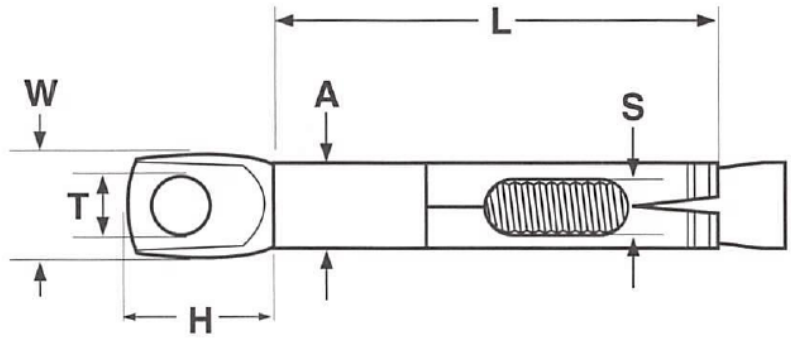
FF-S-325, Group II, Type 3, Class 3

A x L	H	W				S	Required Torque to Set (Ft. Lbs.)		Tensile Strength (psi.)	Shear Strength (psi.)
Anchor Diam x Length	Head Height	Head Width	Drill Diameter	Fixture Clearance Hole	Minimum Embedment	Thread Size of Stud	Carbon Steel	Stainless Steel	4000 psi. Concrete Strength	
	Ref	Ref								
1/4 x 2	11/64	29/64	1/4	5/16	1 1/8	10-24	4	3	1440	1630
1/4 x 2 3/4										
1/4 x 3 3/4										
3/8 x 2 1/2	15/64	43/64	3/8	7/16	1 5/8	5/16-18	16	11	2700	3250
3/8 x 3 3/4										

Description	A device for giving stability to one part of a structure by making it fasten to another. It consists of (A) a threaded stud with a conical end flared outward; (B) a hollow, cylindrical dilating sleeve assembled over the stud and positioned against the minor diameter of the cone; (C) a slotted, dome-shaped head at the end opposite the cone.	
Applications/ Advantages	The anchor works by expanding against the material in which it is embedded. When the flat head is turned clockwise the conical end is pulled into the dilating sleeve pushing it outward 360° around the anchor into the masonry. They are designed to be used in solid or hollow masonry, including cinder block, brick, marble and concrete. One advantage of the sleeve anchor is that it can be removed after it's been installed. Another is that the length of the sleeve induces less stress on the substrate than does a wedge anchor. It is well-suited for permanently anchoring heavy equipment to concrete.	
Material	*Steel*	*Stainless*
	Threaded Bolt: AISI 1010 - 1018 steel ***Sleeve:*** AISI 1010 - 1020 steel	***Sleeve:*** Type 304 stainless steel ***Threaded Bolt:*** 18-8 stainless steel
Anchor Spacing	Anchors should be installed with a minimum of 10 anchor diameters between each other and a minimum of 5 diameters from the edge.	
Tensile Strength	The suggested safe working load is one-fourth of the average proof test load shown in the above table.	
Shear Strength	The suggested safe working load is one-fourth of the average proof test load shown in the above table.	
Plating	Steel sleeve anchors are usually supplied plated zinc.	Stainless sleeve anchors usually have no additional finish applied.

SLEEVE

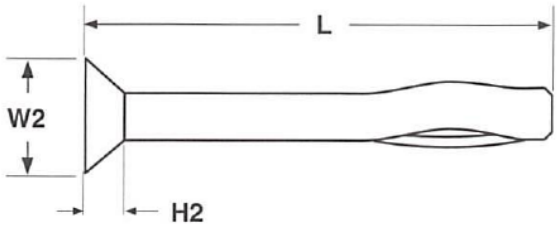
Tie Wire



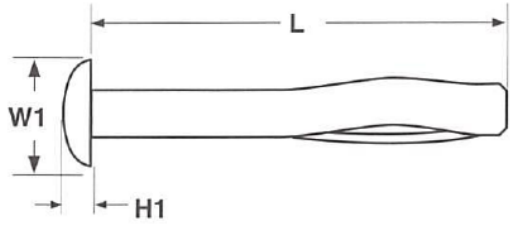
SLEEVE ANCHORS, TIE-WIRE									FF-S-325, Group II, Type 3, Class 3
A x L	H	W	T	Drill Diameter	Minimum Embedment	S	Required Torque to Set (Ft. Lbs.)	Tensile Strength (psi.)	Shear Strength (psi.)
Anchor Diam x Length	Head Height	Head Width	Tie-Wire Hole Size			Thread Size of Stud			
	Ref	Ref	Ref				Carbon Steel	4000 psi. Concrete Strength	
5/16 x 1 1/2	1 9/16	31/64	1/4	5/16	1 1/2	1/4-20	8	1750	2015

Description	A device for giving stability to one part of a structure by making it fasten to another. It consists of (A) a threaded stud with a conical end flared outward; (B) a hollow, cylindrical dilating sleeve assembled over the stud and positioned against the minor diameter of the cone; (C) at the end opposite the cone is a head which is flat on two sides with a hole in its center.
Applications/ Advantages	The anchor works by expanding against the material in which it is embedded. When the flat head is turned clockwise, the conical end is pulled into the dilating sleeve pushing it outward 360° around the anchor into the masonry. They are designed to be used in solid or hollow masonry, including cinder block, brick, marble and concrete. One advantage of the sleeve anchor is that it can be removed after it's been installed. Another is that the length of the sleeve induces less stress on the substrate than does a wedge anchor. It is designed for hanging acoustical dropped ceilings or lighting fixtures suspended from above.
Material	***Threaded Bolt:*** AISI 1010 - 1018 steel ***Sleeve:*** AISI 1010 - 1020 steel
Anchor Spacing	Anchors should be installed with a minimum of 10 anchor diameters between each other and a minimum of 5 diameters from the edge.
Tensile Strength	The suggested safe working load is one-fourth of the average proof test load shown in the above table.
Shear Strength	The suggested safe working load is one-fourth of the average proof test load shown in the above table.
Plating	Steel sleeve anchors are usually supplied plated zinc.

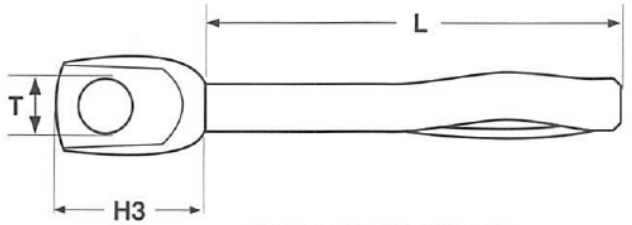
Flat, Pan & Tie Wire SPLIT DRIVE



FLAT HEAD



PAN HEAD



TIE-WIRE HEAD

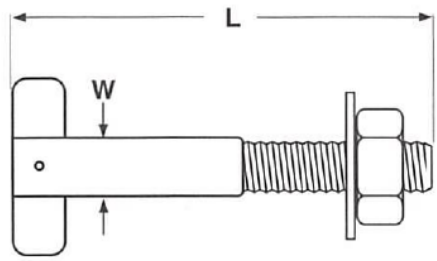
Split Drive Anchors

FF-S-325, Group VI

Anchor Size	Fixture Clearance Hole	H1	W1	H2	W2	H3	T	Performance Data		
		Round Head		Flat Head		Tie-Wire		Embedment Depth	In 4000 psi. Concrete	
		Height	Width	Height	Width	Head Height	Tie Wire Hole			
		Ref	Ref	Ref	Ref	Ref	Ref	Min	Tensile (lbs.)	Shear (lbs.)
3/16	1/4	3/32	3/8	7/64	3/8	-	-	7/8	1350	1520
1/4	5/16	1/8	1/2	9/64	1/2	5/8	13/64	1 1/8	2200	2320
3/8	7/16	3/16	3/4	-	-	-	-	1 7/8	5300	7810
1/2	9/16	1/4	1	-	-	-	-	2 5/8	6200	11,340

Description	A one-piece steel anchor with two sheared or "split" halves at the base which are pre-expanded to a specific size. Split drive anchors are available in flat head, pan and tie-wire head styles.
Applications/ Advantages	A light-duty anchor for use with dead loads in concrete or stone. The opening in the base of the anchor is of a size which, when under pressure, the anchor will try to regain, which creates the pressure on the inner walls of the hole, holding the fastening in place. The friction caused by this expansion can compensate for poor grades of concrete.
Material	Heat treated AISI 1038 or an equivalent alloy steel
Anchor Spacing	Should be at least ten anchor diameters between anchors and a minimum of five anchor diameters from the edge of the work surface.
Tensile and Shear Strengths	Split drive anchors shall not be removable or show evidence of failure when subjected to axially applied proof test loads as specified in the above table when set in concrete of 4000 psi. compressive strength. The suggested safe working load is one-fourth the loads shown in the above table.
Plating	Split drive anchors are most frequently supplied with a zinc plating.

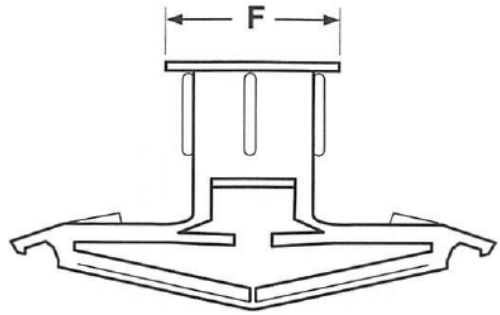
T-ANCHOR — Flat Head



T-Anchors, Flat Head						
Part Number	W	L	Drill Size	Grip Range	Pull Out Strength	Shear Strength
	Diameter	Total Length				
	Nominal	Nominal		Inches	Lbs.	Lbs.
1428AT	1/4	1.75	5/16	1.0	700	1500
1440AT		2.5		1.0 - 1.75		
1452AT		3.25		1.0 - 2.5		
3140AT	5/16	2.5	5/16	.875 - 1.5	900	2300
3152AT		3.25		1.25 - 2.25		
3160AT		3.75		1.875 - 2.75		
3752AT	3/8	3.25	3/8	1.0 - 2.0	1000	3000
3760AT		3.75		1.875 - 2.5		
3764AT		4		2.0 - 2.75		
3772AT		4.5		.875 - 3.125		

Description	A four-piece steel fastener consisting of (1) a partially threaded shank with a slit cut into the center of the unthreaded end; (2) a flat, rectangular stamped toggle that swivels on a pin that attaches it to the unthreaded end of the shank; (3) a hex nut; and (4) a circular flat washer.
Applications/ Advantages	Can be used in ceilings, hollow walls, steel, concrete or wood. Requires smaller holes than toggle bolts. Applications include overhead doors, light fixtures, shelf brackets and cable television units.
Material	Carbon steel
Proof Load	T-Anchors shall meet the minimum pull out and shear values as noted in the above table. The suggested safe working load is 1/4 the loads listed here.
Plating	T-Anchors are typically supplied with a zinc yellow finish.

TOGGLES, PLASTIC



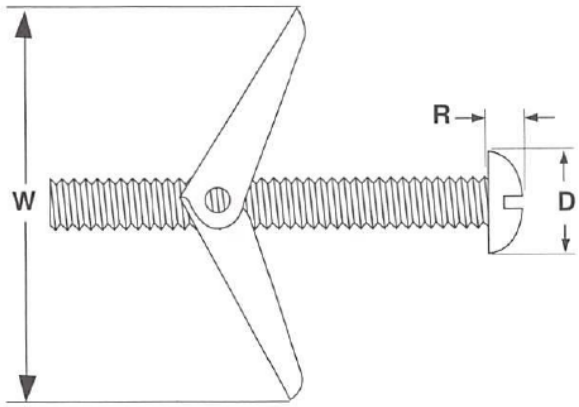
Plastic Toggle Anchors

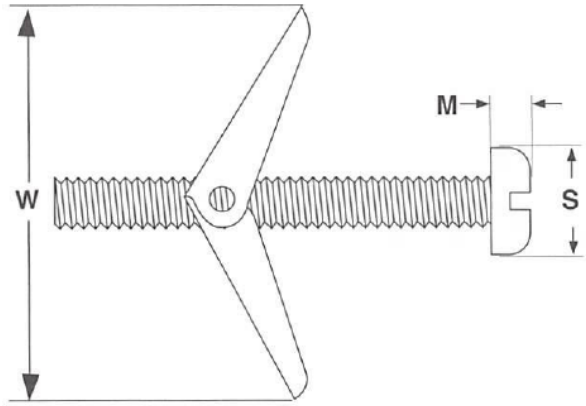
FF-S-325 Group V, Type 2, Class 4

Part Number	Size	Wall Thickness	Drill Diameter	Screw Diameter Range	Minimum Screw Length	F	Minimum Embedment	Performance in Wallboard		Performance in Cinder Block	
						Flange Diameter		Tensile	Shear	Tensile	Shear
284835	Extra Short	1/8	5/16	#6 - #12	1	29/64	5/8	120	100	-	-
284873	Short	3/8	5/16	#6 - #12	1 1/4	1/2	1 1/8	135	165	240	220
284888	Medium	1/2	5/16	#6 - #12	1 1/4	1/2	1 1/4	150	220	280	230
284891	Long	5/8	5/16	#6 - #12	1 1/2	1/2	1 3/8	170	250	350	230
284909	Extra Long	3/4	5/16	#6 - #12	1 3/4	1/2	1 1/2	180	250	400	240
284918	XX-Long	1	5/16	#6 - #12	2	1/2	1 3/4	220	250	450	250

Description	A one-piece, plastic anchor with a cylindrical body and four legs. The hole through the center of the body has ribs on the outside to hold the anchor in place during installation.
Applications/ Advantages	When a tapping screw is driven into the toggle, the legs collapse which forms a tongue. As the screw is driven through the body, it pulls in and expands the legs. Plastic toggles are intended for lightweight duty in hollow walls (wallboard or plaster), ie. drapery rods, junction boxes, soap dishes, towel bars, etc.. The anchor remains in place even after the screw is removed.
Material	Engineered Plastic
Anchor Spacing	Anchors should be spaced 18-24 inches center to center (spacing can be closer in high-density material).
Tensile and Shear Strengths	The suggested safe working load is one-fourth the average maximum proof test loads listed in the above table.

TOGGLE BOLT — Steel



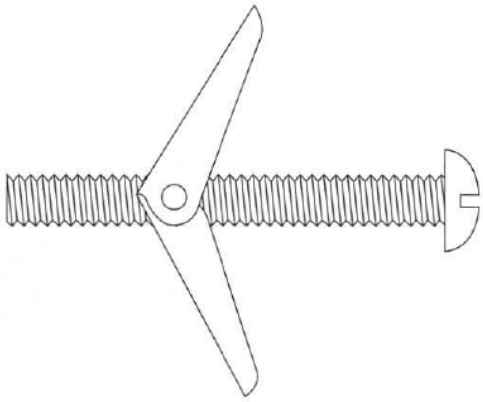


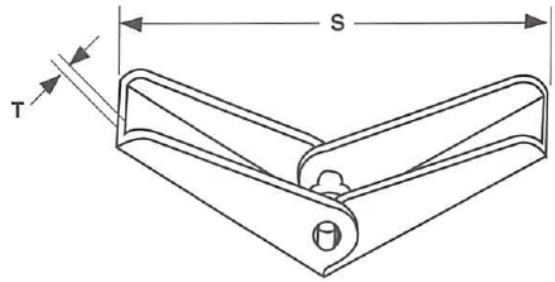
Toggle Bolts

Anchor Size	Thread Size	Drill Bit Size	M		S		R		D		W	Performance Information				
			Mushroom Head Height		Mushroom Head Diameter		Round Head Height		Round Head Diameter			In 1/2" Wallboard		In Hollow Block		
			Max	Min	Max	Min	Max	Min	Max	Min	Wing Clearance	Tensile (lbs.)	Shear (lbs.)	Embedment Depth	Tensile (lbs.)	Shear (lbs.)
1/8	6-32	3/8	.097	.072	.270	.256	.103	.091	.260	.240	1-1/16	200	205	3/8	310	270
3/16	10-24	1/2	.133	.099	.373	.357	.137	.123	.359	.334	1-3/8	245	280	1/2	430	700
1/4	1/4-20	5/8	.175	.130	.492	.473	.175	.160	.472	.443	1-1/2	310	350	5/8	830	1390
5/16	5/16-18	7/8	.218	.162	.615	.594	.216	.198	.590	.557	2-1/8	330	420	7/8	1070	2980
3/8	3/8-16	7/8	.261	.195	.740	.716	.256	.237	.708	.670	2-1/8	340	440	7/8	1385	3120
1/2	1/2-13	1-1/4	.348	.260	.987	.958	.355	.332	.813	.766	3	435	470	1-1/4	2550	3620

Description	A fastening system consisting of (1) two matching steel "wings" each bent at two 90° angles, (2) an internally threaded nut with protrusions spaced 180° apart which serves as a pivot attaching the two wings, (3) a wire spring providing the necessary tension to open and close the wings, and (4) a machine screw which mates with the nut.
Applications/ Advantages	Toggle bolts are light-duty anchors for use in hollow block or gypsum wallboard. They spread the load over a larger area and are more temperature resistant than other hollow wall anchors. They are single-use anchors.
Material	***Wing Body:*** AISI 1008-1010 or equivalent cold rolled steel ***Trunnion Nut:*** 1/4" thru 3/8": AISI 1010 steel: 1/2": Zamac alloy ***Screw:*** carbon steel
Tensile and Shear Strengths	Ultimate load capacities for toggle bolts in various materials are listed in the above table. The suggested safe working load is 1/4 the loads listed here.
Plating	Toggle bolts are commonly supplied with a clear zinc finish.

Steel TOGGLE WING

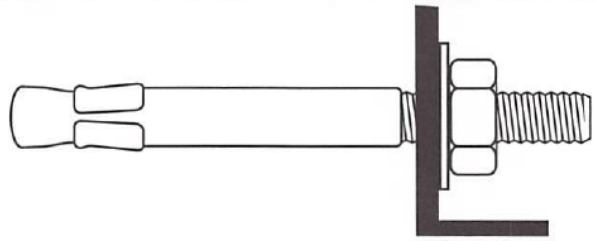




TOGGLE WINGS					FF-B-588E, Type 1, Class A
Thread Size or Bolt Diameter	S	T	Recommended Hole Size		Proof Load, Lbs. (min)
	Wing Spread (min)	Metal Thickness (min)	Nom	Max	
6-32 (1/8)	.75	.024	.38	.50	175
8-32 (5/32)	1.00	.024	.43	.50	**
10-24 (3/16)	1.50	.028	.50	.62	350
1/4-20 (1/4)	1.75	.035	.62	.75	600
5/16-18 (5/16)	2.00	.042	.88	1.00	900
3/8-16 (3/8)	2.25	.047	.88	1.00	1100
1/2-13 (1/2)	3.50	.062	1.12	1.25	1500

Description	A four-piece fastener consisting of (1) two matching steel "wings" each bent at two 90° angles, (2) an internally threaded nut with protrusions spaced 180° apart which serves as a pivot attaching the two wings, and (3) a wire spring providing the necessary tension to open and close the wings.
Applications/ Advantages	Toggle wings are light-duty anchors for use in hollow base material applications. They spread the load over a larger area and are more temperature resistant than other hollow wall anchors. They are single-use anchors.
Material	AISI 1008 or equivalent cold rolled steel
Proof Load	Toggle wings shall meet the minimum proof load values as noted in the above table. The suggested safe working load is 1/4 the loads listed here.
Plating	See Appendix-A for plating information.

WEDGE - DIMESIONS & PERFORMANCE DATA



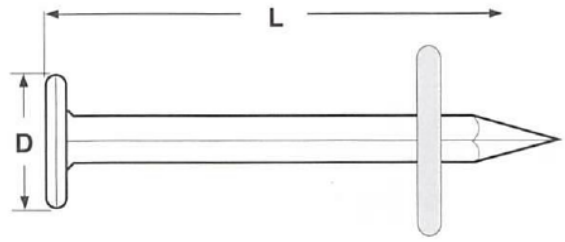
ICC Approved Wedge Anchors					FF-S-325 Group II, Type 4, Class 1
W x L	Minimum Embedment (inches)	Fastens Material Up To	Thread Length	Average Ultimate Tensile & Shear Values	
Anchor Size				4000 psi concrete	2000 psi concrete
				Tensile	Shear
1/4-20 x 1-3/4	1	3/8	7/8	1500	900
1/4-20 x 2		3/4	1-1/8		
1/4-20 x 2-1/4		7/8	1-1/4		
1/4-20 x 3		1-1/2	3/4		
1/4-20 x 3-1/4		1-7/8	2-1/4		
5/16-18 x 2-3/4	1-1/4	1-1/8	1-3/4	1900	2700
5/16-18 x 3		1-3/8	1-3/4		
5/16-18 x 4		2-3/8	1		
3/8-16 x 2-1/4	1-1/2	3/8	1-1/2	3600	4100
3/8-16 x 2-3/4		7/8	1-3/4		
3/8-16 x 3		1-1/8	3		
3/8-16 x 3-1/4		1-3/8	2		
3/8-16 x 3-1/2		1-5/8	2-7/8		
3/8-16 x 3-3/4		1-7/8	2-3/4		
3/8-16 x 5		3-1/8	2-3/4		
3/8-16 x 6-1/2		4-5/8	2-1/8		
3/8-16 x 7		4-3/4	5-3/4		
1/2-13 x 2-3/4	2	1/4	1-1/2	4800	6400
1/2-13 x 3		1/2	1-1/2		
1/2-13 x 3-1/4		3/4	1-13/16		
1/2-13 x 3-3/4		1/4	2-1/4		
1/2-13 x 4		1-1/2	2-1/2		
1/2-13 x 4-1/4		1-1/2	1-1/4		
1/2-13 x 4-1/2		1-3/4	3		
1/2-13 x 5-1/2		3	2-3/4		
1/2-13 x 6		3-1/2	2-1/2		
1/2-13 x 7		4-1/2	2-3/8		
1/2-13 x 8-1/2		6	2-1/2		
1/2-13 x 10		7-1/2	2-1/2		
1/2-13 x 12		9-1/2	2-1/2		
5/8-11 x 3-1/2	2-1/2	3/8	1-7/8	6500	9400
5/8-11 x 4		7/8	2-1/2		
5/8-11 x 4-1/2		1-3/8	2-7/8		
5/8-11 x 5		1-7/8	3-3/8		
5/8-11 x 5-1/2		2-3/8	2-1/2		
5/8-11 x 6		2-7/8	4-3/8		
5/8-11 x 7		3-7/8	5-3/8		
5/8-11 x 8-1/2		5-3/8	1-5/8		
5/8-11 x 10		6-7/8	2-1/2		
5/8-11 x 12		8-7/8	2-1/4		

WEDGE - DIMENSIONS & PERFORMANCE DATA

ICC Approved Wedge Anchors					FF-S-325 Group II, Type 4, Class 1
W x L Anchor Size	Minimum Embedment (inches)	Fastens Material Up To	Thread Length	Average Ultimate Tensile & Shear Values	
				4000 psi concrete	2000 psi concrete
				Tensile	Shear
3/4-10 x 4-1/4	3	1/2	2-1/2	7200	14,800
3/4-10 x 4-1/2		7/10	2-1/2		
3/4-10 x 4-3/4		1	2-1/8		
3/4-10 x 5-1/2		1-3/4	2-3/4		
3/4-10 x 6		2-1/5	2-1/2		
3/4-10 x 6-1/4		2-1/2	3		
3/4-10 x 7		3-1/4	2-1/4		
3/4-10 x 8-1/2		4-3/4	2-3/8		
3/4-10 x 10		6-1/4	2-3/8		
3/4-10 x 12		8-1/4	2-1/2		
7/8-9 x 6	3-1/2	1-5/8	2-1/2	12,800	21,500
7/8-9 x 8		3-5/8	2-1/2		
7/8-9 x 10		5-5/8	2-1/4		
1-8 x 6	4	1	2-1/2	13,700	27,300
1-8 x 9		4	2-1/4		
1-8 x 12		7	2-1/2		
1 1/4-7 x 9	5-5/8	2-1/8	3-1/4	27,320	38,035
1 1/4-7 x 12		5-1/8	3-1/4		

Description	A four-piece assembly consisting of (1) an anchor bolt threaded at one end with a unified pitch, and a shoulder at the opposite end which retains a free-spinning clip, (2) a clip with three lateral slits and projections designed to exert greater holding power the greater the load that is applied, (3) a hex nut, and (4) a flat washer.	
Applications/ Advantages	These are heavy-duty, non-bottom bearing anchors of greater shear strength than other light and medium-duty expansion anchors. The design of the expansion clip assures full contact with the masonry. Wedge anchors withstand temperature fluctuations well. For best performance, minimum anchor spacing should be 10 hole diameters and minimum edge distance be 5 hole diameters.	
Material	***Carbon Steel***	***Type 304 Stainless***
	Anchor Body: AISI 1018 - 12L14 or equivalent free-machining carbon steel ***Expansion Wedge:*** AISI C1008 - 1010 or equivalent carbon steel ***Nut:*** ASTM A-563 Grade-A carbon steel ***Washer:*** Carbon steel	***Anchor Body:*** Type 304Cu (1/4" thru 3/4" diameters) Type 304 (7/8 thru 1-1/4" diams & all lengths over 7") ***Expansion Wedge:*** Type 304 stainless ***Nut:*** 18-8 stainless ***Washer:*** 18-8 stainless
Ultimate Shear Strength	See average test values as listed in above table. ***Important:*** The maximum working loads should not exceed 1/4 of the average ultimate values for a specific size.	
Plating	Steel wedge anchors are typically zinc or mechanically galvanized plated	Stainless wedge anchors are usually supplied without any additional coating.

DRIVE PIN — Alloy Steel



DRIVE PINS		U.S. Anchor Corp*
HxL Head Diameter x Overall Length	Pin Diameter	Minimum Embedment
1/4 x 1/2	1/7	3/8
1/4 x 3/4	1/7	5/8
1/4 x 1	1/7	5/8
1/4 x 1 1/4	1/7	5/8
1/4 x 1 1/2	1/7	5/8
1/4 x 2	1/7	5/8
1/4 x 2 1/2	1/7	5/8
1/4 x 3	1/7	5/8

Description	A nail-type fastener with a 3/8" diameter steel washer as an integral part of the nail, approximately 1/3 up the shank of the nail from the point.
Applications/ Advantages	Used to anchor metal, plastic, wood, particle board or fiber board in concrete, block or brick. It doesn't require a pre-drilled hole and can be set with a hammer when using a setting tool designed for drive pins.
Material	Heat treated alloy steel
Anchor Spacing	Anchors should be installed a minimum of ten anchor diameters between each other and a minimum of five anchor diameters from the edge.

*Drive pin dimensions are based on those originally published by the U.S. Anchor Corporation.

WELD FASTENERS

Head Body & Thread Dimensions
Mechanical and Performance Requirements

Weld Screws

Top Projection Style 462
Bottom Projection Style 464
Flat 90° Spade, No Projections 466

Tab Weld Nuts

Offset Hole, Single Projection 468
Center Hole, Multiple Round Projections 469
Center Hole, Without Projections 470
Offset Hole, Without Projections 471
Part Comparisons 472
Offset Hole, Thin Target Area 473
Center Hole, Multi Ribbed Projections 474

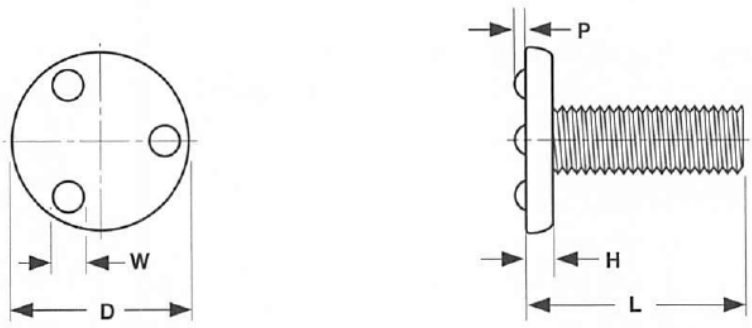
Hex Weld Nuts

Three Projections 475
Six Projections 475

Round Base Weld Nuts

Without Projections 476
With Projections 477

TOP PROJECTION STYLE



‡Length of a weld stud is measured from the welding surface of the head to the end of the shank, excluding the projections.

Steel Weld Screws with Top Projections

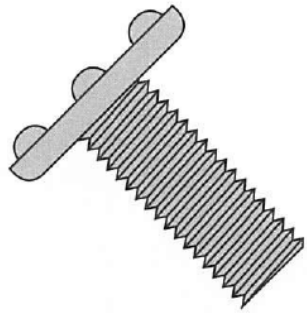
Ohio Nut & Bolt*

Nominal Size or Basic Screw Diameter		Threads per Inch	D		H		P		W	
			Head Diameter		Head Height		Projection Height		Projection Width	
			Max	Min	Max	Min	Max	Min	Max	Min
6	.138	32	.260	.240	.046	.036	.022	.018	.055	.045
8	.164	32	.323	.303	.052	.042	.027	.023	.075	.065
10	.190	24	.385	.365	.068	.058	.032	.028	.085	.075
10	.190	32	.385	.365	.068	.058	.032	.028	.085	.075
1/4	.250	20	.510	.485	.083	.073	.042	.038	.105	.095
5/16	.312	18	.630	.605	.099	.089	.047	.043	.125	.115
3/8	.375	16	.755	.725	.114	.104	.052	.048	.135	.125
Tolerance on Length					Up to 1 in., Incl.: -0.03			Over 1 in. to 2 in., incl.: -0.06		

Description	A fastener with unified thread pitch and a cylindrical, low profile head with flat parallel surfaces. The top of the head has three hemispheroidal-shaped weld projections equally spaced on a locating circle concentric with the shank.
Applications/ Advantages	Enables a threaded fastener to become a permanent, integral part of an assembly. The top projection style is preferred when a smooth, finished appearance on the outer surface is desired.
Material	C1008 - 1010 or equivalent welding quality carbon steel
Tensile Strength	60,000 psi., minimum
Length of Thread	Studs with nominal lengths of 2 inches or less should have threads extend to within one thread of the top of the weld projections. Studs over 2 inches should have a minimum thread length of 1.75 inches.
Finish	Weld screws are supplied with a plain, unplated finish to facilitate welding.

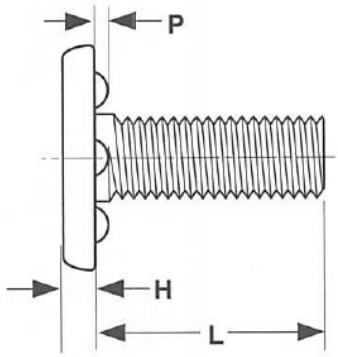
*Ohio Nut & Bolt is the original writer of these weld screw specifications.

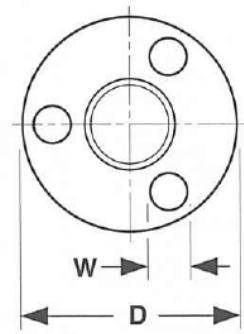
TOP PROJECTION STYLE



Weld Stud Part Number Comparison					
Projections On Top of the Head					
Catalog Part #	Buckeye	Gripco®	Catalog Part #	Buckeye	Gripco®
0604WT	GW 1104	NN-0632-S-0250	1016WT	GW 1516	NN-1024-S-1000
0606WT	GW 1106	NN-0632-S-0375	1106WT	GW 1606	NN-1032-S-0375
0608WT	GW 1108	NN-0632-S-0500	1108WT	GW 1608	NN-1032-S-0500
0610WT	GW 1110	NN-0632-S-0625	1110WT	GW 1610	NN-1032-S-0625
0806WT	GW 1406	NN-0832-S-0375	1112WT	GW 1612	NN-1032-S-0750
0808WT	GW 1408	NN-0832-S-0500	1116WT	GW 1616	NN-1032-S-1000
0810WT	GW 1410	NN-0832-S-0625	1406WT	GW 2106	NN-1420-S-0375
0812WT	GW 1412	NN-0832-S-0750	1408WT	GW 2108	NN-1420-S-0500
0816WT	GW 1416	NN-0832-S-1000	1410WT	GW 2110	NN-1420-S-0625
1006WT	GW 1506	NN-1024-S-0375	1412WT	GW 2112	NN-1420-S-0750
1008WT	GW 1508	NN-1024-S-0500	1416WT	GW 2116	NN-1420-S-1000
1010WT	GW 1510	NN-1024-S-0625	3112WT	GW 2712	-
1012WT	GW 1512	NN-1024-S-0750			

BOTTOM PROJECTION STYLE





‡Length of a weld stud is measured from the welding surface of the head to the end of the shank, excluding the projections.

STEEL WELD SCREWS WITH BOTTOM PROJECTIONS

Paulin®

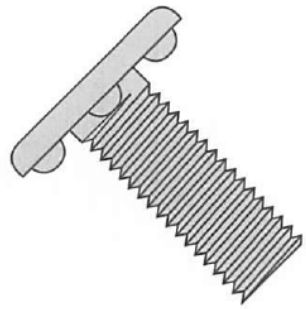
Nominal Size or Basic Screw Diameter		Threads per Inch	D		H		P		W	
			Head Diameter		Head Height		Projection Height		Projection Width	
			Max	Min	Max	Min	Max	Min	Max	Min
6	.138	32	.323	.303	.052	.042	.022	.018	.055	.045
8	.164	32	.385	.365	.068	.058	.027	.023	.075	.065
10	.190	24	.448	.428	.068	.058	.032	.028	.085	.075
10	.190	32	.448	.428	.068	.058	.032	.028	.085	.075
1/4	.250	20	.575	.550	.083	.073	.042	.038	.105	.095
5/16	.3125	18	.755	.725	.099	.089	.047	.043	.125	.115
3/8	.375	16	.880	.850	.114	.104	.052	.048	.135	.125
1/2	.500	13	1.005	.975	.146	.136	.062	.058	.156	.145

Tolerance on Length	Up to 1 in., Incl.: -0.031	Over 1 in. to 2 in., incl.: -.062	Over 2 in.: -.093

Description	A fastener with unified thread pitch and a cylindrical, low profile head with flat parallel surfaces. The underside of the head has three hemispheroidal-shaped weld projections equally spaced on a locating circle concentric with the shank.
Applications/ Advantages	Enables a threaded fastener to become a permanent, integral part of an assembly. The bottom projection style can assemble into a prelocated hole and is stronger than the top projection style, utilizing the full head strength of the fastener.
Material	C1008 - 1010 welding quality carbon steel
Tensile Strength	60,000 psi., minimum
Length of Thread	Studs with nominal lengths of 2 inches or less should have threads extend to within one thread of the top of the weld projections. Studs over 2 inches should have a minimum thread length of 1.75 inches.
Finish	Weld screws are supplied with a plain, unplated finish to facilitate welding.

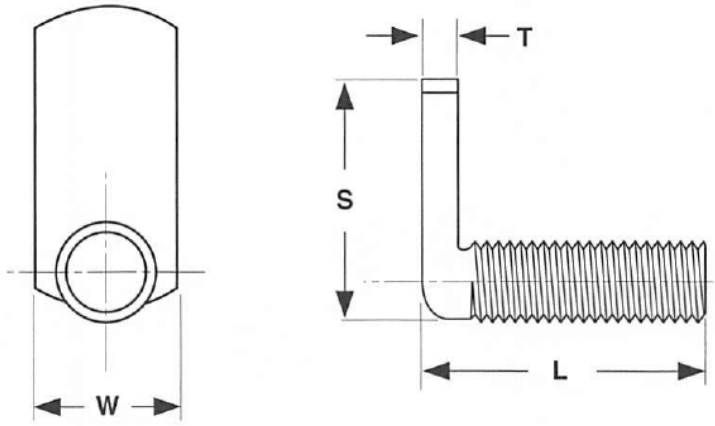
Paulin® is a registered trademark of Paulin Industries, Inc.

BOTTOM PROJECTION STYLE



WELD STUD PART NUMBER COMPARISON					
Projections Under the Head					
Kanebridge	Buckeye	Gripco®	Kanebridge	Buckeye	Gripco®
0604WB	HW 1104	MN-0632-S-0250	1116WB	HW 1616	MN-1032-S-1000
0606WB	HW 1106	MN-0632-S-0375	1406WB	HW 2106	MN-1420-S-0375
0608WB	HW 1108	MN-0632-S-0500	1408WB	HW 2108	MN-1420-S-0500
0610WB	HW 1110	MN-0632-S-0625	1410WB	HW 2110	MN-1420-S-0625
0612WB	HW 1112	MN-0632-S-0750	1412WB	HW 2112	MN-1420-S-0750
0616WB	-	MN-0632-S-1000	1414WB	HW 2114	-
0806WB	HW 1406	MN-0832-S-0375	1416WB	HW 2116	MN-1420-S-1000
0808WB	HW 1408	MN-0832-S-0500	1420WB	HW 2120	MN-1420-S-1250
0810WB	HW 1410	MN-0832-S-0625	1424WB	HW 2124	MN-1420-S-1500
0812WB	HW 1412	MN-0832-S-0750	1428WB	HW 2128	-
0816WB	HW 1416	MN-0832-S-1000	1432WB	HW 2132	-
1006WB	HW 1506	MN-1024-S-0375	3110WB	HW 2710	-
1008WB	HW 1508	MN-1024-S-0500	3112WB	HW 2712	-
1010WB	HW 1510	MN-1024-S-0625	3116WB	HW 2716	-
1012WB	HW 1512	MN-1024-S-0750	3120WB	HW 2720	-
1016WB	HW 1516	MN-1024-S-1000	3132WB	HW 2732	-
1020WB	HW 1520	MN-1024-S-1250	3716WB	HW 3316	-
1106WB	HW 1606	MN-1032-S-0375	3720WB	HW 3320	-
1108WB	HW 1608	MN-1032-S-0500	3724WB	HW 3324	-
1110WB	HW 1610	MN-1032-S-0625	3728WB	HW 3328	-
1112WB	HW 1612	MN-1032-S-0750	5020WB	HW 4420	-

FLAT 90° SPACE - NO PROJECTIONS

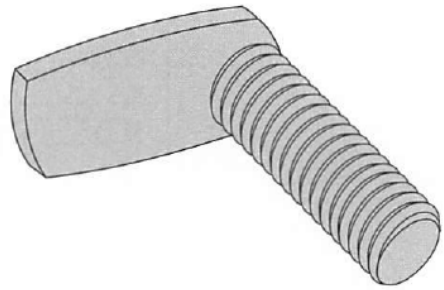


SPOT WELD SCREWS, FLAT 90° SPADE				Paulin®
Thread Size	W	T		S
	Spade Width	Spade Thickness		Spade Length
	Ref	Max	Min	Ref
6-32	.218	.052	.042	.562
8-32	.250	.068	.058	.625
10-24	.312	.068	.058	.688
10-32	.343	.068	.058	.688
1/4-20	.375	.099	.089	.750
Tolerance on Length	Under 1": + .000, -.031		1" to 2": + .000, - .060	

Description	An externally threaded fastener with a Unified thread. The spade-shaped head is at a 90° angle to one side of the threaded shank
Applications / Advantages	This item allows the welder to use various electrode tips, reducing the amount of equipment changes. Ideal for use in confined areas such as corners with limited clearance, or in applications requiring the threaded area be offset from the welding area.
Material	1006 - 1010 low carbon steel
Tensile Strength	60,000 psi. minimum
Finish	Weld screws are supplied with a plain, unplated finish to facilitate welding.

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90° SPOT WELD STYLE

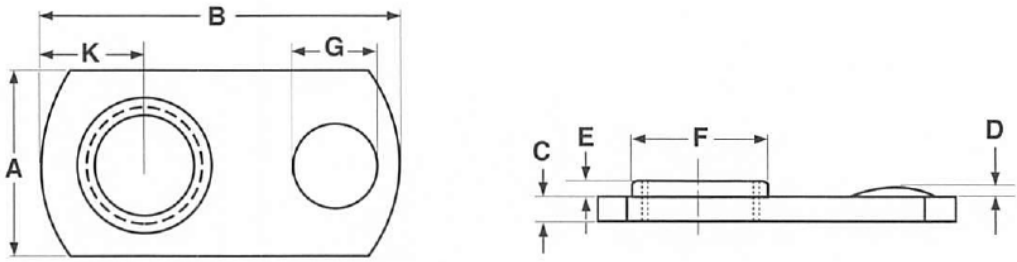


Spot Weld Screws Part Number Comparison

90° Spot Weld Screws

Catalog	Buckeye	Gripco®	Catalog	Buckeye	Gripco®	Catalog	Buckeye	Gripco®
0606WLJ	-	LJ-0632-S-0375	0824WLJ	SS 1424	LJ-0832-S-1500	1110WLJ	-	LJ-1032-S-0625
0608WLJ	SS 1108	LJ-0632-S-0500	0828WLJ	-	LJ-0832-S-1750	1112WLJ	SS 1612	LJ-1032-S-0750
0610WLJ	-	LJ-0632-S-0625	0832WLJ	-	LJ-0832-S-2000	1116WLJ	SS 1616	LJ-1032-S-1000
0612WLJ	-	LJ-0632-S-0750	1006WLJ	SS 1506	LJ-1024-S-0375	1120WLJ	-	LJ-1032-S-1250
0614WLJ	-	LJ-0632-S-0875	1008WLJ	SS 1508	LJ-1024-S-0500	1124WLJ	-	LJ-1032-S-1500
0616WLJ	-	LJ-0632-S-1000	1010WLJ	SS 1510	LJ-1024-S-0625	1128WLJ	-	LJ-1032-S-1750
0806WLJ	SS 1406	LJ-0832-S-0375	1012WLJ	SS 1512	LJ-1024-S-0750	1132WLJ	-	LJ-1032-S-2000
0808WLJ	SS 1408	LJ-0832-S-0500	1016WLJ	SS 1516	LJ-1024-S-1000	1408WLJ	SS 2108	LJ-1420-S-0500
0810WLJ	SS 1410	LJ-0832-S-0625	1020WLJ	SS 1520	LJ-1024-S-1250	1410WLJ	SS 2110	LJ-1420-S-0625
0812WLJ	SS 1412	LJ-0832-S-0750	1024WLJ	SS 1524	LJ-1024-S-1500	1412WLJ	SS 2112	LJ-1420-S-0750
0814WLJ	-	LJ-0832-S-0875	1028WLJ	-	LJ-1024-S-1750	1414WLJ	SS 2114	LJ-1420-S-0875
0816WLJ	SS 1416	LJ-0832-S-1000	1032WLJ	SS 1532	LJ-1024-S-2000	1416WLJ	SS 2116	LJ-1420-S-1000
0820WLJ	-	LJ-0832-S-1250	1106WLJ	SS 1606	LJ-1032-S-0375	1420WLJ	SS 2120	LJ-1420-S-1250
			1108WLJ	SS 1608	LJ-1032-S-0500			

OFFSET HOLE - SINGLE PROJECTIONS



WELD NUTS - OFFSET HOLE DESIGN WITH SINGLE PROJECTION

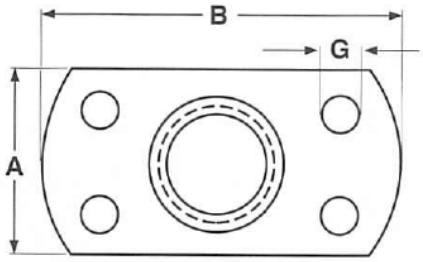
Paulin®

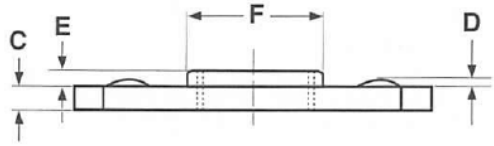
Size	A	C	B	F	E	G	D	K	Sheet Hole
	Width	Thickness	Length	Pilot Diameter	Pilot Height	Projection Width	Projection Height	Center of Pilot Hole to Outside of Rounded Edge	
6-32	.453 .433	.098 .088	.640 .610	.198 .178	.042 .026	.193 .183	.014 .010	.202 .172	.203
8-32	.453 .433	.098 .088	.640 .610	.213 .193	.042 .026	.193 .183	.014 .010	.202 .172	.219
10-24	.453 .433	.098 .088	.640 .610	.244 .224	.042 .026	.193 .183	.014 .010	.202 .172	.250
10-32	.453 .433	.098 .088	.640 .610	.244 .224	.042 .026	.193 .183	.014 .010	.202 .172	.250
1/4-20	.520 .495	.130 .120	.827 .797	.307 .287	.062 .046	.224 .214	.025 .021	.265 .235	.312
1/4-28	.520 .495	.130 .120	.827 .797	.307 .287	.062 .046	.224 .214	.025 .021	.265 .235	.312
5/16-18	.655 .620	.145 .135	.999 .969	.369 .349	.092 .076	.317 .307	.029 .025	.296 .266	.375
3/8-16	.655 .620	.145 .135	1.140 1.110	.448 .428	.102 .086	.317 .307	.029 .025	.359 .329	.453
3/8-24	.655 .620	.145 .135	1.140 1.110	.448 .428	.102 .086	.317 .307	.029 .025	.359 .329	.453

Description	A four-sided, internally threaded fastener with rounded edges at the two ends most opposite each other. The threaded hole is set off to one side and has a pilot for the entire circumference of the opening which extends above the flat surface of the nut. Next to this opening is a single, round, dome-shaped protrusion of a lesser height than the pilot.
Applications/ Advantages	Preferred over other styles of weld nuts when working with heavier gage material. The large, single projection gives a deeper weld than possible with smaller projections. The height of the pilot minimizes the amount of welding residue that could clog the threads.
Material	1006 - 1010 Low Carbon Steel

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CENTER HOLE - MULTIPLE PROJECTIONS





WELD NUTS - CENTER HOLE DESIGN WITH MULTIPLE PROJECTIONS

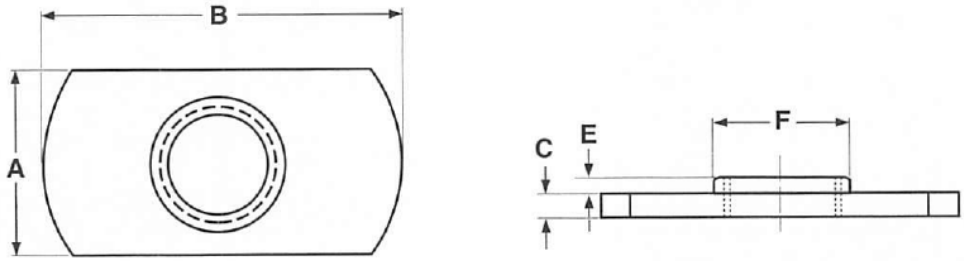
Paulin®

Size	A	C	B	F	E	G	D	Sheet Hole
	Width	Thickness	Length	Pilot Diameter	Pilot Height	Projection Width	Projection Height	
6-32	.453 .433	.098 .088	.640 .610	.198 .178	.042 .026	.095 .085	.017 .013	.203
8-32	.453 .433	.098 .088	.640 .610	.213 .193	.042 .026	.095 .085	.017 .013	.219
10-24	.453 .433	.098 .088	.640 .610	.244 .224	.042 .026	.095 .085	.017 .013	.250
10-32	.453 .433	.098 .088	.640 .610	.244 .224	.042 .026	.095 .085	.017 .013	.250
1/4-20	.520 .495	.098 .088	.827 .797	.307 .272	.042 .026	.130 .120	.022 .018	.312
5/16-18	.655 .620	.130 .120	.999 .969	.369 .349	.092 .076	.155 .145	.035 .025	.375
3/8-16	.655 .620	.130 .120	.999 .969	.369 .349	.092 .076	.155 .145	.035 .025	.453
3/8-24	.655 .620	.130 .120	.999 .969	.448 .428	.102 .086	.155 .145	.035 .025	.453
1/2-13	.797 .734	.192 .178	1.266 1.234	.599 .569	.102 .086	.176 .166	.040 . 030	.609
1/2-20	.797 .734	.192 .178	1.266 1.234	.599 .569	.102 .086	.176 .166	.040 . 030	.609

Description	A four-sided, internally threaded fastener with rounded edges at the two ends most opposite each other. The threaded hole runs through the center and has a pilot for the entire circumference of the opening which extends above the flat surface of the nut. Surrounding the hole in the four corners and on the same side of the nut as the pilot, are four identical round, dome-shaped protrusions of less height than the pilot.
Applications/ Advantages	The four projections are designed to weld simultaneously, covering a greater area than single projection nuts to achieve maximum weld strength. The height of the pilot minimizes the amount of welding residue that could clog the threads.
Material	1006 - 1010 Low Carbon Steel

Paulin® is a registered trademark of Paulin Industries, Inc.

CENTER HOLE - WITHOUT PROJECTIONS



Weld Nuts, Center Hole Design Without Projections

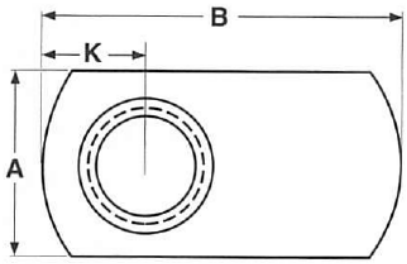
Paulin®

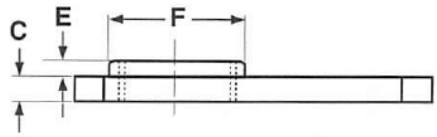
Size	A	C	B	F	E	Pilot Hole
	Width	Thickness	Length	Pilot Diameter	Pilot Height	
6-32	.453 .433	.098 .088	.890 .860	.198 .178	.042 .026	.203
8-32	.453 .433	.098 .088	.890 .860	.213 .193	.042 .026	.219
10-24	.453 .433	.098 .088	.890 .860	.244 .224	.042 .026	.250
10-32	.453 .433	.098 .088	.890 .860	.244 .224	.042 .026	.250
1/4-20	.453 .433	.098 .088	1.015 .985	.307 .272	.042 .026	.312
1/4-20	.520 .495	.130 .120	1.140 1.110	.307 .287	.062 .046	.312
5/16-18	.655 .620	.145 .135	1.515 1.485	.369 .349	.092 .075	.375
3/8-16	.655 .620	.145 .135	1.515 1.485	.448 .428	.092 .075	.453
1/2-13	.827 .797	.192 .178	1.515 1.485	.599 .569	.102 .085	.609

Description	A four-sided, internally threaded fastener with rounded edges at the two ends most opposite each other. The threaded hole runs through the center and has a pilot for the entire circumference of the opening which extends above the flat surface of the nut. The remaining top surface of the nut is flat.
Applications/ Advantages	The center hole design enables this nut to bridge corners or depressions offering additional strength. The tabs allow the installer to use multiple sizes of electrodes, thus improving efficiency by reducing equipment changes. The height of the pilot minimizes the amount of welding residue that could clog the threads.
Material	1006 - 1010 Low Carbon Steel

Paulin® is a registered trademark of Paulin Industries, Inc.

OFFSET HOLE - WITHOUT PROJECTIONS





TAB WELD NUTS, OFFSET HOLE WITHOUT PROJECTIONS

Paulin®

Size	A Width	C Thickness	B Length	F Pilot Diameter	E Pilot Height	K Center of Pilot Hole to Outside of Rounded Edge	Pilot Hole
6-32	.453 .433	.097 .091	.640 .610	.198 .178	.042 .025	.202 .172	.203
8-32	.453 .433	.098 .088	.640 .610	.213 .193	.042 .025	.202 .172	.219
10-24	.453 .433	.098 .088	.640 .610	.244 .224	.042 .025	.201 .172	.250
10-32	.453 .433	.098 .088	.640 .610	.244 .224	.042 .025	.202 .172	.250
1/4-20	.448 .428	.097 .091	.953 .923	.307 .271	.047 .030	.270 .230	.312
1/4-20	.520 .495	.128 .122	.827 .797	.307 .287	.062 .045	.265 .235	.312
5/16-18	.655 .620	.130 .120	.999 .969	.369 .349	.092 .075	.296 .266	.375
3/8-16	.655 .620	.130 .120	.999 .969	.448 .428	.102 .085	.359 .329	.453
3/8-24	.655 .620	.130 .120	.999 .969	.448 .428	.102 .085	.359 .329	.453

Description	A four-sided, internally threaded fastener with rounded edges at the two ends most opposite each other. The threaded hole runs through the center and has a pilot for the entire circumference of the opening which extends above the flat surface of the nut. The remainder of the top surface of the nut is flat.
Applications/ Advantages	This style weld nut is to be used with thinner gage metals to reinforce an area. The tab allows the installer to use mulitple sizes of electrodes, thus improving efficiency by reducing equipment changes. The height of the pilot minimizes the amount of welding residue that could clog the threads.
Material	1006 - 1010 Low Carbon Steel

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PART NUMBER COMPARISONS

Tab Weld Nuts, Steel

Offset Hole Design, Single Projection Style

Kanebridge	Buckeye	Gripco®	Kanebridge	Buckeye	Gripco®
06NWP1	PN 1109	P1C-6-S	15NWP1	PN 2213	-
08NWP1	PN 1409	P1C-8-S	31NWP1	PN 2716	P1C-56-S
10NWP1	PN 1510	P1C-10-S	37NWP1	PN 3318	P1C-38-S
11NWP1	PN 1710	-	38NWP1	PN 3418	-
14NWP1	PN 2113	P1C-14-S			

Center Hole Design, Multiple Projection Style

Kanebridge	Buckeye	Gripco®	Kanebridge	Buckeye	Gripco®
06NWP2	-	P2C-6-S	31NWP2	QN 2716	P2C-56-S
08NWP2	QN 1401	P2C-8-S	37NWP2	QN 3316	P2C-38-S
10NWP2	QN 1501	P2C-10-S	38NWP2	-	-
11NWP2	QN 1701	-	50NWP2	QN 4421	P2C-12-S
14NWP2	QN 2113	P2C-14-S	51NWP2	-	-

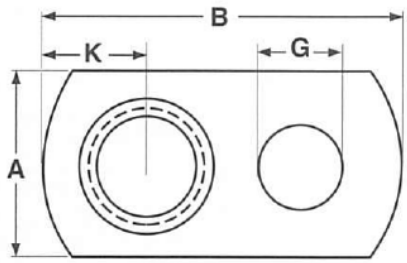
Offset Hole Design, Without Projections

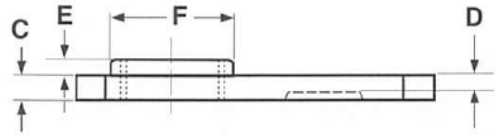
Kanebridge	Buckeye	Gripco®	Kanebridge	Buckeye	Gripco®
06NWS1	SN 1109	S1C-6-S	14NWS1	SN 2113	S1C-14-S
08NWS1	SN 1409	S1C-8-S	31NWS1	SN 2716	S1C-56-S
10NWS1	SN 1510	S1C-10-S	37NWS1	SN 3318	S1C-38-S
11NWS1	SN 1710	-			

Center Hole Design, Without Projections

Kanebridge	Buckeye	Gripco®	Kanebridge	Buckeye	Gripco®
06NWS2	ND 1114	S2C-6-S	14NWS2	ND 2116	S2C-14-S
08NWS2	ND 1414	S2C-8-S	31NWS2	ND 2724	S2C-56-S
10NWS2	ND 1514	S2C-10-S	37NWS2	ND 3324	S2C-38-S
11NWS2	ND 1714	-	50NWS2	-	S2C-12-S

OFFSET HOLE - THIN TARGET AREA





WELD NUTS - OFFSET HOLE DESIGN WITH THIN TARGET AREA

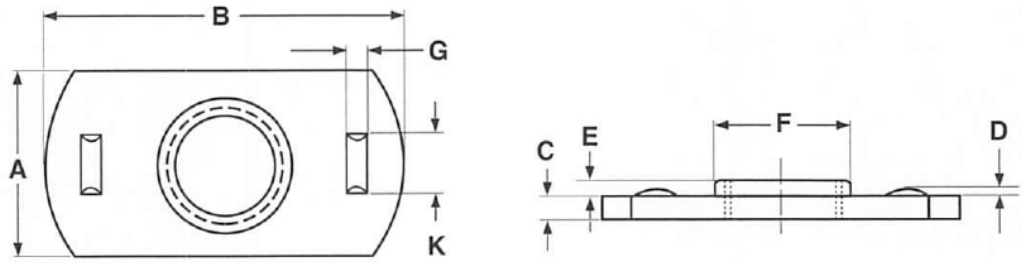
Paulin®

Size	A Width	C Thickness	B Length	F Pilot Diameter	E Pilot Height	G Target Diameter	D Target Thickness	K Center of Pilot Hole to Outside of Rounded Edge	Sheet Hole
6-32	.390 .370	.097 .091	.734 .704	.198 .178	.042 .025	.265 .235	.085 .075	.208 .168	.203
8-32	.390 .370	.097 .091	.734 .704	.213 .193	.042 .025	.265 .235	.085 .075	.208 .168	.219
10-24	.453 .433	.097 .091	.827 .797	.244 .224	.042 .025	.296 .266	.085 .075	.208 .168	.250
10-32	.453 .433	.097 .091	.827 .797	.244 .224	.042 .025	.296 .266	.085 .075	.208 .168	.250
1/4-20	.448 .428	.097 .091	.953 .923	.307 .271	.047 .030	.296 .266	.085 .075	.270 .230	.312
5/16-18	.448 .428	.128 .122	1.140 1.110	.369 .349	.092 .075	.358 .328	.100 .090	.280 .240	.375
3/8-16	.572 .552	.128 .122	1.265 1.235	.448 .428	.102 .085	.421 .396	.100 .090	.364 .324	.453

Description	A four-sided, internally threaded fastener with rounded edges at the two ends most opposite each other. The threaded hole is set off to one side and has a pilot for the entire circumference of the opening which extends above the flat surface of the nut. On the side opposite the pilot and at the other end of the nut is a circular indentation
Applications/ Advantages	Preferred over other styles of weld nuts when welding to thinner gage material. The height of the pilot minimizes the amount of welding residue that could clog the threads and facilitates locating the pilot hole.
Material	1006 - 1010 Low Carbon Steel

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CENTER HOLE - MULTI RIBBED PROJECTIONS



CENTER HOLE DESIGN WELD NUTS WITH MULTIPLE RIBBED PROJECTIONS

Paulin®

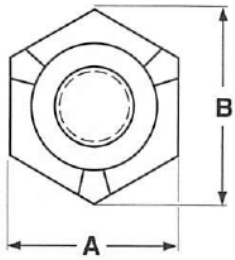
Size	A Nut Width	C Nut Thickness	B Nut Length	F Pilot Diameter	E Pilot Height	G Projection Width	D Projection Height	K Projection Length	Sheet Hole
10-24	.390 .370	.097 .091	.640 .610	.244 .224	.042 .026	.099 .089	.014 .010	.109 .079	.250
10-32	.390 .370	.097 .091	.640 .610	.244 .224	.042 .026	.099 .089	.014 .010	.109 .079	.250
1/4-20	.520 .495	.128 .122	.827 .797	.307 .287	.062 .046	.130 .120	.025 .021	.140 .110	.312

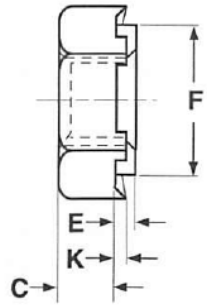
Description	A four-sided, internally threaded fastener with rounded edges at the two ends most opposite each other. The threaded hole runs through the center and has a pilot for the entire circumference of the opening which extends above the flat surface of the nut. At opposite ends on the top surface of the nut are two identical rectangular, ribbed protrusions of less height than the pilot
Applications/ Advantages	The center hole design enables this nut to bridge corners or depressions offering additional strength. The ribbed projections provide equal welding strength on both sides of the pilot. The height of the pilot eliminates the need for re-tapping damaged threads.
Material	1006 - 1010 Low Carbon Steel

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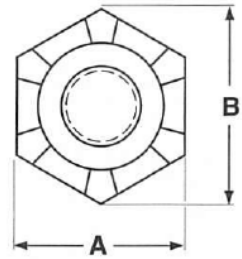
HEX - 3 & 6 PROJECTIONS

3 Projection Style





6 Projection Style



HEX PILOTED PROJECTION WELD NUTS, WITH THREE PROJECTIONS

Paulin®

Size	A	C	B	F	E	K	Pilot Hole
	Width	Thickness	Width Across the Corners	Pilot Diameter	Pilot Height	Projection Height	
1/4-20	.500 .489	.198 .178	.556	.406 .394	.090 .080	.043 .037	.422
3/8-16	.625 .612	.260 .240	.691	.531 .519	.090 .080	.043 .037	.547

HEX PILOTED PROJECTION WELD NUTS, WITH SIX PROJECTIONS

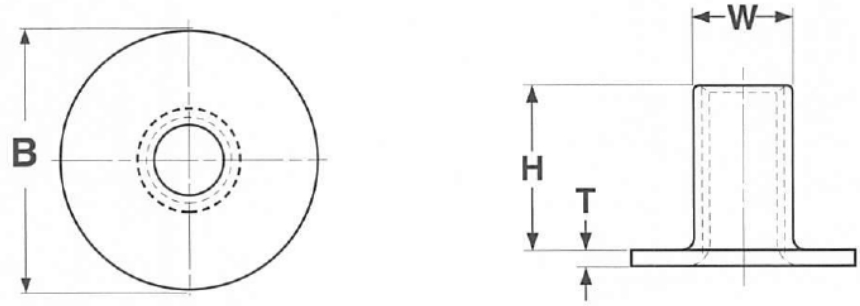
Paulin®

Size	A	C	B	F	E	K	Pilot Hole
	Width	Thickness	Width Across the Corners	Pilot Diameter	Pilot Height	Projection Height	
1/4-20	.500 .489	.198 .178	.556	.406 .394	.090 .080	.043 .037	.422
5/16-18	.551 .562	.229 .209	.624	.469 .457	.090 .080	.043 .037	.484

Description	A six-sided, internally threaded fastener with rounded projections on the top surface of the corners of the fastener. The six-projection style has weldable projections at all six corners; the three projection style has weldable projections atop every other corner. The threaded hole runs through the center and has a pilot for the entire circumference of the opening which extends above the top surface of the nut and above the projections. The remainder of the top surface of the nut is flat.
Applications/ Advantages	This weld nut is designed to achieve two ends: (1) the pilot is self-locating so it can be used with an automated feeding mechanism; (2) when the nut is fully tightened, the pilot protects the internal threads from welding residue.
Material	1006 - 1010 Low Carbon Steel

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PLAIN ROUND BASE - WITHOUT PROJECTIONS

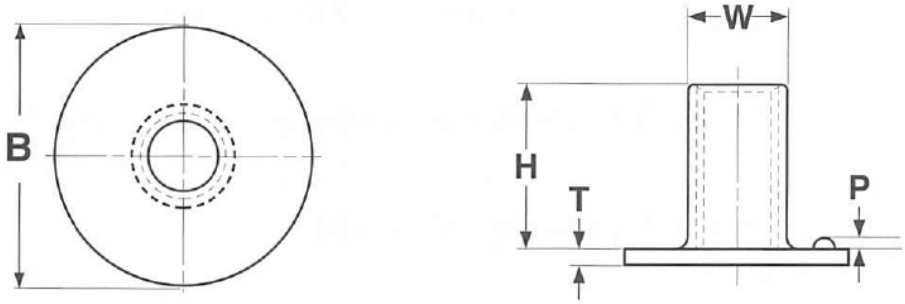


Round Base Weld Nuts Without Projections

Part Number	Thread Size	H		W		B		T	
		Barrel Height		Barrel Diameter		Base Diameter		Material Thickness	
		Max	Min	Max	Min	Max	Min	Max	Min
0604NWR	6-32	.281	.219	.177	.147	.594	.531	.039	.009
0804NWR	8-32	.281	.219	.224	.194	.750	.688	.046	.016
10093NWR	10-24	.312	.250	.258	.228	.781	.719	.054	.024
11093NWR	10-32	.312	.250	.258	.228	.781	.719	.054	.024
1405NWR	1/4-20	.344	.281	.320	.290	.781	.719	.062	.032
1407NWR	1/4-20	.469	.406	.320	.290	.781	.719	.062	.032
1409NWR	1/4-20	.594	.531	.320	.290	.781	.719	.062	.032

Description	Internally threaded barrel-shaped fasteners integrally formed with a circular, flat base.
Applications/ Advantages	An economical welding fastener for use in metal working or for use as a leveling device in appliances.
Material	Cold rolled steel

ROUND BASE - WITH PROJECTIONS



Round Base Weld Nuts With Projections

Part Number	Thread Size	H		W		B		N	P		T	
		Barrel Height		Barrel Diameter		Base Diameter		Projection Width	Projection Height		Material Thickness	
		Max	Min	Max	Min	Max	Min	± 1/32	Max	Min	Max	Min
0804NWRP	8-32	.281	.219	.224	.194	.750	.688	7/64	.046	.016	.046	.016
10093NWRP	10-24	.312	.250	.258	.228	.781	.719	7/64	.054	.024	.054	.024
11093NWRP	10-32	.312	.250	.258	.228	.781	.719	7/64	.054	.024	.054	.024
1405NWRP	1/4-20	.344	.281	.320	.290	.781	.719	7/64	.054	.024	.062	.032
1407NWRP	1/4-20	.469	.406	.320	.290	.781	.719	7/64	.054	.024	.062	.032

Description	Internally threaded barrel-shaped fasteners integrally formed with a circular, flat base that has three dome-shaped protrusions on its top side.
Applications/ Advantages	An economical welding fastener used when it is neccesary to restrict the nut from rotating when tightened.
Material	Cold rolled steel

ELECTRONIC HARDWARE

Dimensions
Mechanical and Performance Requirements

Hex Jack Screws, Steel & Stainless 479

Clinch Studs, Flush Head, Steel & SS.... 480-482

Broaching Stud, Flush Head, Phosphor Bronze.. 483

Self-Clinch Standoffs
Blind Threaded Style..... 484-486
Through-Hole Style..... 487-488

Round Spacers 489

Hex Spacers 490

Round Female Standoffs..... 491

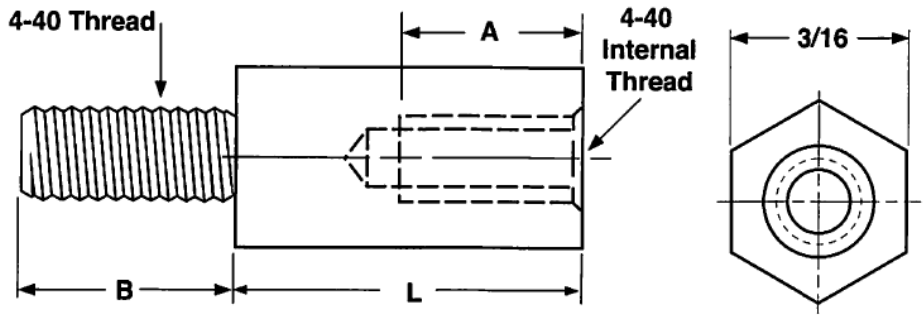
Hex Female Standoffs..... 492

Hex & Round Male-Female Standoffs 493

Round Swage Spacers..... 494

Hex Swage Spacers..... 495

HEX JACK SCREWS

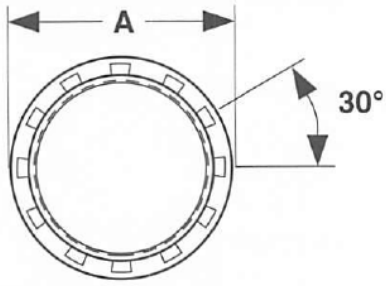


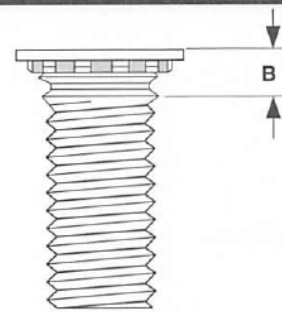
3/16 Hex Jackscrews

Part Number	A	B		L		Across the Flats		External Thread Size	Internal Thread Size
	Internal Thread Depth	Length of External Thread		Body Length					
	Min	Max	Min	Max	Min	Max	Min		
100304JM	.100	.188	.182	.1875	.1825	.1875	.1825	4-40	4-40
100404JM		.250	.245						
100504JM		.313	.307						
100604JM		.375	.370						
100704JM		.438	.432						
100804JM		.500	.495						
100904JM		.563	.557						
101004JM		.625	.620						

Description	A hex shaped mechanical device that has an opening with a partial internal thread at one end, and an externally threaded post at the opposite end.
Applications/ Advantages	Used to mount D-subminiature connectors to a metal panel, such as the housing of a personal computer tower.
Material	***Steel:*** Low Carbon Steel ***Stainless:*** Class 303 Stainless

12-RIB STYLE - FLUSH HEAD





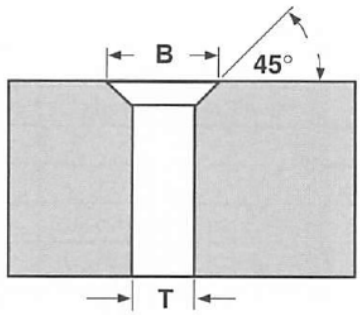
Steel Self-Clinching Studs - 12-Rib Style with Annular Groove

Thread Size	A		B	Minimum Sheet Thickness	Hole in Sheet (+.003, -.000)	Distance to Center of Hole in Panel	Push-Out (lbs.)	Torque-Out (In.-lbs.)	Estimate of Installation Force in Steel
	Head Diameter		Unthreaded Length				#2 thru #10 diam based on .060 steel plates. 1/4 & 5/16 diam based on .088 steel plates.		
	Max	Min	Max			Min			Tons (Approx)
2-56	.156	.125	.075	.040	.085	.18	250	8.5	3
4-40	.204	.172	.085	.040	.111	.22	280	11	4
5-40	.207	.177	.085	.040	.113	.22	280	11	4
6-32	.219	.187	.090	.040	.137	.25	350	30	4.5
8-32	.250	.218	.090	.040	.163	.28	400	65	5
10-24	.266	.234	.100	.040	.189	.28	500	100	6
10-32	.266	.234	.100	.040	.189	.28	500	100	6
1/4-20	.344	.312	.135	.062	.249	.31	700	120	7
1/4-28	.344	.312	.135	.062	.249	.31	*	*	*
5/16-18	.391	.361	.160	.093	.311	.38	850	200	8
3/8-16	.467	.435	.185	.125	.374	.45	1000	260	8.5
1/2-13	.640	.630	.170	*	.502	.62	1250	290	9.5
Tolerance on Length				±.015					

*Standards are unavailable.

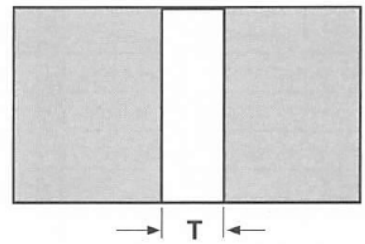
Description	A fastener with unified thread pitch and a cylindrical, low profile head with small, rectangular ribs protruding from the underside of the head. The top of the head is flat and is flush with the mating surface when installation is complete. Below the ribs and above the first thread is an annular groove which helps to hold the fastener in position.	
Applications/ Advantages	Intended for metal panel-to-panel applications and well-suited for use in printed circuit boards. A hole is pierced into the circuit board and the unit it is attached to. The stud is inserted using a hand press or by hand, applying parallel squeezing forces. A hex nut is twisted onto the stud, securing it from the back. As the nut is tightened, the ribbed stud head grips the front panel to secure the application from the front as well, eliminating the need for welding. As the application force is applied, part of the sheet cold flows into an undercut under the head, making the fastener an integral part of the sheet.	
Material	*Steel*	*Stainless*
	Low carbon steel	300 series stainless
Heat Treatment	Clinch studs shall be case hardened, oil quenched and tempered.	-
Case Hardness	Rockwell C 45 minimum	Not required to test for hardness
Core Hardness	Rockwell C 29 - 38	Not required to test for hardness
For Use In...	...materials with a hardness of Rockwell B80 or less.	...materials with a hardness of Rockwell B70 or less.
Finish	Steel clinch studs are usually furnished with a zinc plating.	Stainless clinch studs are usually supplied without additional finish.

12-RIB STYLE - FLUSH HEAD



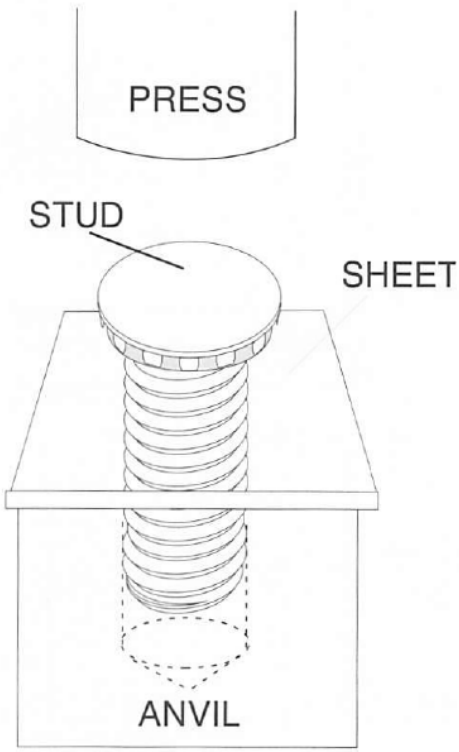
THIN SHEET ANVIL

Intended for panels less than 0.060" in thickness, with #4 thru #10 thread sizes, inclusive. Also, for panels less than 0.093" in thickness with 1/2" thread size.



THICK SHEET ANVIL

Intended for panels 0.060" and greater in thickness, with #4 thru #10 thread sizes, inclusive. Also, for panels 0.093" and greater in thickness with 1/4" thread size.



Anvil Dimensions		
Thread Size	Anvil	
	B	T
2-56	0.110 0.114	0.087 0.090
4-40	0.136 0.140	0.113 0.116
6-32	0.162 0.166	0.139 0.142
8-32	0.188 0.192	0.165 0.168
10-24 & 10-32	0.216 0.220	0.191 0.194
1/4-20	0.295 0.300	0.250 0.253
5/16-18	0.355 0.360	0.3125 0.3155
3/8-16	0.465 0.470	0.3750 0.3780
1/2-13	0.570 0.580	0.502 0.505

Notes on Installation: Apply only sufficient squeezing pressure to embed head of stud flush with panel. Do not use more pressure than necessary. Amount of pressure varies with panel material and size of stud. Studs install flush in sheets .040" or thicker but will project up to .020" in thinner sheets.

12-RIB STYLE - FLUSH HEAD

Part Number Comparison - Flush Head Clinch Studs, Steel

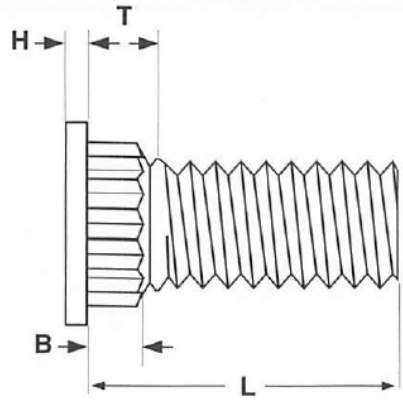
Catalog	PEM®	Captive	Catalog	PEM®	Captive	Catalog	PEM®	Captive
0208SCN	FH-256-8-ZI	CH 256-8	0804SCN	FH-832-4-ZI	CH 832-4	1120SCN	FH-032-20-ZI	CH 1032-20
0210SCN	FH-256-10-ZI	CH 256-10	0805SCN	FH-832-5-ZI	CH 832-5	1124SCN	FH-032-24-ZI	CH 1032-24
0404SCN	FH-440-4-ZI	CH 440-4	0806SCN	FH-832-6-ZI	CH 832-6	1206SCN	-	-
0405SCN	FH-440-5-ZI	CH 440-5	0808SCN	FH-832-8-ZI	CH 832-8	1404SCN	-	-
0406SCN	FH-440-6-ZI	CH 440-6	0810SCN	FH-832-10-ZI	CH 832-10	1406SCN	FH-0420-6-ZI	CH 420-6
0407SCN	-	-	0812SCN	FH-832-12-ZI	CH 832-12	1408SCN	FH-0420-8-ZI	CH 420-8
0408SCN	FH-440-8-ZI	CH 440-8	0814SCN	FH-832-14-ZI	CH 832-14	1410SCN	FH-0420-10-ZI	CH 420-10
0410SCN	FH-440-10-ZI	CH 440-10	0816SCN	FH-832-16-ZI	CH 832-16	1412SCN	FH-0420-12-ZI	CH 420-12
0412SCN	FH-440-12-ZI	CH 440-12	0820SCN	FH-832-20-ZI	CH 832-20	1414SCN	FH-0420-14-ZI	CH 420-14
0414SCN	FH-440-14-ZI	CH 440-14	0824SCN	FH-832-24-ZI	CH 832-24	1416SCN	FH-0420-16-ZI	CH 420-16
0416SCN	-	-	0832SCN	-	-	1418SCN	FH-0420-18-ZI	CH 420-18
0418SCN	-	-	1006SCN	FH-024-6-ZI	CH 024-6	1420SCN	FH-0420-20-ZI	CH 420-20
0424SCN	-	-	1008SCN	FH-024-8-ZI	CH 024-8	1424SCN	FH-0420-24-ZI	CH 420-24
0504SCN	-	-	1010SCN	FH-024-10-ZI	CH 1024-10	1432SCN	-	-
0516SCN	-	-	1012SCN	FH-024-12-ZI	CH 1024-12	1512SCN	-	-
0604SCN	FH-632-4-ZI	CH 632-4	1014SCN	FH-024-14-ZI	CH 1024-14	3108SCN		
0605SCN	FH-632-5-ZI	CH 632-5	1016SCN	FH-024-16-ZI	CH 1024-16	3110SCN	FH-0518-10-ZI	CH 518-10
0606SCN	FH-632-6-ZI	CH 632-6	1020SCN	FH-024-20-ZI	CH 1024-20	3112SCN	FH-0518-12-ZI	CH 518-12
0608SCN	FH-632-8-ZI	CH 632-8	1024SCN	FH-024-24-ZI	CH 1024-24	3114SCN	FH-0518-14-ZI	CH 518-14
0610SCN	FH-632-10-ZI	CH 632-10	1104SCN	-	CH1032-4	3116SCN	FH-0518-16-ZI	CH 518-16
0612SCN	FH-632-12-ZI	CH 632-12	1105SCN	FH-032-5-ZI	CH 1032-5	3120SCN	FH-0518-20-ZI	CH 518-20
0614SCN	FH-632-14-ZI	CH 632-14	1106SCN	FH-032-6-ZI	CH 1032-6	3124SCN	FH-0518-24-ZI	CH 518-24
0616SCN	FH-632-16-ZI	CH 632-16	1108SCN	FH-032-8-ZI	CH 1032-8	3128SCN	-	-
0620SCN	FH-632-20-ZI	CH 632-20	1110SCN	FH-032-10-ZI	CH 1032-10	3132SCN	-	-
0624SCN	FH-632-24-ZI	CH 632-24	1112SCN	FH-032-12-ZI	CH 1032-12	3716SCN	-	-
0632SCN	-	-	1114SCN	FH-032-14-ZI	CH 1032-14	3720SCN		
0648SCN	-	-	1116SCN	FH-032-16-ZI	CH 1032-16			

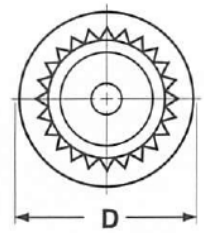
Part Number Comparison - Flush Head Clinch Studs, Stainless

Catalog	PEM®	Captive	Catalog	PEM®	Captive	Catalog	PEM®	Captive
0604SCN300	FHS-632-4	CHS 632-4	0824SCN300	FHS-832-24	CHS 832-24	1408SCN300	FHS-0420-8	CHS 420-8
0605SCN300	FHS-632-5	CHS 632-5	1006SCN300	FHS-024-6	CHS 1024-6	1410SCN300	FHS-0420-10	CHS 420-10
0606SCN300	FHS-632-6	CHS 632-6	1008SCN300	FHS-024-8	CHS 1024-8	1412SCN300	FHS-0420-12	CHS 420-12
0608SCN300	FHS-632-8	CHS 632-8	1010SCN300	FHS-024-10	CHS 1024-10	1414SCN300	FHS-0420-14	CHS 420-14
0610SCN300	FHS-632-10	CHS 632-10	1012SCN300	FHS-024-12	CHS 1024-12	1416SCN300	FHS-0420-16	CHS 420-16
0612SCN300	FHS-632-12	CHS 632-12	1016SCN300	FHS-024-16	CHS 1024-16	1420SCN300	FHS-0420-20	CHS 420-20
0616SCN300	FHS-632-16	CHS 632-16	1106SCN300	FHS-032-6	CHS 1032-6	1424SCN300	FHS-0420-24	CHS 420-24
0806SCN300	FHS-832-6	CHS 832-6	1108SCN300	FHS-032-8	CHS 1032-8	1432SCN300	-	-
0808SCN300	FHS-832-8	CHS 832-8	1110SCN300	FHS-032-10	CHS 1032-10	3110SCN300	FHS-0518-10	CHS 518-10
0810SCN300	FHS-832-10	CHS 832-10	1112SCN300	FHS-032-12	CHS 1032-12	3112SCN300	FHS-0518-12	CHS 518-12
0812SCN300	FHS-832-12	CHS 832-12	1116SCN300	FHS-032-16	CHS 1032-16	3116SCN300	FHS-0518-16	CHS 518-16
0816SCN300	FHS-832-16	CHS 832-16	1120SCN300	FHS-032-20	CHS 1032-20	3120SCN300	FHS-0518-20	CHS 518-20
0820SCN300	FHS-832-20	CHS 832-20				3124SCN300	FHS-0518-24	CHS 518-24

Phosphor Bronze

FLUSH HEAD





BROACHING TYPE STUDS

PEM®

Thread Size	D		H		B	T	Sheet Thickness	Hole Size in Sheet		Clearance Hole Size in Attached parts	Distance from Hole Center to Edge
	Head Diameter		Head Height		Shank	Distance to first full form thread					
	Max	Min	Max	Min	Max	Max	Min	Min	Min	Max	Min
4-40	.190	.170	.025	.015	.065	.090	.060	.123	.120	.145	.15
6-32	.210	.190	.025	.015	.065	.090	.060	.143	.140	.170	.19
8-32	.235	.215	.025	.015	.065	.090	.060	.169	.166	.195	.20
10-32	.260	.240	.025	.015	.065	.090	.060	.192	.189	.220	.20
Tolerance on Length					± .010						

Description	An externally threaded fastener with unified thread pitch and a circular, low-profile head. Directly below the head is a shoulder with a series of ribs that extend vertically from the head to above the first full form thread. The diameter of the ribbed area is greater than the major diameter of the threaded shank.
Applications / Advantages	Designed for use in personal computer boards as either (a) a permanently affixed mechanical fastener that holds its place, or (b) as a connector that can be soldered.
Material	CDA 510 Phosphor Bronze
For use in...	...materials with a hardness of Rockwell B-65 or less.
Installation Force	400 pounds (all diameters)
Nut Tightening Torque (Max.)	**4-40:** 4 in. lbs.; **6-32:** 8 in. lbs.; **8-32:** 15 in. lbs.; **10-32:** 18 in. lbs.
Pushout	**4-40:** 65 lbs.; **6-32:** 70 lbs.; **8-32:** 80 lbs.; **10-32:** 90 lbs.
Torque Out	**4-40:** 7 in. lbs.; **6-32:** 11 in. lbs.; **8-32:** 16 in. lbs.; **10-32:** 17 in. lbs.
Plating	Electro-Tin plated

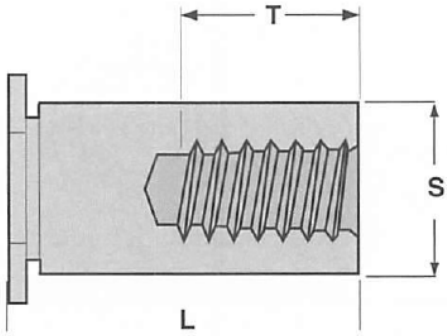
PART NUMBER COMPARISON - BROACHING-TYPE STUD, STEEL ZINC

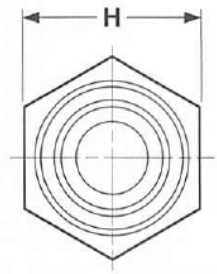
Catalog	Captive	PEM®	Catalog	Captive	PEM®
0406SBKFH	CKFH440-6	KFH440-6	0806SBKFH	CKFH832-6	KFH832-6
0408SBKFH	CKFH440-8	KFH440-8	0808SBKFH	CKFH832-8	KFH832-8
0410SBKFH	CKFH440-10	KFH440-10	0810SBKFH	CKFH832-10	KFH832-10
0606SBKFH	CKFH632-6	KFH632-6	1108SBKFH	CKFH1032-8	KFH1032-8
0608SBKFH	CKFH632-8	KFH632-8	1112SBKFH	CKFH1032-12	KFH1032-12
0610SBKFH	CKFH632-10	KFH632-10			

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BLIND THREADED STYLE

303 Stainless



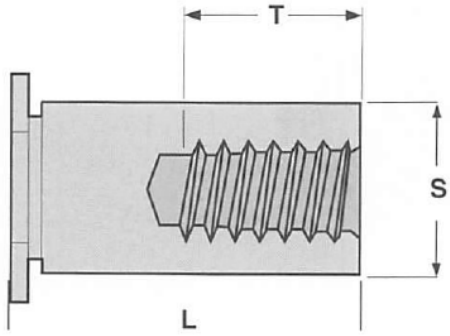


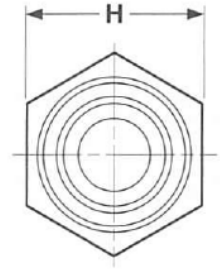
SELF-CLINCHING STANDOFFS -- 303 STAINLESS STEEL													
Body Code & Thread Size	S		H		Hole Size in Sheet		Distance from center line of hole to edge of sheet	Min. Sheet Thickness	Performance in .060 in. thick 5052 Aluminum				
	Shank Outside Diameter		Hex Head Dimension						Installation Force	Pushout	Torque Out	Axial Pull Through	Recommended Tightening Torque for Mating Screw (In. Lbs.)
	Max	Min	Max	Min	Max	Min	Min	Inches	Lbs.	Lbs.	In. Lbs.	Lbs.	Max
4-40	.165	.160	.192	.182	.169	.166	.234	.040	1075	155	10	220	3.8
6 4-40	.212	.207	.255	.245	.216	.213	.266	.040	1680	290	24	235	3.8
6-32	.212	.207	.255	.245	.216	.213	.266	.040	1680	290	24	235	7
8 6-32	.280	.275	.317	.307	284	.281	.312	.050	2350	380	25	248	7
8-32	.280	.275	.317	.307	.284	.281	.312	.050	2400	400	45	464	14
10-32	.280	.275	.317	.307	.284	.281	.312	.050	2400	400	45	464	25
Tolerance on Length					+.002, -.005								

Description	A cylindrical fastener with a low-profile, hexagon-shaped head. The end opposite the head is internally threaded. It is considered a "blind" fastener because the threaded section does not extend through the entire length of the standoff. Immediately below the head is a slight indentation that extends completely around the item's circumference. This indentation, or groove, provides the clinching action when the part is pressed thru a properly-sized hole in sheet metal.
Applications / Advantages	The standoff becomes permanently set when squeezed into place into a proper size drilled or punched hole. After it is pressed into place, the standoff forms a flush surface with the sheet metal.
Material	303 Stainless Steel, passivated to ASTM A 380 specifications
For use in...	...materials with a hardness of Rockwell B70 or less.
Finish	Stainless self-clinching standoffs usually do not have any additional finish.

303 Stainless

BLIND THREADED STYLE





Length of Thread for Self-Clinching Standoffs

Part #	Body Code (if app.) x Thread x Length	T Thread Length	Part #	Body Code (if app.) x Thread x Length	T Thread Length	Part #	Body Code (if app.) x Thread x Length	T Thread Length
040506SCBSOS	6-4-40 x 5/16	.156	060508SCBSOS	8-6-32 x 5/16	.156	0805SCBSOS	8-32 x 5/16	.156
0405SCBSOS	4-40 x 5/16	.156	0605SCBSOS	6-32 x 5/16	.156	0806SCBSOS	8-32 x 3/8	.156
040606SCBSOS	6-4-40 x 3/8	.156	060608SCBSOS	8-6-32 x 3/8	.156	0807SCBSOS	8-32 x 7/16	.187
0406SCBSOS	4-40 x 3/8	.156	0606SCBSOS	6-32 x 3/8	.156	0808SCBSOS	8-32 x 1/2	.250
040706SCBSOS	6-4-40 x 7/16	.187	060708SCBSOS	8-6-32 x 7/16	.187	0809SCBSOS	8-32 x 9/16	.250
0407SCBSOS	4-40 x 7/16	.187	0607SCBSOS	6-32 x 7/16	.187	0810SCBSOS	8-32 x 5/8	.250
040806SCBSOS	6-4-40 x 1/2	.250	060808SCBSOS	8-6-32 x 1/2	.250	1105SCBSOS	10-32 x 5/16	.156
0408SCBSOS	4-40 x 1/2	.250	0608SCBSOS	6-32 x 1/2	.250	1106SCBSOS	10-32 x 3/8	.156
040906SCBSOS	6-4-40 x 9/16	.250	060908SCBSOS	8-6-32 x 9/16	.250	1107SCBSOS	10-32 x 7/16	.187
0409SCBSOS	4-40 x 9/16	.250	0609SCBSOS	6-32 x 9/16	.250	1108SCBSOS	10-32 x 1/2	.250
041006SCBSOS	6-4-40 x 5/8	.250	061008SCBSOS	8-6-32 x 5/8	.250	1109SCBSOS	10-32 x 9/16	.250
0410SCBSOS	4-40 x 5/8	.250	0610SCBSOS	6-32 x 5/8	.250	1110SCBSOS	10-32 x 5/8	.250

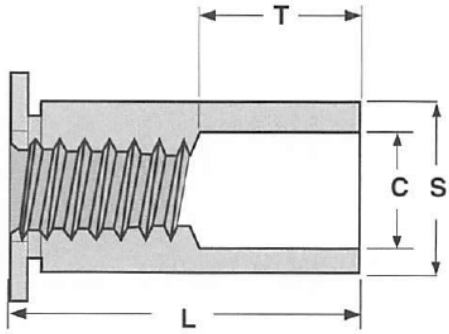
BLIND THREADED STYLE

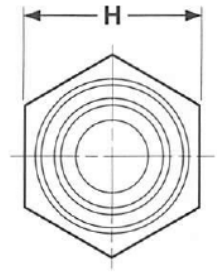


PART NUMBER COMPARISON - SELF-CLINCHING STANDOFFS, 303 STAINLESS					
Catalog	Captive	PEM®	Catalog	Captive	PEM®
040506SCBSOS	CFBSOS-6440-10	BSOS-6440-10	060808SCBSOS	CFBSOS-8632-16	BSOS-8632-16
0405SCBSOS	CFBSOS-440-10	BSOS-440-10	0608SCBSOS	CFBSOS-632-16	BSOS-632-16
040606SCBSOS	CFBSOS-6440-12	BSOS-6440-12	060908SCBSOS	CFBSOS-8632-18	BSOS-8632-18
0406SCBSOS	CFBSOS-440-12	BSOS-440-12	0609SCBSOS	CFBSOS-632-18	BSOS-632-18
040706SCBSOS	CFBSOS-6440-14	BSOS-6440-14	061008SCBSOS	CFBSOS-8632-20	BSOS-8632-20
0407SCBSOS	CFBSOS-440-14	BSOS-440-14	0610SCBSOS	CFBSOS-632-20	BSOS-632-20
040806SCBSOS	CFBSOS-6440-16	BSOS-6440-16	0805SCBSOS	CFBSOS-832-10	BSOS-832-10
0408SCBSOS	CFBSOS-440-16	BSOS-440-16	0806SCBSOS	CFBSOS-832-12	BSOS-832-12
040906SCBSOS	CFBSOS-6440-18	BSOS-6440-18	0807SCBSOS	CFBSOS-832-14	BSOS-832-14
0409SCBSOS	CFBSOS-440-18	BSOS-440-18	0808SCBSOS	CFBSOS-832-16	BSOS-832-16
041006SCBSOS	CFBSOS-6440-20	BSOS-6440-20	0809SCBSOS	CFBSOS-832-18	BSOS-832-18
0410SCBSOS	CFBSOS-440-20	BSOS-440-20	0810SCBSOS	CFBSOS-832-20	BSOS-832-20
060508SCBSOS	CFBSOS-8632-10	BSOS-8632-10	1105SCBSOS	CFBSOS-032-10	BSOS-032-10
0605SCBSOS	CFBSOS-632-10	BSOS-632-10	1106SCBSOS	CFBSOS-032-12	BSOS-032-12
060608SCBSOS	CFBSOS-8632-12	BSOS-8632-12	1107SCBSOS	CFBSOS-032-14	BSOS-032-14
0606SCBSOS	CFBSOS-632-12	BSOS-632-12	1108SCBSOS	CFBSOS-032-16	BSOS-032-16
060708SCBSOS	CFBSOS-8632-14	BSOS-8632-14	1109SCBSOS	CFBSOS-032-18	BSOS-032-18
0607SCBSOS	CFBSOS-632-14	BSOS-632-14	1110SCBSOS	CFBSOS-032-20	BSOS-032-20

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THROUGH-HOLE STYLE





Self-Clinching Standoffs -- Through Hole Style, Steel

Body Code & Thread Size	S		H	C		Hole Size in Sheet		Distance from center line of hole to edge of sheet	Min. Sheet Thickness	Performance in .060 in. thick cold-rolled Steel		
	Shank Outside Diameter		Hex Dimension	Counterbore Diameter						Installation Force	Pushout	Torque Out
	Max	Min	Nom.	Max	Min	Max	Min	Min	Inches	Lbs.	Lbs.	In. Lbs.
4-40	.165	.160	.187	.130	.120	.169	.166	.23	.040	2200	270	20
6-32	.212	.207	.250	.161	.151	.216	.213	.27	.040	3400	380	35
8-32	.280	.275	.312	.193	.183	.284	.281	.31	.050	4000	575	78
10-32	.280	.275	.312	.208	.198	.284	.281	.31	.050	4000	575	78
Tolerance on Length						+.002, -.005						

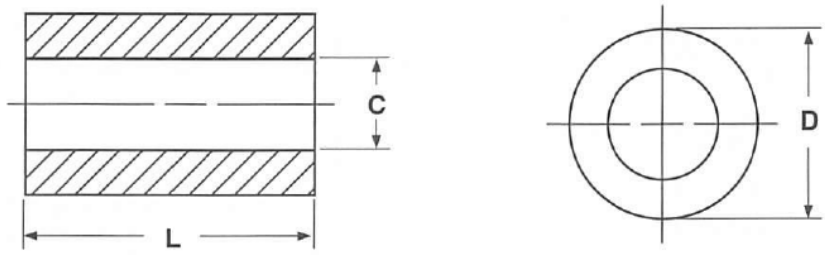
Description	A cylindrical fastener with a low-profile, hexagon-shaped head. The same end as the head is internally threaded. Immediately below the head is a slight indentation that extends completely around the item's circumference. This indentation, or groove, provides the clinching action when the part is pressed thru a properly-sized hole in sheet metal.
Applications / Advantages	The standoff becomes permanently set when squeezed into place into a proper size drilled or punched hole. After it is pressed into place, the standoff forms a flush surface with the sheet metal.
Material	Heat-treated Carbon Steel
Finish	Commercial Zinc finish

THROUGH-HOLE STYLE

Part Number Comparison - Through-Hole Style Self-Clinching Standoffs, Steel Zinc

Catalog	Captive	PEM®	Catalog	Captive	PEM®
0408SCSO	CFSO 440-16	SO-440-16	0808SCSO	CFSO 832-16	SO-832-16
0409SCSO	CFSO 440-18	SO-440-18	0809SCSO	CFSO 832-18	SO-832-18
0410SCSO	CFSO 440-20	SO-440-20	0810SCSO	CFSO 832-20	SO-832-20
0411SCSO	CFSO 440-22	SO-440-22	0811SCSO	CFSO 832-22	SO-832-22
0412SCSO	CFSO 440-24	SO-440-24	0812SCSO	CFSO 832-24	SO-832-24
0608SCSO	CFSO 632-16	SO-632-16	1108SCSO	CFSO 1032-16	SO-032-16
0609SCSO	CFSO 632-18	SO-632-18	1109SCSO	CFSO 1032-18	SO-032-18
0610SCSO	CFSO 632-20	SO-632-20	1110SCSO	CFSO 1032-20	SO-032-20
0611SCSO	CFSO 632-22	SO-632-22	1111SCSO	CFSO 1032-22	SO-032-22
0612SCSO	CFSO 632-24	SO-632-24	1112SCSO	CFSO 1032-24	SO-032-24

ROUND SPACERS



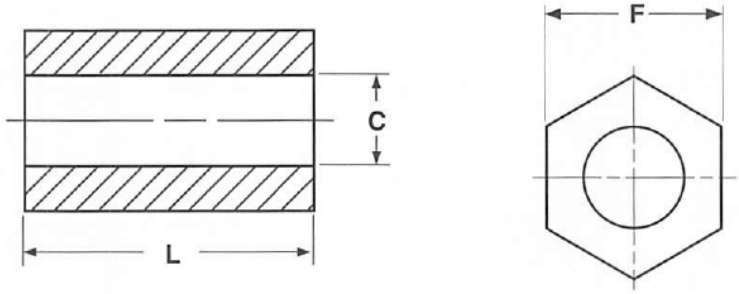
Round Spacers

D	C			D	C		
Nominal Diameter (± 1/64)	Clearance Hole			Nominal Diameter (± 1/64)	Clearance Hole		
	Hole Number	Max	Min		Hole Number	Max	Min
3/16	#2	.100	.090	3/8	#12	.228	.218
3/16	#4	.124	.114	3/8	1/4"	.262	.252
1/4	#2	.100	.090	1/2	#6	.150	.140
1/4	#4	.124	.114	1/2	#8	.176	.166
1/4	#6	.150	.140	1/2	#10	.202	.192
1/4	#8	.176	.166	1/2	#12	.224	.214
5/16	#4	.124	.114	1/2	1/4"	.262	.252
5/16	#6	.150	.140	5/8	#6	.150	.140
5/16	#8	.176	.166	5/8	#8	.176	.166
5/16	#10	.202	.192	5/8	#10	.202	.192
3/8	#6	.150	.140	5/8	1/4"	.262	.252
3/8	#8	.176	.166	5/8	#5/16	.325	.315
3/8	#10	.202	.192	5/8	#3/8	.390	.380

Tolerance on Length (up to 4 in.)	Nylon parts: ±.015	All other materials: ±.005

Description	A cylindrical, unthreaded, mechanical device used to hold two components at a given distance from each other.
Applications/ Advantages	Round spacers are the most common shape, used primarily in minimum clearance space requirements. Aluminum is popular for its light weight/ strength compromise. It is non-magnetic, performs well in severe temperatures, and has insulating properties. Nylon is a good insulator and has a surface smoothness which will not fray the insulation of wires that rub against it. Brass is used in making high-quality spacers. It is conductive, resists corrosion, and is non-magnetic. It is costlier and heavier than aluminum and is usually plated zinc or nickel. Stainless has the advantages of brass but has superior resistance to corrosion and chemical fumes. Steel is used in applications requiring greater strength, but it is heavier than aluminum and does not resist corrosion like aluminum, brass or stainless.
Material	***Aluminum***: 2011 Aluminum (*Copper*: 5.0-6.0%; *Silicon*: 0.4% maximum; *Iron*: 0.7% maximum; *Zinc*: 0.3% maximum; *Bismuth*: 0.2-0.6%; Lead: 0.2-0.6%) ***Nylon***: Nylon 6/6 Brass: C36000 Brass (*Copper*: 60.00-63.00%; *Lead*: 2.50-3.70%; *Iron*: .35% maximum) ***Stainless***: 303 stainless, passivated to ASTM A 380 ***Steel***: 12L14 Steel-Leaded Grade A (*Carbon*: .15% maximum; *Manganese*: .85-1.15%; *Phosphorus*: .04-.09%; *Sulphur*: .26-.35%)

HEX SPACERS



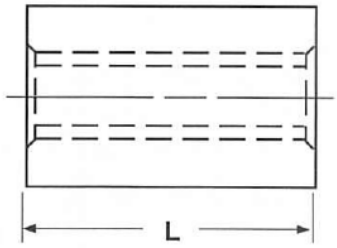
Hexagon Spacers

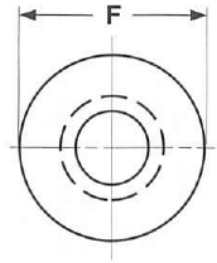
F	C			F	C		
Width Across the Flats (± 1/64)	Clearance Hole			Width Across the Flats (± 1/64)	Clearance Hole		
	Hole Number	Max	Min		Hole Number	Max	Min
3/16	#1	.077	.067	3/8	#8	.176	.166
3/16	#2	.100	.090	3/8	#10	.202	.192
3/16	#4	.124	.114	1/2	#6	.150	.140
1/4	#2	.100	.090	1/2	#8	.176	.166
1/4	#4	.124	.114	1/2	#10	.202	.192
1/4	#6	.150	.140	1/2	1/4	.262	.252
1/4	#8	.176	.166	5/8	#6	.150	.140
5/16	#4	.124	.114	5/8	#8	.176	.166
5/16	#6	.150	.140	5/8	#10	.202	.192
5/16	#8	.176	.166	5/8	#1/4	.262	.252
5/16	#10	.202	.192	5/8	#5/16	.325	.315
3/8	#6	.150	.140	5/8	#3/8	.390	.380

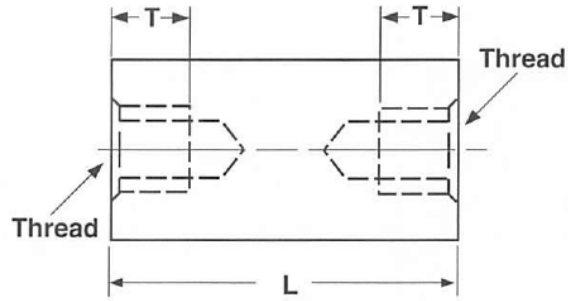
Tolerance on Length (up to 4 in.)	Nylon parts: ±.015	All other materials: ±.005

Description	A hexagonal, unthreaded, mechanical device used to hold two components at a given distance from each other.
Applications/ Advantages	Hex spacers are much less common than round, used in some applications to resist twisting. Aluminum is popular for its light weight/ strength compromise. It is non-magnetic, performs well in severe temperatures, and has insulating properties. Nylon is a good insulator and has a surface smoothness which will not fray the insulation of wires that rub against it. Brass is used in making high-quality spacers. It is conductive, resists corrosion, and is non-magnetic. It is costlier and heavier than aluminum and is usually plated zinc or nickel. Stainless has the advantages of brass but has superior resistance to corrosion and chemical fumes. Steel is used in applications requiring greater strength, but it is heavier than aluminum and does not resist corrosion like aluminum or brass.
Material	**Aluminum**: 2011 Aluminum (Copper: 5.0-6.0%; Silicon: 0.4% maximum; Iron: 0.7% maximum; Zinc: 0.3% maximum; Bismuth: 0.2-0.6%; Lead: 0.2-0.6%) **Nylon:** Nylon 6/6 **Brass**: C36000 Brass (Copper: 60.00-63.00%; Lead: 2.50-3.70%; Iron: .35% maximum) **Stainless**: 303 stainless, passivated to ASTM A 380 **Steel**: 12L14 Steel-Leaded Grade A (Carbon: .15% maximum; Manganese: .85-1.15%; Phosphorus: .04-.09%; Sulphur: .26-.35%)

ROUND THREADED, FEMALE STANDOFFS







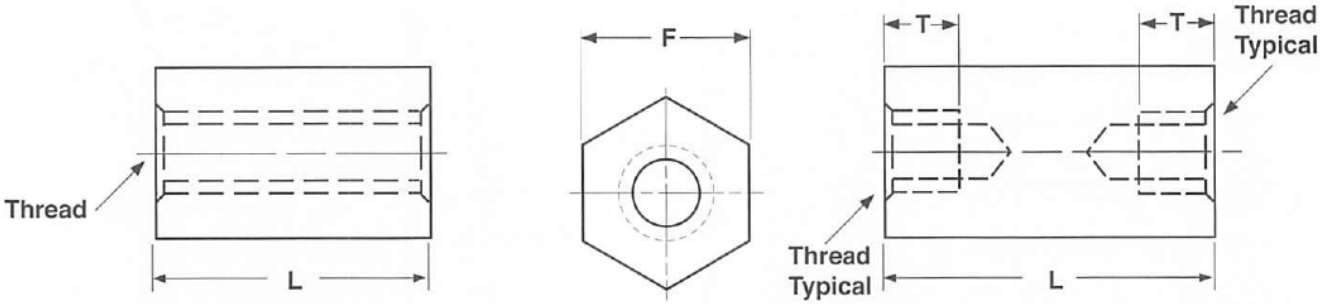
ROUND STANDOFFS

F Nominal Diameter (± 1/64)	Thread Size	T Thread Depth Min	F Nominal Diameter (± 1/64)	Thread Size	T Thread Depth Min
3/16	2-56	3/16	3/8	8-32	7/16
3/16	4-40	1/4	3/8	10-32	1/2
1/4	2-56	3/16	1/2	6-32	3/8
1/4	4-40	1/4	1/2	8-32	7/16
1/4	6-32	3/8	1/2	10-32	1/2
1/4	8-32	7/16	1/2	1/4-20	5/8
1/4	10-32	1/2	5/8	8-32	7/16
5/16	4-40	1/4	5/8	10-32	1/2
5/16	6-32	3/8	5/8	1/4-20	5/8
5/16	8-32	7/16	5/8	5/16-18	5/8
5/16	10-32	1/2	5/8	3/8-16	5/8
3/8	6-32	3/8			

Tolerance on Length (up to 4 in.)	Nylon parts: ±.015	All other materials: ±.005

Description	A cylindrical, mechanical device which has a partial or complete internal thread, used to hold two components at a given distance from each other.
Applications/ Advantages	Standoffs are usually chosen over spacers when longer sizes are required. Round standoffs are less common than hex, used in applications where wrenching of the standoff is not required. Aluminum is popular for its light weight/ strength compromise. It is non-magnetic, performs well in severe temperatures, and has insulating properties. Nylon is a good insulator and has a surface smoothness which will not fray the insulation of wires that rub against it. Its threads will withstand torque without stripping. Brass is used in making high-quality standoffs. It is conductive, resists corrosion, and is non-magnetic. It is costlier and heavier than aluminum and is usually plated zinc or nickel. Stainless has the advantages of brass but has superior resistance to corrosion and chemical fumes. Steel is used in applications requiring greater strength, but it is heavier than aluminum and does not resist corrosion like aluminum or brass.
Material	***Aluminum:*** 2011 Aluminum (*Copper*: 5.0-6.0%; *Silicon*: 0.4% maximum; *Iron*: 0.7% maximum; *Zinc*: 0.3% maximum; *Bismuth*: 0.2-0.6%; *Lead*: 0.2-0.6%) ***Nylon:*** Nylon 6/6 ***Brass:*** C36000 Brass (*Copper*: 60.00-63.00%; *Lead*: 2.50-3.70%; *Iron*: .35% maximum) ***Stainless:*** 303 stainless, passivated to ASTM A 380 ***Steel:*** 12L14 Steel-Leaded Grade A (*Carbon*: .15% maximum; *Manganese*: .85-1.15%; *Phosphorus*: .04-.09%; *Sulphur*: .26-.35%)

HEX THREADED, FEMALE STANDOFFS



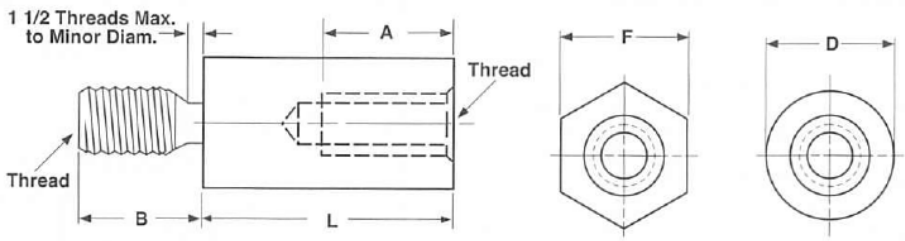
HEXAGON STANDOFFS

F	Thread Size	T	F	Thread Size	T
Width Across the Flats (± 1/64)		Thread Depth Min	Width Across the Flats (± 1/64)		Thread Depth Min
3/16	2-56	3/16	3/8	6-32	3/8
3/16	4-40	1/4	3/8	8-32	7/16
1/4	2-56	3/16	3/8	10-32	1/2
1/4	4-40	1/4	1/2	6-32	3/8
1/4	6-32	3/8	1/2	8-32	7/16
1/4	8-32	7/16	1/2	10-32	1/2
1/4	10-32	1/2	1/2	1/4-20	5/8
5/16	4-40	1/4	5/8	8-32	7/16
5/16	6-32	3/8	5/8	10-32	1/2
5/16	8-32	7/16	5/8	1/4-20	5/8
5/16	10-32	1/2	5/8	5/16-18	5/8
			5/8	3/8-16	5/8

Tolerance on Length (up to 4 in.)	Nylon parts: ±.015	All other materials: ±.005

Description	A hexagonal, mechanical device which has a partial or complete internal thread, used to hold two components at a given distance from each other.
Applications/ Advantages	Standoffs are usually chosen over spacers when longer sizes are required. Hex standoffs can be installed with a nutsetter or other wrenching device. Aluminum is popular for its light weight/ strength compromise. It is non-magnetic, performs well in severe temperatures, and has insulating properties. Nylon is a good insulator and has a surface smoothness which will not fray the insulation of wires that rub against it. Its threads will withstand torque without stripping. Brass is used in making high-quality standoffs. It is conductive, resists corrosion, and is non-magnetic. It is costlier and heavier than aluminum and is usually plated zinc or nickel. Stainless has the advantages of brass but has superior resistance to corrosion and chemical fumes. Steel is used in applications requiring greater strength, but it is heavier than aluminum and does not resist corrosion like aluminum or brass.
Material	***Aluminum:*** 2011 Aluminum (*Copper*: 5.0-6.0%; *Silicon*: 0.4% maximum; *Iron*: 0.7% maximum; *Zinc*: 0.3% maximum; *Bismuth*: 0.2-0.6%; *Lead*: 0.2-0.6%) ***Nylon:*** Nylon 6/6 ***Brass:*** C36000 Brass (*Copper*: 60.00-63.00%; *Lead*: 2.50-3.70%; *Iron*: .35% maximum) ***Stainless:*** 303 stainless, passivated to ASTM A 380 ***Steel:*** 12L14 Steel-Leaded Grade A (*Carbon*: .15% maximum; *Manganese*: .85-1.15%; *Phosphorus*: .04-.09%; *Sulphur*: .26-.35%)

HEX & ROUNDED, MALE-FEMALE STANDOFFS



Hexagon and Round Male-Female Standoffs

F	D	Thread Size	B	A
Hex Standoffs	Round Standoffs			Full Thread Depth*
Width Across the Flats (± 1/64)	Nominal Diameter (± 1/64)		Male Thread Length	Nom
3/16	3/16	2-56	5/32	3/16
3/16	3/16	4-40	3/16	1/4
1/4	1/4	4-40	3/16	1/4
1/4	1/4	6-32	1/4	3/8
1/4	1/4	8-32	3/8	7/16
5/16	5/16	4-40	3/16	1/4
5/16	5/16	6-32	1/4	3/8
5/16	5/16	8-32	3/8	7/16
5/16	5/16	10-32	3/8	1/2
3/8	3/8	6-32	1/4	3/8
3/8	3/8	8-32	3/8	7/16
3/8	3/8	10-32	3/8	1/2

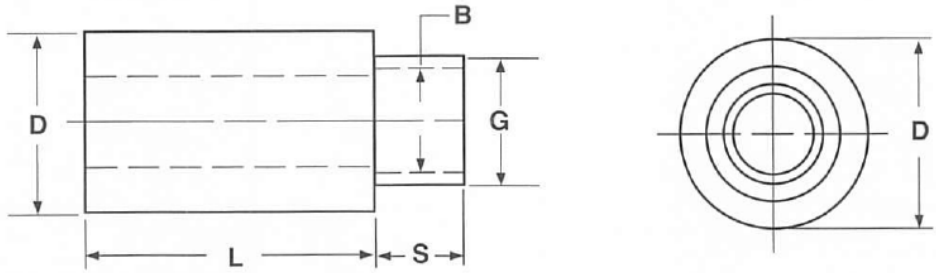
*For Minimum Thread Depths (A) for shorter Body Lengths (L), see chart below.

Tolerance on Length (up to 4 in.)	Nylon parts: ±.015	All other materials: ±.005

Body Length (L)	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8
Thread	Minimum Depth (A)							
2-56	.077	.140						
4-40	.070	.133	.195					
6-32		.105	.166	.229	.291			
8-32		.090	.152	.215	.277	.340	.402	
10-32		.078	.140	.203	.265	.328	.434	.452

Description	A hex or round shaped, mechanical device which has an opening with a partial internal thread at one end, and an externally threaded post at the opposite end. It is used to hold two components at a given distance from each other.
Applications/ Advantages	Male-female standoffs are used when one of the components is internally threaded. Aluminum is popular for its light weight/ strength compromise. It is non-magnetic, performs well in severe temperatures, and has insulating properties. Nylon is a good insulator and has a surface smoothness which will not fray the insulation of wires that rub against it. Its threads will withstand torque without stripping. Brass is used in making high-quality standoffs. It is conductive, resists corrosion, and is non-magnetic. It is costlier and heavier than aluminum and is usually plated zinc or nickel. Stainless has the advantages of brass but has superior resistance to corrosion and chemical fumes. Steel is used for its greater strength, but it is heavier than aluminum and does not resist corrosion like aluminum or brass.
Material	***Aluminum:*** 2011 Aluminum (*Copper*: 5.0-6.0%; *Silicon*: 0.4% maximum; *Iron*: 0.7% maximum; *Zinc*: 0.3% maximum; *Bismuth*: 0.2-0.6%; *Lead*: 0.2-0.6%) ***Nylon:*** Nylon 6/6 ***Brass:*** C36000 Brass (*Copper*: 60.00-63.00%; *Lead*: 2.50-3.70%; *Iron*: .35% maximum) ***Stainless:*** Type 303 stainless ***Steel:*** 12L14 Steel-Leaded Grade A (*Carbon*: .15% maximum; *Manganese*: .85-1.15%; *Phosphorus*: .04-.09%; *Sulphur*: .26-.35%)

ROUND SWAGE SPACERS



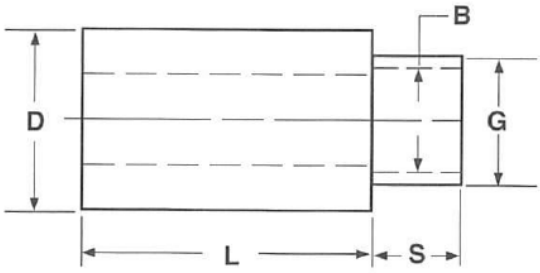
Round Swage Spacers

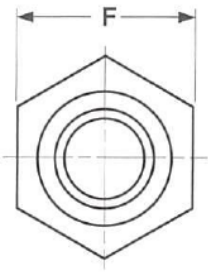
D	C		S		G		B		D	C		S		G		B	
Nominal Diameter	Clearance Hole		Swage Length		Swage Diameter		Bore Diameter		Nominal Diameter	Clearance Hole		Swage Length		Swage Diameter		Bore Diameter	
	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min	Max	Min	Max	Min
1/4	.125	.115	.078	.072	.188	.185	.152	.149	5/16	.176	.166	.138	.132	.234	.231	.203	.200
			.108	.102								.168	.162				
			.138	.132						.202	.192	.078	.072				
			.168	.162								.108	.102				
	.150	.140	.078	.072								.138	.132				
			.108	.102								.168	.162				
			.138	.132						.150	.140	.078	.072				
			.168	.162								.108	.102				
5/16	.125	.115	.078	.072	.234	.231	.203	.200				.138	.132				
			.108	.102								.168	.162				
			.138	.132					3/8	.176	.166	.078	.072	.234	.231	.203	.200
			.168	.162								.108	.102				
	.150	.140	.078	.072								.138	.132				
			.108	.102								.168	.162				
			.138	.132						.202	.192	.078	.072				
			.168	.162								.108	.102				
	.176	.166	.078	.072								.138	.132				
			.108	.102								.168	.162				

Tolerance on Length	±.005

Description	A one-piece, cylindrical, unthreaded, mechanical device which has a protrusion at one end of the same shape but smaller in diameter.
Applications/ Advantages	Round swage spacers are mounted in circuit boards to keep the board at a given distance from another object. The spacer becomes an integral and permanently attached part of the board. Aluminum is popular for its light weight/ strength compromise. It is non-magnetic, performs well in severe temperatures, and has insulating properties. Brass is used in making high-quality swage spacers. It is conductive, resists corrosion, and is non-magnetic. It is costlier and heavier than aluminum and is usually plated zinc or nickel. Steel is used in applications requiring greater strength, but it is heavier than aluminum and does not resist corrosion like aluminum or brass.
Material	***Aluminum:*** 2011 Aluminum (*Copper*: 5.0-6.0%; *Silicon*: 0.4% maximum; *Iron*: 0.7% maximum; *Zinc*: 0.3% maximum; *Bismuth*: 0.2-0.6%; *Lead*: 0.2-0.6%) ***Brass:*** C36000 Brass (*Copper*: 60.00-63.00%; *Lead*: 2.50-3.70%; *Iron*: .35% maximum) ***Steel:*** 12L14 Steel-Leaded Grade A (*Carbon*: .15% maximum; *Manganese*: .85-1.15%; *Phosphorus*: .04-.09%; *Sulphur*: .26-.35%)

HEX SWAGE SPACERS





HEXAGON SWAGE SPACERS

D	C		S		G		B	
Nominal Diameter	Clearance Hole		Swage Length		Swage Diameter		Bore Diameter	
	Max	Min	Max	Min	Max	Min	Max	Min
1/4	.125	.115	.078	.072	.188	.185	.152	.149
			.108	.102				
			.138	.132				
			.168	.162				
	.150	.140	.078	.072				
			.108	.102				
			.138	.132				
			.168	.162				
5/16	.125	.115	.078	.072	.234	.231	.203	.200
			.108	.102				
			.138	.132				
			.168	.162				
	.150	.140	.078	.072				
			.108	.102				
			.138	.132				
			.168	.162				
	.176	.166	.078	.072				
			.108	.102				
5/16	.176	.166	.138	.132	.234	.231	.203	.200
			.168	.162				
	.202	.192	.078	.072				
			.108	.102				
			.138	.132				
			.168	.162				
3/8	.150	.140	.078	.072	.234	.231	.203	.200
			.108	.102				
			.138	.132				
			.168	.162				
	.176	.166	.078	.072				
			.108	.102				
			.138	.132				
			.168	.162				
	.202	.192	.078	.072				
			.108	.102				
			.138	.132				
			.168	.162				

Tolerance on Length	±.005

Description	A one-piece, hex-shaped, unthreaded, mechanical device which has a cylindrical protrusion at one end which is smaller in diameter than the hexagonal part of the spacer.
Applications/ Advantages	Hex swage spacers are monunted in circuit boards to keep the board at a given distance from another object. The spacer becomes an integral and permanently attached part of the board. The hex-shaped vairety is preferred when wrenching of the spacer is required. Aluminum is popular for its light weight/strength compromise. It is non-magnetic, performs well in severe temperatures, and has insulating properties. Brass is used in making hgh-quality swage spacers. It is conductive, resists corrosion, and is non-magnatic. It is costlier and heavier than aluminum and is usually plated zinc or nickel. STeel is used in applications requiring greater strength, but it is heavier than aluminum and does not resist corrosion like aluminum or brass.
Material	***Aluminum:*** 2011 Aluminum (*Copper*: 5.0-6.0%; *Silicon*: 0.4% maximum; *Iron*: 0.7% maximum; *Zinc*: 0.3% maximum; *Bismuth*: 0.2-0.6%; *Lead*: 0.2-0.6%) ***Brass:*** C36000 Brass (*Copper*: 60.00-63.00%; *Lead*: 2.50-3.70%; *Iron*: .35% maximum) ***Steel:*** 12L14 Steel-Leaded Grade A (*Carbon*: .15% maximum; *Manganese*: .85-1.15%; *Phosphorus*: .04-.09%; *Sulphur*: .26-.35%)

NYLON FASTENERS

Dimensions
Mechanical and Performance Requirements

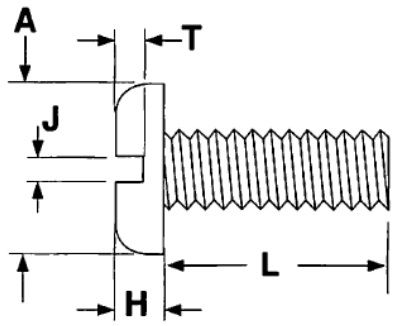
Pan Head Machine Screws 497

Hex Nuts 498

Flat Washers 499

Shoulder Washers 500

Cable Clamps 501-502



Nylon Pan Head Machine Screws

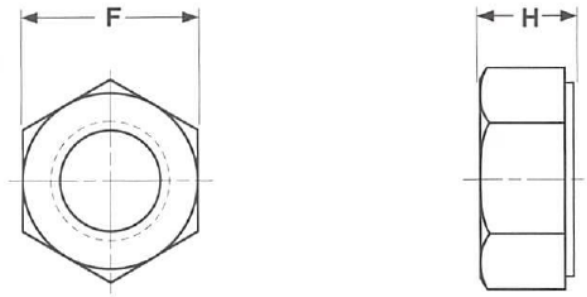
Nominal Size	A		H		J		T	
	Head Diameter		Height of Head		Width of Slot		Depth of Slot	
	Max	Min	Max	Min	Max	Min	Max	Min
1	.142	.130	.046	.038	.026	.019	.027	.018
2	.167	.155	.053	.045	.031	.023	.031	.022
4	.219	.205	.068	.058	.039	.031	.040	.030
6	.270	.256	.082	.072	.048	.039	.050	.037
8	.322	.306	.096	.085	.054	.045	.058	.045
10	.373	.357	.110	.099	.060	.050	.068	.053
1/4	.492	.473	.144	.130	.075	.064	.087	.070

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.
	1 thru 10	-0.02	-0.03	-0.06	-0.09
	1/4	-0.03	-0.03	-0.06	-0.09

Description	An externally threaded fastener with a head that has slightly rounded sides, a flat top and a flat underside.
Applications/ Advantages	To be used with internally threaded nylon fasteners in applications that require corrosion resistance or electrical insulation. Nylon's other advantages include: resistance to greases and oils; a low coefficient of friction; ability to maintain its torque strength when exposed to a wide range of temperatures.
Material	Nylon 6/6
Hardness	Rockwell M80
Tensile, shear and torque data is offered for informational purposes only. This data should not be used to set specification limits. It is always wise to test parts in the actual application.	
Tensile Test (Break Pounds)	***2-56:*** 19 lbs.; ***4-40:*** 41 lbs.; ***6-32:*** 69 lbs.; ***8-32:*** 108 lbs.; ***10-24:*** 149 lbs.; ***10-32:*** 165 lbs.; ***1/4-20:*** 312 lbs.
Double Shear (Break Pounds)	***2-56:*** (No test); ***4-40:*** 50 lbs.; ***6-32:*** 97 lbs.; ***8-32:*** 164 lbs.; ***10-24:*** 257 lbs.; ***10-32:*** 241 lbs.; ***1/4-20:*** 432 lbs.
Maximum Torque (before deformation)	***2-56:*** (No test); ***4-40:*** 12-16 in. oz.; ***6-32:*** 18-20 in. oz.; ***8-32:*** 2-3 in. lbs.; ***10-24:*** 2-4 in. lbs.; ***10-32:*** 3-4 in. lbs.; ***1/4-20:*** 9-10 in. lbs.
Thermal Properties	***Melting Point:*** 500° F ***Continuous Use Temperature:*** 185° F

HEX NUTS

Standard Sizes

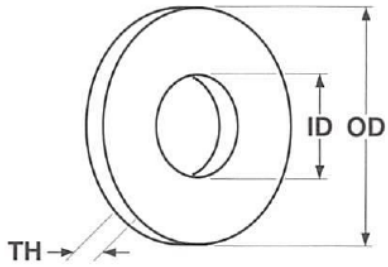


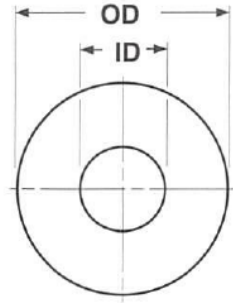
Nylon Hex Nuts				
Diameter & Thread Pitch	F		H	
	Width Across Flats		Nut Thickness	
	Max	Min	Max	Min
2-56	0.190	0.170	0.080	0.060
3-48	0.190	0.170	0.080	0.060
4-40	0.260	0.240	0.110	0.090
6-32	0.315	0.295	0.130	0.110
6-40	0.315	0.295	0.130	0.110
8-32	0.345	0.325	0.140	0.120
10-24	0.375	0.355	0.145	0.125
10-32	0.375	0.355	0.145	0.125
12-24	0.435	0.415	0.217	0.197
1/4-20	0.435	0.415	0.245	0.225
1/4-28	0.435	0.415	0.245	0.225

Description	A six-sided internally threaded fastener which has chamfered corners on one side only, and a washer face on the opposite side.
Applications/ Advantages	For use with externally threaded nylon fasteners. Nylon's advantages include: resistance to greases and oils; a low coefficient of friction; ability to maintain its strength when exposed to heat.
Material	Nylon 6/6
Hardness	Rockwell M80
Tensile Strength	12,000 psi.
Shear Strength	9,500 psi.
Thermal Properties	*Melting Point:* 500° F *Continuous Use Temperature:* 185° F

Standard Sizes

FLAT WASHERS





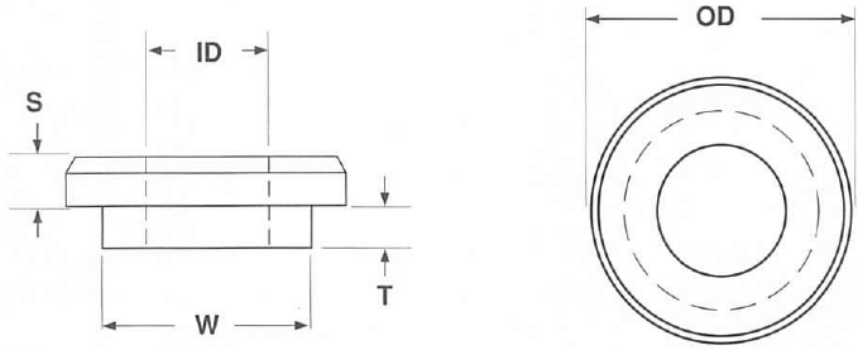
Nylon Flat Washers

Nominal Washer Size	OD		ID		TH	
	Outside Diameter		Inside Diameter		Thickness	
	Max	Min	Max	Min	Max	Min
2 x 1/4 x .032	.255	.245	.095	.085	.037	.027
2 x 1/4 x .062	.255	.245	.095	.085	.067	.057
2 x 1/4 x .093	.255	.245	.095	.085	.098	.088
2 x 1/4 x .125	.255	.245	.095	.085	.130	.120
4 x 1/4 x .032	.255	.245	.120	.110	.037	.027
4 x 1/4 x .062	.255	.245	.120	.110	.067	.057
4 x 1/4 x .093	.255	.245	.120	.110	.098	.088
4 x 1/4 x .125	.255	.245	.120	.110	.130	.120
6 x 5/16 x .032	.317	.307	.145	.135	.037	.027
6 x 5/16 x .062	.317	.307	.145	.135	.067	.057
6 x 5/16 x .093	.317	.307	.145	.135	.098	.088
6 x 5/16 x .125	.317	.307	.145	.135	.130	.120
8 x 3/8 x .032	.380	.370	.176	.166	.037	.027
8 x 3/8 x .062	.380	.370	.176	.166	.067	.057
8 x 3/8 x .093	.380	.370	.176	.166	.098	.088
8 x 3/8 x .125	.380	.370	.176	.166	.130	.120
10 x 3/8 x .032	.380	.370	.199	.189	.037	.027
10 x 3/8 x .062	.380	.370	.199	.189	.067	.057
10 x 3/8 x .093	.380	.370	.199	.189	.098	.088
10 x 3/8 x .125	.380	.370	.199	.189	.130	.120
1/4 x 1/2 x .032	.505	.495	.262	.252	.037	.027
1/4 x 1/2 x .062	.505	.495	.262	.252	.067	.057
1/4 x 1/2 x .093	.505	.495	.262	.252	.098	.088
1/4 x 1/2 x .125	.505	.495	.262	.252	.130	.120

Description	A thin, flat circular stamping with a centrally located hole
Applications/ Advantages	Designed for assembly around a nylon screw. Flat washers improve stress distribution and help to span large clearance holes.
Material	Nylon 6/6
Hardness	Rockwell M80
Thermal Properties	*Melting Point:* 500° F *Continuous Use Temperature:* 185° F

SHOULDER WASHERS

Standard Sizes



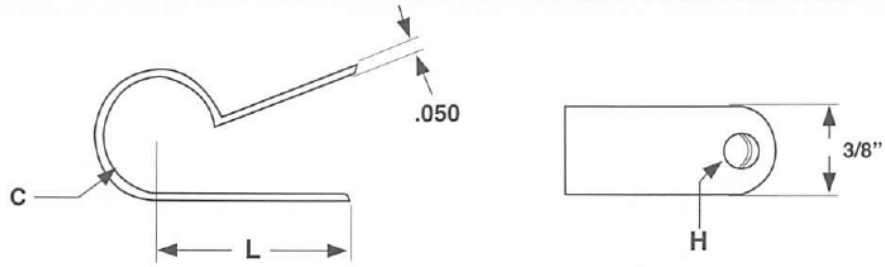
Nylon Shoulder Washers

Nominal Washer Size	OD		ID		S		T		W	
	Outside Diameter		Inside Diameter		Shoulder Thickness		Small Section Thickness		Small Section Width	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
2	.255	.245	.098	.088	.045	.035	.045	.035	.161	.151
4	.286	.276	.127	.117	.045	.035	.045	.035	.192	.182
6	.333	.323	.151	.141	.045	.035	.045	.035	.223	.213
8	.380	.370	.179	.169	.055	.045	.055	.045	.255	.245
10	.442	.432	.206	.196	.055	.045	.055	.045	.286	.276
1/4	.567	.557	.265	.255	.065	.055	.065	.055	.380	.370

Description	An integrally-formed nylon disk that has a centrally located hole, with a sleeve that has the same internal diameter as the washer, but has an outside diameter which is less than that of the washer's base.
Applications/ Advantages	Used to insulate screws, rivets or shafts from panels in electronic applications. May also be used as a bushing in mechanical applications to reduce friction between parts.
Material	Nylon 6/6
Hardness	Rockwell M80
Thermal Properties	***Melting Point:*** 500° F ***Continuous Use Temperature:*** 185° F

3/8" Wide Contact Area

CABLE CLAMPS

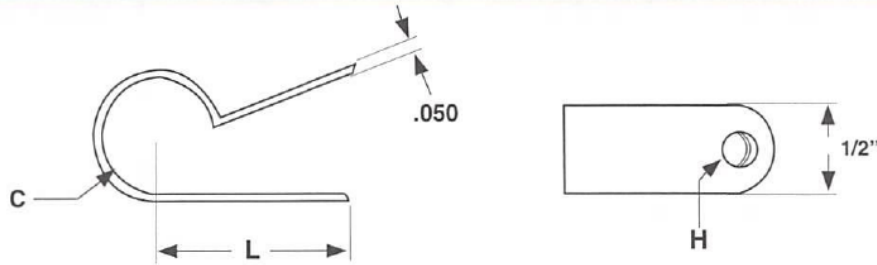


NYLON STANDARD CABLE CLAMPS—3/8" WIDE CONTACT AREA							
Part Number	Size (Clamping Diam. x Hole Size x Contact Length)	C		H		L	
		Clamping Diameter		Hole Size		Hole-to-Clamp Length	
		Max	Min	Max	Min	Max	Min
125140CCN06	1/8x.140x.329	.130	.120	.155	.125	.344	.314
125167CCN06	1/8x.167x.329	.130	.120	.182	.152	.344	.314
125203CCN06	1/8x.203x.329	.130	.120	.218	.188	.344	.314
188140CCN06	3/16x.140x.430	.193	.183	.155	.125	.445	.415
188167CCN06	3/16x.167x.430	.193	.183	.182	.152	.445	.415
188203CCN06	3/16x.203x.430	.193	.183	.218	.188	.445	.415
250140CCN06	1/4x.140x.410	.255	.245	.155	.125	.425	.395
250167CCN06	1/4x.167x.410	.255	.245	.182	.152	.425	.395
250203CCN06	1/4x.203x.410	.255	.245	.218	.188	.425	.395
312140CCN06	5/16x.140x.495	.317	.307	.155	.125	.510	.480
312167CCN06	5/16x.167x.495	.317	.307	.182	.152	.510	.480
312203CCN06	5/16x.203x.495	.317	.307	.218	.188	.510	.480
375140CCN06	3/8x.140x.595	.380	.370	.155	.125	.610	.580
375167CCN06	3/8x.167x.595	.380	.370	.182	.152	.610	.580
375203CCN06	3/8x.203x.595	.380	.370	.218	.188	.610	.580
438167CCN06	7/16x.167x.574	.443	.433	.182	.152	.589	.559
438203CCN06	7/16x.203x.574	.443	.433	.218	.188	.589	.559
500140CCN06	1/2x.140x.605	.505	.495	.155	.125	.620	.590
500167CCN06	1/2x.167x.605	.505	.495	.182	.152	.620	.590
500203CCN06	1/2x.203x.605	.505	.495	.218	.188	.620	.590
625203CCN06	5/8x.203x.678	.630	.620	.218	.188	.693	.663

Description	A molded nylon component formed into a shape that creates a cylindrical area through which wires or cables may pass. The part holds its shape until manual pressure is applied to the two flat ends to join them together. A hole in the center of the two flat ends allows for a screw to pass through and be fastened with a nut to securely close the clamp once the cables it is to hold are in place. The edges of the two ends are rounded. The size is marked on each clamp. The standard series has a 3/8" wide contact area.
Applications/ Advantages	Designed for medium to lightweight applications that involve securing, insulating and routing cable wiring, tubing and fiber optic cable.
Material	Flame Retardant Nylon 6/6
Continuous Use Temperature	220° F
Melting Point	470° F

CABLE CLAMPS

1/2" Wide Contact Area



Nylon Heavy Duty Cable Clamps—1/2" wide contact area

Part Number	Size (Clamping Diam. x Hole Size x Contact Length)	C		H		L	
		Clamping Diameter		Hole Size		Hole-to-Clamp Length	
		Max	Min	Max	Min	Max	Min
125167CCN08	1/8x.167x.315	.130	.120	.182	.152	.330	.300
125203CCN08	1/8x.203x.315	.130	.120	.218	.188	.330	.300
188203CCN08	3/16x.203x.425	.193	.183	.218	.188	.440	.410
250167CCN08	1/4x.167x.410	.255	.245	.182	.152	.425	.395
250203CCN08	1/4x.203x.410	.255	.245	.218	.188	.425	.395
312167CCN08	5/16x.167x.500	.317	.307	.182	.152	.515	.485
312203CCN08	5/16x.203x.500	.317	.307	.218	.188	.515	.485
375167CCN08	3/8x.167x.530	.380	.370	.182	.152	.545	.515
438203CCN08	7/16x.203x.560	.443	.433	.218	.188	.575	.545
500167CCN08	1/2x.167x.595	.505	.495	.182	.152	.610	.580
500203CCN08	1/2x.203x.595	.505	.495	.218	.188	.610	.580
562167CCN08	9/16x.167x.606	.567	.557	.182	.152	.621	.591
562203CCN08	9/16x.203x.606	.567	.557	.218	.188	.621	.591
625203CCN08	5/8x.203x.678	.630	.620	.218	.188	.670	.640
688203CCN08	11/16x.203x.755	.696	.680	.218	.188	.770	.740
750167CCN08	3/4x.167x.780	.758	.742	.182	.152	.795	.765
750203CCN08	3/4x.203x.780	.758	.742	.218	.188	.795	.765
812203CCN08	13/16x.203x.815	.820	.804	.218	.188	.830	.800
875203CCN08	7/8x.203x.845	.883	.867	.218	.188	.860	.830
1000203CCN08	1x.203x.910	1.008	.992	.218	.188	.930	.895
1125203CCN08	1 1/8x.203x.970	1.135	1.115	.218	.188	1.000	.955
1250203CCN08	1 1/4x.203x1.060	1.260	1.240	.218	.188	1.075	1.045
1375203CCN08	1 3/8x.203x1.125	1.385	1.365	.218	.188	1.140	1.110
1500203CCN08	1 1/2x.203x1.190	1.510	1.490	.218	.188	1.205	1.175

Description	A molded nylon component formed into a shape that creates a cylindrical area through which wires or cables may pass. The part holds its shape until manual pressure is applied to the two flat ends to join them together. A hole in the center of the two flat ends allows for a screw to pass through and be fastened with a nut to securely close the clamp once the cables it is to hold are in place. The edges of the two ends are rounded. The size is marked on each clamp. The heavy duty series has a 1/2" wide contact area.
Applications/ Advantages	Designed for heavy duty industrial and commercial applications that involve securing, insulating and routing cable wiring, tubing and fiber optic cable.
Material	Flame Retardant Nylon 6/6
Continuous Use Temperature	220° F
Melting Point	470° F

Specifications for Additional Nylon Fasteners:

Drive Pin Anchor Rivets: pages 307-310

Hollow Wall Anchors: pages 436-438

Nail-In Anchors: page 445

One-Step Anchor: page 446

Toggle Anchor: page 455

Round & Hex Spacers: pages 489-490

Round & Hex Standoffs: pages 491-493

Round & Hex Swage Spacers: pages 494-495

INSERT BITS

Dimensions
Mechanical and Performance Requirements

Phillips Bits 505

Slotted Bits 506

Torx® / Six-Lobe Bits 507

Pozidriv® Alternative Bits 508

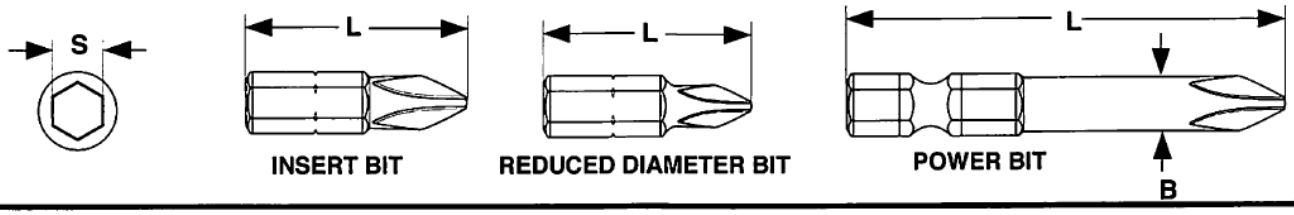
Square Recess Bits 509

Bit Holders 510

Nutsetters 511

Torx® is a registered trademark of the Camcar Corporation, division of Textron Industries.
Pozidriv® is a registered trademark of the Phillips Screw Company.
Kanebridge's insert and power bits are not manufactured by or connected with the producers of Torx® and Pozidriv® bits.

PHILLIPS DRIVE, EXTRA HARD



INSERT BIT REDUCED DIAMETER BIT POWER BIT

PHILLIPS INSERT BITS •EXTRA HARD

Magna™, Apex®*

Part Numbers			S	Point Size	L
Kanebridge	Apex®	Magna™	Shank (A.F.)		Overall Length
27-019	-	27019	1/4	0	1
27-020	440-1	27020	1/4	1	1
27-021	440-2	27021	1/4	2	1
27-022	440-3	27022	1/4	3	1
27-023	440-215	27023	1/4	2	1-1/2
27-024	440-22	27024	1/4	2	2
27-025	440-225	27025	1/4	2	2-1/2

PHILLIPS REDUCED DIAMETER BITS - EXTRA HARD

Magna™, Apex®*

Part Numbers			S	Point Size	L
Kanebridge	Apex®	Magna™	Shank (A.F.)		Overall Length
27-035	446-1	27035	1/4	1R	1
27-036	446-2	27036	1/4	2R	1

PHILLIPS POWER BITS •EXTRA HARD

Magna™, Apex®*

Part Numbers			S	Point Size	L	B
Kanebridge	Apex®	Magna™	Shank (A.F.)		Overall Length	Body Diameter
27-360	491	27360	1/4	1	1-15/16	3/16
27-361	492	27361	1/4	2	1-15/16	1/4
27-362	4930	27362	1/4	3	1-15/16	1/4
27-363	491-A	27363	1/4	1	2-3/4	3/16
27-364	492-A	27364	1/4	2	2-3/4	1/4
27-365	4930-A	27365	1/4	3	2-3/4	1/4
27-366	491-B	27366	1/4	1	3-1/2	3/16
27-367	492-B	27367	1/4	2	3-1/2	1/4
27-368	4930-B	27368	1/4	3	3-1/2	1/4
45-625	492-C	45625	1/4	2	6	1/4

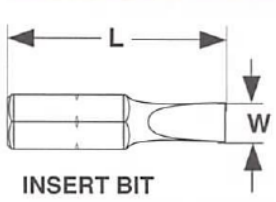
*Bits meet the same dimensions as those published by the manufacturers of the Apex® and Magna™b rands.

Applications/ Advantages	Phillips is the most popular drive style in the industry. The reduced diameter variety is recommended for installing drywall or particle board screws. Power bits are used with power driven tools. Insert bits are ideal for hand drivers, or may be used in conjunction with bit holders in power drivers. Extra hard bits are used specifically with case hardened screws.
Material	Chrome vanadium tool steel
Hardness	Rockwell C 59 - 62.

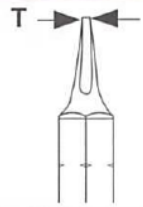
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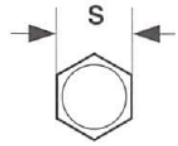
SLOTTED DRIVE

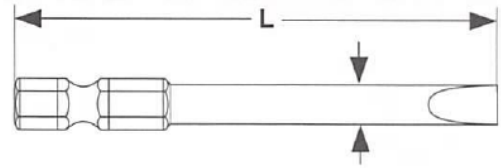
Extra Hard



INSERT BIT







POWER BIT

D

SLOTTED INSERT BITS - EXTRA HARD

Magna™, Apex®*

Part Numbers			Screw Size	S	L	T	W
Kanebridge	Apex®	Magna™		Shank (A.F.)	Overall Length	Blade Thickness	Blade Width
27-001	445-2-15	27001	6 - 8	1/4	1-1/2	.040	.250
27-002	445-3-15	27002	8 - 10	1/4	1-1/2	.042	.281
27-003	445-4-15	27003	10 - 12	1/4	1-1/2	.046	.281
39-534	445-10	39534	4 - 5	1/4	1	.034	.187
39-535	445-20	39535	5 - 6	1/4	1	.036	.218
39-536	445-2	39536	6 - 8	1/4	1	.040	.250
39-537	445-3	39537	8 - 10	1/4	1	.042	.281
39-538	445-4	39538	10 - 12	1/4	1	.046	.281
39-539	-	39539	12 - 14	1/4	1	.050	.281
41-175	-	41175	0 - 1	1/4	1	.024	.109
41-176	445-000	41176	1 - 2	1/4	1	.026	.125
41-177	445-00	41177	2 - 3	1/4	1	.028	.140
41-178	445-0	41178	3 - 4	1/4	1	.032	.156

SLOTTED POWER BITS - EXTRA HARD

Magna™, Apex®*

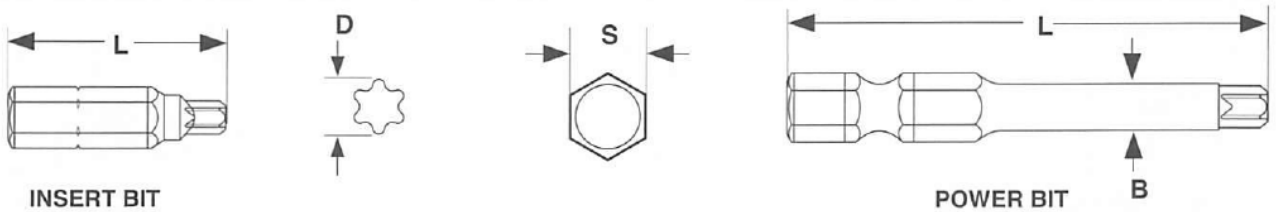
Part Numbers			Screw Size	S	L	T	D
Kanebridge	Apex®	Magna™		Shank (A.F.)	Overall Length	Blade Thickness	Body Diameter
27-461	320-00	27461	2 - 3	1/4	1-15/16	.028	.134
27-462	320-0	27462	3 - 4	1/4	1-15/16	.032	.154
27-463	320-1	27463	4 - 5	1/4	1-15/16	.034	.187
27-464	320-2	27464	5 - 6	1/4	1-15/16	.036	.215
27-465	320-3	27465	6 - 7	1/4	1-15/16	.038	.250
27-466	320-4	27466	8 - 10	1/4	1-15/16	.042	.275
27-467	320-5	27467	10 - 12	1/4	1-15/16	.046	.312
27-468	320-6	27468	12 - 14	1/4	1-15/16	.050	.360

*Bits meet the same dimensions as those published by the manufacturers of the Apex® and Magna™b rands.

Applications/ Advantages	Slotted bits require less downward pressure to drive parts than those with cross-recessed openings. It is important to choose the proper fitting blade to minimize slippage. Power bits are for use with power drivers. Insert bits are used with hand drivers, or may be used in power drivers when inserted into a bit holder. Extra hard bits are used specifically with case hardened screws.
Material	Chrome vanadium tool steel
Hardness	Rockwell C 59 - 62.

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Kanebridge's insert and power bits are not manufactured by or connected with the producers of Apex® or Magna™ bits.

Extra Hard — TORX® OR SIX-LOBE DRIVE



INSERT BIT

POWER BIT

TORX® ALTERNATIVE INSERT BITS • EXTRA HARD

Magna™, Apex®*

Part Numbers			S	Drive Size	D	L
Kanebridge	Apex®	Magna™	Shank (A.F.)		Point Width	Overall Length
37-153	440-TX-08	37153	1/4	T8	.090	1
37-155	440-TX-09	37155	1/4	T9	.097	1
37-157	440-TX-10	37157	1/4	T10	.107	1
37-159	440-TX-15	37159	1/4	T15	.128	1
37-161	440-TX-20	37161	1/4	T20	.151	1
37-163	440-TX-25	37163	1/4	T25	.173	1
37-165	440-TX-27	37165	1/4	T27	.195	1
37-167	440-TX-30	37167	1/4	T30	.216	1
37-169	440-TX-40	37169	1/4	T40	.260	1

TORX® ALTERNATIVE POWER BITS • EXTRA HARD

Magna™, Apex®*

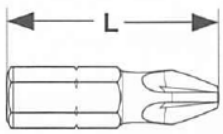
Part Numbers			S	Drive Size	D	B		L
						Body Diameter		
Kanebridge	Apex®	Magna™	Shank (A.F.)		Point Width	Max	Min	Overall Length
37-713	49-TX-08	37713	1/4	T8	.090	.125	.115	1-15/16
39-933	49-TX-09	39933	1/4	T9	.097	.125	.115	1-15/16
37-715	49-TX-10	37715	1/4	T10	.107	.156	.146	1-15/16
37-717	49-TX-15	37717	1/4	T15	.128	.156	.146	1-15/16
37-719	49-TX-20	37719	1/4	T20	.151	.187	.177	1-15/16
37-721	49-TX-25	37721	1/4	T25	.173	.187	.177	1-15/16
37-723	49-TX-27	37723	1/4	T27	.195	.250	.240	1-15/16
37-725	49-TX-30	37725	1/4	T30	.216	.250	.240	1-15/16
37-727	49-TX-40	37727	1/4	T40	.280	.315	.296	1-15/16

*Bits meet the same dimensions as those published by the manufacturers of the Apex® and Magna™b rands.

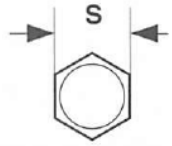
Applications/ Advantages	Torx -alternative bits offer a positive-engaging, fast-locating method of transmitting torque and optimizing worker efficiency. The positive torque control adds to the bit s drive life. Power bits are used with power drivers. Insert bits are ideal for use with hand drivers, or may be used in power drivers when attached to a bit holder. Extra hard bits are used specifically with case hardened screws.
Material	Chrome vanadium tool steel
Hardness	Rockwell C 59 - 62.

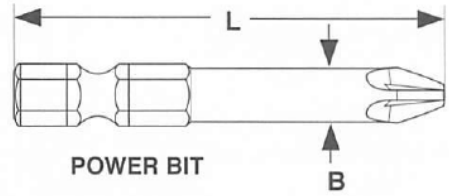
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Torx® is a registered trademark of the Camcar Corporation, division of Textron Industries.
Kanebridge's insert and power bits are not manufactured by or connected with the producers of Apex® or Magna™ bits.

POZIDRIV®-ALTERNATIVE DRIVE — Extra Hard



INSERT BIT





POWER BIT

POZIDRIV®-ALTERNATIVE INSERT BITS • EXTRA HARD					Magna™, Apex®*
Part Numbers			S	Point Size	L
Kanebridge	Apex®	Magna™	Shank (A.F.)		Overall Length
27-045	440-1-PZD	27045	1/4	1PZD	1
27-046	440-2-PZD	27046	1/4	2PZD	1
27-047	440-3-PZD	27047	1/4	3PZD	1

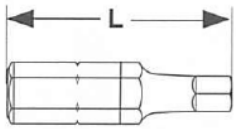
POZIDRIV®-ALTERNATIVE POWER BITS • EXTRA HARD						Magna™, Apex®*
Part Numbers			S	Point Size	L	B
Kanebridge	Apex®	Magna™	Shank (A.F.)		Overall Length	Body Diameter
27-380	491-PZD	27380	1/4	1PZD	1-15/16	3/16
27-381	492-PZD	27381	1/4	2PZD	1-15/16	1/4
27-382	493-PZD	27382	.1/4	3PZD	1-15/16	1/4

*Bits meet the same dimensions as those published by the manufacturers of the Apex® and Magna™b rands.

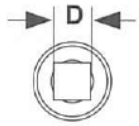
Applications/ Advantages	Pozidriv -alternative bits have an eight-bar pattern as opposed to Phillips bits which have a four-bar pattern. The extra bars provide greater torque with less cam-out. They are for use with Pozidriv -alternative screws. Power bits are ideal for use with power drivers. Insert bits are for hand drivers, or may be used in power drivers in conjunction with a properly fitting bit holder. Extra hard bits are used specifically for use with case hardened screws.
Material	Chrome vanadium tool steel
Hardness	Rockwell C 59 - 62.

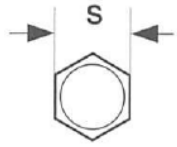
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Pozidriv® is a registered trademark of the Camcar Corporation, division of Textron Industries.
Kanebridge's insert and power bits are not manufactured by or connected with the producers of Apex®, Magna™ or Pozidriv® bits.

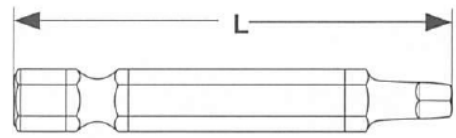
Extra Hard SQUARE DRIVE



INSERT BIT







POWER BIT

Square Recess Insert Bits - Extra Hard

Magna™, Apex®*

Part Numbers			S	Point Size	D	L
Kanebridge	Apex®	Magna™	Shank (A.F.)		Point Diam. (Ref)	Overall Length
38-509	950-0	38509	1/4	0	.062	1
29-049	950-1	29049	1/4	1	.094	1
29-050	950-2	29050	1/4	2	.125	1
29-051	950-3	29051	1/4	3	.141	1

Square Recess Power Bits • Extra Hard

Magna™, Apex®*

Part Numbers			S	Point Size	D	L
Kanebridge	Apex®	Magna™	Shank (A.F.)		Point Diam. (Ref)	Overall Length
29-052	954-1	29052	1/4	1	.094	1-15/16
29-053	954-2	29053	1/4	2	.125	1-15/16
29-054	954-3	29054	1/4	3	.141	1-15/16
29-058	954-A-1	29058	1/4	1	.094	2-3/4**

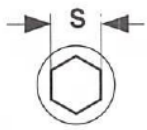
*Bits meet the same dimensions as those published by the manufacturers of the Apex® and Magna™ brands.
**3 inch length is also acceptable.

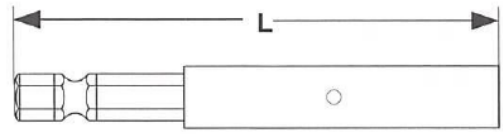
Applications/ Advantages	Square recess bits are popular in the furniture, mobile home and recreational vehicle industries. They are used in many overhead installations. They increase productivity with excellent torque transmission and resist cam-out. Power bits are intended for use in power drivers. Insert bits are to be used in hand drivers, or in power drivers when used with a properly fitting bit holder. Extra hard bits are used specifically with case hardened screws.
Material	Chrome vanadium tool steel
Hardness	Rockwell C 59 - 62.

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Kanebridge's insert and power bits are not manufactured by or connected with the producers of Apex® or Magna™ bits.

BIT HOLDERS

Hardened Steel
Stainless Steel





MAGNETIC HEX INSERT BIT HOLDERS •HARDENED STEEL

Magna™, Apex®*

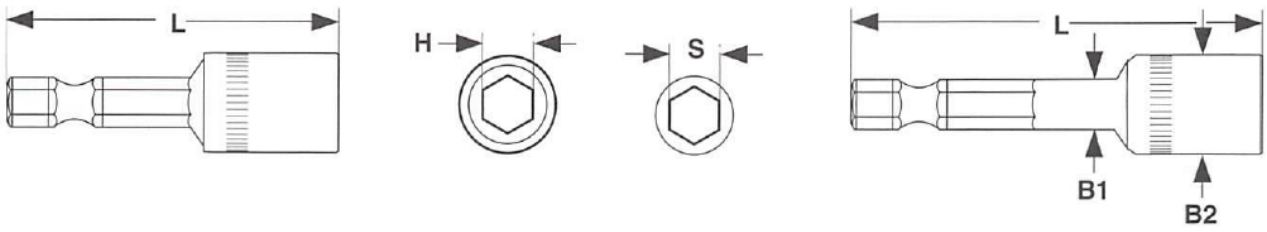
Part Numbers			S	Shank Size	L	Other Features
Kanebridge	Apex®	Magna™	Hex Tool Shank		Overall Length	
27-690	M-490	27690	1/4	1/4	2-7/8	C-ring retainer
27-710	M-490-4	27710	1/4	1/4	4	C-ring retainer
27-750	M-490-6	27750	1/4	1/4	6	C-ring retainer
39-972	M-497	39972	1/4	1/4	2-7/8	No C-ring
40-832	-	40832	1/4	1/4	2-31/32	C-ring retainer, turned body, 1-piece construction
40-833	-	40833	1/4	1/4	2-31/32	C-ring retainer, 1-piece construction
40-941	M-490-2	40941	1/4	1/4	2-1/8	C-ring retainer
40-942	M-495	40942	1/4	1/4	2-31/32	C-ring retainer, turned body

*Bits meet the same dimensions as those published by the manufacturers of the Apex® and Magna™b rands.

Applications/ Advantages	Bit holders offer versatility in the bit driving process by (1) extending the reach of the bit from the driving tool to the fasteners, and (2) enabling insert bits to be used with power-driven equipment. All of the bit holders listed above are magnetic to better hold the bit in place within the holder, and to hold the screw on the end of the bit. They are available in various configurations-- single-piece and two-piece construction, straight or turned body, with or without a retaining ring. Extra hard bits are used specifically with case hardened screws.
Material	***Shank:*** 50BV30 steel (similar to SAE 6150) ***Body:*** #704 or 707 Stainless steel
Hardness	Rockwell C 42 - 48

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Kanebridge's bits holders are not manufactured by or connected with the producers of Apex® or Magna™ bits.

Magnetic Hardened Steel NUTSETTERS



Magnetic Power Nutsetters • Hardened Steel							Magna™, Apex®*
Part Numbers			S	H	L	B1	B2
Kanebridge	Apex®	Magna™	Shank (A.F.)	Hex Opening	Overall Length	Shank Body Diameter	Socket Body Diameter
31-450	MDA-08	31450	1/4	1/4	1-5/8	-	7/16
31-452	MDA-10	31452	1/4	5/16	1-5/8	-	1/2
36-165	MDA-12	36165	1/4	3/8	1-7/8	-	9/16
37-893	MDA-14	37893	1/4	7/16	2	-	11/16
37-582	MDB-08	37582	1/4	1/4	2-9/16	5/16	7/16
37-583	MDC-10	37583	1/4	5/16	2-9/16	3/8	1/2
37-584	MDC-12	37584	1/4	3/8	2-9/16	3/8	9/16
38-639	-	38639	1/4	7/16	2-9/16	3/8	5/8

*Nutsetters meet the same dimensions as those published by the manufacturers of the Apex® and Magna™ brands.

Applications/ Advantages	Nutsetters are used to drive hex head tapping screws and machine screws. They are magnetic to provide excellent tool-to-fastener holding power. They are popular in prefabricated home and metal building construction.
Material	50BV30 steel (similar to SAE 6150)
Hardness	Rockwell C 42 - 48

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Kanebridge's nutsetters are not manufactured by or connected with the producers of Apex® or Magna™ bits.

METRIC FASTENERS

DIN/ISO
Cross Reference Chart 514

SELF TAPPING SCREWS
ISO 1478 Gimlet Point (Type C) 516
ISO 1478 Blunt Point (Type F) 517
ISO 1479 Indented Hex Head 518
ISO 1481 & 7049 Pan, Phillips & Slotted 519
ISO 1482 & 7050 Flat, Phillips & Slotted 520
ISO 1483 & 7051 Oval, Phillips & Slotted 521

THREAD FORMING SCREWS
DIN 7500-1 Thread Rolling
Trilobular Thread & Material Specs 522
DIN 7500C Pan (Heads to DIN 7985) 523
DIN 7500M Flat (Head to DIN 965) 523
DIN 7500 Hole Diameter Guidelines 524
DIN 7500TX Pan (Heads to DIN 7500CE) 525
DIN 7500~D, Hex Washer Unslotted 526
DIN 7500M Flat 6-Lobe, Stainless 528
DIN 7500ME Flat 6-Lobe 529
Type PT®-Alternative
Pan 6-Lobe 530
Pan Phillips 531
Flat 6-Lobe 532
Flat Phillips 533
Hole Size Recommendations 534
Plastite®/Plas-Fix®- 45 Alternatives
Flat 6-Lobe 535
Pan 6-Lobe 536
Pan Type Z 537

MACHINE SCREWS
DIN 7985A Pan Phillips 538
ISO 1580 & 7045 Pan, Slotted & Phillips 539
ISO 2009 & 7046 Flat, Slotted & Phillips 540
ISO 2010 & 7047 Oval, Slotted & Phillips 541
ISO 14581 Flat 6-Lobe, Cl. 8.8 & A2 SS 542
ISO 14583 Pan 6-Lobe, Cl. 8.8 & A2 SS 543
JIS B1111 Small Pan Phillips, Steel 544
JIS B1111 Small Pan Phillips, A2 SS 545
JIS B1111 Truss Phillips 546
DIN 965 Flat Phillips 547
ISO 7045 Pan Six-Lobe 547
Mechanical & Performance Requirements
Class 4.8 Steel & A2/A4 Stainless 548
Thread Dimensions, Class 6g 549

SEMS
DIN 7985 Pan Phillips
w/DIN 6902A Captive Flat Washer 550
ISO 7045 Pan Phillips
Helical Split Lockwasher 551
ISO 7045 Pan Phillips
Internal Tooth Lockwasher 552
DIN 7985 Pan Phillips
Internal Tooth Lockwasher 553
ISO 7045 Pan Phillips
External Tooth Lockwasher 554
JIS B1187 Hex Phillips
Split Washer/Flat Washer 555
JIS B1188 Pan Phillips
External Tooth Washer 556
JIS B1188 Pan Phillips
Internal Tooth Washer 557
JIS B1188 Pan Phillips
Helical Split Washer 558
JIS B1188 Small Pan Phillips
Split Washer/Flat Washer 559
DIN 7985 Pan Phillips
w/DIN 6905 Spring Lock Washer 560
ISO 7045 Pan Phillips
Conical Lockwasher, Steel & Stainless 561

MACHINE SCREW & SEMS
Thread Pitch Chart (Metric to Unified) 562

CAP SCREWS & BOLTS
Thread Dimensions, Class 6g 563
DIN 6921 Flange Bolts
Serrated 564
Class 8.8 & 10.9 565
DIN 931 Hex Cap Screw 566
DIN 933 Hex Cap Screw 567
ISO 4014 Hex Bolt, Partial Thread, Gr-A&B 568
Hex Bolt, Partial Thread, Cl-8.8 & 10.9 569
ISO 4017 Hex Cap Sc., Full Thread, Gr-A&B 570
Hex Cap Screw, Full Thread, Cl-8.8 & 10.9 571
ISO 8677 Carriage Bolt, Square Neck, Large 572
ISO 8678 Carriage Bolt, Short Neck 573

All dimensions listed in this section are given in millimeters (mm) unless otherwise noted.

METRIC FASTENERS

NUTS

Barrel Tee, Straight 574
DIN 1587 Domed Cap, Class 6 575

Full Hex

DIN 934 Hex
- Class 6, 8 & 10 Steel 576
- Class A2-70 Stainless 577

ISO 4032 Hex, Style 1
- Class 6 578
- Class 8 & 10 578-579

ISO 4033 Hex, Style 2
- Class 9 580
- Class 12 581

Hex Jam

DIN 439B, Class 04 582
ISO 4035, Class 04 583

Lock Nuts

DIN 934K K-Lock, Class 8 584
Prevailing Torque
- DIN 980V 585
- ASME B18.16.3M 585

DIN 985 Nylon Insert, Regular Pattern 586
ISO 7040 Nylon Insert, Regular Pattern 587
ISO 7040 Nylon Insert, Heavy Pattern 588

Hex Flange

DIN 6923 Flange Nut
- Class 8 & 10 Steel 589
- Class A2 & A4 Stainless 590
- *Serrated*: Cl. 8 Steel & A2 Stainless 591

DIN 6926 Nylon Insert 592
DIN 6927 Prevailing Torque Cl. 10 593
ISO 4161 Hex Flange 594

Wing

DIN 315 Malleable Cast Wing 595
DIN 3155 Cold Forged Wing, Class 5 596
Cold Forged Wing, Class 5 597

Weld

DIN 928 Square, Multiple Projection 598
DIN 929 Hex, Multiple Projection 599
Multiple Projection, Center Hole 600
Single Projection, Offset Hole 601

Spring Steel Cage 602

Self-Clinching

Round 603
Internal Thread Dimensions, Class 6H 604

WASHERS

Countersunk Finishing 605
DIN 125A Standard Flat
- Stainless & Steel 606

DIN 127B Regular Spring Lock
- Stainless & Steel 607

DIN 128 Curved Spring Lock 608
DIN 7980 High Collar Lock 609
DIN 6797A External Tooth Lock 610
DIN 6797J Internal Tooth Lock 611
DIN 6797V Countersunk External Tooth Lock .. 612
DIN 6999D External-Internal Tooth Lock 613
ISO 7089 Standard Flat, Grade A 614
ISO 7091 Flat, Wider I.D., Grade C 615
ISO 7092 Flat, Small O.D., Grade A 616
ISO 7093 Flat, Larger O.D., Grade A & C 617

RIVET NUTS

Flat Head, Smooth Body 618
Flat Head, Ribbed Body 619
Thin Head, Ribbed Body 620
Thin Head, Hex Body 621

SOCKET PRODUCTS

ISO 4762 Socket Head Cap Screw 622
ASME B18.3.5M Flat Hd Socket Cap 623
Socket Set Screws
- ISO 4026, Flat Point 624
- ISO 4027, Cone Point 625
- ISO 4028, Dog Point 626
- ISO 4029, Cup Point 627
- ISO 4029, *Knurled* Cup Point 628

ASME B18.3.4M Button Hd Socket Cap 629
ISO 7379 Socket Shoulder Screw 630-631
ISO 7380 6-Lobe Button Head Cap Screw 632
Hex Wrenches 633
Thread Dimensions, Class 5g/6g 634

SPRING PINS

ISO 8752 Heavy Duty, Slotted 635

ELECTRONIC HARDWARE

Self-Clinching Studs, Flush Head 636
Standoffs, Hex Male-Female 637

WOODWORKING SCREWS

European Drawer Slide Screws 638

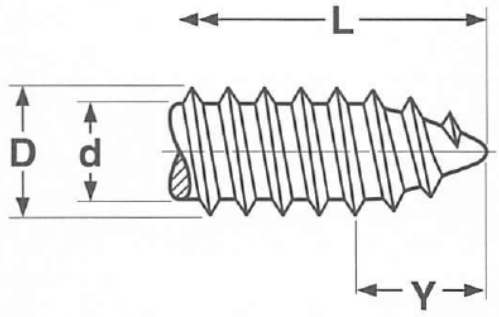
DIN - ISO - JIS CROSS REFERENCE

DIN Standard	ISO Standard	JIS Standard	Category Descriptions
13	68		Internal Threads, Class 6H
13	898-1		External Threads, Class 6g
13	R1501		Internal Threads, Class 6H
84	1207		Machine Screws, Slotted Cheese Head
85	1580		Machine Screws, Slotted Pan Head
125A	7089		Flat Washers, Standard
126	7091		Flat Washers, Wider I.D.
127B			Split Lockwashers
128			Curved Spring Lockwashers
267	4759/1		Tolerance Values for Metric Fasterners
315			Malleable Cast Wing Nuts
439B	4035		Hex Jam Nuts
433	7092		Flat Washers, Small O.D.
603	8677	B1171	Carriage Bolts, Regular Square Neck
603	8678	B1171	Carriage Bolts, Short Neck
911	2936		Hex Keys
912	4762		Socket Head Cap Screws
913	4026		Socket Set Screws - Flat Point
914	4027		Socket Set Screws - Cone Point
915	4028		Socket Set Screws - Dog Point
916	4029		Socket Set Screws - Cup Point
931	4014		Hex Bolts, Partial Thread
933	4017		Hex Cap Screws, Full Thread
934	4032		Hex Nuts, Style 1, Class 6, 8 (some sizes), 10 (some sizes)
934K			K-Lock Nuts, Class 8

DIN - ISO - JIS CROSS REFERENCE

DIN Standard	ISO Standard	JIS Standard	Category Descriptions
963	2009		Machine Screws, Slotted Flat Head
964	2010		Machine Screws, Slotted Oval Head
965	7046		Machine Screws, Phillips Flat Head
966	7047		Machine Screws, Phillips Oval Head
970	4032		Hex Nuts, Style 1, Classes 6, 8 & 10
980	7719		All Metal Lock Nuts
982	7041		Nylon Insert Lock Nuts, Heavy Pattern, Class 8
985	7040		Nylon insert Lock Nuts, Regular Pattern, Class 8
1587			Domed Hex Cap Nuts, Class 6
3155			Cold Formed Wing Nuts, Class 5
6797A		B1255	External Tooth Lockwashers
6797J		B1255	Internal Tooth Lockwashers
6798V		B1255	Countersunk External Tooth Lockwasheres
6921		B1189	Flange Bolts
6923	4161	B 1190	Flange Nuts
6999D		B1255	Combination External-InternalTooth Lockwashers
7971B	1481		Slotted Tapping Screws - Pan Head
7972B	1482		Slotted Tapping Screws - Flat Head
7973B	1483		Slotted Tapping Screws - Oval Head
7976B	1479		Slotted Tapping Screws - Hex Head
7981B	7049		Phillips Tapping Screws - Hex Head
7982B	7050		Phillips Tapping Screws - Pan Head
7983B	7051		Phillips Tapping Screws - Oval Head
7985	7045		Machine Screws, Phillips Cheese Head
7985	7045		Flat Socket Cap Screws
9021	7093		Flat Washers, Large O.D.
	7379		Socket Shoulder Screws

SELF-TAPPING SCREWS — Gimlet Point (Type C)



METRIC - Threads for Self Tapping Screws, Gimlet Point (type C)

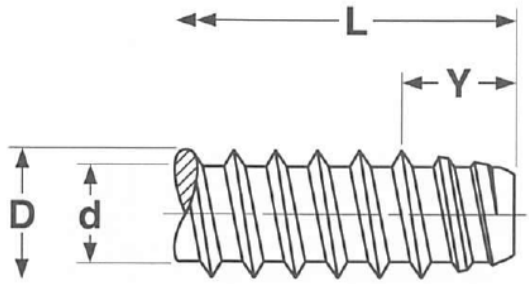
ISO 1478, 2702 & 4759-1; JIS B 1007

Nominal Size	Thread Pitch	D		d		Y	Minimum Torsional Strength (N m)
		Major Diameter		Minor Diameter		Length of Incomplete Thread	
		Max	Min	Max	Min	Max	
ST2.2	0.8	2.24	2.1	1.63	1.52	2	0.45
ST2.9	1.1	2.90	2.76	2.18	2.08	2.6	1.5
ST3.5	1.3	3.53	3.35	2.64	2.51	3.2	2.7
ST4.2	1.4	4.22	4.04	3.10	2.95	3.7	4.4
ST4.8	1.6	4.80	4.62	3.58	3.43	4.3	6.3
ST5.5	1.8	5.46	5.28	4.17	3.99	5	10
ST6.3	1.8	6.25	6.03	4.88	4.70	6	13.6
ST8	2.1	8	7.78	6.20	5.99	7.5	30.5
ST9.5	2.1	9.65	9.43	7.85	7.59	8	-

Tolerance on Length	Up to 25mm, incl.: ±0.8	Over 25mm: ±1.3

Description	A thread forming, tapping screw with spaced threads and a tapered, gimlet point.
Applications/ Advantages	For self starting in thin metal or resin-filled plywood.
Material	Cold heading, case hardening quality steel
Surface Hardness	Vickers HV 450 minimum
Case Depth	***Diameters 2.2 thru 2.6:*** 0.04 - 0.10 *Diameters 2.9 thru 3.5:* 0.05 - 0.18 *Diameters 3.9 thru 5.5:* 0.10 - 0.23 *Diameters 6.3 thru 8:* 0.15 - 0.28
Core Hardness	***Diameters 2.2 thru 3.9:*** 270 HV 5 - 390 HV 5 *Diameters 4.2 and greater:* 270 HV 10 - 390 HV 10
Plating	See Appendix-A for plating information.

Blunt Point (Type F) SELF-TAPPING SCREWS



METRIC - THREADS FOR SELF TAPPING SCREWS, BLUNT POINT (TYPE F)

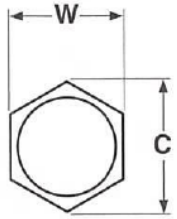
ISO 1478, 2702 & 4759-1; JIS B 1007

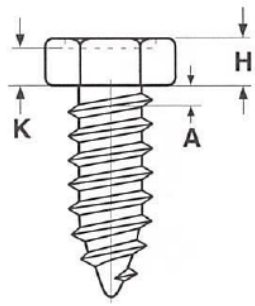
Nominal Size	Thread Pitch	D		d		Y	Minimum Torsional Strength (N m)
		Major Diameter		Minor Diameter		Length of Incomplete Thread	
		Max	Min	Max	Min	Ref	
ST2.2	0.8	2.24	2.1	1.63	1.52	1.6	0.45
ST2.9	1.1	2.90	2.76	2.18	2.08	2.1	1.5
ST3.5	1.3	3.53	3.35	2.64	2.51	2.5	2.7
ST4.2	1.4	4.22	4.04	3.10	2.95	2.8	4.4
ST4.8	1.6	4.80	4.62	3.58	3.43	3.2	6.3
ST5.5	1.8	5.46	5.28	4.17	3.99	3.6	10
ST6.3	1.8	6.25	6.03	4.88	4.70	3.6	13.6
ST8	2.1	8	7.78	6.20	5.99	4.2	30.5
ST9.5	2.1	9.65	9.43	7.85	7.59	4.2	-
Tolerance on Length		Up to 19mm, incl.: -0.8		Over 19mm to 38mm, incl.: -1.3		over 38mm: -1.5	

Description	A thread forming, tapping screw with spaced threads and a blunt point with incomplete entering threads.
Applications/ Advantages	For molded or through holes in thin metal, non-ferrous castings, plastics or resin-filled plywood.
Material	Cold heading, case hardening quality steel
Surface Hardness	Vickers HV 450 minimum
Case Depth	***Diameters 2.2 thru 2.6:*** 0.04 - 0.10 ***Diameters 2.9 thru 3.5:*** 0.05 - 0.18 ***Diameters 3.9 thru 5.5:*** 0.10 - 0.23 Diameters 6.3 thru 8: 0.15 - 0.28
Core Hardness	***Diameters 2.2 thru 3.9:*** 270 HV 5 - 390 HV 5 *Diameters 4.2 and greater:* 270 HV 10 - 390 HV 10
Plating	See Appendix-A for plating information.

SELF-TAPPING SCREWS

ISO 1479
Indented Hex Head



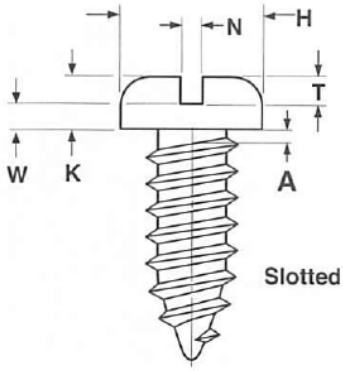


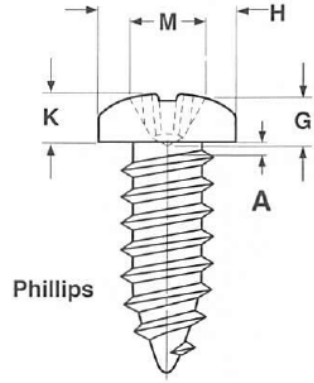
METRIC - INDENTED HEX HEADS FOR SELF-TAPPING SCREWS ISO 1479

Nominal Diameter	Thread Pitch	A	H		K	W		C
		Distance from underside of head to 1st major diam of thread	Total Head Height		Head Height to Indent	Width Across the Flats		Width Across the Corners
		Max	Max	Min	Min	Max	Min	Min
ST 2.2	0.8	0.8	1.6	1.3	0.9	3.2	3.02	3.38
ST 2.9	1.1	1.1	2.3	2	1.4	5	4.82	5.4
ST 3.5	1.3	1.3	2.6	2.3	1.6	5.5	5.32	5.96
ST 4.2	1.4	1.4	3	2.6	1.8	7	6.78	7.59
ST 4.8	1.6	1.6	3.8	3.3	2.3	8	7.78	8.71
ST 5.5	1.8	1.8	4.1	3.6	2.5	8	7.78	8.71
ST 6.3	1.8	1.8	4.7	4.1	2.9	10	9.78	10.95
ST 8	2.1	2.1	6	5.2	3.6	13	12.73	14.26
ST 9.5	2.1	2.1	7.5	6.5	4.5	16	15.73	17.62

See Page 514 for a Cross Reference of DIN standards to ISO standards.

ISO 1481 & 7049 Pan Head SELF-TAPPING SCREWS





METRIC - SLOTTED PAN HEADS FOR SELF-TAPPING SCREWS

ISO 1481

Nominal Diameter	Thread Pitch	A	H		K		N		T	W
		Distance from underside of head to 1st major diam of thread	Head Diameter		Head Height		Slot Width		Slot Depth	Head Height to Slot
		Max	Max	Min	Max	Min	Max	Min	Min	Min
ST 2.2	0.8	0.8	4	3.7	1.3	1.1	0.7	0.56	0.5	0.5
ST 2.9	1.1	1.1	5.6	5.3	1.8	1.6	1	0.86	0.7	0.7
ST 3.5	1.3	1.3	7	6.6	2.1	1.9	1.2	1.06	0.8	0.8
ST 4.2	1.4	1.4	8	7.6	2.4	2.2	1.51	1.26	1	0.9
ST 4.8	1.6	1.6	9.5	9.1	3	2.7	1.51	1.26	1.2	1.2
ST 5.5	1.8	1.8	11	10.6	3.2	2.9	1.91	1.66	1.3	1.3
ST 6.3	1.8	1.8	12	11.6	3.6	3.3	1.91	1.66	1.4	1.4
ST 8	2.1	2.1	16	15.6	4.8	4.5	2.31	2.06	1.9	1.9
ST 9.5	2.1	2.1	20	19.5	6	5.7	2.81	2.56	2.4	2.4

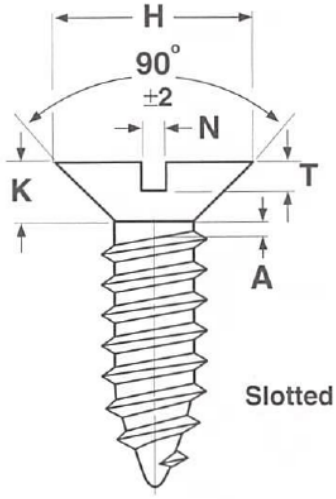
METRIC - PHILLIPS PAN HEADS FOR SELF-TAPPING SCREWS

ISO 7049

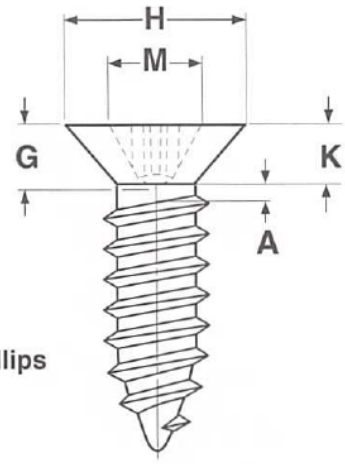
Nominal Diameter	Thread Pitch	A	H		K		M	G		Phillips Driver Size
		Distance from underside of head to 1st major diam of thread	Head Diameter		Head Height		Recess Diameter	Recess Penetration		
		Max	Max	Min	Max	Min	Ref	Max	Min	
ST 2.2	0.8	0.8	4	3.7	1.6	1.4	1.9	1.2	0.85	0
ST 2.9	1.1	1.1	5.6	5.3	2.4	2.15	3	1.8	1.4	1
ST 3.5	1.3	1.3	7	6.64	2.6	2.35	3.9	1.9	1.4	2
ST 4.2	1.4	1.4	8	7.64	3.1	2.8	4.4	2.4	1.9	2
ST 4.8	1.6	1.6	9.5	9.14	3.7	3.4	4.9	2.9	2.4	2
ST 5.5	1.8	1.8	11	10.57	4	3.7	6.4	3.1	2.6	3
ST 6.3	1.8	1.8	12	11.57	4.6	4.3	6.9	3.6	3.1	3
ST 8	2.1	2.1	16	15.57	6	5.6	9	4.7	4.15	4
ST 9.5	2.1	2.1	20	19.48	7.5	7.1	10.1	5.8	5.2	4

SELF-TAPPING SCREWS

ISO 1482 & 7050
Flat Head



Slotted



Phillips

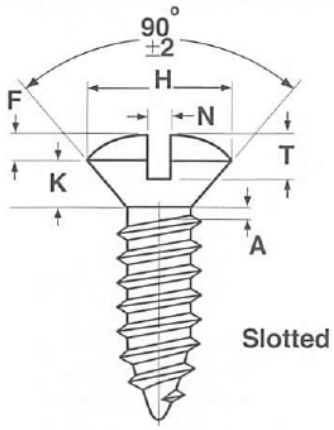
METRIC - SLOTTED FLAT HEADS FOR SELF-TAPPING SCREWS — ISO 1482

Nominal Diameter	Thread Pitch	A	H		K	N		T	
		Distance from underside of head to 1st major diam of thread	Head Diameter		Head Height	Slot Width		Slot Depth	
		Max	Max	Min	Max	Max	Min	Max	Min
ST 2.2	0.8	0.8	4.4	3.8	1.1	0.7	0.56	0.6	0.4
ST 2.9	1.1	1.1	6.3	5.5	1.7	1	0.86	0.85	0.6
ST 3.5	1.3	1.3	8.2	7.3	2.35	1.2	1.06	1.2	0.9
ST 4.2	1.4	1.4	9.4	8.4	2.6	1.51	1.26	1.3	1
ST 4.8	1.6	1.6	10.4	9.3	2.8	1.51	1.26	1.4	1.1
ST 5.5	1.8	1.8	11.5	10.3	3	1.91	1.66	1.5	1.1
ST 6.3	1.8	1.8	12.6	11.3	3.15	1.91	1.66	1.6	1.2
ST 8	2.1	2.1	17.3	15.8	4.65	2.31	2.06	2.3	1.8
ST 9.5	2.1	2.1	20	18.3	5.25	2.81	2.56	2.6	2

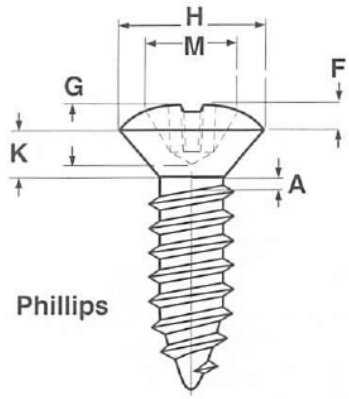
METRIC - PHILLIPS FLAT HEADS FOR SELF-TAPPING SCREWS — ISO 7050

Nominal Diameter	Thread Pitch	A	H		K	M	G		Phillips Driver Size
		Distance from underside of head to 1st major diam of thread	Head Diameter		Head Height	Recess Diameter	Recess Penetration		
		Max	Max	Min	Max	Ref	Max	Min	
ST 2.2	0.8	0.8	3.8	3.5	1.1	1.9	1.2	0.9	0
ST 2.9	1.1	1.1	5.5	5.2	1.7	3.2	2.1	1.7	1
ST 3.5	1.3	1.3	7.3	6.9	2.35	4.4	2.4	1.9	2
ST 4.2	1.4	1.4	8.4	8	2.6	4.6	2.6	2.1	2
ST 4.8	1.6	1.6	9.3	8.9	2.8	5.2	3.2	2.7	2
ST 5.5	1.8	1.8	10.3	9.9	3	6.6	3.3	2.8	3
ST 6.3	1.8	1.8	11.3	10.9	3.15	6.8	3.5	3	3
ST 8	2.1	2.1	15.8	15.4	4.65	8.9	4.6	4	4
ST 9.5	2.1	2.1	18.3	17.8	5.25	10	5.7	5.1	4

ISO 1483 & 7051 Oval Head SELF-TAPPING SCREWS



Slotted



Phillips

METRIC - SLOTTED OVAL HEADS FOR SELF-TAPPING SCREWS

ISO 1483

Nominal Diameter	Thread Pitch	A	H		K	F	N		T	
		Distance from underside of head to 1st major diam of thread	Head Diameter		Head Side Height	Height of Oval Section	Slot Width		Slot Depth	
		Max	Max	Min	Max	Nom	Max	Min	Max	Min
ST 2.2	0.8	0.8	3.8	3.5	1.1	0.5	0.7	0.56	1	0.8
ST 2.9	1.1	1.1	5.5	5.2	1.7	0.7	1	0.86	1.45	1.2
ST 3.5	1.3	1.3	7.3	6.9	2.35	0.8	1.2	1.06	1.7	1.4
ST 4.2	1.4	1.4	8.4	8	2.6	1	1.51	1.26	1.9	1.6
ST 4.8	1.6	1.6	9.3	8.9	2.8	1.2	1.51	1.26	2.4	2
ST 5.5	1.8	1.8	10.3	9.9	3	1.3	1.91	1.66	2.6	2.2
ST 6.3	1.8	1.8	11.3	10.9	3.15	1.4	1.91	1.66	2.8	2.4
ST 8	2.1	2.1	15.8	15.4	4.65	2	2.31	2.06	3.7	3.2
ST 9.5	2.1	2.1	18.3	17.8	5.25	2.3	2.81	2.56	4.4	3.8

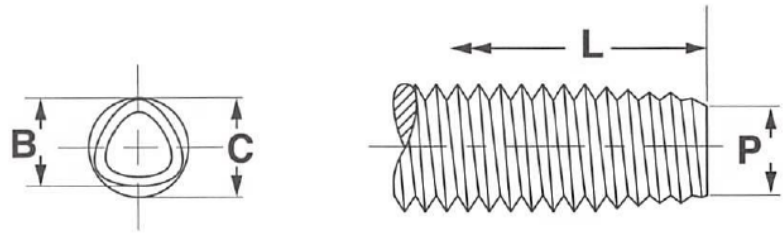
METRIC - PHILLIPS OVAL HEADS FOR SELF-TAPPING SCREWS

ISO 7051

Nominal Diameter	Thread Pitch	A	H		F	K	M	G		Phillips Driver Size
		Distance from underside of head to 1st major diam of thread	Head Diameter		Raised Head Height	Head Side Height	Recess Diameter	Recess Penetration		
		Max	Max	Min	Nom	Max	Ref	Max	Min	
ST 2.2	0.8	0.8	3.8	3.5	0.5	1.1	2.2	1.5	1.2	0
ST 2.9	1.1	1.1	5.5	5.2	0.7	1.7	3.4	2.2	1.8	1
ST 3.5	1.3	1.3	7.3	6.9	0.8	2.35	4.8	2.75	2.25	2
ST 4.2	1.4	1.4	8.4	8	1	2.6	5.2	3.2	2.7	2
ST 4.8	1.6	1.6	9.3	8.9	1.2	2.8	5.4	3.4	2.9	2
ST 5.5	1.8	1.8	10.3	9.9	1.3	3	6.7	3.45	2.95	3
ST 6.3	1.8	1.8	11.3	10.9	1.4	3.15	7.3	4	3.5	3
ST 8	2.1	2.1	15.8	15.4	2	4.65	9.6	5.25	4.75	4
ST 9.5	2.1	2.1	18.3	17.8	2.3	5.25	10.4	6	5.5	4

THREAD FORMING SCREWS

DIN 7500 Trilobular Thread Rolling Screws



METRIC - TRILOBULAR THREAD ROLLING SCREWS

DIN 7500-1

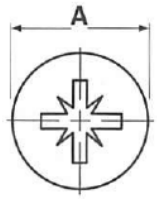
Nominal Size & Thread Pitch	C		B		P	Test Plate Thickness	Hole Diameter		Minimum Breaking Torque	Minimum Breaking Force	Maximum Screw-in Torque
	Diameter of Circumscribing Circle		Major Thread Diameter		Point Diameter						
	Max	Min	Max	Min	Max		Max	Min	Nm	N	Nm
M2-0.40	2.06	1.98	1.98	1.90	1.67	2.0	1.825	1.8	0.4	1650	0.3
M2.5-0.45	2.55	2.47	2.48	2.38	2.11	2.5	2.325	2.3	1	2700	0.6
M3-0.5	3.05	2.97	2.95	2.87	2.57	3.0	2.775	2.75	1.8	4000	1
M3.5-0.6	3.58	3.48	3.46	3.36	3.00	3.5	3.230	3.2	2.8	5400	1.6
M4-0.7	4.07	3.99	3.93	3.85	3.39	4.0	3.680	3.65	4.1	7000	2.4
M5-0.8	5.08	5.00	4.92	4.84	4.30	5.0	4.630	4.6	8.7	11,400	4.7
M6-1.0	6.10	5.97	5.90	5.77	5.13	6.0	5.530	5.5	15	16,000	8

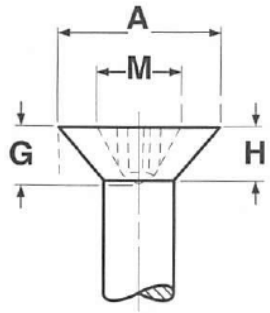
Tolerance on Length			
	3-6mm: ±0.375	over 6-10mm: ±0.45	over 10-18mm: ±0.55
	over 18-30mm: ±0.65	over 30 - 50mm: ±0.80	over 50-80: ±0.95

Description	A trilobular thread forming screw with a machine screw's thread pitch. As each lobe of the screw moves through the pilot hole in the nut material, it forms and work hardens the nut thread metal, producing an uninterrupted grain flow.	
Applications/ Advantages	For use in drilled, punched or cored holes in ductile metals and punch extruded metals. They provide superior prevailing torque than can be achieved with most locking screws. Eliminates chips that result from using thread cutting screws. Requires low drive torque and provides excellent resistance to vibrational loosening. Since these thread rolling screws are case hardened, it is not recommended they be used in die-cast or extruded aluminum or zinc.	Can be used to roll threads in aluminum or non-ferrous materials.
Material	*Carbon Steel*	*Stainless*
	AISI 1022 Steel	A2 Stainless Steel
Surface Hardness	450 HV 0.3 Min.	-
Case Depth	*M2 & M2.5:* 0.05-0.15 mm *M3 & M3.5:* 0.07-0.18 mm *M4 & M5:* 0.10-0.25 mm *M6 & M8:* 0.15-0.28 mm	-
Core Hardness	M2 - M3.5: 290 - 370 HV 5 M4 & larger: 290 - 370 HV 10	-
Torsional Strength	Torque required to cause failure shall be equal to or greater than breaking torque values shown in above table.	-
Tensile Strength	Tensile force required to cause failure shall be equal to or greater than breaking force values shown in above table.	-
Plating	Thread rolling screws shall have a zinc finish with a wax coating. For more details see Appendix-A.	Stainless thread-rolling screws are typically passivated with a wax coating.

Thread Rolling Screws
Head Dimensions to DIN 965 & 7985

THREAD FORMING SCREWS

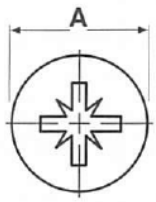


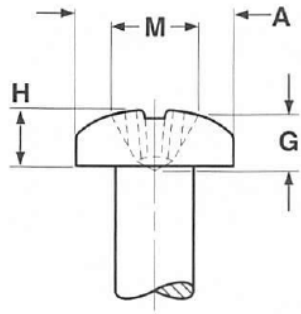


METRIC - TYPE Z (1A) FLAT HEADS FOR TAPPING SCREWS

DIN 965

Nominal Size	A		H	M	G		Drive Size
	Head Diameter		Head Height	Recess Diameter	Recess Penetration		
	Max	Min	Max	Ref	Max	Min	
M2.5	4.7	4.4	1.5	2.5	1.73	1.48	1
M3	5.6	5.3	1.65	2.8	2.01	1.76	1
M4	7.5	7.14	2.2	4	2.51	2.06	2
M5	9.2	8.84	2.5	4.4	3.05	2.60	2
M6	11	10.57	3	6.1	3.3	2.8	3





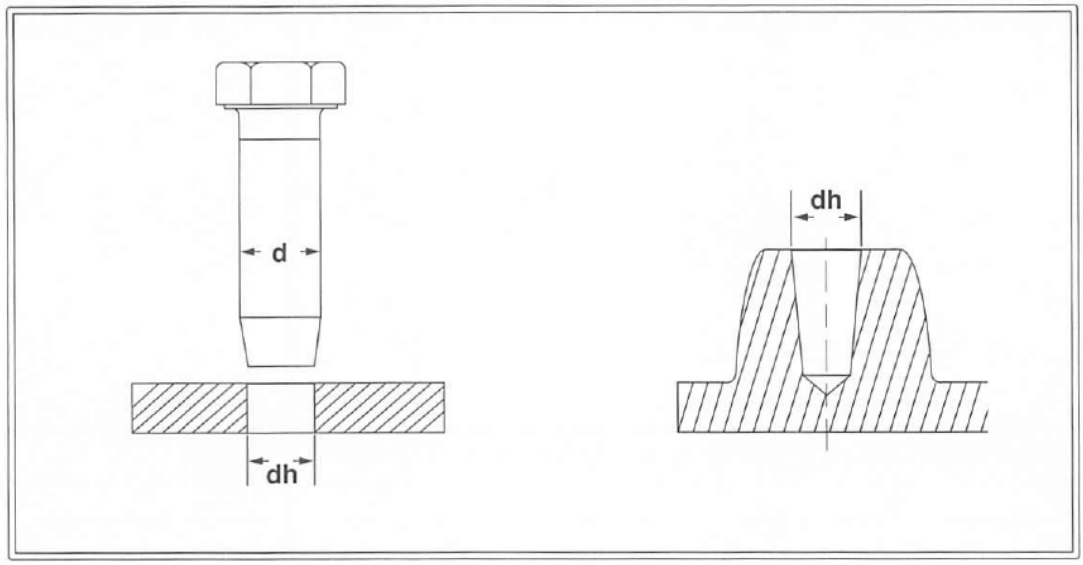
METRIC - TYPE Z (1A) PAN HEADS FOR TAPPING SCREWS

DIN 7985

Nominal Size	A		H		M	G		Drive Size
	Head Diameter		Head Height		Recess Diameter	Recess Penetration		
	Max	Min	Max	Min	Ref	Max	Min	
M2	4.00	3.70	1.72	1.48	2.4	1.35	1.10	1
M2.5	5.00	4.70	2.12	1.88	2.6	1.52	1.27	1
M3	6.00	5.70	2.52	2.28	3.0	1.93	1.68	1
M4	8.00	7.64	3.25	2.95	4.3	2.36	1.90	2
M5	10.00	9.64	3.95	3.65	5.0	3.10	2.64	2
M6	12.0	11.57	4.75	4.45	6.8	3.53	3.03	3

THREAD FORMING SCREWS

DIN 7500 Thread Rolling Screw Hole Size Data



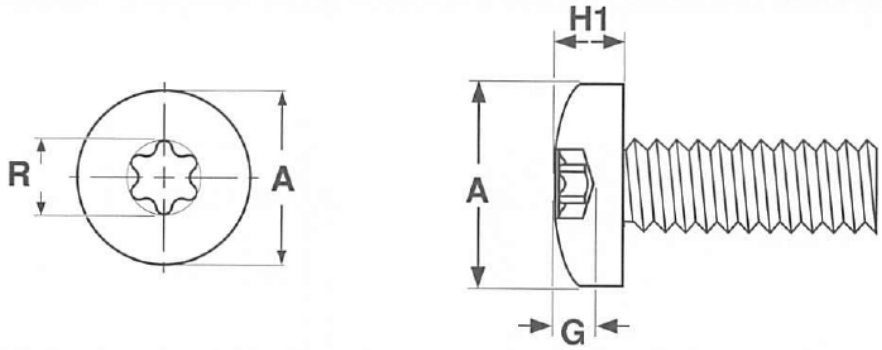
Guideline Values for Hole Diameters Using DIN 7500 Thread Rolling Screws

DIN 7500

Thread Size	M2.5		M3		M3.5		M4		M5		M6	
Material thickness or length of engagement	Hole Diameter (dh)											
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
0.8	2.31	2.25										
0.9	2.31	2.25										
1	2.31	2.25	2.76	2.7	3.18	3.13						
1.2	2.31	2.25	2.76	2.7	3.21	3.16						
1.5	2.31	2.25	2.76	2.7	3.21	3.16	3.66	3.6	4.56	4.5		
1.6	2.31	2.25	2.76	2.7	3.24	3.19	3.66	3.6	4.56	4.5		
1.7	2.31	2.25	2.76	2.7	3.24	3.19	3.66	3.6	4.56	4.5		
1.8	2.31	2.25	2.81	2.75	3.24	3.19	3.66	3.6	4.56	4.5		
2	2.31	2.25	2.81	2.75	3.24	3.19	3.66	3.6	4.56	4.5	5.46	5.4
2.2	2.31	2.25	2.81	2.75	3.24	3.19	3.66	3.6	4.56	4.5	5.46	5.4
2.5	2.31	2.25	2.81	2.75	3.29	3.24	3.71	3.65	4.56	4.5	5.46	5.4
3	2.36	2.3	2.81	2.75	3.29	3.24	3.71	3.65	4.56	4.5	5.51	5.45
3.2	2.375	2.3	2.825	2.75	3.29	3.24	3.725	3.65	4.625	4.55	5.525	5.45
3.5	2.375	2.3	2.825	2.75	3.29	3.24	3.725	3.65	4.625	4.55	5.525	5.45
4	2.375	2.3	2.825	2.75	3.32	3.27	3.725	3.65	4.625	4.55	5.525	5.45
5	2.375	2.3	2.825	2.75	3.32	3.27	3.775	3.7	4.675	4.6	5.525	5.45
5.5			2.825	2.75	3.32	3.27	3.775	3.7	4.675	4.6	5.575	5.5
6			2.825	2.75	3.32	3.27	3.775	3.7	4.675	4.6	5.575	5.5
6.3							3.79	3.7	4.74	4.65	5.59	5.5
6.5							3.79	3.7	4.74	4.65	5.59	5.5
7							3.79	3.7	4.74	4.65	5.59	5.5
7.5							3.79	3.7	4.74	4.65	5.59	5.5
8 thru 10									4.74	4.65	5.74	5.65

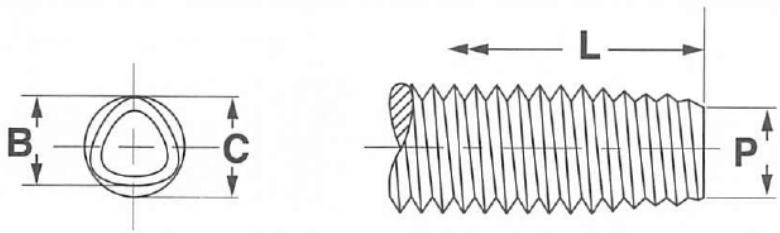
NOTE:
The values listed above are assigned to various materials and lengths of engagement and should be used as guidelines.

DIN 7500TX Head Dimensions per DIN 7500CE
THREAD FORMING SCREWS



METRIC - Six-Lobe Pan Head DIN 7500TX Head per DIN 7500CE

Nominal Size	Thread Pitch	A		H1		R	G	(Fallaway) Max Penetration	Six-Lobe Driver Size
		Head Diameter		Height of Head		Recess Diameter	Recess Penetration		
		Max	Min	Max	Min	Ref	Min	Max	
M2	0.40	4.00	3.70	1.72	1.46	1.75	0.63	0.35	T6
M2.5	0.45	5.0	4.7	2.10	1.96	2.4	0.83	0.48	T8
M3	0.5	5.6	5.3	2.40	2.26	2.8	0.88	0.56	T10
M3.5	0.6	7	6.64	2.60	2.44	3.35	1.14	0.67	T15
M4	0.7	8.00	7.64	3.10	2.92	3.9	1.40	0.79	T20
M5	0.8	9.50	9.14	3.70	3.52	4.5	1.78	0.90	T25
M6	1.0	12	11.57	4.75	4.3	5.6	1.90	1.12	T30



METRIC - Trilobular Thread Rolling Screws

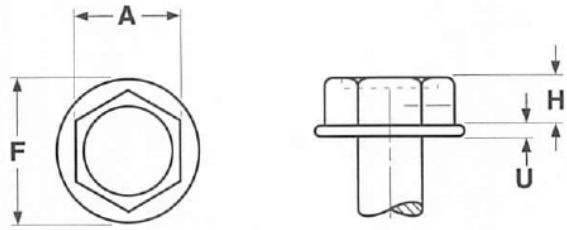
DIN 7500-1

Nominal Size & Thread Pitch	C		B		P	Test Plate Thickness	Hole Diameter		Minimum Breaking Torque	Minimum Breaking Force	Maximum Screw-in Torque
	Diameter of Circumscribing Circle		Major Thread Diameter		Point Diameter						
	Max	Min	Max	Min	Max		Max	Min	Nm	N	Nm
M2-0.40	2.06	1.98	1.98	1.90	1.67	2.0	1.825	1.8	0.4	1650	0.3
M2.5-0.45	2.55	2.47	2.48	2.38	2.11	2.5	2.325	2.3	1	2700	0.6
M3-0.5	3.05	2.97	2.95	2.87	2.57	3.0	2.775	2.75	1.8	4000	1
M3.5-0.6	3.58	3.48	3.46	3.36	3.00	3.5	3.230	3.2	2.8	5400	1.6
M4-0.7	4.07	3.99	3.93	3.85	3.39	4.0	3.680	3.65	4.1	7000	2.4
M5-0.8	5.08	5.00	4.92	4.84	4.30	5.0	4.630	4.6	8.7	11,400	4.7
M6-1.0	6.10	5.97	5.90	5.77	5.13	6.0	5.530	5.5	15	16,000	8

Tolerance on Length			
	3-6mm: ±0.375	over 6-10mm: ±0.45	over 10-18mm: ±0.55
	over 18-30mm: ±0.65	over 30 - 50mm: ±0.80	over 50-80: ±0.95

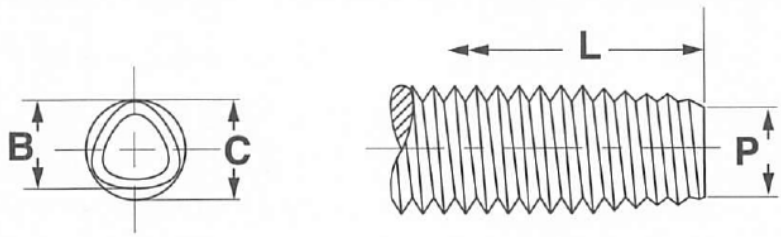
THREAD FORMING SCREWS

DIN 7500~D Hex Washer Head



METRIC - Unslotted Hex Washer DIN 7500~D Head

Nominal Size	Thread Pitch	A		H		F		U
		Width Across the Flats		Height of Head		Washer Diameter		Washer Thickness
		Max	Min	Max	Min	Max	Min	Max
M2.5	0.45	5.00	4.88	1.80	1.32	6.40	5.90	0.50
M3	0.5	5.50	5.32	2.00	1.52	7.10	6.60	0.60
M4	0.7	7.00	6.82	3.53	3.05	8.90	8.40	0.70
M5	0.8	8.00	7.78	4.45	3.75	10.40	10.00	0.80
M6	1.0	10.00	9.78	5.20	4.50	13.00	12.00	1.05
M8	1.25	13.00	12.73	7.05	6.30	17.00	16.40	1.30



METRIC - Trilobular Thread Rolling Screws

DIN 7500-1

Nominal Size & Thread Pitch	C		B		Test Plate Thickness	Hole Diameter	Minimum Breaking Torque	Minimum Breaking Force	Maximum Rolling Torque
	Diameter of Circumscribing Circle		Major Thread Diameter						
	Max	Min	Max	Min			Nm	N	Nm
M2.5-0.45	2.57	2.48	2.48	2.39	2.5	2.3	1	2700	0.6
M3-0.5	3.07	2.98	2.97	2.88	3.0	2.75	1.5	4000	1
M4-0.7	4.08	3.98	3.94	3.84	4.0	3.6	3.4	7000	2.4
M5-0.8	5.09	4.98	4.93	4.82	5.0	4.6	7.1	11,400	4.7
M6-1.0	6.10	5.97	5.90	5.77	6.0	5.5	12	16,000	8
M8-1.25	8.13	7.97	7.88	7.72	8.0	7.4	29	29,000	20

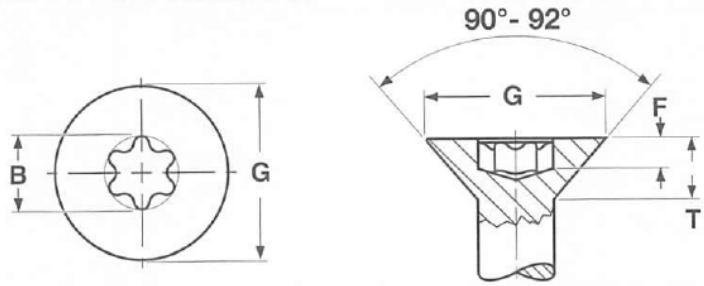
Tolerance on Length			
	3-6mm: ±0.375	over 6-10mm: ±0.45	over 10-18mm: ±0.55
	over 18-30mm: ±0.65	over 30 - 50mm: ±0.80	over 50-80: ±0.95

THREAD FORMING SCREWS

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THREAD FORMING SCREWS

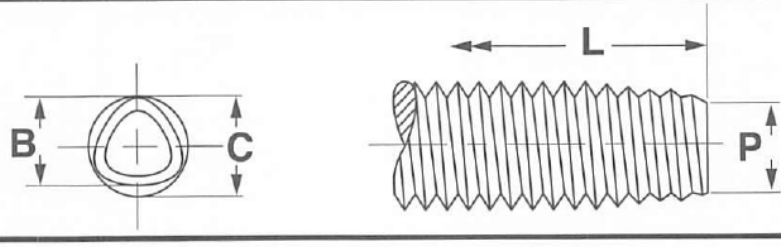
DIN 7500M / STAINLESS Six-Lobe Flat Head



METRIC - DIN 7500M 90° FLAT SIX-LOBE—STAINLESS

Nominal Size	Thread Pitch	G		T	B	F		Recess Size
		Head Diameter		Height of Head	Recess Diameter	Recess Penetration		
		Max	Min	Max	Nom	Max	Min	
M2.5	0.45	4.7	4.4	1.5	2.4	0.79	0.66	T8
M3	0.5	5.5	5.2	1.65	2.8	0.83	0.70	T10
M4	0.7	8.4	8.04	2.7	3.95	1.53	1.14	T20
M5	0.8	9.3	8.94	2.7	4.5	1.51	1.12	T25
M6	1.0	11.3	10.87	3.3	5.6	1.78	1.39	T30

Tolerance on Length			
	3mm: ±0.20	4-6mm: ±0.24	7-10mm: ±0.29
	11-16mm: ±0.35	20-30mm: ±0.42	35-50mm: ±0.50



METRIC - TRILOBULAR THREAD ROLLING SCREWS

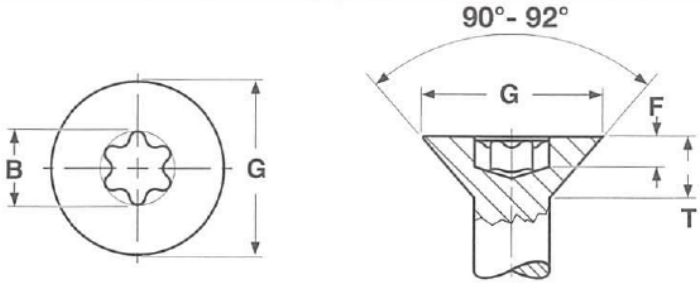
DIN 7500-1

Nominal Size & Thread Pitch	C		B	
	Diameter of Circumscribing Circle		Major Thread Diameter	
	Max	Min	Max	Min
M2.5-0.45	2.57	2.48	2.48	2.39
M3-0.5	3.07	2.98	2.97	2.88
M4-0.7	4.08	3.98	3.94	3.84
M5-0.8	5.09	4.98	4.93	4.82
M6-1.0	6.10	5.97	5.90	5.77

Tolerance on Length			
	3-6mm: ±0.375	over 6-10mm: ±0.45	over 10-18mm: ±0.55
	over 18-30mm: ±0.65	over 30 - 50mm: ±0.80	over 50-80: ±0.95

Description	A trilobular thread forming screw with a machine screw's thread pitch. As each lobe of the screw moves through the pilot hole in the nut material, it forms and work hardens the nut thread metal, producing an uninterrupted grain flow.
Applications/ Advantages	For use in drilled, punched or cored holes in stainless steel applications. Eliminates chips that result from using thread cutting screws. Requires low drive torque and provides resistance to vibrational loosening. Since A2 stainless thread rolling screws are not hardened, it is recommended they only be used in materials that have a hardness gradient of at least 15-20 Rockwell points lower than the hardness of the screw.
Material	A2 Stainless Steel
Plating	Stainless thread rolling screws shall have a wax coating to maximize performance.

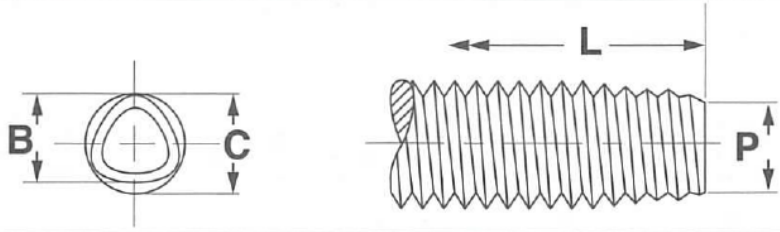
DIN 7500ME / Six-Lobe Flat Head THREAD FORMING SCREWS



METRIC - DIN 7500ME 90° FLAT SIX-LOBE

Nominal Size	Thread Pitch	G Head Diameter Max	G Head Diameter Min	T Height of Head Max	B Recess Diameter Ref	F Recess Penetration Max	F Recess Penetration Min	Recess Size
M2.5	0.45	5.5	4.4	1.5	2.4	0.79	0.66	T8
M3	0.5	6.3	5.2	1.65	2.80	0.83	0.70	T10
M4	0.7	9.4	8.04	2.70	3.95	1.53	1.14	T20
M5	0.8	10.4	8.94	2.70	4.50	1.51	1.12	T25
M6	1.0	12.6	10.87	3.30	5.60	1.78	1.39	T30

Tolerance on Length			
	3mm: ±0.20	4-6mm: ±0.24	7-10mm: ±0.29
	11-16mm: ±0.35	20-30mm: ±0.42	35-50mm: ±0.50



METRIC - TRILOBULAR THREAD ROLLING SCREWS

DIN 7500-1

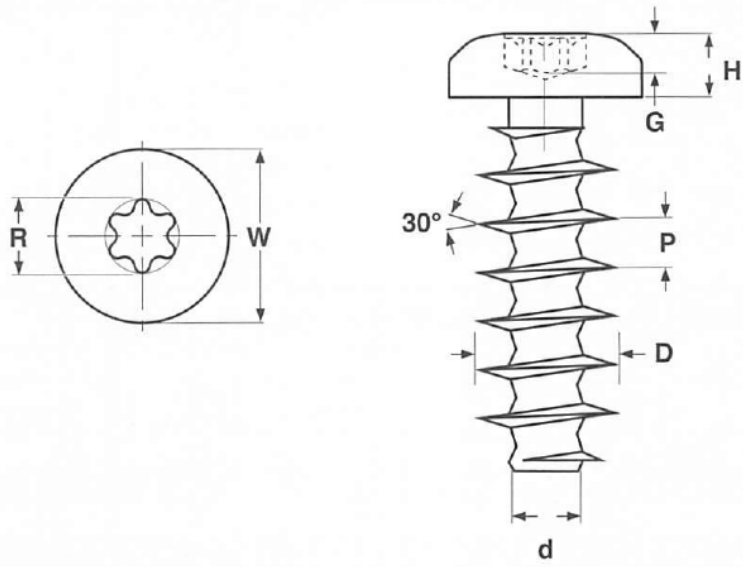
Nominal Size & Thread Pitch	C Diameter of Circumscribing Circle Max	C Diameter of Circumscribing Circle Min	B Major Thread Diameter Max	B Major Thread Diameter Min
M2.5-0.45	2.57	2.48	2.48	2.39
M3-0.5	3.07	2.98	2.97	2.88
M4-0.7	4.08	3.98	3.94	3.84
M5-0.8	5.09	4.98	4.93	4.82
M6-1.0	6.10	5.97	5.90	5.77

Tolerance on Length			
	3-6mm: ±0.375	over 6-10mm: ±0.45	over 10-18mm: ±0.55
	over 18-30mm: ±0.65	over 30 - 50mm: ±0.80	over 50-80: ±0.95

Description	A trilobular thread forming screw with a machine screw's thread pitch. As each lobe of the screw moves through the pilot hole in the nut material, it forms and work hardens the nut thread metal, producing an uninterrupted grain flow.
Applications/ Advantages	For use in drilled, punched or cored holes in stainless steel applications. Eliminates chips that result from using thread cutting screws. Requires low drive torque and provides resistance to vibrational loosening. Since A2 stainless thread rolling screws are not hardened, it is recommended they only be used in materials that have a hardness gradient of at least 15-20 Rockwell points lower than the hardness of the screw.
Material	A2 Stainless Steel
Plating	Stainless thread rolling screws shall have a wax coating to maximize performance.

THREAD FORMING SCREWS

Type-PT® Alternative Pan Six-Lobe



METRIC - TYPE PT®-ALTERNATIVE THREAD FORMING SCREWS, PAN 6-LOBE

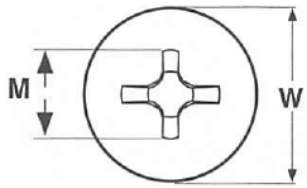
Screw Size	P	D		d	W		H		R	G	Drive Size
	Thread Dimensions				Head Dimensions				Recess Dimensions		
	Thread Pitch	External Thread Diam.		Thread Core	Diameter		Height		Diameter	Gauge Penetration	
		Max	Min	Ref	Max	Min	Max	Min	Max	Min	
M2.2	0.98	2.34	2.20	1.25	4.00	3.72	1.70	1.50	1.75	0.70	T6
M3	1.34	3.14	3.00	1.66	5.60	5.32	2.20	2.00	2.80	1.05	T10
M3.5	1.57	3.68	3.50	1.91	6.90	6.56	2.40	2.20	2.80	1.15	T15
M4	1.79	4.18	4.00	2.17	7.50	7.16	2.70	2.50	3.95	1.25	T20

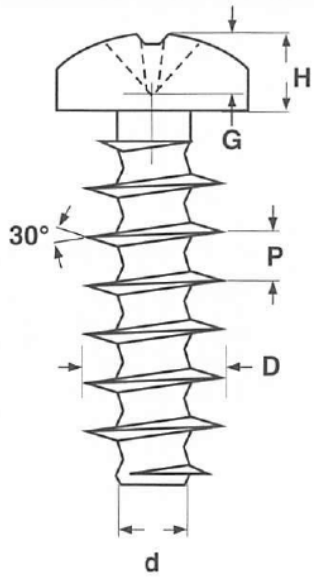
Tolerance on Length		
	3 ~ 6mm: ± 0.30 mm	7 ~ 10mm: ± 0.40 mm
	11 ~ 30mm: ± 0.50 mm	31 ~ 80mm: ±0.65 mm

Description	A spaced thread fastener with a head that has a gently rounded top, cylindrical sides and a flat bearing surface that is 90° to the screw's shank. When compared to a Plastite®-alternative thread rolling screw, the PT®-alternative threads are wider and have a sharper angle. Furthermore, the core of the shank has a reduced diameter between each consecutive set of threads. The point opposite the head is blunt.	
Applications/ Advantages	Designed to form its own thread in thermoplastic materials. The 30° thread angle reduces the outward expansion of the material being displaced. The recessed design of the thread root enables more material to flow into the area between threads. The depth of the thread pattern increases the fastener's load carrying properties while resisting vibrations, thus resisting loosening.	
Material	***Steel***	***Stainless***
	Diameter M3 & smaller.2: Case-Hardened C1022 Steel Diameters M3.5 and larger: Through-hardened C1022 Steel	A2 Stainless
Core Hardness	HV 270 - 390	-
Surface Hardness	HV 450 min.	-

Type PT® is a registered trademark of EJOT Verbindungstechnik GmbH & Co. KG.

Type-PT® Alternative Pan Phillips THREAD FORMING SCREWS





METRIC - TYPE PT®-ALTERNATIVE THREAD FORMING SCREWS, PAN PHILLIPS

Screw Size	P	D		d	W		H		M	G		Drive Size
	Thread Dimensions				Head Dimensions				Recess Dimensions			
	Thread Pitch	External Thread Diam.		Thread Core	Diameter		Height		Diameter	Gauge Penetration		
		Max	Min	Ref	Max	Min	Max	Min	Max	Max	Min	
M2.2	0.98	2.34	2.20	1.25	3.90	3.62	1.60	1.40	2.40	1.21	0.85	1
M2.5	1.12	2.64	2.50	1.40	4.40	4.12	1.80	1.60	2.60	1.42	1.05	1
M3	1.34	3.14	3.00	1.66	5.30	5.02	2.10	1.90	2.90	1.65	1.24	1
M3.5	1.57	3.68	3.50	1.91	6.10	5.82	2.60	2.40	4.0	1.86	1.23	2
M4	1.79	4.18	4.00	2.17	7.00	6.72	2.80	2.60	4.30	2.14	1.51	2

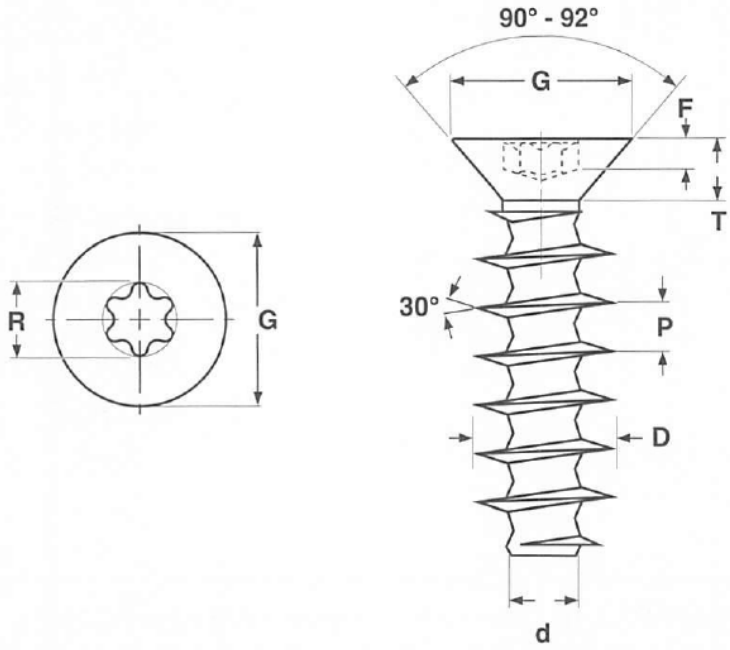
Tolerance on Length	3 ~ 6mm: ± 0.30 mm	7 ~ 10mm: ± 0.40 mm
	11 ~ 30mm: ± 0.50 mm	31 ~ 80mm: ±0.65 mm

Description	A spaced thread fastener with a head that has a gently rounded top, cylindrical sides and a flat bearing surface that is 90° to the screw's shank. When compared to a Plastite -alternative thread rolling screw, the PT- alternative threads are wider and have a sharper angle. Furthermore, the core of the shank has a reduced diameter between each consecutive set of threads. The point opposite the head is blunt.	
Applications/ Advantages	Designed to form its own thread in thermoplastic materials. The 30° thread angle reduces the outward expansion of the material being displaced. The recessed design of the thread root enables more material to flow into the area between threads. The depth of the thread pattern increases the fastener's load carrying properties while resisting vibrations, thus resisting loosening.	
Material	***Steel***	***Stainless***
	Diameters M3 & smaller: Case-Hardened C1022 Steel Diameters M3.5 and larger: Through-hardened C1022 Steel	A2 Stainless
Core Hardness	HV 270 - 390	-
Surface Hardness	HV 450 min.	-

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THREAD FORMING SCREWS

Type-PT® Alternative Flat Six-Lobe



METRIC - TYPE PT®-ALTERNATIVE THREAD FORMING SCREWS, FLAT 6-LOBE

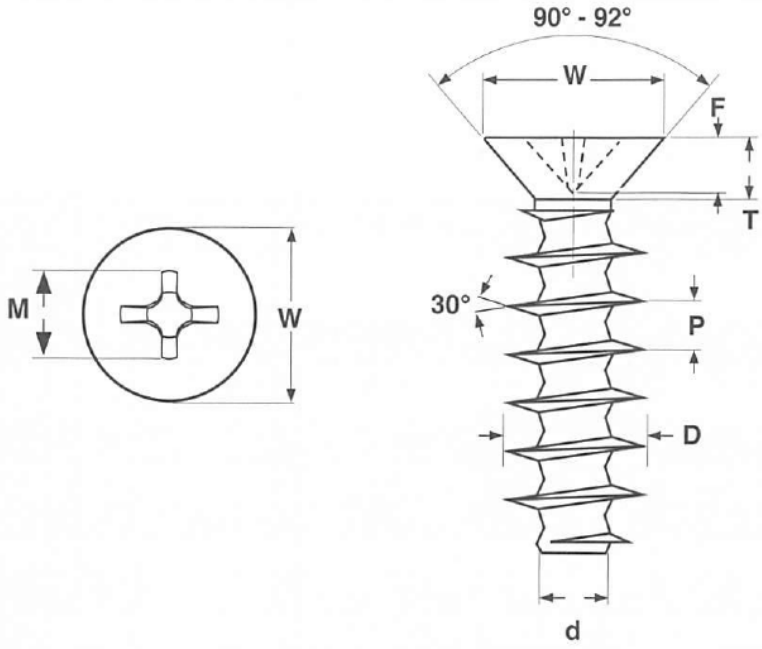
Screw Size	P	D		d	G		T	R	F	Drive Size
	Thread Dimensions				Head Dimensions			Recess Dimensions		
	Thread Pitch	External Thread Diam.		Thread Core	Diameter		Height	Diameter	Gauge Penetration	
	Ref	Max	Min	Ref	Max	Min	Ref	Max	Min	
M2.2	0.98	2.34	2.20	1.25	3.80	3.53	1.20	1.75	0.80	T6
M2.5	1.12	2.64	2.50	1.40	4.70	4.43	1.70	2.39	0.90	T8
M3	1.34	3.14	3.00	1.66	5.50	5.23	1.80	2.82	1.00	T10
M3.5	1.57	3.68	3.50	1.91	7.30	6.97	2.50	3.35	1.20	T15
M4	1.79	4.18	4.00	2.17	8.40	8.07	2.90	3.95	1.40	T20

Tolerance on Length	3 ~ 6mm: ± 0.30 mm	7 ~ 10mm: ± 0.40 mm
	11 ~ 30mm: ± 0.50 mm	31 ~ 80mm: ±0.65 mm

Description	A spaced thread fastener with a countersunk head, having a flat top sutface and a cone-shaped bearing surface with a head angle of approximately 90°. When compared to a Plastite®-alternative thread rolling screw, the PT®-alternative threads are wider and have a sharper angle. Furthermore, the core of the shank has a reduced diameter between each consecutive set of threads. The point opposite the head is blunt.	
Applications/ Advantages	Designed to form its own thread in thermoplastic materials. The 30° thread angle reduces the outward expansion of the material being displaced. The recessed design of the thread root enables more material to flow into the area between threads. The depth of the thread pattern increases the fastener's load carrying properties while resisting vibrations, thus resisting loosening.	
Material	***Steel***	***Stainless***
	Diameter M3 & smaller: Case-Hardened C1022 Steel Diameters M3.5 and larger: Through-hardened C1022 Steel	A2 Stainless Steel
Core Hardness	HV 270 - 390	-
Surface Hardness	HV 450 min.	-

Type PT® is a registered trademark of EJOT Verbindungstechnik GmbH & Co. KG.

Type-PT® Alternative Flat Phillips THREAD FORMING SCREWS



METRIC - TYPE PT®-ALTERNATIVE THREAD FORMING SCREWS, FLAT PHILLIPS

Screw Size	P	D		d	W		T	M	F		Drive Size
	Thread Dimensions				Head Dimensions			Recess Dimensions			
	Thread Pitch	External Thread Diam.		Thread Core	Diameter		Height	Diameter	Gauge Penetration		
	Ref	Max	Min	Ref	Max	Min	Ref	Max	Max	Min	
M2.2	0.98	2.34	2.20	1.25	3.80	3.53	1.20	1.80	1.08	0.85	0
M2.5	1.12	2.64	2.50	1.40	4.70	4.43	1.70	2.60	1.43	1.04	1
M3	1.34	3.14	3.00	1.66	5.50	5.23	1.80	2.70	1.56	1.17	1
M3.5	1.57	3.68	3.50	1.91	7.30	6.97	2.50	3.90	1.96	1.40	2
M4	1.79	4.18	4.00	2.17	8.40	8.07	2.90	4.20	2.22	1.66	2

Tolerance on Length	3 ~ 6mm: ± 0.30 mm	7 ~ 10mm: ± 0.40 mm
	11 ~ 30mm: ± 0.50 mm	31 ~ 80mm: ±0.65 mm

Description	A spaced thread fastener with a countersunk head, having a flat top sutface and a cone-shaped bearing surface with a head angle of approximately 90°. When compared to a Plastite®-alternative thread rolling screw, the PT®-alternative threads are wider and have a sharper angle. Furthermore, the core of the shank has a reduced diameter between each consecutive set of threads. The point opposite the head is blunt.	
Applications/ Advantages	Designed to form its own thread in thermoplastic materials. The 30° thread angle reduces the outward expansion of the material being displaced. The recessed design of the thread root enables more material to flow into the area between threads. The depth of the thread pattern increases the fastener's load carrying properties while resisting vibrations, thus resisting loosening.	
Material	***Steel***	***Stainless***
	Diameters M3 & smaller: Case-Hardened C1022 Steel Diameters M3.5 and larger: Through-hardened C1022 Steel	A2 Stainless Steel
Core Hardness	HV 270 - 390	-
Surface Hardness	HV 450 min.	-

Type PT® is a registered trademark of EJOT Verbindungstechnik GmbH & Co. KG.

THREAD FORMING SCREWS

Type-PT® Alternative Recommended Hole Sizes

HOLE SIZE RECOMMENDATIONS FOR EJOT® TYPE-PT®-ALTERNATIVES

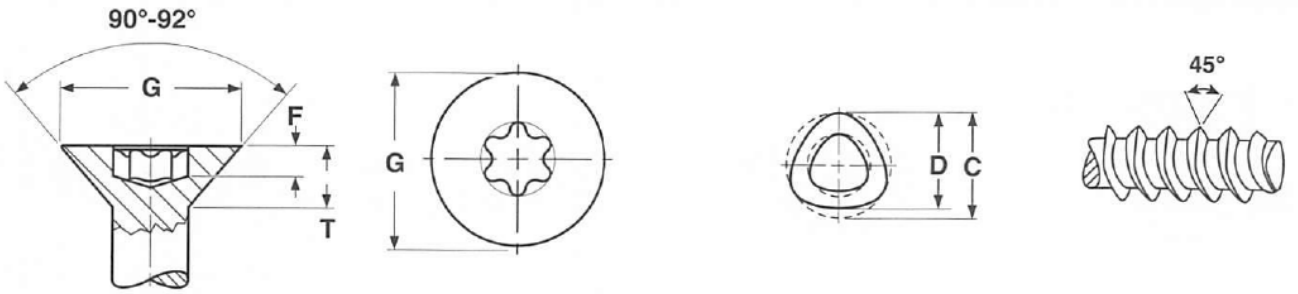
EJOT®

Material		Nominal Screw Diameter				
		M2.2	M2.5	M3	M3.5	M4
ABS	Acrynonitrile Butadiene Styrene	1.76	2	2.4	2.8	3.2
ABS PC Blend	Same as above with the addition of reclaimed material as an additive, a/k/a regrind	1.76	2	2.4	2.8	3.2
ASA	Acrylonitrile Styrene Acrylate	1.716	1.95	2.34	2.73	3.12
PA 4.6	Polyamide, generic name for nylon; 4.6 references polymer chain	1.606	1.825	2.19	2.555	2.92
PA 6	Same as above, differing polymer structure and applicatopn properties	1.65	1.875	2.25	2.625	3
PA 6.6	Same as above	1.65	1.875	2.25	2.625	3
PBT	Polybutylene Terephthalate	1.65	1.875	2.25	2.625	3
PE - LD	Polyethelene- Low density Polymer	1.54	1.75	2.1	2.45	2.8
PE - HD	Polyethylene- High Density Polymer	1.65	1.875	2.25	2.625	3
PET	Polymer blend of Terephtalate. Delrin is a trade name PET	1.65	1.875	2.25	2.625	3
PET-GF 30	Same as above w/ 30% glass reinforcement (fiber glass chards molded in during injection)	1.76	2	2.4	2.8	3.2
POM	Polyoxymethylene	1.65	1.875	2.25	2.625	3
POM-GF 30	Same as above w/ 30% glass reinforcement	1.76	2	2.4	2.8	3.2
PP	Polypropylene	1.54	1.75	2.1	2.45	2.8
PP - GF 30	Same as above w/ 30% glass reinforcement	1.584	1.8	2.16	2.52	2.88
PP - TV 20	Polypropylene w/ 20% reclaimed materials	1.584	1.8	2.16	2.52	2.88
PS	Polystyrene	1.76	2	2.4	2.8	3.2
PVC	Polyvinyl Chloride	1.76	2	2.4	2.8	3.2
SAN	Styrene Acrylonitrile Resin	1.694	1.925	2.31	2.695	3.08
High Strength Materials with High Torques*		**M2.2**	**M2.5**	**M3**	**M3.5**	**M4**
PA 4.6 - GF 30	Glass reinforced polyamide (glass filled nylon)	1.76	2	2.4	2.8	3.2
PA 6 - GF 30	Same as above, with differing polymer and application properties					
PA 6.6 - GF 30	Same as above, with differing polymer and application properties					
PBT-GF30	Glass reinforced Polybutylene Terphthalate					
PC	Polycarbonate					
PC GF 30	Glass reinforced polycarbonate					
PMMA	Polymethylmrthacrylate					
PPO	Polyphenal Ether					
PEEK	Polyetheretherketone					
PPS	Polyphenylene Sulfide					

* For materials with high filler content or high internal strength, the optimum hole diameter can be increased to 0.88(d) where d is the nominal diameter of the screw.

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Flat Hd Six-Lobe Plastite® / Plas-Fix®-45 Alternatives THREAD FORMING SCREWS



Flat Six-Lobe Plastite® Plas-Fix® 45° Alternative Thread Rolling Screws

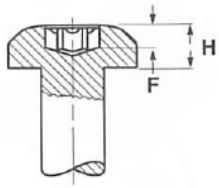
Nominal Screw Size	G		T	F	Driver Size	C		D		Recommended Pilot Hole Sizes	
	Head Diameter		Head Height	Recess Depth		Diameter of Circumscribing Circle		Measurements Across Center			
	Max	Min	Ref	Min		Max	Min	Max	Min	Min	Max
M2.5	4.40	3.50	1.30	0.60	T6	2.55	2.41	2.5	2.37	1.85	2.05
M3	5.50	4.45	1.50	0.75	T8	3.05	2.92	3	2.87	2.30	2.50
M3.5	6.30	5.25	1.65	1.05	T10	3.55	3.42	3.5	3.34	2.75	3.00
M4	7.35	6.12	1.90	1.05	T15	4.06	3.89	4	3.79	3.20	3.45
M5	8.40	7.04	2.20	1.38	T20	5.06	4.89	5	4.79	3.70	4.10
Tolerance on Length							M2 thru M5, up to 20mm: ±0.8			M2 thru M5, Over 20mm: ±1.3	

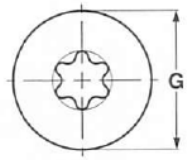
Description	Trilobular thread-rolling screw with extra wide spacing between 45° profile threads and a single lead thread that extends from the blunt point. The head is countersunk with a hexalobular recess for driving the crew
Applications/ Advantages	Thermoplastics, engineering resins and certain thermosets. Sharper thread profile increases holding strength while reducing material displacement. Drive and strip torques are higher, reducing the need for inserts or reinforcing clips.
Material	***Steel***
	AISI 1022 steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.
Case Hardness	HV 450 minimum
Case Depth	***M2 thru M3.5 diameters:*** 0.05 - 0.18 mm *M4 & M5 diameters:* 0.10 - 0.25 mm
Core Hardness (after tempering)	HV 250 - 380
Plating	Screws have a RoHS-compliant zinc finish.

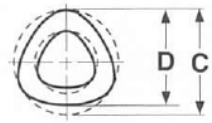
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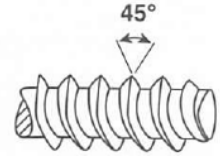
THREAD FORMING SCREWS

Pan Hd Six-Lobe Plastite® / Plas-Fix®-45 Alternatives









Pan Six-Lobe Plastite® Plas-Fix® 45° Alternative Thread Rolling Screws

Nominal Screw Size	G		T		F	Driver Size	C		D		Recommended Pilot Hole Sizes	
	Head Diameter		Head Height		Recess Depth		Diameter of Circumscribing Circle		Measurements Across Center			
	Max	Min	Max	Min	Min		Max	Min	Max	Min	Min	Max
M2.5	4.00	3.70	1.60	1.46	0.64	T6	2.55	2.41	2.5	2.37	1.85	2.05
M3	5.00	4.70	1.95	1.81	0.76	T8	3.05	2.92	3	2.87	2.30	2.50
M3.5	6.00	5.70	2.30	2.16	0.89	T10	3.55	3.42	3.5	3.34	2.75	3.00
M4	7.00	6.61	2.45	2.31	1.14	T15	4.06	3.89	4	3.79	3.20	3.45
M5	8.00	7.64	2.80	2.66	1.40	T20	5.06	4.89	5	4.79	3.70	4.10
Tolerance on Length								M2 thru M5, up to 20mm: ±0.8			M2 thru M5, Over 20mm: ±1.3	

Description	Trilobular thread-rolling screw with extra wide spacing between 45° profile threads and a single lead thread that extends from the blunt point. Head is gently rounded with a hexlobular recess for driving the screw.
Applications/ Advantages	Thermoplastics, engineering resins and certain thermosets. Sharper thread profile increases holding strength while reducing material displacement. Drive and strip torques are higher, reducing the need for inserts or reinforcing clips.
Material	***Steel***
	AISI 1022 steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.
Case Hardness	HV 450 minimum
Case Depth	***M2 thru M3.5 diameters:*** 0.05 - 0.18 mm *M4 & M5 diameters:* 0.10 - 0.25 mm
Core Hardness (after tempering)	HV 250 - 380
Plating	Screws have a RoHS-compliant zinc finish.

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Pan Hd Type-Z Plastite® / Plas-Fix®-45 Alternatives THREAD FORMING SCREWS



Pan Type-Z Plastite® Plas-Fix® 45° Alternative Thread Rolling Screws

Nominal Screw Size	G		T		Recess Size	C		D		Recommended Pilot Hole Sizes	
	Head Diameter		Head Height			Diameter of Circumscribing Circle		Measurements Across Center			
	Max	Min	Max	Min		Max	Min	Max	Min	Min	Max
M2.2	4.24	3.94	1.57	1.43	1	2.25	2.15	2.15	2.05	1.47	1.79
M2.5	4.00	3.70	1.60	1.46	1	2.55	2.41	2.5	2.37	1.85	2.05
M3	5.00	4.70	1.95	1.81	1	3.05	2.92	3	2.87	2.30	2.50
M3.5	6.00	5.70	2.30	2.16	1	3.55	3.42	3.5	3.34	2.75	3.00
M4	7.00	6.61	2.45	2.31	2	4.06	3.89	4	3.79	3.20	3.45
M5	8.00	7.64	2.80	2.66	2	5.06	4.89	5	4.79	3.70	4.10

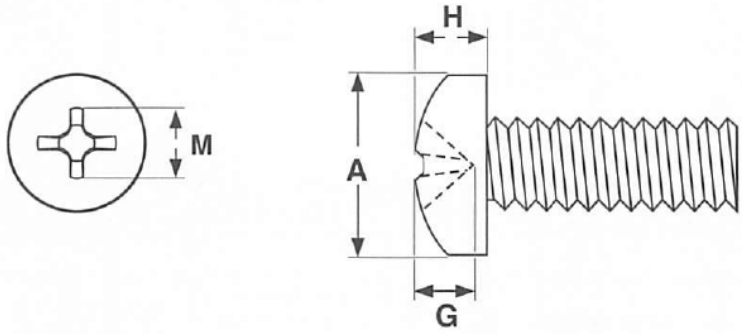
Tolerance on Length	M2.2 (All Lengths): ±0.8	M2.5 thru M5, up to 20mm: ±0.8	M2.5 thru M5, Over 20mm: ±1.3

Description	Trilobular thread-rolling screw with extra wide spacing between 45° profile threads and a single lead thread that extends from the blunt point. Head is gently rounded. Recess features a large center opening; wide, straight wings; and a blunt bottom.
Applications/ Advantages	Thermoplastics, engineering resins and certain thermosets. Sharper thread profile increases holding strength while reducing material displacement. Drive and strip torques are higher, reducing the need for inserts or reinforcing clips.
Material	***Steel***
	AISI 1022 steel
Heat Treatment	Screws shall be quenched in liquid and then tempered by reheating to 650°F minimum.
Case Hardness	HV 450 minimum
Case Depth	*M2 thru M3.5 diameters:* 0.05 - 0.18 mm *M4 & M5 diameters:* 0.10 - 0.25 mm
Core Hardness (after tempering)	HV 250 - 380
Plating	Screws have a RoHS-compliant zinc finish.

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MACHINE SCREWS

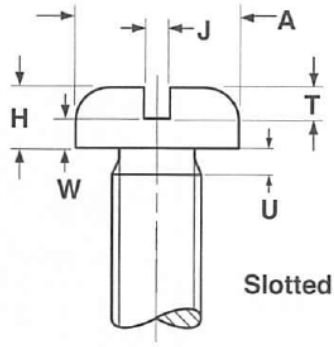
DIN 7985A Pan Head



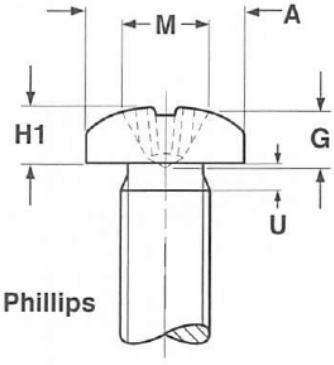
METRIC - DIN 7985A PHILLIPS PAN MACHINE SCREWS									DIN 7985
Nominal Size	Thread Pitch	A		H		M	G		Phillips Driver Size
		Head Diameter		Height of Head		Recess Diameter	Recess Penetration		
		Max	Min	Max	Min	Ref	Max	Min	
M2	0.4	4.0	3.7	1.72	1.48	2.5	1.4	1.1	1
M2.5	0.45	5.0	4.7	2.12	1.88	2.7	1.6	1.3	1
M3	0.5	6.0	5.7	2.52	2.28	3.1	2.0	1.7	1
M3.5	0.6	7.0	6.64	2.82	2.58	4.2	2.24	1.74	2
M4	0.7	8.0	7.64	3.25	2.95	4.6	2.54	2.04	2
M5	0.8	10.0	9.64	3.95	3.65	5.3	3.27	2.77	2
M6	1	12.0	11.57	4.75	4.45	6.8	3.53	3.03	3
M8	1.25	16.0	15.57	6.15	5.85	9	4.68	4.18	4

Tolerance on Length			
	1-3mm: ±0.20	4-6mm: ±0.24	7-10mm: ±0.29
	11-18mm: ±0.35	19-30mm: ±0.42	31-50mm: ±0.50

ISO 1580 & 7045 Pan Head MACHINE SCREWS



Slotted



Phillips

METRIC - SLOTTED PAN HEADS FOR MACHINE SCREWS

ISO 1580

Nominal Size	Thread Pitch	A		H		J		T	W	U
		Head Diameter		Head Height		Width of Slot		Depth of Slot	Wall Thickness	Thread Runout
		Max	Min	Max	Min	Max	Min	Min	Min	Max
M1.6	0.35	3.2	2.9	1.00	0.86	0.60	0.46	0.35	0.3	0.7
M2	0.4	4.0	3.7	1.30	1.16	0.70	0.56	0.5	0.4	0.8
M2.5	0.45	5.0	4.7	1.50	1.36	0.80	0.66	0.6	0.5	0.9
M3	0.5	5.6	5.3	1.80	1.66	1.00	0.86	0.7	0.7	1
M4	0.7	8.00	7.64	2.40	2.26	1.51	1.26	1	1	1.4
M5	0.8	9.50	9.14	3.00	2.86	1.51	1.26	1.2	1.2	1.6
M6	1	12.00	11.57	3.6	3.3	1.91	1.66	1.4	1.4	2
M8	1.25	16.00	15.57	4.8	4.5	2.31	2.06	1.9	1.9	2.5
M10	1.5	20.00	19.48	6.0	5.7	2.81	2.56	2.4	2.4	3

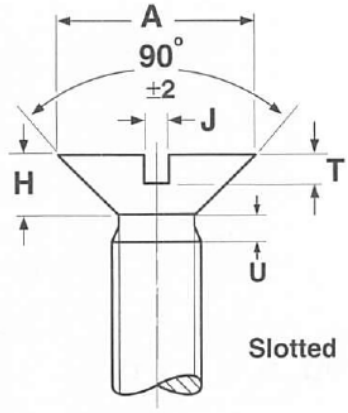
METRIC - PHILLIPS PAN HEADS FOR MACHINE SCREWS

ISO 7045

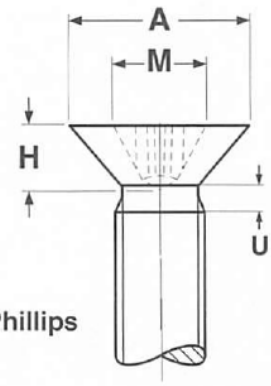
Nominal Size	Thread Pitch	A		H1		M	G		U	Phillips Driver Size
		Head Diameter		Height of Head		Recess Diameter	Recess Penetration		Thread Runout	
		Max	Min	Max	Min	Ref	Max	Min	Max	
M1.6	0.35	3.2	2.9	1.30	1.16	1.7	0.95	0.70	0.7	0
M2	0.4	4.0	3.7	1.60	1.46	1.9	1.2	0.9	0.8	0
M2.5	0.45	5.0	4.7	2.10	1.96	2.7	1.55	1.15	0.9	1
M3	0.5	5.6	5.3	2.40	2.26	3	1.8	1.4	1	1
M3.5	0.6	7.00	6.64	2.60	2.46	3.9	1.9	1.4	1.2	2
M4	0.7	8.00	7.64	3.10	2.92	4.4	2.4	1.9	1.4	2
M5	0.8	9.50	9.14	3.70	3.52	4.9	2.9	2.4	1.6	2
M6	1	12.00	11.57	4.6	4.3	6.9	3.6	3.1	2	3
M8	1.25	16.00	15.57	6.0	5.7	9	4.6	4.0	2.5	4
M10	1.5	20.00	19.48	7.50	7.14	10.1	5.8	5.2	3	4

MACHINE SCREWS

ISO 2009 & 7046-1
Flat Head



Slotted



Phillips

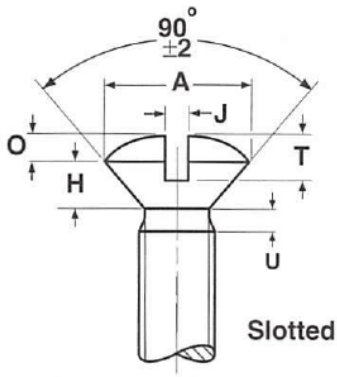
METRIC - SLOTTED FLAT HEADS FOR MACHINE SCREWS — ISO 2009

Nominal Size	Thread Pitch	A		H	J		T		U
		Head Diameter		Head Height	Width of Slot		Depth of Slot		Thread Runout
		Max	Min	Max	Max	Min	Max	Min	Max
M1.6	0.35	3.0	2.7	1	0.60	0.46	0.50	0.32	0.7
M2	0.4	3.8	3.5	1.2	0.70	0.56	0.6	0.4	0.8
M2.5	0.45	4.7	4.4	1.5	0.80	0.66	0.75	0.50	0.9
M3	0.5	5.5	5.2	1.65	1.00	0.86	0.85	0.60	1
M4	0.7	8.40	8.04	2.7	1.51	1.26	1.3	1.0	1.4
M5	0.8	9.30	8.94	2.7	1.51	1.26	1.4	1.1	1.6
M6	1	11.30	10.87	3.3	1.91	1.66	1.6	1.2	2
M8	1.25	15.80	15.37	4.65	2.31	2.06	2.3	1.8	2.5
M10	1.5	18.30	17.78	5	2.81	2.56	2.6	2.0	3

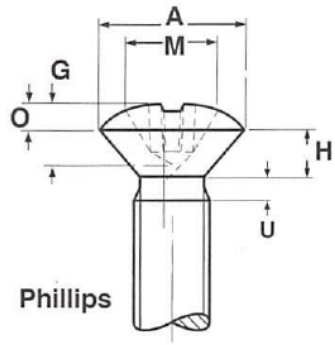
METRIC - PHILLIPS FLAT HEADS FOR MACHINE SCREWS — ISO 7046-1

Nominal Size	Thread Pitch	A		H	M	G		U	Phillips Driver Size
		Head Diameter		Head Height	Recess Diameter	Recess Penetration		Thread Runout	
		Max	Min	Max	Ref	Max	Min	Max	
M1.6	0.35	3.0	2.7	1	1.6	0.9	0.6	0.7	0
M2	0.4	3.8	3.5	1.2	1.9	1.2	0.9	0.8	0
M2.5	0.45	4.7	4.4	1.5	2.9	1.8	1.4	0.9	1
M3	0.5	5.5	5.2	1.65	3.2	2.1	1.7	1	1
M4	0.7	8.40	8.04	2.7	4.6	2.6	2.1	1.4	2
M5	0.8	9.30	8.94	2.7	5.2	3.2	2.7	1.6	2
M6	1	11.30	10.87	3.3	6.8	3.5	3.0	2	3
M8	1.25	15.80	15.37	4.65	8.9	4.6	4.0	2.5	4
M10	1.5	18.30	17.78	5	10	5.7	5.1	3	4

ISO 2010 & 7047
Oval Head
MACHINE SCREWS



Slotted



Phillips

METRIC - SLOTTED OVAL HEADS FOR MACHINE SCREWS

ISO 2010

Nominal Size	Thread Pitch	A		H	O	J		T		U
		Head Diameter		Head Side Height	Height of Oval	Width of Slot		Depth of Slot		Thread Runout
		Max	Min	Max	Ref	Max	Min	Max	Min	Max
M1.6	0.35	3.0	2.7	1	0.4	0.60	0.46	0.80	0.64	0.7
M2	0.4	3.8	3.5	1.2	0.5	0.70	0.56	1.0	0.8	0.8
M2.5	0.45	4.7	4.4	1.5	0.6	0.80	0.66	1.2	1.0	0.9
M3	0.5	5.5	5.2	1.65	0.7	1.00	0.86	1.45	1.20	1
M4	0.7	8.40	8.04	2.7	1	1.51	1.26	1.9	1.6	1.4
M5	0.8	9.30	8.94	2.7	1.2	1.51	1.26	2.4	2.0	1.6
M6	1	11.30	10.87	3.3	1.4	1.91	1.66	2.8	2.4	2
M8	1.25	15.80	15.37	4.65	2	2.31	2.06	3.7	3.2	2.5
M10	1.5	18.30	17.78	5	2.3	2.81	2.56	4.4	3.8	3

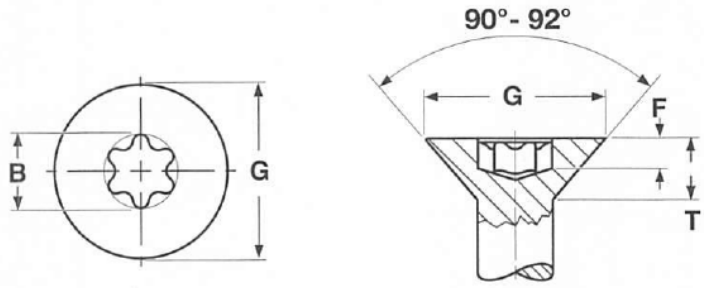
METRIC - PHILLIPS OVAL HEADS FOR MACHINE SCREWS

ISO 7047

Nominal Size	Thread Pitch	A		H	O	M	G		U	Phillips Driver Size
		Head Diameter		Head Side Height	Height of Oval	Recess Width	Recess Penetration		Thread Runout	
		Max	Min	Max	Ref	Ref	Max	Min	Max	
M1.6	0.35	3.0	2.7	1	0.4	1.9	1.2	0.9	0.7	0
M2	0.4	3.8	3.5	1.2	0.5	2	1.5	1.2	0.8	0
M2.5	0.45	4.7	4.4	1.5	0.6	3	1.85	1.50	0.9	1
M3	0.5	5.5	5.2	1.65	0.7	3.4	2.2	1.8	1	1
M4	0.7	8.40	8.04	2.7	1	5.2	3.2	2.7	1.4	2
M5	0.8	9.30	8.94	2.7	1.2	5.4	3.4	2.9	1.6	2
M6	1	11.30	10.87	3.3	1.4	7.3	4.0	3.5	2	3
M8	1.25	15.80	15.37	4.65	2	9.6	5.25	4.75	2.5	4
M10	1.5	18.30	17.78	5	2.3	10.4	6.0	5.5	3	4

MACHINE SCREWS

ISO 14581
Flat Six-Lobe

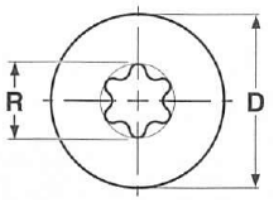


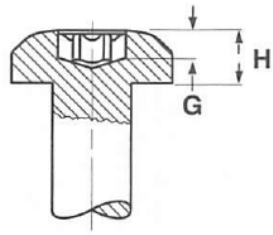
METRIC - ISO 14581 90° FLAT SIX-LOBE MACHINE SCREWS								ISO 14581
Nominal Size	Thread Pitch	G		T	B	F		Recess Size
		Head Diameter		Height of Head	Recess Diameter	Recess Penetration		
		Max	Min	Max	Ref	Max	Min	
M2	0.4	4.4	3.5	1.2	1.75	0.64	0.51	T6
M2.5	0.45	5.5	4.4	1.5	2.4	0.79	0.66	T8
M3	0.5	6.3	5.2	1.65	2.80	0.83	0.70	T10
M4	0.7	9.4	8.04	2.70	3.95	1.53	1.14	T20
M5	0.8	10.4	8.94	2.70	4.50	1.51	1.12	T25
M6	1	12.6	10.87	3.30	5.60	1.78	1.39	T30
M8	1.25	17.3	15.37	4.65	7.95	2.54	2.15	T45

Tolerance on Length			
	3mm: ±0.20	4-6mm: ±0.24	7-10mm: ±0.29
	11-16mm: ±0.35	20-30mm: ±0.42	35-50mm: ±0.50

Description	A countersunk head, straight shank fastener with a six-lobe shaped recess and a metric thread pitch designed to go through a hole or nut that is pre-tapped to form a mating thread for the screw. The head has a flat top surface and a cone-shaped bearing surface with a head angle of approximately 90 degrees.	
Applications/ Advantages	Ideal for applications where extra driving torque is required, especially where fasteners are subject to repetitive vibration; and where protrusion above the mating surface is unacceptable.	Used in applications where protrusion above the mating surface is unacceptable. The stainless variety is ideal for equipment used in the food industry or in corrosive environments.
Material	**Class 8.8 Steel**	**Stainless**
	Medium carbon steel that conforms to the following chemical composition: **Carbon:** 0.25 - 0.55%; **Phosphorous:** 0.04% maximum; **Sulfur:** 0.05% maximum	Class A2-50
Heat Treatment	Class 8.8 machine screws shall be heat treated by quenching in a liquid medium from above the transformation temperature and reheating to a tempering temperature of 425°C.	-
Hardness	Rockwell C 22 - 32	-
Tensile Strength	640 N/mm² minimum	-
Plating	See Appendix-A	Stainless machine screws are usually supplied with a plain finish.

ISO 14583 Pan Six-Lobe MACHINE SCREWS





METRIC - ISO 14583 PAN SIX-LOBE MACHINE SCREWS

ISO 14583

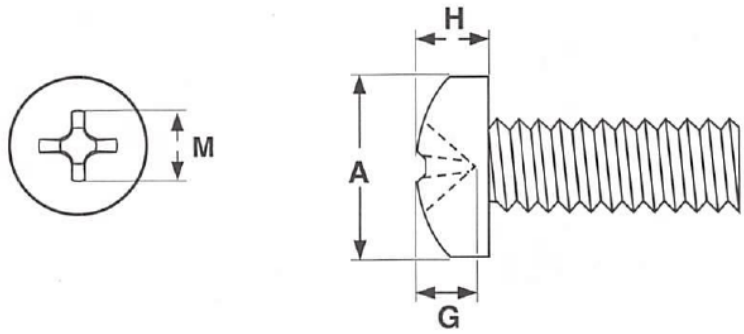
Nominal Size	Thread Pitch	D		H		R	G		Recess Size
		Head Diameter		Height of Head		Recess Diameter	Recess Penetration		
		Max	Min	Max	Min	Ref	Max	Min	
M2	0.4	4.0	3.7	1.60	1.46	1.75	0.77	0.63	T6
M2.5	0.45	5.0	4.7	2.10	1.96	2.4	1.04	0.91	T8
M3	0.5	5.6	5.3	2.4	2.26	2.8	1.27	1.10	T10
M4	0.7	8.00	7.64	3.10	2.92	3.95	1.66	1.27	T20
M5	0.8	9.50	9.14	3.70	3.52	4.5	1.91	1.52	T25
M6	1	12.0	11.57	4.6	4.3	5.6	2.42	2.02	T30

Tolerance on Length			
	3mm: ±0.20	4-6mm: ±0.24	7-10mm: ±0.29
	11-16mm: ±0.35	20-30mm: ±0.42	35-50mm: ±0.50

Description	A pan head, straight shank fastener made of medium carbon steel with a metric thread pitch designed to go through a hole or nut that is pre-tapped to form a mating thread for the screw.	A pan head, straight shank fastener made of stainless steel with a metric thread pitch designed to go through a hole or nut that is pre-tapped to form a mating thread for the screw.
Applications/ Advantages	Ideal for applications where extra driving torque is required, especially where fasteners are subject to repetitive vibration. Has a general purpose bearing area that can be substituted in most instances for round, truss or binding heads.	Has a general purpose bearing area that can be substituted in most instances for round, truss or binding heads.
Material	*Steel*	*Stainless*
	Medium carbon steel that conforms to the following chemical composition: **Carbon:** 0.25 - 0.55%; **Phosphorous:** 0.04% maximum; **Sulfur:** 0.05% maximum	A2 Stainless Steel
Heat Treatment	Class 8.8 machine screws shall be heat treated by quenching in a liquid medium from above the transformation temperature and reheating to a tempering temperature of 425°C.	-
Hardness	Rockwell C 22 - 32	-
Tensile Strength	640 N/mm^2 minimum	-
Plating	See Appendix-A	Stainless screws are typically provided without additional finish.

MACHINE SCREWS

JIS B1111
Small Pan Head

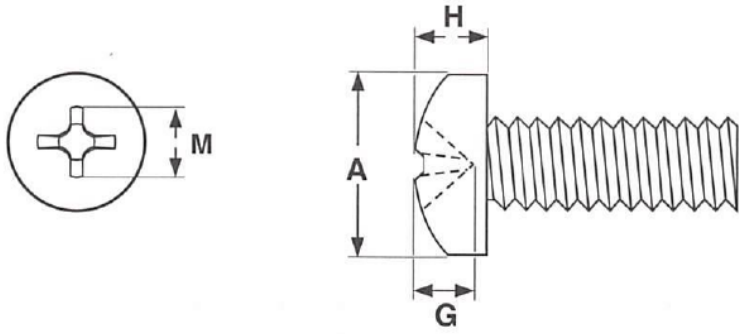


METRIC - JIS-B1111 SMALL PAN HEAD PHILLIPS MACHINE SCREW									JIS-B1111
Nominal Size	Thread Pitch	A		H		M	G		Phillips Driver Size
		Head Diameter		Height of Head		Recess Diameter	Recess Gauge Penetration		
		Max	Min	Max	Min	Ref	Max	Min	
M3	0.5	5.5	5.0	2.15	1.85	3.6	1.43	0.86	2
M4	0.7	7.0	6.5	2.75	2.45	4.2	2.03	1.45	2
M5	0.8	9.0	8.4	3.45	3.15	4.9	2.73	2.14	2
M6	1	10.5	9.8	4.1	3.7	6.3	2.86	2.26	3

Tolerance on Length	Nominal Diameter	Nominal Screw Length				
		4mm or under	Over 4mm to 10mm	Over 10mm to 20mm	Over 20mm to 40mm	Over 40mm
	M3 and M4	-	-0.6	-0.6	-0.8	-1
	M5 and M6	-	-0.8	-1	-1	-1

Description	A pan head, straight shank fastener with a metric thread pitch designed to go through a hole or nut that is pre-tapped to form a mating thread for the screw. The height and diameter of the pan head are between 5 and 20% smaller than a standard pan head.
Applications/ Advantages	The Small Pan head machine screw per JIS-B1111 is a preferred design for use in small electronic components where there is limited clearance area. The M3 and M4 diameters also meet the requirements of SN 213307 Cheese head screws.
Material	Class 4.8 machine screws shall be made from a carbon steel, partially or fully annealed as required, which conforms to the following chemical composition-- ***Carbon***: 0.55% maximum; ***Phosphorus***: 0.05% maximum; ***Sulfur***: 0.06% maximum.
Hardness	Rockwell B 71 - 99.5 (Vickers HV 130 - 250)
Tensile Strength	420 N/mm^2 minimum
Plating	Parts are typically provided with a clear zinc finish.

Stainless JIS B1111 Small Pan Head MACHINE SCREWS



METRIC - JIS-B1111 SMALL PAN HEAD PHILLIPS MACHINE SCREW

JIS-B1111

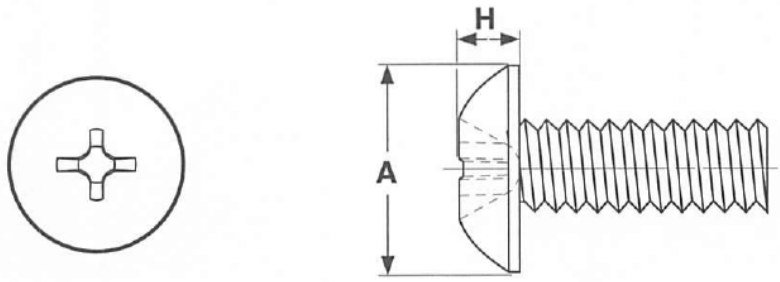
Nominal Size	Thread Pitch	A		H		M	G		Phillips Driver Size
		Head Diameter		Height of Head		Recess Diameter	Recess Gauge Penetration		
		Max	Min	Max	Min	Ref	Max	Min	
M3	0.5	5.5	5.0	2.15	1.85	3.6	1.43	0.86	2
M4	0.7	7.0	6.5	2.75	2.45	4.2	2.03	1.45	2
M5	0.8	9.0	8.4	3.45	3.15	4.9	2.73	2.14	2
M6	1	10.5	9.8	4.1	3.7	6.3	2.86	2.26	3

Tolerance on Length	Nominal Diameter	Nominal Screw Length				
		4mm or under	Over 4mm to 10mm	Over 10mm to 20mm	Over 20mm to 40mm	Over 40mm
	M3 and M4	-	-0.6	-0.6	-0.8	-1
	M5 and M6	-	-0.8	-1	-1	-1

Description	A pan head, straight shank fastener with a metric thread pitch designed to go through a hole or nut that is pre-tapped to form a mating thread for the screw. The height and diameter of the pan head are between 5 and 20% smaller than a standard pan head.
Applications/ Advantages	Used in applications requiring resistance to corrosive environments. The "Small Pan" head machine screw per JIS-B1111 is a preferred design for use in small electronic components where there is limited clearance area. The M3 and M4 diameters also meet the requirements of SN 213307 Cheese head screws.
Material	A2 Stainless Steel
Hardness	-
Tensile Strength	72,500 psi. minimum
Plating	Stainless machine screws are usually suuplied without any additional finish.

MACHINE SCREWS

JIS B1111 Truss Phillips

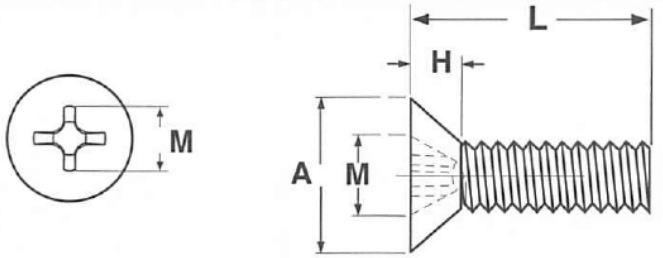


METRIC - JIS-B1111 TRUSS HEAD PHILLIPS MACHINE SCREW							JIS-B1111
Nominal Size	Thread Pitch	A		H		D	Phillips Driver Size
		Head Diameter		Height of Head		Recess Diameter	
		Max	Min	Max	Min	Ref	
M2	0.4	4.5	4.1	1.3	1.1	2.2	1
M2.5	0.45	5.7	5.3	1.6	1.4	2.5	1
M3	0.5	6.9	6.4	2.05	1.75	2.9	1
M4	0.7	9.4	8.9	2.65	2.35	4.3	2
M5	0.8	11.8	11.2	3.25	2.95	5.0	2
M6	1	14	13.3	3.9	3.5	6.3	3

Tolerance on Length	Nominal Diameter	Nominal Screw Length				
		4mm or under	Over 4mm to 10mm	Over 10mm to 20mm	Over 20mm to 40mm	Over 40mm
	M2 and M2.5	-0.3	-0.4	-0.6	-0.8	-
	M3 and M4	-	-0.6	-0.6	-0.8	-1
	M5 and M6	-	-0.8	-1	-1	-1

Description	A straight shank fastener with a low rounded top surface and a flat bearing surface greater in area than a pan head screw of the same size. The screw has a metric thread pitch designed to go through a hole or nut that is pre-tapped to form a mating thread for the screw.	
Applications/ Advantages	The truss head machine screw is a preferred design in applications where minimal clearance exists above the head.	
Material	*Steel*	*Stainless*
	Class 4.8 machine screws shall be made from a carbon steel, partially or fully annealed as required, which conforms to the following chemical composition-- ***Carbon***: 0.55% maximum; ***Phosphorus***: 0.05% maximum; ***Sulfur***: 0.06% maximum.	A2-50 Stainless
Hardness	Rockwell B 71 - 99.5 (Vickers HV 130 - 250)	-
Tensile Strength	420 N/mm² minimum	-
Plating	Parts are typically provided with a clear zinc finish.	Stainless machine screws are typically provided with no additional finish.

DIN 965 & ISO 7045 Torx®
MACHINE SCREWS

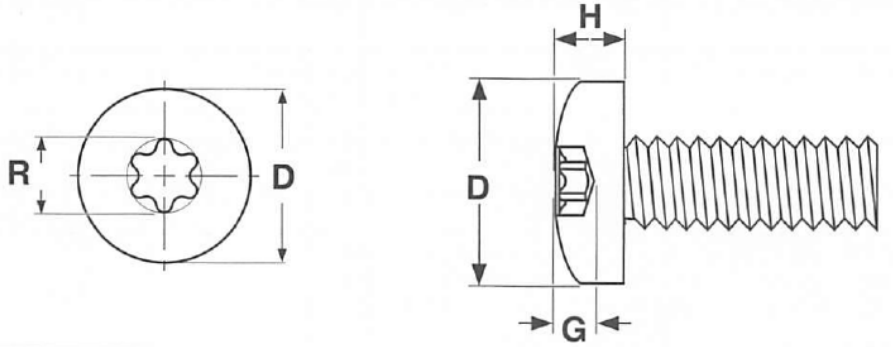


DIN 965 90° Flat Phillips (Type H Recess) Machine Screws

DIN 965

Nominal Diameter	Thread Pitch	A		H	M	Phillips Driver Size
		Head Diameter		Head Height	Recess Diameter	
		Max	Min	Max	Ref	
M1.6	0.35	3	2.7	1	1.7	0
M2.0	0.4	3.8	3.5	1.2	2.5	1
M2.5	0.45	4.7	4.4	1.5	2.70	1
M3.0	0.5	5.6	5.3	1.65	2.8	1
M3.5	0.6	6.5	6.14	1.93	4.2	2
M4.0	0.7	7.5	7.14	2.2	4	2
M5.0	0.8	9.2	8.84	2.5	4.4	2
M6.0	1.0	11	10.57	3	6.1	3
M8	1.25	14.5	14.07	4	8.7	3

Tolerance on Length			
	thru 3mm: ±0.20	over 3 thru 6mm: ±0.24	over 6 thru 10mm: ±0.29
	over 10 thru 18m: ±0.35	over 18 thru 30mm: ±0.42	over 30 thru 50mm: ±0.50



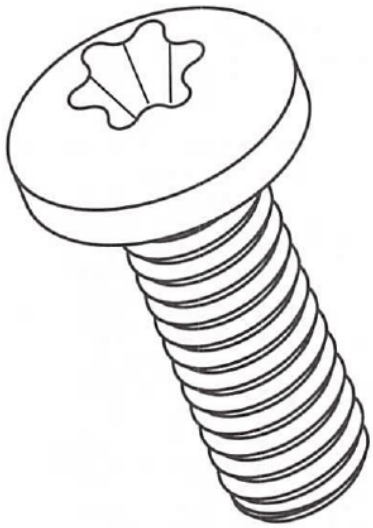
METRIC - ISO 7045 Six-Lobe Pan Head Machine Screws

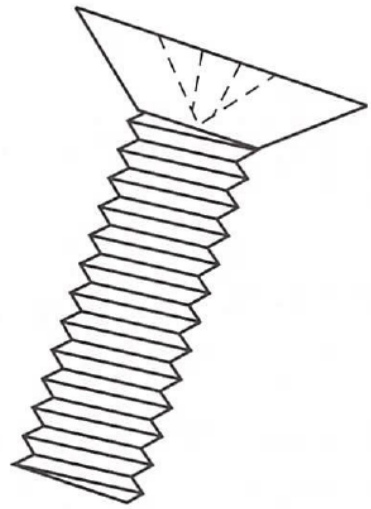
ISO 7045 & Camcar

Screw Size	D		H		R	G		Drive Size
	Head Dimensions				Recess Dimensions			
	Head Diameter		Head Height		Diameter	Gauge Penetration	(Fallaway) Max Penetration	
	Max	Min	Max	Min	Ref	Min		
M2	4.0	3.70	1.60	1.46	1.75	0.63	.35	T6
M2.5	5.0	4.70	2.10	1.96	2.39	0.83	.48	T8
M3	5.6	5.30	2.40	2.26	2.82	0.88	.56	T10
M3.5	7.00	6.64	2.60	2.46	3.35	1.14	.67	T15
M4	8.00	7.64	3.10	2.92	3.94	1.27	.79	T20
M5	9.50	9.14	3.70	3.52	4.52	1.52	.90	T25
M6	12.00	11.57	4.60	4.30	5.61	1.90	1.12	T30
M8	16.00	15.57	6.00	5.70	6.76	2.79	1.18	T40

MACHINE SCREWS

Mechanical & Peformance Requirements

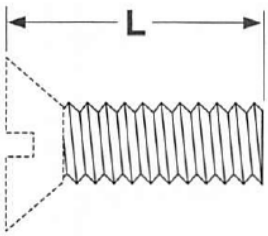


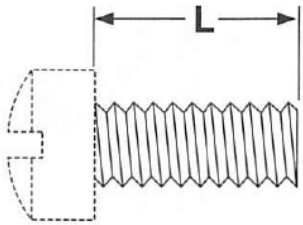


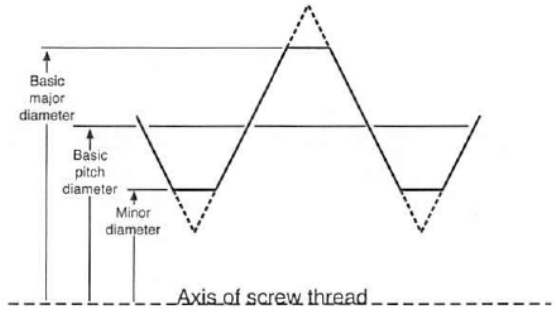
Description	A metric machine screw is a straight shank fastener with a metric thread pitch designed to go through a hole or nut that is pre-tapped to form a mating thread for the screw.	
Applications/ Advantages	Machine screws form a fastening superior in strength to spaced thread screws. Metric screws are the type almost exclusively used in items manufactured in Europe.	
Material	***Steel***	***Stainless***
	Class 4.8 machine screws shall be made from a carbon steel, partially or fully annealed as required, which conforms to the following chemical composition-- ***Carbon***: 0.55% maximum; ***Phosphorus***: 0.05% maximum; ***Sulfur***: 0.06% maximum.	A2 - A4 Stainless
Hardness	Rockwell B 71 - 99.5	-
Tensile Strength	60,900 psi. minimum	72,500 - 101,500 psi.
Plating	See Appendix-A for plating information	

Thread Dimensions

MACHINE SCREWS







METRIC - External Threads for Machine Screws & Cap Screws, Class 6g

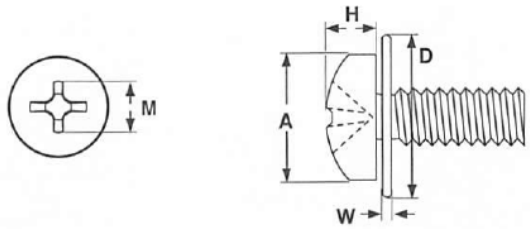
DIN 13; ISO 898-1 & 965

Nominal Size	Major Diameter		Pitch Diameter		Minor Diameter		Stress Area, mm^2	Tensile Strength N, min.		
	Max	Min	Max	Min	Max	Min		Class 4.8	Class 8.8	Class 10.9
M1.6	1.581	1.496	1.354	1.291	1.151	1.075	-	-		
M2	1.981	1.886	1.721	1.654	1.490	1.407	-	-		
M2.5	2.480	2.380	2.188	2.117	1.928	1.840	-	-		
M3	2.980	2.874	2.655	2.580	2.367	2.273	5.03	2110	4020	5230
M4	3.978	3.838	3.523	3.433	3.119	3.002	8.78	3690	7020	9130
M5	4.976	4.826	4.456	4.361	3.995	3.869	14.2	5960	11,350	14,800
M6	5.974	5.794	5.324	5.212	4.747	4.596	20.1	8440	16,100	20,900
M8	7.972	7.760	7.160	7.042	6.438	6.272	36.6	15,400	29,200	38,100
M10	9.968	9.732	8.994	8.862	8.128	7.938	58	24,400	46,400	60,300
M12	11.966	11.701	10.829	10.679	9.819	9.602	84.3	35,400	67,400	87,700
M14	13.962	13.682	12.663	12.503	11.508	11.271	115	48,300	92,000	120,000
M16	15.962	15.682	14.663	14.503	13.508	13.271	157	65,900	125,000	163,000
M20	19.958	19.623	18.334	18.164	16.891	16.625	245	103,000	203,000	255,000
M24	23.952	23.577	22.003	21.803	20.271	19.955	353	148,000	293,000	367,000
M30	29.947	29.522	27.674	27.462	25.653	25.306	561	236,000	466,000	583,000
M36	35.940	35.465	33.342	33.118	31.033	30.655	817	343,000	678,000	850,000

Tolerance on Length	3mm: ±0.2	4-6mm: ±0.24	8-10mm: ±0.29	12-16mm: ±0.35
	20-30mm: ±0.42		35-50mm: ±0.5	55-60mm: ±0.95

SEMS

DIN 7985 Pan Phillips w/ DIN 6902A Captive Flat Washer



METRIC - DIN 7985 PAN PHIL SEMS W/ DIN 6902A FLAT WASHER

DIN 7985 & DIN 6902A

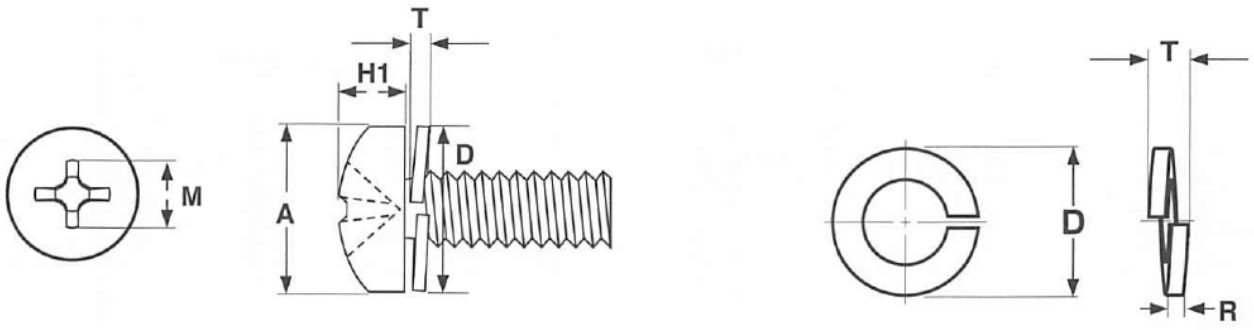
Machine Screw Dimensions									Flat Washer Dimensions				Phillips Driver Size
Nominal Size	Thread Pitch	A		H1				M	D		T1		
		Head Diameter		Height of Head		Penetration Depth		Recess Diameter	Outside Diameter		Thickness		
		Max	Min	Max	Min	Max	Min	Ref	Max	Min	Max	Min	
M3	0.5	6.00	5.70	2.52	2.28	2.00	1.70	3.10	7.00	6.78	0.65	0.55	1
M4	0.7	8.00	7.64	3.25	2.95	2.54	2.04	4.60	9.00	8.78	0.88	0.72	2
M5	0.8	10.00	9.64	3.95	3.65	3.27	2.77	5.30	10.00	9.78	1.06	0.94	2

Tolerance on Length	4mm thru 6mm	+/- 0.24
	8mm thru 10mm	+/- 0.29
	12mm thru 18mm	+/- 0.35
	20mm thru 30 mm	+/- 0.42

Description	A cross-recessed, pan head machine screw with a free-spinning, round captive flat washer.	
Applications/ Advantages	Machine pre-assembly provides cost savings to the end user. The flat washer distributes force more evenly across the bearing surface and compensates for oversized holes.	
Component	***Screw***	***Captive Flat Washer***
Material	C1022 or equivalent carbon steel	C1008 or equivalent carbon steel
Hardness	Rockwell B 67 minimum	Vickers HV 200 - 250
Tensile Strength	400 N/mm² (applies to screws with a minimum nominal length of 2.5d (where d is the nominal diameter of the screw)	-
Plating	Sems are available in a clear zinc finish and baked after plating.	

ISO 7045 Pan Phillips Helical Split L/W

SEMS



METRIC - ISO 7045 Pan Phil Split Lockwasher SEMS

ISO 7045

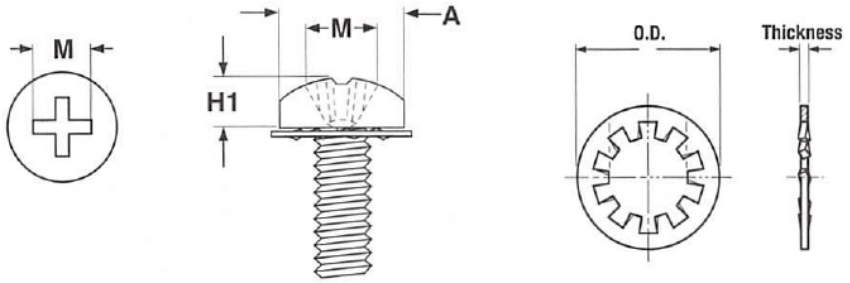
Machine Screw Dimensions							Split Lockwasher Dimensions					Phillips Driver Size
Nominal Size	Thread Pitch	A		H1		M	D	T		R		
		Head Diameter		Height of Head		Recess Diameter	Outside Diameter	Free Height		Section Thickness		
		Max	Min	Max	Min	Ref	Max	Max	Min	Max	Min	
M2	0.4	4	3.7	1.6	1.46	2.2	3.7	-	0.85	0.80	0.60	1
M2.5	0.45	5	4.7	2.1	1.96	2.70	4.90	-	1	0.80	0.79	1
M3	0.5	5.6	5.3	2.40	2.26	3	5.6	1.3	1.1	0.80	0.60	1
M4	0.7	8	7.64	3.1	2.92	4.4	6.8	1.4	1.2	0.90	0.70	2
M5	0.8	9.5	9.14	3.7	3.52	4.9	8.34	-	2.2	-	1.42	2

Tolerance on Length	over 3mm to 6mm	± 0.24
	over 6mm to 10mm	± 0.29
	over 10mm to 18 mm	±0.35
	over 18mm to 30 mm	±0.42

Description	A cross-recessed, pan head machine screw with a free-spinning, captive, helical split lockwasher.	
Applications/ Advantages	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. The split lockwasher variety is preferred for use with hardened bearing surfaces.	
Material	***Steel***	***Stainless***
	Screw: C1008 or equivalent carbon steel Washer: Spring Steel	Screw: Class 304 SS Washer: Class 304 SS
Hardness	Screw: Rockwell B 67 minimum Washer: HV 430 - 530	-
Tensile Strength	400 N/mm² (applies to screws with a minimum nominal length of 2.5*d* (where d is the nominal diameter of the screw)	-
Plating	Sems are available in a clear zinc finish and baked after plating.	Stainless sems are usually supplied without a secondary finish.

SEMS

ISO 7045 Pan Phillips Internal Tooth L/W



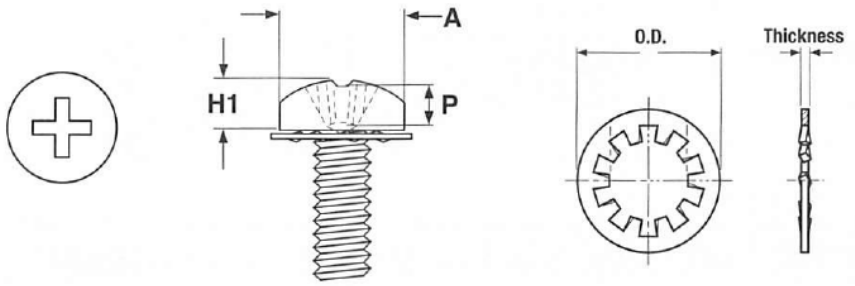
METRIC - ISO 7045 PAN PHIL INTERNAL TOOTH SEMS											ISO 7045*
Machine Screw Dimensions							Internal Tooth Lockwasher Dimensions				
Nominal Size	Thread Pitch	A		H1		M	O.D.		Material Thickness		Phillips Driver Size
		Head Diameter		Height of Head		Recess Diameter	Outside Diameter				
		Max	Min	Max	Min	Ref	Max	Min	Max	Min	
M3	0.5	5.6	5.3	2.40	2.26	3	7.35	6.85	0.45	0.30	1
M4	0.7	8.00	7.64	3.10	2.92	4.4	8.75	8.25	0.60	0.45	2

Tolerance on Length		
	over 3mm to 6mm	± 0.24
	over 6mm to 10mm	± 0.29
	over 10mm to 18 mm	±0.35
	over 20mm to 30mm	±0.42

*Washers to ASME B18.13.1M

Description	A cross-recessed, pan head machine screw with a free-spinning, internal tooth captive lockwasher.			
Applications/ Advantages	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. The internal tooth variety is recommended when it is desirable to hide the teeth for appearance or to prevent snagging.			
Component	*Screw*	*Internal Tooth Lockwasher*	*Screw*	*Internal Tooth Lockwasher*
Material	Class 4.8 Steel		Stainless	
	C1008 or equivalent carbon steel	C1050 Carbon Steel	A2 Stainless	A2 Stainless
Hardness	Rockwell B 67 minimum	410 - 490 HV 5	-	-
Tensile Strength	60,900 psi.	-	72,500 - 101,500 psi.	-
Plating	Sems are available in a clear zinc finish and baked after plating.		Sems are provided with no additional finish	

DIN 7985 Pan Phillips Internal Tooth L/W SEMS



METRIC - DIN 7985 PAN PHIL INTERNAL TOOTH SEMS												DIN 7985*
Machine Screw Dimensions								Internal Tooth Lockwasher Dimensions				
Nominal Size	Thread Pitch	A		H1		P		O.D.		Material Thickness		Phillips Driver Size
		Head Diameter		Height of Head		Recess Penetration		Outside Diameter				
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
M3	0.5	6	5.7	2.52	2.28	2	1.7	7.35	6.85	0.45	0.30	1

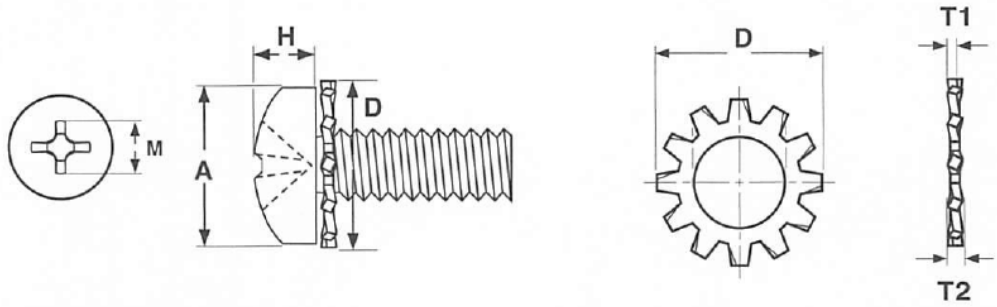
Tolerance on Length	
over 3mm to 6mm	± 0.24
over 6mm to 10mm	± 0.29
over 10mm to 18 mm	±0.35
over 20mm to 30mm	±0.42

*Washers to ASME B18.13.1M

Description	A cross-recessed, pan head machine screw with a free-spinning, internal tooth captive lockwasher.			
Applications/ Advantages	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. The internal tooth variety is recommended when it is desirable to hide the teeth for appearance or to prevent snagging.			
Component	*Screw*	*Internal Tooth Lockwasher*	*Screw*	*Internal Tooth Lockwasher*
Material	Class 4.8 Steel		Stainless	
	C1008 or equivalent carbon steel	C1050 Carbon Steel	A2 Stainless	A2 Stainless
Hardness	Rockwell B 67 minimum	410 - 490 HV 5	-	-
Tensile Strength	60,900 psi.	-	72,500 - 101,500 psi.	-
Plating	Sems are available in a clear zinc finish and baked after plating.		Sems are provided with no additional finish	

SEMS

ISO 7045 Pan Phillips External Tooth L/W



METRIC - ISO 7045 Pan Phil External Tooth SEMS

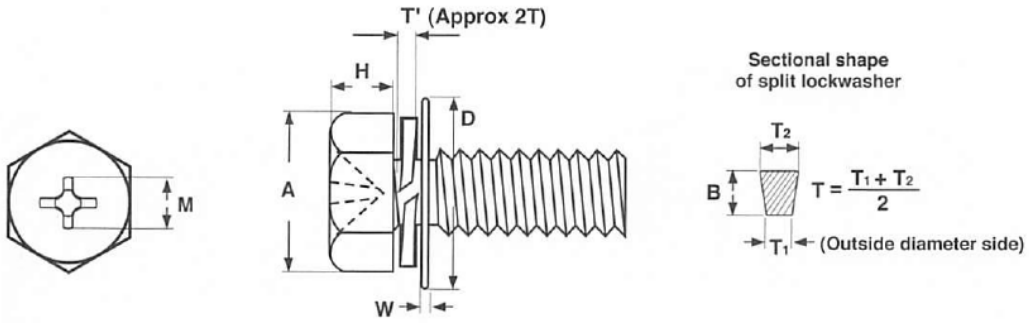
ISO 7045

Machine Screw Dimensions							External Tooth Lockwasher Dimensions					Phillips Driver Size
Nominal Size	Thread Pitch	A		H1		M	D		T1		T2	
		Head Diameter		Height of Head		Recess Diameter	Outside Diameter		Material Thickness		Free Height	
		Max	Min	Max	Min	Ref	Max	Min	Max	Min	Min	
M2	0.4	4.0	3.7	1.60	1.46	1.9	4.5	4.2	0.5	0.3	-	0
M2.5	0.45	5.00	4.70	2.10	1.96	2.70	5.84	5.59	0.51	0.36	-	1
M3	0.5	5.6	5.3	2.40	2.26	3	6.0	5.82	0.44	0.36	0.80	1
M4	0.7	8.00	7.64	3.10	2.92	4.4	7.35	7.15	0.68	0.58	0.80	2
M5	0.8	9.50	9.14	3.70	3.52	4.9	10.0	9.6	0.5	0.3	-	2
M6	1	12	11.57	4.6	4.3	5.9	12.1	11.6	0.75	0.60	-	3

Tolerance on Length	
over 3mm to 6mm	± 0.24
over 6mm to 10mm	± 0.29
over 10mm to 18 mm	±0.35
over 20mm to 30mm	±0.42

Description	A cross-recessed, pan head machine screw with a free-spinning, external tooth captive lockwasher.			
Applications/ Advantages	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. The external tooth variety offers greater torsional resistance than an internal tooth Sems.		Offers same advantages of the steel variety but with superior resistance to corrossion.	
Component	*Screw*	*External Tooth Lockwasher*	*Screw*	*External Tooth Lockwasher*
Material	*Steel*		*Stainless*	
	C1008 or equivalent carbon steel	C1050 Carbon Steel	A2 Stainless	A4 Stainless
Hardness	Rockwell B 67 minimum	410 - 490 HV 5	-	-
Tensile Strength	400 N/mm² (applies to screws with a minimum nominal length of 2.5d where d is the nominal diameter of the screw)	-	72,500 psi min.	-
Plating	Sems are available in a clear zinc finish and baked after plating.		Parts are usually supplied without a supplemental finish.	

JIS B1187 Hex Phillips Split Lockwasher/Flat Washer SEMS



METRIC - JIS-B1187 PHILLIPS HEX SPLIT WASHER / FLAT WASHER SEMS

JIS-B1187 & JIS-B1180

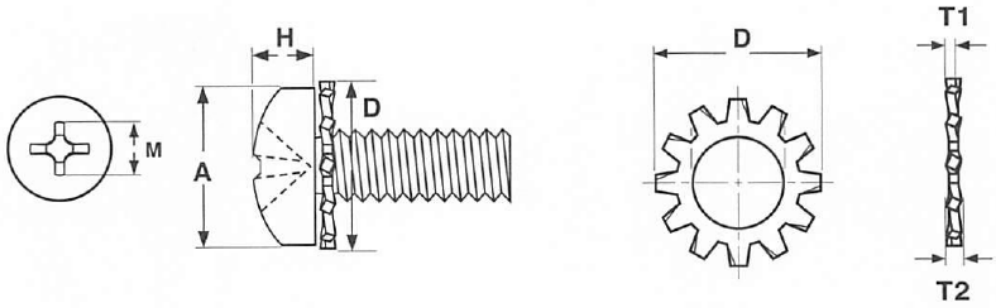
Screw Dimensions							Flat Washer				Split Washer		
Nominal Size	Thread Pitch	A		H		M	D		W		D1	B(min) x T (min)	Phillips Drive Size
		Head Diameter Across the Flats		Head Height		Recess Diam	Outside Diameter		Thickness		Outside Diameter		
		Max	Min	Max	Min	Ref	Max	Min	Max	Min	Max		
M3	0.5	5.5	5.32	2.125	1.875	3.6	7	6.65	0.55	0.45	5.5	1.1 x 0.7	2

Tolerance on Length	Nominal Screw Size	Nominal Screw Lengths			
		Up to 10 mm	Over 10 mm to 20 mm, incl.	Over 20 mm to 40 mm, incl.	Over 40 mm
	M3 to M4	-0.6	-0.6	-0.8	-1
	M5 to M8	-0.8	-1	-1	-1

Description	A cross-recessed, hex head machine screw with two free-spinning, captive washers. Directly below the hex head is a helical split lockwasher; beneath the split lockwasher is a round flat washer.		
Applications/ Advantages	This double washer sems screw is typically a more economical alternative to a patented conical washer sems screw. The phillips hex variety is preferred in the electronics industry where initial installation is performed with a nut driver, but the finished product has minimal clearance requiring a phillips driver to loosen the screw.		
Component	***Screw***	***Split Lockwasher***	***Flat Washer***
Material	Class 4.8 carbon steel	Split lockwashers shall be made from a carbon steel that conforms to the following chemical composition requirements: ***Carbon:*** 0.54 - 0.81%; ***Silicon***: 0.15 - 0.35%; ***Manganese***: 0.30 - 0.90%; ***Phosphorus***: 0.030% max.; ***Sulfur***: 0.030% max.	Plain washers shall be made from a carbon steel that conforms to the following chemical composition requirements: ***Carbon:*** 0.12% max.; ***Manganese***: 0.50% max.; ***Phosphorus***: 0.040% max.; ***Sulfur***: 0.045% max.
Hardness	Rockwell B 71 minimum	Rockwell C 42 - 50	Rockwell B 60 maximum
Plating	Sems are available in zinc yellow and clear zinc finishes, and baked after plating.		

SEMS

JIS B1188 Pan Phillips External Tooth Lockwasher



METRIC - JIS B1188 Pan Phil External Tooth SEMS

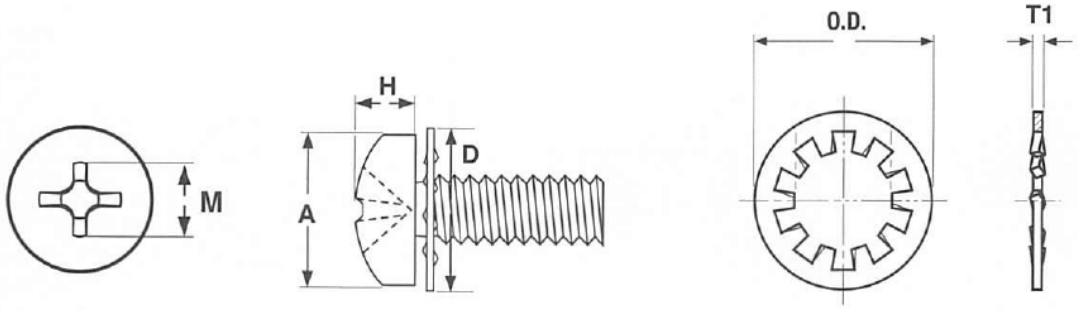
JIS B1188

Machine Screw Dimensions							External Tooth Lockwasher Dimensions					Phillips Driver Size
Nominal Size	Thread Pitch	A		H1		M	D		T1		T2	
		Head Diameter		Height of Head		Recess Diameter	Outside Diameter		Material Thickness		Free Height	
		Max	Min	Max	Min	Ref	Max	Min	Max	Min	Ref	
M3	0.5	5.5	5.0	2.15	1.85	3.6	6.5	6.1	0.485	0.415	0.90	2

Tolerance on Length		
	up to 10 mm	- 0.6
	over 10 mm to 20 mm	- 0.6
	over 20 mm to 40 mm	- 0.8

Description	A cross-recessed, pan head machine screw with a free-spinning, external tooth captive lockwasher.	
Applications/ Advantages	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. The external tooth variety offers greater torsional resistance than an internal tooth Sems.	
Component	***Screw***	***External Tooth Lockwasher***
Material	C1008 or equivalent carbon steel	C1050 Carbon Steel
Hardness	Rockwell B 67 minimum	410 - 490 HV 5
Tensile Strength	400 N/mm² (applies to screws with a minimum nominal length of 2.5d where d is the nominal diameter of the screw)	-
Plating	Sems are available in a clear zinc finish and baked after plating.	

JIS B1188 Pan Phillips Internal Tooth Lockwasher SEMS



METRIC - JIS B1188 PAN PHIL INTERNAL TOOTH SEMS

JIS B1188

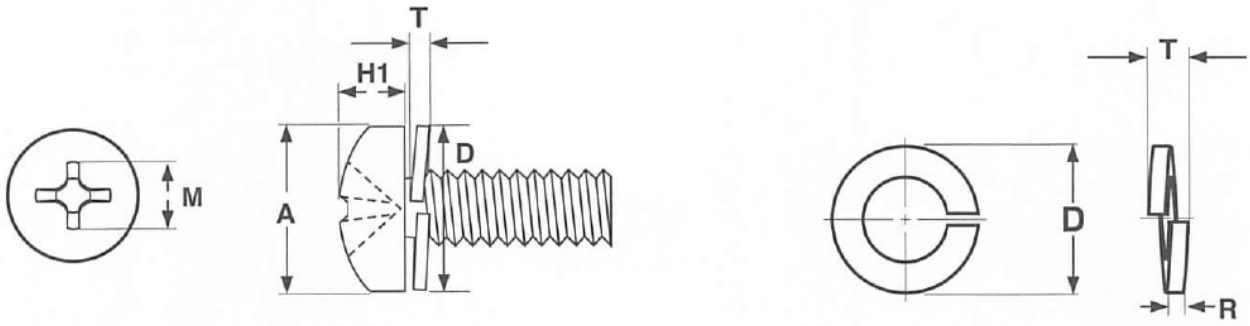
Machine Screw Dimensions							Internal Tooth Lockwasher Dimensions				Phillips Driver Size
Nominal Size	Thread Pitch	A		H		M	O.D.		T1		
		Head Diameter		Height of Head		Recess Diameter	Outside Diameter		Material Thickness		
		Max	Min	Max	Min	Ref	Max	Min	Max	Min	
M3	0.5	5.5	5.0	2.15	1.85	3.6	6.50	6.10	0.485	0.415	2

Tolerance on Length		
	up to 10 mm	- 0.6
	over 10 mm to 20 mm	- 0.6
	over 20 mm to 40 mm	- 0.8

Description	A cross-recessed, pan head machine screw with a free-spinning, internal tooth captive lockwasher.	
Applications/ Advantages	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. The internal tooth variety is recommended when it is desirable to hide the teeth for appearance or to prevent snagging.	
Component	***Screw***	***Internal Tooth Lockwasher***
Material	C1008 or equivalent carbon steel	C1050 Carbon Steel
Hardness	Rockwell B 67 minimum	410 - 490 HV 5
Tensile Strength	400 N/mm² (applies to screws with a minimum nominal length of 2.5d where d is the nominal diameter of the screw)	-
Plating	Sems are available in a clear zinc finish and baked after plating.	

SEMS

JIS B1188 Pan Phillips Helical Split Lockwasher

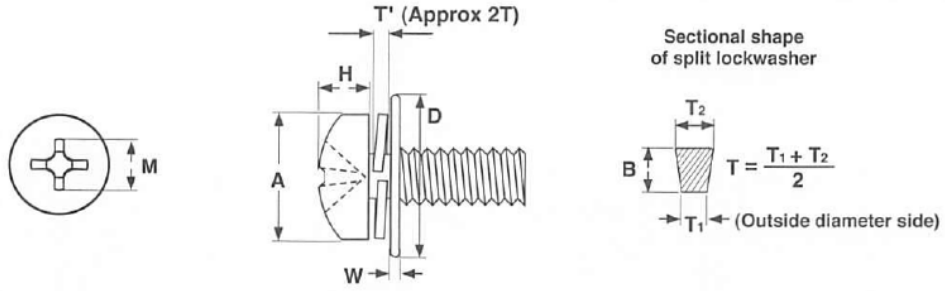


METRIC - JIS B1188 PAN PHIL SPLIT LOCKWASHER SEMS										JIS B1188
Machine Screw Dimensions							Split Lockwasher Dimensions			
Nominal Size	Thread Pitch	A		H1		M	D	T	R	Phillips Driver Size
		Head Diameter		Height of Head		Recess Diameter	Outside Diameter	Free Height After Compression Test	Section Thickness	
		Max	Min	Max	Min	Ref	Max	Ref	Min	
M2	0.4	3.5	3.1	1.4	1.2	2.2	4	0.85	0.50	1
Tolerance on Length				over 3mm to 6mm			± 0.24			

Description	A cross-recessed, pan head machine screw with a free-spinning, captive, helical split lockwasher.	
Applications/ Advantages	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. The split lockwasher variety is preferred for use with hardened bearing surfaces.	
Component	***Screw***	***Helical Split Lockwasher***
Material	C1008 or equivalent carbon steel	Spring Steel
Hardness	Rockwell B 67 minimum	HV 430 - 530
Tensile Strength	400 N/mm² (applies to screws with a minimum nominal length of 2.5*d* where d is the nominal diameter of the screw)	-
Plating	Sems are available in a clear zinc finish and baked after plating.	

JIS B1188 *Small Pan* Phillips Split Lockwasher/Flat Washer

SEMS



METRIC - JIS B1188 PHILLIPS SMALL PAN SPLIT WASHER / FLAT WASHER SEMS

JIS B1188

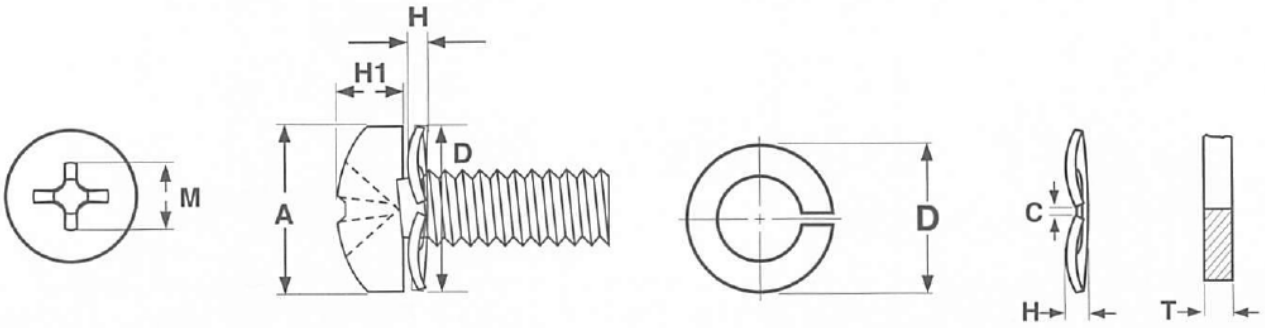
Screw Dimensions							Flat Washer				Split Washer		
Nominal Size	Thread Pitch	A		H		M	D		W		D1	B(min) x T (min)	Phillips Drive Size
		Head Diameter		Head Height		Recess Diam	Outside Diameter		Thickness		Outside Diameter		
		Max	Min	Max	Min	Ref	Max	Min	Max	Min	Max		
M2	0.4	3.5	3.1	1.4	1.2	2.2	5	4.7	0.34	0.26	4	0.9 x 0.5	1
M2.5	0.45	4.5	4.1	1.8	1.6	2.6	6.5	6.15	0.55	0.45	4.8	1 x 0.6	1
M3	0.5	5.5	5	2.15	1.85	3.6	7	6.65	0.55	0.45	5.5	1.1 x 0.7	2
							6	5.7	0.55	0.45			
M4	0.7	7	6.5	2.75	2.45	4.2	9	8.65	0.9	0.7	7	1.4 x 1	2
M5	0.8	9	8.4	3.45	3.15	4.9	10	9.65	1.1	0.9	8.5	1.7 x 1.3	2
M6	1.0	10.5	9.8	4.1	3.7	6.3	12.5	12.1	1.75	1.45	11.5	2.7 x 1.5	3

Tolerance on Length	Nominal Screw Size	Nominal Screw Lengths			
		Up to 10 mm	Over 10 mm to 20 mm, incl.	Over 20 mm to 40 mm, incl.	Over 40 mm
	M2.5	-0.4	-0.6	-0.8	-
	M3 to M4	-0.6	-0.6	-0.8	-1
	M5 to M8	-0.8	-1	-1	-1

Description	A cross-recessed, pan head machine screw with two free-spinning, captive washers. Directly below the pan head is a helical split lockwasher; beneath the split lockwasher is a round flat washer. The diameter and height of the pan head are between 5% and 20% smaller than a standard pan head.		
Applications/ Advantages	This double washer sems screw is typically a more economical alternative to a patented conical washer sems screw. They are commonly used in the electronics industry.		
Component	***Screw***	***Split Lockwasher***	***Flat Washer***
Material	Class 4.8 carbon steel	Split lockwashers shall be made from a carbon steel that conforms to the following chemical composition requirements: ***Carbon:*** 0.54 - 0.81%; ***Silicon:*** 0.15 - 0.35%; ***Manganese:*** 0.30 - 0.90%; ***Phosphorus:*** 0.030% max.; ***Sulfur:*** 0.030% max.	Plain washers shall be made from a carbon steel that conforms to the following chemical composition requirements: ***Carbon:*** 0.12% max.; ***Manganese:*** 0.50% max.; ***Phosphorus:*** 0.040% max.; ***Sulfur:*** 0.045% max.
Hardness	Rockwell B 71 minimum	Rockwell C 42 - 50	Rockwell B 60 maximum
Tensile Strength	420 N/mm² (applies to screws with a minimum nominal length of 2.5d (where *d* is the nominal diameter of the screw)	-	-
Plating	Sems are available in zinc yellow and clear zinc finishes, and baked after plating.		

SEMS

DIN 7985 Pan Phillips w/ DIN 6905 Spring Lock Washer



C ≤ (0.9H min.)

METRIC - DIN 7985 PAN PHIL SPRING LOCKWASHER SEMS

DIN 7985
DIN 6905

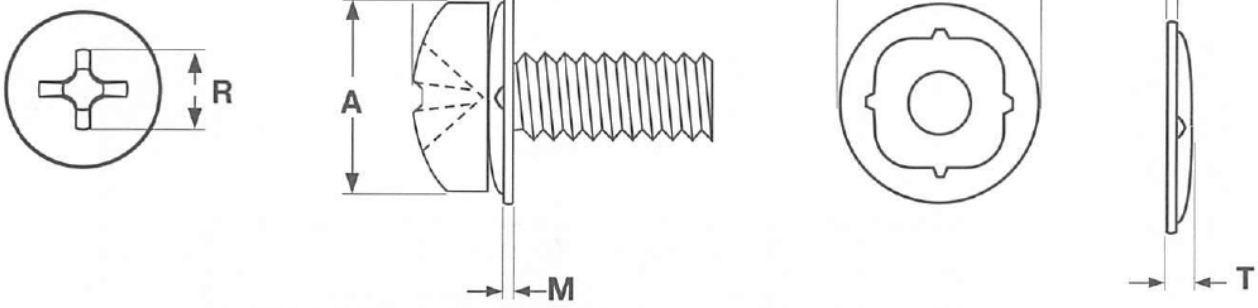
Machine Screw Dimensions							Spring Lockwasher Dimensions					Phillips Driver Size
Nominal Size	Thread Pitch	A		H1		M	D	H		T		
		Head Diameter		Height of Head		Recess Diameter	Outside Diameter	Free Height		Section Thickness		
		Max	Min	Max	Min	Ref	Max	Max	Min	Max	Min	
M3	0.5	6.00	5.70	2.52	2.28	3.10	5.6	1.3	1.1	0.80	0.60	1
M4	0.7	8.00	7.64	3.25	2.95	4.60	6.95	1.4	1.2	0.90	0.70	2

Tolerance on Length	4mm thru 6mm	± 0.24
	8mm thru 10mm	± 0.29
	12mm thru 18 mm	±0.35
	20mm thru 30 mm	±0.42

Description	A cross-recessed, pan head machine screw with a free-spinning, captive, spring lockwasher.	
Applications/ Advantages	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. The spring lockwasher variety is preferred for use with hardened bearing surfaces.	
Component	***Screw***	***Spring Lockwasher***
Material	Class 4.8 steel	Spring Steel
Hardness	Rockwell B 71 - 99.5	HV 350 - 425
Tensile Strength	60,900 psi.	-
Plating	Sems are available in a clear zinc finish and baked after plating.	

ISO 7045 Pan Phillips Conical L/W—Steel & Stainless

SEMS



METRIC - ISO 7045 Pan Phil Conical Washer SEMS

ISO 7045

Machine Screw Dimensions							Conical Lockwasher Dimensions					Phillips Driver Size
Nominal Size	Thread Pitch	A		H		R	D		T		M	
		Head Diameter		Height of Head		Recess Diameter	Outside Diameter		Total Height		Material Thick-ness	
		Max	Min	Max	Min	Ref	Max	Min	Max	Min	Min	
M3	0.5	5.60	5.31	2.39	2.21	3.0	6.37	6.20	1.00	0.58	0.38	1
M4	0.7	7.99	7.63	3.11	2.82	4.4	8.48	8.21	1.66	1.32	0.76	2

Tolerance on Length	over 3mm to 6mm	± 0.24
	over 6mm to 10mm	± 0.29
	over 10mm to 18 mm	±0.35
	over 20mm to 30mm	±0.42

Description	A cross-recessed, pan head machine screw with a free-spinning, conical captive lockwasher.			
Applications/ Advantages	The conical washer Sems offers a controlled tension with minimal torque while providing a higher retained clamp load than possible with other styles of lockwashers. The Sems can withstand a high tension load and still have the conical washer maintain its spring action. This style of Sems is preferred when fastening more fragile materials since its load is spread to the outermost diameter of the lockwasher.			
Component	*Screw*	*Conical Lockwasher*	*Screw*	*Conical Lockwasher*
Material	*Steel*		*Stainless*	
	C1008 or equivalent carbon steel	C1050 - 1065 or equivalent steel	Class 302 Stainless	410 Stainless
Hardness	Rockwell B 67 minimum	Rockwell C 40-48	-	Rockwell C 40-50
Tensile Strength	60,900 psi min.	-	72,500 - 101,500 psi	-
Plating	Sems are available in a clear zinc finish and baked after plating.		Stainless Sems are usually supplied without an additional finish.	

MACHINE SCREW & SEMS

Conversion Chart

Thread Pitch Comparison	
Millimeters	Threads per Inch
0.25	101.5
0.3	84.75
0.35	72.5
0.4	63.5
0.45	56.5
0.5	50.75
0.6	42.5
0.7	36.5
0.75	33.75
0.8	31.75
0.9	28.5
1	25.5
1.25	20.25
1.5	17
1.75	14.5
2	12.75
2.5	10.25
3	8.5
3.5	7.25
4	6.25
4.5	5.5
5	5.25
5.5	4.5
6	4.25

Thread Dimensions

CAP SCREWS & BOLTS

METRIC - External Threads for Cap Screws, Class 6g

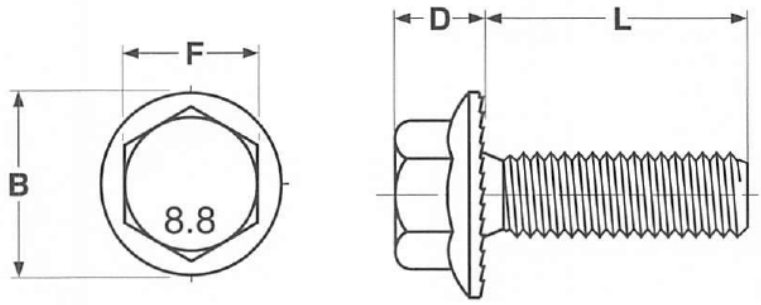
DIN 13; ISO 898-1 & 965

Nominal Size	Major Diameter		Pitch Diameter		Minor Diameter		Stress Area, mm^2	Tensile Strength N, min.		
	Max	Min	Max	Min	Max	Min		Class 4.8	Class 8.8	Class 10.9
M1.6	1.581	1.496	1.354	1.291	1.151	1.075	-	-		
M2	1.981	1.886	1.721	1.654	1.490	1.407	-	-		
M2.5	2.480	2.380	2.188	2.117	1.928	1.840	-	-		
M3	2.980	2.874	2.655	2.580	2.367	2.273	5.03	2110	4020	5230
M4	3.978	3.838	3.523	3.433	3.119	3.002	8.78	3690	7020	9130
M5	4.976	4.826	4.456	4.361	3.995	3.869	14.2	5960	11,350	14,800
M6	5.974	5.794	5.324	5.212	4.747	4.596	20.1	8440	16,100	20,900
M8	7.972	7.760	7.160	7.042	6.438	6.272	36.6	15,400	29,200	38,100
M10	9.968	9.732	8.994	8.862	8.128	7.938	58	24,400	46,400	60,300
M12	11.966	11.701	10.829	10.679	9.819	9.602	84.3	35,400	67,400	87,700
M14	13.962	13.682	12.663	12.503	11.508	11.271	115	48,300	92,000	120,000
M16	15.962	15.682	14.663	14.503	13.508	13.271	157	65,900	125,000	163,000
M20	19.958	19.623	18.334	18.164	16.891	16.625	245	103,000	203,000	255,000
M24	23.952	23.577	22.003	21.803	20.271	19.955	353	148,000	293,000	367,000
M30	29.947	29.522	27.674	27.462	25.653	25.306	561	236,000	466,000	583,000
M36	35.940	35.465	33.342	33.118	31.033	30.655	817	343,000	678,000	850,000

Tolerance on Length	3mm: ±0.2	4-6mm: ±0.24	8-10mm: ±0.29	12-16mm: ±0.35
	20-30mm: ±0.42		35-50mm: ±0.5	55-60mm: ±0.95

CAP SCREWS & BOLTS

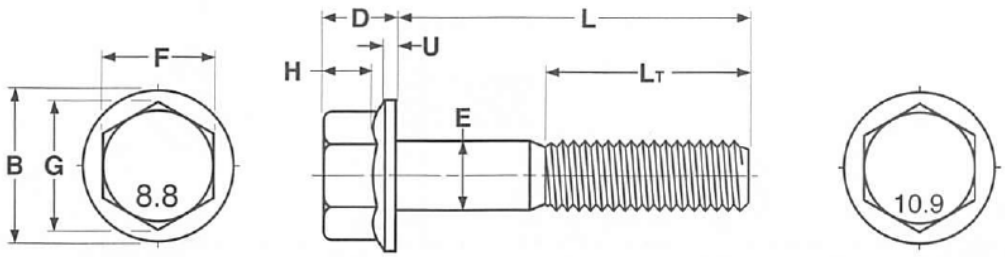
DIN 6921
Serrated Flange Bolts



DIN 6921 SERRATED HEX FLANGE BOLTS						DIN 6921
Nominal Size	Thread Pitch	F		D	B	
		Width Across Flats		Total Head Height	Flange Diameter	
		Max	Min	Max	Max	Min
M5	0.8	8	7.78	5.4	11.8	-
M6	1	10	9.78	6.6	14.2	12.2
M8	1.25	13	12.73	8.1	18	16.8
Tolerance on Length	12 thru 16mm: ±0.35mm		20mm thru 30mm: ±0.42m		35 thru 50mm: ±0.5 mm	
	55 thru 80 mm: ±0.6 mm		90 thru 120 mm: ±0.7 mm		130 thru 180 mm: ±0.8 mm	

Description	A one-piece hex washer head bolt with a serrated bearing surface, made of medium carbon steel.
Applications / Advantages	Designed for use in applications where loosening forces, such as vibration, are present. After being installed, the serrations grip to the bearing surface so that significantly greater torque is needed to loosen the fastener than to tighten it. Can eliminate the need for a lockwasher or locknut in certain applications.
Material	**Class 8.8** carbon steel chemical composition: Carbon- 0.15 - 0.55%; Phosphorous- 0.35% max; Sulphur- 0.35% max
Tempering Temperature	425° C Minimum
Tensile Strength	Class 8.8: 800 N/mm² min.
Surface Hardness	HR30N 54.0 max.
Core Hardness	Class 8.8: Rockwell C22 - 32
Proof Stress	Class 8.8: 640 N/mm² min.
Elongation after Fracture	Class 8.8: 12 mm
Plating	See Appendix-A for plating information

DIN 6921 Flange Bolts
CAP SCREWS & BOLTS



DIN 6921 Hex Flange Bolts

DIN 6921

Nominal Size	Thread Pitch	E		F		G	D	H	U	B	
		Body Diameter		Width Across Flats		Width Across Corners	Total Head Height	Wrenching Height	Flange Edge Thickness	Flange Diameter	
		Max	Min	Max	Min	Min	Max	Min	Min	Max	Min
M6	1	6	5.82	10	9.78	10.95	6.6	2.6	1.1	14.2	12.2
M8	1.25	8	7.78	13	12.73	14.26	8.1	3.2	1.2	18	16.8
M10	1.5	10	9.78	15	14.73	16.5	9.2	3.6	1.5	22.3	19.6
M12	1.75	12	11.73	16	15.73	17.62	11.5	4.6	1.8	28.6	23.8

Tolerance on Length	12 thru 16mm: ±0.35mm	20mm thru 30mm: ±0.42m	35 thru 50mm: ±0.5 mm
	55 thru 80 mm: ±0.6 mm	90 thru 120 mm: ±0.7 mm	130 thru 180 mm: ±0.8 mm

Thread Lengths (Lt) for DIN 6921 Hex Flange Bolts

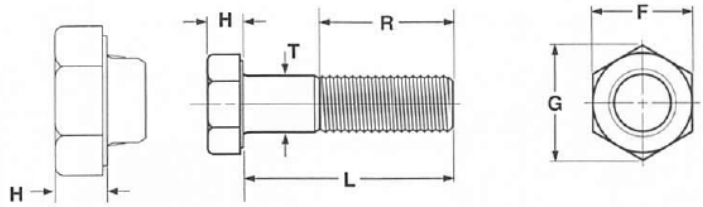
DIN 6921

Nominal Size	Thread Pitch	For Lengths <= 125mm	For Lengths > 125mm <= 200mm	For Lengths > 200mm
M6	1	18		
M8	1.25	22	28	
M10	1.5	26	32	
M12	1.75	30	36	

Description	A one-piece hex washer head bolt with a flat bearing surface, made of medium carbon or high-alloy steel.
Applications / Advantages	Primary use for Class 10.9 bolt is on truck cassis frames. The flange eliminates the need for a flat washer and helps compensate for a misaligned hole. When used with a proper class flange nut, the bolt system resists bolt slippage by distributing the clamp load over a wide area.
Material	**Class 8.8 carbon steel** chemical composition: Carbon- 0.15 - 0.55%; Phosphorous- 0.35% max; Sulphur- 0.35% max **Class 10.9 alloy steel** chemical composition: Carbon- 0.20 - 0.55%; Phosphorous- 0.35% max; Sulphur- 0.35% max
Tempering Temperature	425° C Minimum
Tensile Strength	Class 8.8: 800 N/mm² min.; Class 10.9: 1040 N/mm² min.
Rockwell Hardness	Class 8.8: Rockwell C22 - 32.; Class 10.9: Rockwell C32 - 39
Proof Stress	Class 8.8: 640 N/mm² min.; Class 10.9: 940 N/mm² min.
Elongation after Fracture	Class 8.8: 12 mm; Class 10.9: 9 mm
Plating	Parts are available in various finishes including black phosphate, zinc, or with a plain finish.

CAP SCREWS & BOLTS

Hex Cap Screws DIN 931



METRIC - DIN 931 HEX HEAD CAP SCREWS, COARSE THREAD

DIN 931

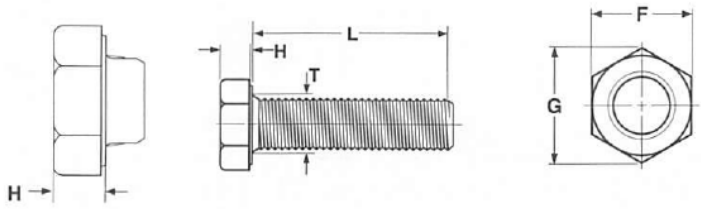
Nominal Size	Thread Pitch	R		H		F		T		G
		Threaded Length		Head Height		Width Across Flats		Body Diameter		Width Across Corners
		L <= 125 mm	L>125mm <=200mm	Max	Min	Max	Min	Max	Min	Min
M6	1	18	24	4.15	3.85	10	9.78	6	5.82	11.05
M8	1.25	22	28	5.45	5.15	13	12.73	8	7.78	14.38
M10	1.5	26	32	6.58	6.22	17	16.73	10	9.78	17.77
M12	1.75	30	36	7.68	7.32	19	18.67	12	11.73	20.03
M16	2	38	44	10.18	9.82	24	23.67	16	15.73	26.75
M20	2.5	46	52	12.72	12.28	30	29.67	20	19.67	33.53
M24	3	54	60	15.22	14.78	36	35.38	24	23.67	39.98

Tolerance on Length	12-16mm: ±0.35	20-30mm: ±0.42	35-50mm: ±0.5	55-80mm: ±0.6
	90-120: ±0.7		130-180mm: ±0.8	

Description	An externally threaded fastener with hexagonal head, washer-face beneath the head, a metric thread pitch, made from medium carbon steel and heat-treated. Threaded shank does not extend completely to the head.	An externally threaded fastener with hexagonal head, washer-face beneath the head, a metric thread pitch, made from high alloy steel and heat-treated. Threaded shank does not extend completely to the head.
Applications/ Advantages	Has greater tensile strength than Class 4.6, 4.8 and 5.8 bolts.	Has greater tensile strength than Class 8.8 bolts; is most comparable but not exactly equivalent to U.S. Grade 8 cap screws.
Material	***Class 8.8***	***Class 10.9***
	Class 8.8 bolts can be made from a carbon steel which conforms to the following chemical composition-- ***Carbon***: 0.25-0.55%; ***Phosphorus***: 0.035% maximum; ***Sulfur***: 0.035% maximum.	Class 10.9 bolts can be made from an alloy steel which conforms to the following chemical composition-- ***Carbon***: 0.20-0.55%; ***Phosphorus***: 0.035% maximum; ***Sulfur***: 0.035% maximum; and shall contain one or more of the following elements: Chromium, Nickel, Molybdenum or Vanadium
Heat Treatment	Class 8.8 bolts shall be heat treated by quenching in a liquid medium from above the transformation temperature and reheating to a tempering temperature of 425°C.	Class 10.9 bolts shall be heat treated by quenching in oil from above the transformation temperature and reheating to a tempering temperature of 425°C.
Core Hardness	***For diameters less than or equal to 16mm:*** Rockwell C22 - 32 *For diameters greater than 16mm:* Rockwell C23 - 34	*All diameters:* Rockwell C32 - 39
Yield Strength	***For diameters less than or equal to 16mm:*** 92,800 psi. minimum *For diameters greater than 16mm:* 95,700 psi. minimum	*All diameters:* 136,300 psi. minimum
Tensile Strength	***For diameters less than or equal to 16mm:*** 116,000 psi. minimum *For diameters greater than 16mm:* 120,350 psi. minimum	*All diameters:* 150,800 psi. minimum
Plating	See Appendix-A for plating information	See Appendix-A for plating information

Hex Cap Screws DIN 933

CAP SCREWS & BOLTS



METRIC - DIN 933 Hex Head Fully Threaded Cap Screws, Coarse

DIN 933

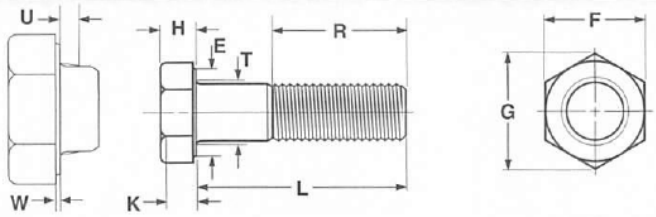
Nominal Size	Thread Pitch	R		H		F		T		G
		Threaded Length		Head Height		Width Across Flats		Body Diameter		Width Across Corners
		L <= 125 mm	L>125mm <=200mm	Max	Min	Max	Min	Max	Min	Min
M6	1	18	24	4.15	3.85	10	9.78	6	5.82	11.05
M8	1.25	22	28	5.45	5.15	13	12.73	8	7.78	14.38
M10	1.5	26	32	6.58	6.22	17	16.73	10	9.78	17.77
M12	1.75	30	36	7.68	7.32	19	18.67	12	11.73	20.03
M16	2	38	44	10.18	9.82	24	23.67	16	15.73	26.75
M20	2.5	46	52	12.72	12.28	30	29.67	20	19.67	33.53
M24	3	54	60	15.22	14.78	36	35.38	24	23.67	39.98

Tolerance on Length	12-16mm: ±0.35	20-30mm: ±0.42	35-50mm: ±0.5	55-80mm: ±0.6
	90-120: ±0.7		130-180mm: ±0.8	

	Class 8.8	Class 10.9
Description	A hex headed externally threaded fastener with washer-face beneath the head, a metric thread pitch, made from medium carbon steel and heat-treated. The threads on the shank extend all of the way to directly beneath the head.	A hex headed externally threaded fastener with washer-face beneath the head, a metric thread pitch, made from high alloy steel and heat-treated. The threads on the shank extend all of the way to directly beneath the head.
Applications/ Advantages	Used to mount motors to machinery. Also popular in automotive and truck repair.	Used in automotive and fleet industries where greater tensile strength is required than can be achieved with a Class 8.8 fastener.
Material	Class 8.8 bolts can be made from a carbon steel which conforms to the following chemical composition-- ***Carbon***: 0.25-0.55%; ***Phosphorus***: 0.035% maximum; ***Sulfur***: 0.035% maximum.	Class 10.9 bolts can be made from an alloy steel which conforms to the following chemical composition-- ***Carbon***: 0.20-0.55%; ***Phosphorus***: 0.035% maximum; ***Sulfur***: 0.035% maximum; and shall contain one or more of the following elements: Chromium, Nickel, Molybdenum or Vanadium
Heat Treatment	Class 8.8 bolts shall be heat treated by quenching in a liquid medium from above the transformation temperature and reheating to a tempering temperature of 425°C.	Class 10.9 bolts shall be heat treated by quenching in oil from above the transformation temperature and reheating to a tempering temperature of 425°C.
Core Hardness	***For diameters less than or equal to 16mm:*** Rockwell C22 - 32 *For diameters greater than 16mm:* Rockwell C23 - 34	*All diameters:* Rockwell C32 - 39
Yield Strength	***For diameters less than or equal to 16mm:*** 92,800 psi. minimum *For diameters greater than 16mm:* 95,700 psi. minimum	*All diameters:* 136,300 psi. minimum
Tensile Strength	***For diameters less than or equal to 16mm:*** 116,000 psi. minimum *For diameters greater than 16mm:* 120,350 psi. minimum	*All diameters:* 150,800 psi. minimum
Plating	See Appendix-A for plating information	See Appendix-A for plating information

CAP SCREWS & BOLTS

Hex Bolts Grade A & B



METRIC - HEX HEAD BOLTS, PRODUCT GRADE A

ISO 4014

Nominal Size	Thread Pitch	R		W		T	U	E	H		F		G	K
		Threaded Length		Washer Face Thickness		Fillet Transition Diameter	Under-head Fillet	Washer Face Diameter	Head Height		Width Across Flats		Width Across Corners	Wrenching Height
		L <= 125 mm	L>125mm <=200mm	Max	Min	Max	Max	Min	Max	Min	Max	Min	Min	Min
M1.6	0.35	9	-	0.25	0.1	2	0.6	2.27	1.225	0.975	3.2	3.02	3.41	0.68
M2	0.4	10	-	0.25	0.1	2.6	0.8	3.07	1.525	1.275	4	3.82	4.32	0.89
M2.5	0.45	11	-	0.25	0.1	3.1	1	4.07	1.825	1.575	5	4.82	5.45	1.1
M3	0.5	12	-	0.4	0.15	3.6	1	4.57	2.125	1.875	5.5	5.32	6.01	1.31
M4	0.7	14	-	0.4	0.15	4.7	1.2	5.88	2.925	2.675	7	6.78	7.66	1.87
M5	0.8	16	-	0.5	0.15	5.7	1.2	6.88	3.65	3.35	8	7.78	8.79	2.35
M6	1	18	-	0.5	0.15	6.8	1.4	8.88	4.15	3.85	10	9.78	11.05	2.7
M8	1.25	22	-	0.6	0.15	9.2	2	11.63	5.45	5.15	13	12.73	14.38	3.61
M10	1.5	26	-	0.6	0.15	11.2	2	14.63	6.58	6.22	16**	15.73	17.77	4.35
M12	1.75	30	-	0.6	0.15	13.7	3	16.63	7.68	7.32	18**	17.73	20.03	5.12
M14	2	34	40	0.6	0.15	15.7	3	19.37	8.98	8.62	21**	20.67	23.36	6.03
M16	2	38	44	0.8	0.2	17.7	3	22.49	10.18	9.82	24	23.67	26.75	6.87
M20	2.5	46	52	0.8	0.2	22.4	4	28.19	12.715	12.285	30	29.67	33.53	8.6
M24	3	54	60 73*	0.8	0.2	26.4	4	33.61	15.215	14.785	36	35.38	39.98	10.35

Tolerance on Length	12-16mm: ±0.35	20-30mm: ±0.42	35-50mm: ±0.5	55-80mm: ±0.6
	90-120: ±0.7		130-150mm: ±0.8	

*For nominal lengths over 200mm.

**DIN 931 spec for maximum width across flats on these three diameters are 17, 19 & 22mm, respectively.

METRIC - HEX HEAD BOLTS, PRODUCT GRADE B

ISO 4014

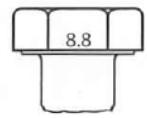
Nominal Size	Thread Pitch	R		W		T	U	E	H		F		G	K
		Threaded Length		Washer Face Thickness		Fillet Transition Diameter	Under-head Fillet	Washer Face Diameter	Head Height		Width Across Flats		Width Across Corners	Wrenching Height
		L>125mm <=200mm	L>200 mm	Max	Min	Max	Max	Min	Max	Min	Max	Min	Min	Min
M16	2	44	-	0.8	0.2	17.7	3	22	10.29	9.71	24	23.16	26.17	6.8
M20	2.5	52	-	0.8	0.2	22.4	4	27.7	12.85	12.15	30	29.16	32.95	8.51
M24	3	60	73	0.8	0.2	26.4	4	33.25	15.35	14.65	36	35	39.55	10.26
M30	3.5	72	85	0.8	0.2	33.4	6	42.75	19.12	18.28	46	45	50.85	12.8
M36	4	84	97	0.8	0.2	39.4	6	51.11	22.92	22.08	55	53.8	60.79	15.46
M42	4.5	96	109	1	0.3	45.6	8	59.95	26.42	25.58	65	63.1	71.3	17.91
M48	5	108	121	1	0.3	52.6	10	69.45	30.42	29.58	75	73.1	82.6	20.71
M56	5.5	-	137	1	0.3	63	12	78.66	35.5	34.5	85	82.8	93.56	24.15
M64	6	-	153	1	0.3	71	13	88.16	40.5	39.5	95	92.8	104.86	27.65

Tolerance on Length	110-120mm: ±1.75	130-180mm: ±2.0	200-240mm: ±2.3	260-300mm: ±2.6
	320-400mm: ±2.85		420-500mm: ±3.15	

Hex Bolts Class 8.8 & 10.9 — CAP SCREWS & BOLTS



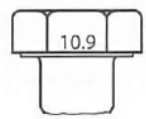
CLASS 8.8 BOLTS



Description	A hex bolt with metric thread pitch made from medium carbon steel and heat-treated. Grade-A bolts are the preferred style for most applications. Grade-B bolts have looser tolerances and can be manufactured in a cold or hot-forging process.
Applications/ Advantages	Has greater tensile strength than Class 4.6, 4.8 and 5.8 bolts.
Material	Class 8.8 bolts can be made from a carbon steel with additives (such as Boron, Manganese or Chromium) which conforms to the following chemical composition-- ***Carbon***: 0.15-0.40%; ***Phosphorus***: 0.035% maximum; ***Sulfur***: 0.035% maximum. In case of plain carbon boron alloyed steel with a carbon content of less than 0.25% (ladle analysis), the minimum Manganese content shall be 0.6%
	Class 8.8 bolts can be made from a carbon steel which conforms to the following chemical composition-- ***Carbon***: 0.25-0.55%; ***Phosphorus***: 0.035% maximum; ***Sulfur***: 0.035% maximum.
Heat Treatment	Class 8.8 bolts shall be heat treated by quenching in a liquid medium from above the transformation temperature and reheating to a tempering temperature of 425°C.
Core Hardness	***For diameters less than or equal to 16mm:*** Rockwell C22 - 32 (Vickers HV 250 - 320) *For diameters greater than 16mm:* Rockwell C23 - 34 (Vickers HV 255 - 335)
Surface Hardness	Shall not be more than 30 Vickers points above the measured core hardness on the product
Proof Load	***For diameters less than or equal to 16mm:*** 640 N/mm² minimum *For diameters greater than 16mm:* 660 N/mm² minimum
Tensile Strength	***For diameters less than or equal to 16mm:*** 800 N/mm² minimum *For diameters greater than 16mm:* 830 N/mm² minimum
Elongation	12% minimum
Plating	See Appendix-A for plating information



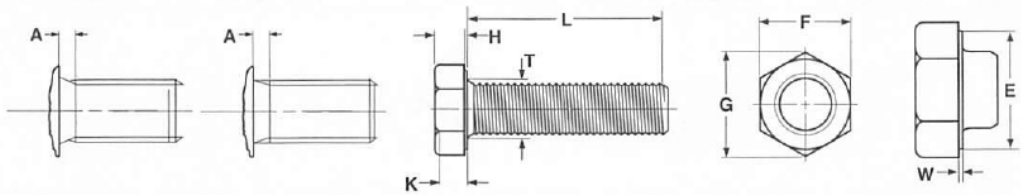
CLASS 10.9 BOLTS



Description	A bolt with metric thread pitch made from medium carbon alloy steel and heat-treated. Grade-A bolts are the preferred style for most applications. Grade-B bolts have looser tolerances and can be manufactured in a cold or hot-forging process.
Applications/ Advantages	Has greater tensile strength than Class 8.8 bolts; is most comparable but not exactly equivalent to U.S. Grade 8 cap screws.
Material	Class 10.9 bolts can be made from a carbon steel which conforms to the following chemical composition-- ***Carbon***: 0.25-0.55%; ***Phosphorus***: 0.035% maximum; ***Sulfur***: 0.035% maximum.
	Class 10.9 bolts can be made from a low carbon martensite steel with additives (such as Boron, Manganese or Chromium) which conforms to the following chemical composition-- ***Carbon***: 0.20-0.55%; ***Phosphorus***: 0.035% maximum; ***Sulfur***: 0.035% maximum. In case of plain carbon boron alloyed steel with a carbon content 0f less than 0.25% (ladle analysis), the minimum Manganese content shall be 0.7%
	Class 10.9 bolts can be made from an alloy steel which conforms to the following chemical composition-- ***Carbon***: 0.20-0.55%; ***Phosphorus***: 0.035% maximum; ***Sulfur***: 0.035% maximum; and shall contain one or more of the following elements: Chromium, Nickel, Molybdenum or Vanadium
Heat Treatment	Class 10.9 bolts shall be heat treated by quenching in oil from above the transformation temperature and reheating to a tempering temperature of 425°C.
Core Hardness	Rockwell C32 - 39 (Vickers HV 320 - 380)
Surface Hardness	Shall not be more than 30 Vickers points above the measured core hardness on the product
Proof Load	940 N/mm² minimum
Tensile Strength	1040 N/mm² minimum
Elongation	9% minimum
Plating	See Appendix-A for plating information

CAP SCREWS & BOLTS

Full Threaded Hex Cap Screws Grade A & B



METRIC - Hex Head Cap Screws, Full Thread, Product Grade A

ISO 4017

Nominal Size	Thread Pitch	A		W		T	E	H		F		G	K
		Thread Run-Out		Washer Face Thickness		Fillet Transition Diameter	Washer Face Diameter	Head Height		Width Across Flats		Width Across Corners	Wrenching Height
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Min	Min
M1.6	0.35	1.05	0.35	0.25	0.1	2	2.27	1.225	0.975	3.2	3.02	3.41	0.68
M2	0.4	1.2	0.4	0.25	0.1	2.6	3.07	1.525	1.275	4	3.82	4.32	0.89
M2.5	0.45	1.35	0.45	0.25	0.1	3.1	4.07	1.825	1.575	5	4.82	5.45	1.1
M3	0.5	1.5	0.5	0.4	0.15	3.6	4.57	2.125	1.875	5.5	5.32	6.01	1.31
M4	0.7	2.1	0.7	0.4	0.15	4.7	6.03	2.925	2.675	7	6.78	7.66	1.87
M5	0.8	2.4	0.8	0.5	0.15	5.7	6.88	3.65	3.35	8	7.78	8.79	2.35
M6	1	3	1	0.5	0.15	6.8	8.88	4.15	3.85	10	9.78	11.05	2.7
M8	1.25	4	1.25	0.6	0.15	9.2	11.63	5.45	5.15	13	12.73	14.38	3.61
M10	1.5	4.5	1.5	0.6	0.15	11.2	14.63	6.58	6.22	16*	15.73	17.77	4.35
M12	1.75	5.3	1.75	0.6	0.15	13.7	16.63	7.68	7.32	18*	17.73	20.03	5.12
M14	2	6	2	0.6	0.15	15.7	19.37	8.98	8.62	21*	20.67	23.36	6.03
M16	2	6	2	0.8	0.2	17.7	22.49	10.18	9.82	24	23.67	26.75	6.87
M20	2.5	7.5	2.5	0.8	0.2	22.4	28.19	12.715	12.285	30	29.67	33.53	8.6
M24	3	9	3	0.8	0.2	26.4	33.61	15.215	14.785	36	35.38	39.98	10.35

Tolerance on Length			
	2-3mm: ±0.2	4-6mm: ±0.24	8-10mm: ±0.29
	12-16mm: ±0.35	20-30mm: ±0.42	35-50mm: ±0.5
	55-80mm: ±0.6	90-120: ±0.7	130-150mm: ±0.8

*DIN 933 spec for maximum width across flats on these three diameters are 17, 19 & 22mm, respectively.

METRIC - Hex Head Cap Screws, Product Grade B

ISO 4017

Nominal Size	Thread Pitch	A		W		T	E	H		F		G	K
		Thread Run-Out		Washer Face Thickness		Fillet Transition Diameter	Washer Face Diameter	Head Height		Width Across Flats		Width Across Corners	Wrenching Height
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Min	Min
M16	2	6	2	0.8	0.2	17.7	22	10.29	9.71	24	23.16	26.17	6.8
M20	2.5	7.5	2.5	0.8	0.2	22.4	27.7	12.85	12.15	30	29.16	32.95	8.51
M24	3	9	3	0.8	0.2	26.4	33.25	15.35	14.65	36	35	39.55	10.26
M30	3.5	10.5	3.5	0.8	0.2	33.4	42.75	19.12	18.28	46	45	50.85	12.8
M36	4	12	4	0.8	0.2	39.4	51.11	22.92	22.08	55	53.8	60.79	15.46
M42	4.5	13.5	4.5	1	0.3	45.6	59.95	26.42	25.58	65	63.1	71.3	17.91
M48	5	15	5	1	0.3	52.6	69.45	30.42	29.58	75	73.1	82.6	20.71
M56	5.5	16.5	5.5	1	0.3	63	78.66	35.5	34.5	85	82.8	93.56	24.15
M64	6	18	6	1	0.3	71	88.16	40.5	39.5	95	92.8	104.86	27.65

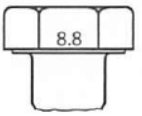
Tolerance on Length				
	60-80mm: ±1.5	90-120mm: ±1.75	130-180mm: ±2.0	200mm: ±2.3

Full Threaded Hex Cap Screws
Class 8.8 & 10.9

CAP SCREWS & BOLTS



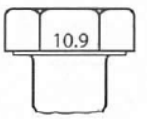
CLASS 8.8 FULL-THREAD CAP SCREWS



Description	A cap screw with metric thread pitch, threaded to the head, made from medium carbon steel and heat-treated. Grade-A bolts are the preferred style for most applications. Grade-B bolts have looser tolerances and can be manufactured in a cold or hot-forging process.
Applications/ Advantages	Has greater tensile strength than Class 4.6, 4.8 and 5.8 cap screws. Being threaded to the head makes the part useful for mounting motors to machinery. They are also used in automotive and truck repair.
Material	Class 8.8 cap screws can be made from a carbon steel with additives (such as Boron, Manganese or Chromium) which conforms to the following chemical composition-- Carbon: 0.15-0.40%; Phosphorus: 0.035% maximum; Sulfur: 0.035% maximum. In case of plain carbon boron alloyed steel with a carbon content of less than 0.25% (ladle analysis), the minimum Manganese content shall be 0.6%
	Class 8.8 cap screws can be made from a carbon steel which conforms to the following chemical composition-- **Carbon**: 0.25-0.55%; **Phosphorus**: 0.035% maximum; **Sulfur**: 0.035% maximum.
Heat Treatment	Class 8.8 cap screws shall be heat treated by quenching in a liquid medium from above the transformation temperature and reheating to a tempering temperature of 425°C.
Core Hardness	***For diameters less than or equal to 16mm:*** Rockwell C22 - 32 (Vickers HV 250 - 320) *For diameters greater than 16mm:* Rockwell C23 - 34 (Vickers HV 255 - 335)
Surface Hardness	Shall not be more than 30 Vickers points above the measured core hardness on the product
Proof Load	***For diameters less than or equal to 16mm:*** 640 N/mm^2 minimum *For diameters greater than 16mm:* 660 N/mm^2 minimum
Tensile Strength	***For diameters less than or equal to 16mm:*** 800 N/mm^2 minimum *For diameters greater than 16mm:* 830 N/mm^2 minimum
Elongation	12% minimum
Plating	See Appendix-A for plating information



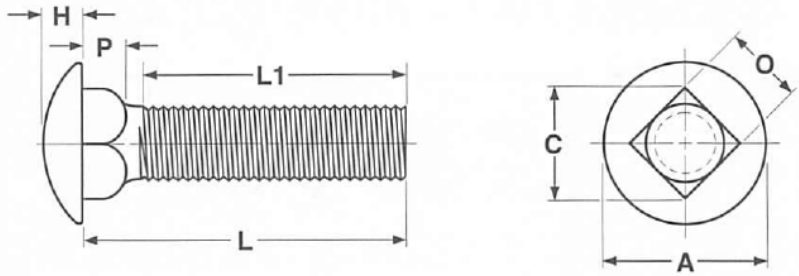
CLASS 10.9 FULL-THREAD CAP SCREWS



Description	A cap screw with metric thread pitch, threaded to the head, made from medium carbon alloy steel and heat-treated. Grade-A bolts are the preferred style for most applications. Grade-B bolts have looser tolerances and can be manufactured in a cold or hot-forging process.
Applications/ Advantages	Has greater tensile strength than Class 8.8 full-thread cap screws. Is most comparable but not exactly equivalent to U.S. Grade 8 cap screws.
Material	Class 10.9 cap screws can be made from a carbon steel which conforms to the following chemical composition-- ***Carbon***: 0.25-0.55%; ***Phosphorus***: 0.035% maximum; ***Sulfur***: 0.035% maximum.
	Class 10.9 cap screws can be made from a low carbon martensite steel with additives (such as Boron, Manganese or Chromium) which conforms to the following chemical composition-- ***Carbon***: 0.20-0.55%; ***Phosphorus***: 0.035% maximum; ***Sulfur***: 0.035% maximum. In case of plain carbon boron alloyed steel with a carbon content 0f less than 0.25% (ladle analysis), the minimum Manganese content shall be 0.7%
	Class 10.9 cap screws can be made from an alloy steel which conforms to the following chemical composition--***Carbon***: 0.20-0.55%; ***Phosphorus***: 0.035% maximum; ***Sulfur***: 0.035% maximum; and shall contain one or more of the following elements: Chromium, Nickel, Molybdenum or Vanadium
Heat Treatment	Class 10.9 cap screws shall be heat treated by quenching in oil from above the transformation temperature and reheating to a tempering temperature of 425°C.
Core Hardness	Rockwell C32 - 39 (Vickers HV 320 - 380)
Surface Hardness	Shall not be more than 30 Vickers points above the measured core hardness on the product
Proof Load	940 N/mm^2 minimum
Tensile Strength	1040 N/mm^2 minimum
Elongation	9% minimum
Plating	See Appendix-A for plating information

CAP SCREWS & BOLTS

Carriage Bolts
Square Neck (Large)



METRIC - CARRIAGE BOLTS

ISO 8677;
DIN 603;
JIS B 1171

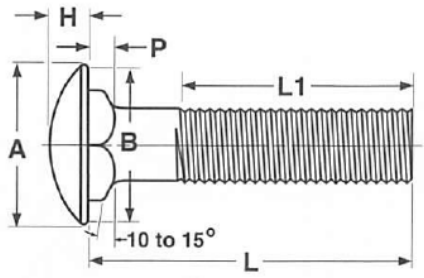
Nominal Diameter	Pitch (mm)	O		C	P		A		H		L_1		
		Square Width Across Flats		Square Width Across Corners	Square Depth		Head Diameter		Head Height		Thread Length <=125	Thread Length >125 & <=200	Thread Length >200
mm		Max	Min	Min	Max	Min	Max	Min	Max	Min	Ref	Ref	Ref
M5	0.8	5.48	4.52	5.9	4.1	2.9	13	11.9	3.1	2.5	16	-	-
M6	1	6.48	5.52	7.2	4.6	3.4	16	14.9	3.6	3	18	-	-
M8	1.25	8.58	7.42	9.6	5.6	4.4	20	18.7	4.8	4	22	28	-
M10	1.5	10.58	9.42	12.2	6.6	5.4	24	22.7	5.8	5	26	32	-
M12	1.75	12.7	11.3	14.7	8.8	7.2	30	28.7	6.8	6	30	36	-
M16	2	16.7	15.3	19.9	12.9	11.1	38	36.4	8.9	8	38	44	57
M20	2.5	20.84	19.16	24.9	15.9	14.1	46	44.4	10.9	10	46	52	65

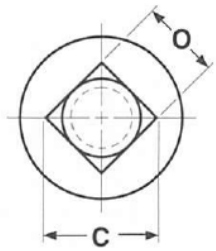
Tolerance on Length				
	20-30mm: ±1.05	35-50mm: ±1.25	55-80mm: ±1.5	
	90-120mm: ±1.75	130-150mm: ±2.0	160-180mm: ±4.0	200mm: ±4.6

Description	A round head, self-anchoring bolt with a square neck under the head and a metric thread pitch.
Applications/ Advantages	The square neck is designed to keep the bolt from turning as a nut is tightened. Best for use in wood or thick gauge sheet metal.
Material	Class 4.6 carriage bolts shall be made from a carbon steel which conforms to the following chemical composition-- ***Carbon***: 0.55% maximum; ***Phosphorus***: 0.05% maximum; ***Sulfur***: 0.06% maximum.
Hardness	Rockwell B 67 - 99.5 (Vickers HV 120 - 250)
Yield Strength	240 N/mm^2 minimum
Tensile Strength	400 N/mm^2 minimum
Elongation	22% minimum
Plating	See Appendix-A for plating information

Carriage Bolts Short Neck

CAP SCREWS & BOLTS





METRIC - CARRIAGE BOLTS, SHORT NECK

ISO 8678; DIN 603; JIS B 1171

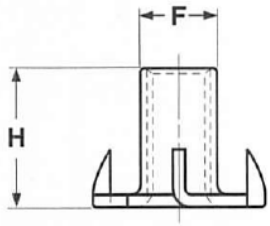
Nominal Diameter	Pitch (mm)	O		C	P		A	B	H		L1	
		Square Width Across Flats		Square Width Across Corners	Square Depth		Head Diameter	Bearing Surface Diameter under Head	Head Height		Thread Length <=125	Thread Length >125 & <=200
mm		Max	Min	Min	Max	Min	Max	Min	Max	Min	Ref	Ref
M6	1	6.48	5.88	7.64	3	2.4	14.2	12.2	3.6	3	18	-
M8	1.25	8.58	7.85	10.2	3	2.4	18	15.8	4.8	4	22	28
M10	1.5	10.58	9.85	12.8	4	3.2	22.3	19.6	5.8	5	26	32
M12	1.75	12.7	11.82	15.37	4	3.2	26.6	23.8	6.8	6	30	36
M16	2	16.7	15.82	20.57	5	4.2	35	31.9	8.9	8	38	44
M20	2.5	20.84	19.79	25.73	5	4.2	43	39.9	10.9	10	46	52

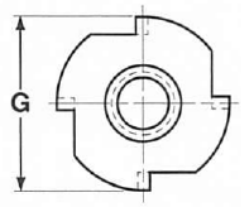
Tolerance on Length			
	12-16mm: ±0.9	20-30mm: ±1.05	35-50mm: ±1.25
	55-80mm: ±1.5	90-120mm: ±1.75	130-160mm: ±2.0

Description	A round head, self-anchoring bolt with a shorter square neck than a standard carriage bolt, and a metric thread pitch.
Applications/ Advantages	Used in the same way as a standard carriage bolt but in sheet metal where a full-sized square neck would cause an obstruction on the nut side of the fastening.
Material	Class 4.8 carriage bolts shall be made from a carbon steel which conforms to the following chemical composition-- ***Carbon:*** 0.55% maximum; ***Phosphorus***: 0.05% maximum; ***Sulfur***: 0.06% maximum.
Hardness	Rockwell B 71 - 99.5 (Vickers HV 130 - 250)
Yield Strength	340 N/mm^2 minimum
Tensile Strength	420 N/mm^2 minimum
Elongation	14% minimum
Plating	See Appendix-A for plating information

NUTS

Barrel Tee Nuts

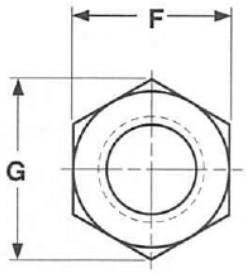


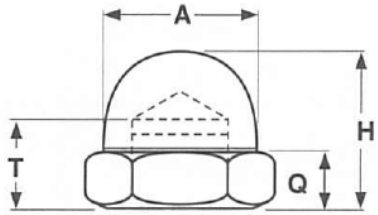


METRIC T-NUTS, STRAIGHT BARREL			
Screw Diameter	H	G	F
	Total Height	Flange Diameter	Barrel Diameter
M3	5	13	4.4
M4	6	15	5.6
M5	8	17	6.5
M6	9	19	7.7
M8	11	22	10
M10	12	25.5	12
M12	14.5	27	14

Description	Internally threaded barrel-shaped fasteners integrally formed with a flat base, which has prong-type projections extending perpendicular from the base aside the barrel.
Applications/ Advantages	Used for fastening metal to products made of wood, particle board or plastic. Four prong tee-nuts can be used in hard or soft woods.
Material	Low-carbon steel.
Plating	See Appendix-A for plating information.

Domed Hex Cap Nuts





METRIC - Domed Cap (Acorn) Nuts, Class 6

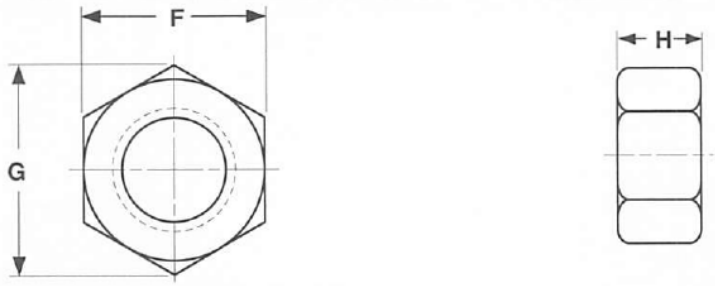
DIN 1587

Nominal Size	Thread Pitch	F	G	H	T	Q
		Width Across Flats	Width Across Corners	Overall Height	Drill Depth	Hexagon Height
		Ref	Min	Ref	Ref	Ref
M4	0.70	7	7.74	8	5.50	4
M5	0.80	8	8.87	10	7.50	5
M6	1	10	11.05	12	8	5
M8	1.25	13	14.38	15	11	6.50
M10	1.50	17	18.90	18	13	8
M12	1.75	19	21.10	22	16	10
M16	2	24	26.75	28	21	13
M20	2.5	30	33.53	34	26	16
M24	3	36	39.98	42	31	19

Description	A one-piece hex nut, milled-from-the-bar, with a dome-shaped top (similar in shape to an acorn) and a threaded hole at the opposite end.
Applications/ Advantages	Cap nuts serve two main purposes: (1) as decorative pieces, and (2) as covers for projecting threads.
Material	Class 6 cap nuts shall be made from a low-carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.50% max.; ***Phosphorus***: 0.060% max.; ***Sulfur***: 0.150% max..
Hardness	***M3 - M16:*** Vickers HV 150 - 302 (Rockwell B 78.7 - C 30) *over M16 - M24:* Vickers HV 170 - 302 (Rockwell B 85 - C 30)
Plating	See Appendix-A for information about the plating of steel cap nuts.

NUTS

DIN 934 Hex Nuts Steel



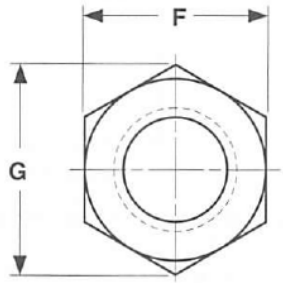
METRIC - HEX NUTS, DIN 934

DIN 934

Nominal Size	Thread Pitch	F		H	
		Width Across Flats		Thickness	
		Max	Min	Max	Min
M2	0.4	4	3.82	1.6	1.35
M2.5	0.45	5	4.82	2	1.75
M3	0.5	5.5	5.32	2.4	2.15
M4	0.7	7	6.78	3.2	2.9
M5	0.8	8	7.78	4	3.7
M6	1	10	9.78	5	4.7
M8	1.25	13	12.73	6.5	6.14
M10	1.5	17	16.73	8	7.64
M12	1.75	19	18.67	10	9.64
M16	2	24	23.67	13	12.3
M20	2.5	30	29.16	16	14.9

Description	A Style 1, heat treated fastener with a metric thread pitch. Nuts M16 and smaller are chamfered on the top and the bearing surface. Nuts M20 and larger may be double chamfered, or have a washer face on one side and a chamfered surface on the opposite side.		
Applications/ Advantages	Class 6 nuts are to be used with screws and bolts of property class 6.8 or lower. They are commonly used with metric machine screws.	Class 8 nuts are for use with screws and bolts of property class 8.8 and lower. They are often used in automotive and electronic applications.	Class 10 nuts are intended for use with screws and bolts of property classes 10.9 and lower. They are widely used in farm equipment.
Material	Class 6 nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.50% maximum; ***Phosphorus***: 0.060% maximum; ***Sulfur***: 0.150% maximum.	Class 8 nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.58% maximum; ***Manganese***: 0.25% minimum; ***Phosphorus***: 0.060% maximum; ***Sulfur***: 0.150% maximum.	Class 10 nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.58% maximum; ***Manganese***: 0.30% minimum; ***Phosphorus***: 0.048% maximum; ***Sulfur***: 0.058% maximum.
Heat Treatment	-	Class 8 nuts of diameter 18mm or greater shall be heat treated by quenching in a liquid medium from a temperature above the transformation temperature and tempering at a temperature of at least 425°C.	Class 10 nuts shall be heat treated by quenching in a liquid medium from a temperature above the transformation temperature and tempering at a temperature of at least 425°C.
Hardness	***Class 6***: ***Thru M16 Diam***: Rockwell B78.7 - C30; ***Diam M18 thru M39***: Rockwell B85 - C30	***Class 8***: ***Diam M1.6 thru M4:*** Rockwell B87.1 - C30; *Diam M5 thru M16:* Rockwell B91.5 - C30; *Diam M18 thru M39:* Rockwell C18 - 36.	***Class 10:*** Rockwell C26 - 36
Proof Load	***Diameters M1.6 thru M10:*** 600 N/mm² *Diameters M5 thru M7:* 670 N/mm² *Diameters M8 thru M10:* 680 N/mm² *Diameters M12 thru M16:* 700 N/mm² *Diameters M18 thru M36:* 720 N/mm²	***Diameters M1.6 thru M4:*** 900 N/mm² *Diameters M5 thru M7:* 855 N/mm² *Diameters M8 thru M10:* 870 N/mm² *Diameters M12 thru M16:* 880 N/mm² ***Diameters M18 thru M36:*** 920 N/mm²	***Diameters through M10:*** 1040 N/mm² ***Diameters M12 through M16:*** 1050 N/mm² *Diameters M18 through M39:* 1060 N/mm²
Plating	DIN 934 Hex Nuts are commonly supplied in both plain and zinc finishes; see Appendix-A for more details.		

DIN 934 Hex Nuts
Stainless





METRIC - Hex Nuts, DIN 934

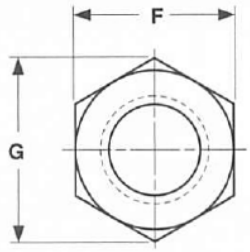
DIN 934

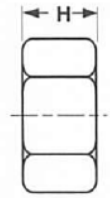
Nominal Size	Thread Pitch	F		H	
		Width Across Flats		Thickness	
		Max	Min	Max	Min
M2	0.4	4	3.82	1.6	1.35
M2.5	0.45	5	4.82	2	1.75
M3	0.5	5.5	5.32	2.4	2.15
M4	0.7	7	6.78	3.2	2.9
M5	0.8	8	7.78	4	3.7
M6	1	10	9.78	5	4.7
M8	1.25	13	12.73	6.5	6.14
M10	1.5	17	16.73	8	7.64
M12	1.75	19	18.67	10	9.64
M16	2	24	23.67	13	12.3
M20	2.5	30	29.16	16	14.9

Description	A Style 1, heat treated fastener with a metric thread pitch. Nuts M16 and smaller are chamfered on the top and the bearing surface. Nuts M20 and larger may be either double chamfered, or have a washer face on one side and a chamfered surface on the opposite side.	
Applications/ Advantages	Stainless nuts are to be used with screws and bolts of property class 50 or lower. They are commonly used with metric machine screws.	Stainless nuts are to be used with screws and bolts of property class 80 or lower. They are commonly used with metric machine screws.
Material	A2 Stainless steel	A4 Stainless Steel
Hardness	Testing for product hardness is not required on stainless steel DIN 934 nuts.	
Proof Load	101,500 psi.	116,000
Plating	DIN 934 Stainless Hex Nuts are commonly supplied either plain or with Black Oxide finish; see Appendix-A for more details.	

NUTS

ISO 4032 Hex Nuts Style 1 & Class 6

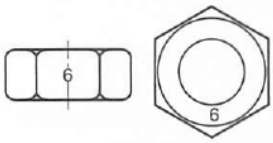




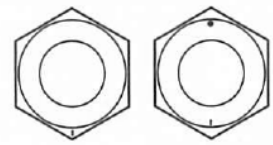
METRIC - HEX NUTS, STYLE 1

ISO 4032

Nominal Size	Thread Pitch	F		G	H	
		Width Across Flats		Width Across Corners	Thickness	
		Max	Min	Min	Max	Min
M1.6	0.35	3.2	3.02	3.41	1.3	1.05
M2	0.4	4	3.82	4.32	1.6	1.35
M2.5	0.45	5	4.82	5.45	2	1.75
M3	0.5	5.5	5.32	6.01	2.4	2.15
M4	0.7	7	6.78	7.66	3.2	2.9
M5	0.8	8	7.78	8.79	4.7	4.4
M6	1	10	9.78	11.05	5.2	4.9
M8	1.25	13	12.73	14.38	6.8	6.44
M10	1.5	16	15.73	17.77	8.4	8.04
M12	1.75	18	17.73	20.03	10.8	10.37
M14	2	21	20.67	23.35	12.8	12.1
M16	2	24	23.67	26.75	14.8	14.1
M20	2.5	30	29.16	32.95	18	16.9
M24	3	36	35	39.55	21.5	20.2
M30	3.5	46	45	50.85	25.6	24.3
M36	4	55	53.8	60.79	31	29.4



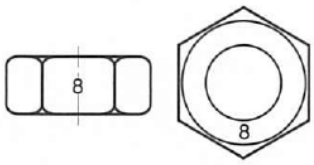
CLASS 6 HEX NUTS



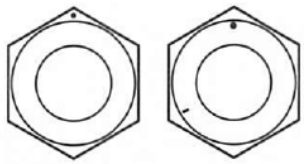
Description	A six-sided internally threaded, non-heat treated fastener with a metric thread pitch. Nuts M16 and smaller are chamfered on the top and the bearing surface. Nuts M18 and larger may be either double chamfered, or have a washer face on one side and a chamfered surface on the opposite side.
Applications/ Advantages	Class 6 nuts are intended for use with screws and bolts of property class 6.8 or lower. They are the most popular nut for use with metric machine screws.
Material	Class 6 nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon:*** 0.50% maximum; ***Phosphorus***: 0.060% maximum; ***Sulfur***: 0.150% maximum. Class 6 nuts may also be made from free-cutting steel which conforms to the following chemical composition-- ***Carbon***: 0.50% maximum; ***Sulfur***: 0.34% minimum; ***Phosphorus***: 0.11% minimum; ***Lead***: 0.35% minimum.
Hardness	***Diam. thru M16:*** Vickers HV 150 - 302 (Rockwell B78.7 - C30); ***Diam. M18 thru M39:*** Vickers HV 170 - 302 (Rockwell B85 - C30)
Proof Load	***Diameters M1.6 through M4:*** 600 N/mm² *Diameters M5 through M7:* 670 N/mm² *Diameters M8 through M10:* 680 N/mm² *Diameters M12 through M16:* 700 N/mm² *Diameters M18 through M36:* 720 N/mm²
Plating	See Appendix-A for plating information

Classes 8 & 10

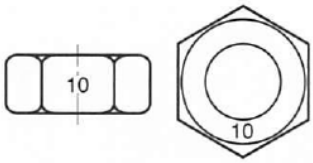
NUTS



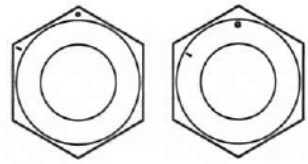
CLASS 8 HEX NUTS



Description	A Style 1 hex nut with a metric thread pitch. Nuts M16 and smaller are chamfered top and bottom, and are not heat-treated. Nuts M18 and larger are (1) heat-treated and (2) may be double chamfered, or have a washer face on one side and a chamfered surface on the opposite side.
Applications/ Advantages	Class 8 nuts are intended for use with screws and bolts of property class 8.8 or lower. They are widely used in the automotive and electronics industries.
Material	Class 8 nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.58% maximum; ***Manganese***: 0.25% minimum; ***Phosphorus***: 0.060% maximum; ***Sulfur***: 0.150% maximum.
Heat Treatment	Class 8 nuts of diameter 18mm or greater shall be heat treated by quenching in a liquid medium from a temperature above the transformation temperature and tempering at a temperature of at least 425°C.
Hardness	***Diameters M1.6 through M4:*** Vickers HV 180 - 302 (Rockwell B87.1 - C30) *Diameters M5 through M16:* Vickers HV 200 - 302 (Rockwell B91.5 - C30) *Diameters through M18 through M39:* Vickers HV 233 - 353 (Rockwell C18 - 36)
Proof Load	***Diameters M1.6 through M4:*** 800 N/mm² *Diameters M5 through M7:* 855 N/mm² *Diameters M8 through M10:* 870 N/mm² *Diameters M12 through M16:* 880 N/mm² *Diameters M18 through M36:* 920 N/mm²
Plating	See Appendix-A for plating information



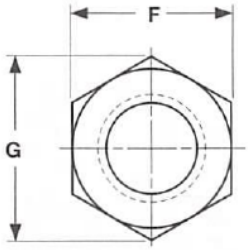
CLASS 10 HEX NUTS

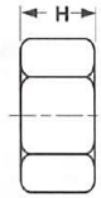


Description	A Style 1, heat treated fastener with a metric thread pitch. Nuts M16 and smaller are chamfered on the top and the bearing surface. Nuts M20 and larger may be either double chamfered, or have a washer face on one side and a chamfered surface on the opposite side.
Applications/ Advantages	Class 10 nuts are intended for use with screws and bolts of property classes 10.9 and lower. They are widely used in farm equipment.
Material	Class 10 nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.58% maximum; ***Manganese***: 0.30% minimum; ***Phosphorus***: 0.048% maximum; ***Sulfur***: 0.058% maximum.
Heat Treatment	Class 10 nuts shall be heat treated by quenching in a liquid medium from a temperature above the transformation temperature and tempering at a temperature of at least 425°C.
Hardness	Rockwell C26 - 36 (Vickers HV 272 - 353)
Proof Load	***Diameters through M10:*** 1040 N/mm² *Diameters M12 through M16:* 1050 N/mm² *Diameters M18 through M39:* 1060 N/mm²
Plating	See Appendix-A for plating information

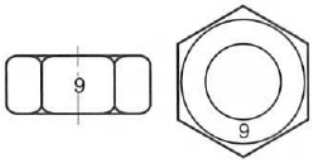
NUTS

ISO 4033 Hex Nut Style 2 Class 9

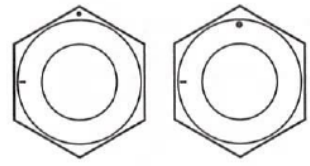




METRIC - HEX NUTS, STYLE 2						ISO 4033
Nominal Size	Thread Pitch	F		G	H	
		Width Across Flats		Width Across Corners	Thickness	
		Max	Min	Min	Max	Min
M5	0.8	8	7.78	8.79	5.1	4.8
M6	1	10	9.78	11.05	5.7	5.4
M8	1.25	13	12.73	14.38	7.5	7.14
M10	1.5	16	15.73	17.77	9.3	8.94
M12	1.75	18	17.73	20.03	12	11.57
M14	2	21	20.67	23.35	14.1	13.4
M16	2	24	23.67	26.75	16.4	15.7
M20	2.5	30	29.16	32.95	20.3	19
M24	3	36	35	39.55	23.9	22.6
M30	3.5	46	45	50.85	28.6	27.3
M36	4	55	53.8	60.79	34.7	33.1

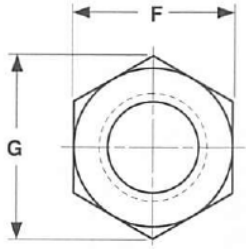


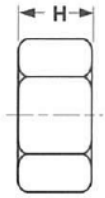
CLASS 9 HEX NUTS



Description	A six-sided internally threaded, non-heat treated fastener with a metric thread pitch which, as a Style 2 nut, is approximately 10% thicker than a Style 1 nut of the same nominal diameter. Nuts M16 and smaller are chamfered on the top and the bearing surface. Nuts M18 and larger may be either double chamfered, or have a washer face on one side and a chamfered surface on the opposite side.
Applications/ Advantages	Class 9 nuts are intended for use with screws and bolts of property classes 4.6, 4.8, 5.8, 8.8 or 9.8.
Material	Class 9 nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.58% maximum; ***Manganese***: 0.25% minimum; ***Phosphorus***: 0.060% maximum; ***Sulfur***: 0.150% maximum.
Hardness	***Diameters M1.6 through M4:*** Rockwell B85 - C30 (Vickers HV 170 - 302) *Diameters M5 through M39:* Rockwell B89 - C30 (Vickers HV 188 - 302)
Proof Load	***Diameters M1.6 through M4:*** 900 N/mm² ***Diameters M5 through M7:*** 915 N/mm² *Diameters M8 through M10:* 940 N/mm² *Diameters M12 through M16:* 950 N/mm² *Diameters M18 through M39:* 920 N/mm²
Plating	See Appendix-A for plating information

ISO 4033 Hex Nut
Style 2 Class 12

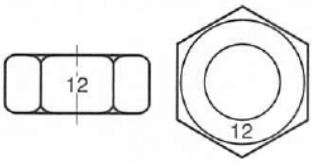




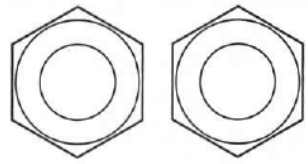
METRIC - Hex Nuts, Style 2

ISO 4033

Nominal Size	Thread Pitch	F		G	H	
		Width Across Flats		Width Across Corners	Thickness	
		Max	Min	Min	Max	Min
M5	0.8	8	7.78	8.79	5.1	4.8
M6	1	10	9.78	11.05	5.7	5.4
M8	1.25	13	12.73	14.38	7.5	7.14
M10	1.5	16	15.73	17.77	9.3	8.94
M12	1.75	18	17.73	20.03	12	11.57
M14	2	21	20.67	23.35	14.1	13.4
M16	2	24	23.67	26.75	16.4	15.7
M20	2.5	30	29.16	32.95	20.3	19
M24	3	36	35	39.55	23.9	22.6
M30	3.5	46	45	50.85	28.6	27.3
M36	4	55	53.8	60.79	34.7	33.1



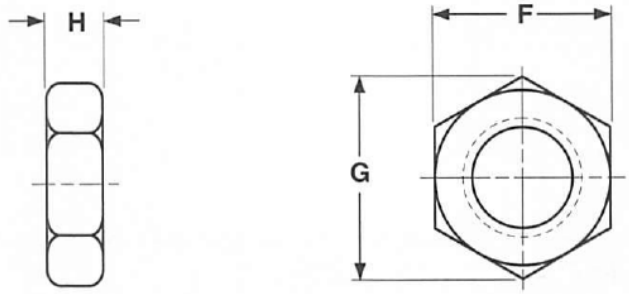
CLASS 12 HEX NUTS



Description	A six-sided internally threaded, heat treated fastener with a metric thread pitch. Style 2 nuts are approximately 10% thicker than Style 1 nuts of the same nominal diameter. Nuts M16 and smaller are chamfered on the top and the bearing surface. Nuts M18 and larger may be either double chamfered, or have a washer face on one side and a chamfered surface on the opposite side.
Applications/ Advantages	Class 12 nuts are intended for use with screws and bolts of property classes 12.9 or lower.
Material	Class 12 nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.58% maximum; ***Manganese***: 0.45% minimum; ***Phosphorus***: 0.048% maximum; ***Sulfur***: 0.058% maximum.
Heat Treatment	Class 12 nuts shall be heat treated by quenching in a liquid medium from a temperature above the transformation temperature and tempering at a temperature of at least 425°C.
Hardness	***Style 1:*** Vickers HV 295 - 353 (Rockwell C 29.2 - 36) Style 2: Vickers HV 272 - 353 (Rockwell C 25 - 36)
Proof Load	***Style 1: Diameters M1.6 through M10***: 1140 N/mm²; Diameters M12 through M16: 1170 N/mm² ***Style 2: Diameters M1.6 through M7***: 1150 N/mm²; Diameters M8 through M10: 1160 N/mm²; ***Diameters M12 through M16***: 1190 N/mm²; Diameters M18 through M36: 1200 N/mm²
Plating	See Appendix-A for plating information

NUTS

DIN 439B Jam Nuts



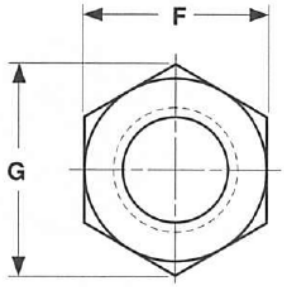
DIN 439B Hex Jam Nuts

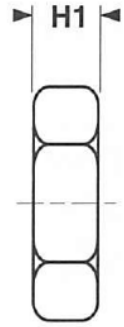
DIN 439B

Nominal Size	Thread Pitch	F		G	H	
		Width Across Flats		Width Across Corners	Thickness	
		Max	Min	Min	Max	Min
M3	0.5	5.5	5.32	6.01	1.8	1.55
M3.5	0.6	6	5.82	6.58	2	1.75
M4	0.7	7	6.78	7.66	2.2	1.95
M5	0.8	8	7.78	8.79	2.7	2.45
M6	1	10	9.78	11.05	3.2	2.9
M8	1.25 and 1	13	12.73	14.38	4	3.7
M10	1.5 and 1.25	17	16.73	18.90	5	4.7
M12	1.75 and 1.5	19	18.67	21.10	6	5.7
M16	2	24	23.67	26.75	8	7.42

Description	A six-sided internally threaded, fastener with a metric thread pitch. The jam nut is approximately 1/2 the thickness of a Style 2 nut. Nuts are chamfered on the top and on the bearing surface	
Applications / Advantages	Class 04 metric hex jam nuts are tightened against the work surface and a Style 1 or Style 2 hex nut is tightened against the jam nut to keep it from loosening.	Class 50 A2 stainless hex jam nuts are used in the same manner with A2 stainless screws.
Material	Class 04 hex jam nuts shall be made of a steel that conforms to the following chemical composition-- Carbon: 0.58% maximum; Manganese: 0.25% minimum; Phosphorus: 0.060% maximum; Sulfur: o.150% maximum.	Class A2 stainless steel
Hardness	HV 188 - 302 (Rockwell B88 - C30)	-
Proof Load	380 N/mm^2	72,500 psi. minimum
Plating	Jam nuts are typically furnished with a zinc plating. See Appendix-A for details.	Stainless jam nuts are typically furnished without any additional finish.

ISO 4035
Hex Jam
NUTS





METRIC - Hex Jam Nuts

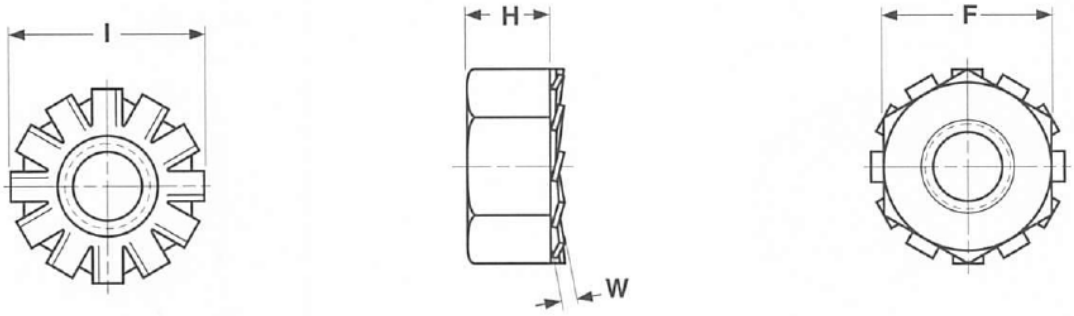
ISO 4035

Nominal Size	Thread Pitch	F		G	H	
		Width Across Flats		Width Across Corners	Thickness	
		Max	Min	Min	Max	Min
M1.6	0.35	3.2	3.02	3.41	1	0.75
M2	0.4	4	3.82	4.32	1.20	0.95
M2.5	0.45	5	4.82	5.45	1.60	1.35
M3	0.5	5.5	5.32	6.01	1.80	1.55
M4	0.7	7	6.78	7.66	2.20	1.95
M5	0.8	8	7.78	8.79	2.70	2.45
M6	1	10	9.78	11.05	3.20	2.9
M8	1.25	13	12.73	14.38	4	3.7
M10	1.5	16	15.73	17.77	5	4.7
M12	1.75	18	17.73	20.03	6	5.7
M14	2	21	20.67	23.35	7	6.42
M16	2	24	23.67	26.75	8	7.42
M20	2.5	30	29.16	32.95	10	9.10
M24	3	36	35	39.55	12	10.9
M30	3.5	46	45	50.85	15	13.9
M36	4	55	53.8	60.79	18	16.9
M42	4.5	65	63.1	71.3	21	19.7
M48	5	75	73.1	82.6	24	22.7

Description	A six-sided internally threaded, non-heat treated fastener with a metric thread pitch that is approximately 1/2 the thickness of a Style 2 nut. Nuts M16 and smaller are chamfered on the top and the bearing surface. Nuts M18 and larger may be either double chamfered, or have a washer face on one side and a chamfered surface on the opposite side.
Applications/ Advantages	Class 04 metric hex jam nuts are tightened against the work surface and a Style 1 or Style 2 hex nut is tightened against the jam nut to keep it from loosening.
Material	Class 04 hex jam nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.58% maximum; ***Manganese***: 0.25% minimum; ***Phosphorus***: 0.060% maximum; ***Sulfur***: 0.150% maximum.
Hardness	HV 188 - 302 (Rockwell B 88 - C 30)
Proof Load	380 N/mm^2
Plating	See Appendix-A for plating information

NUTS

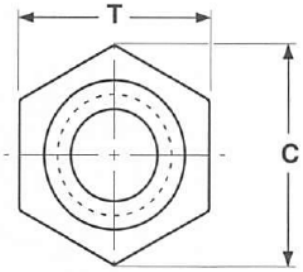
DIN 934K K-Lock Nut w/ Free Spinning External Tooth LW

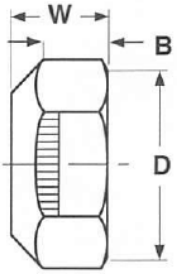


METRIC - K-LOCK NUTS							DIN 934K
Nominal Size	Thread Pitch	F		H	I		W
		Width Across Flats		Nut Thickness	Width of Washer		Washer Thickness
		Max	Min	Max	Max	Min	Ref
M3	0.5	5.5	5.32	2.40	7.2	7.0	0.45
M4	0.7	7	6.78	3.20	8.1	7.9	0.45
M5	0.8	8	7.78	4.0	9.3	9.1	0.60
M6	1.0	10	9.78	5.0	11.15	10.85	0.60
M8	1.25	13	12.73	6.50	15.1	14.7	0.80
M10	1.5	17	16.73	8.0	1919.0	18.6	0.90
M12	1.75	19.0	18.7	10.0	22.0	21.6	-

Description	A hex nut with metric thread pitch, pre-assembled with a free spinning external tooth lock washer. The locking action is achieved when the nut is tightened against a bearing surface as the teeth of the lock washer dig into it.	
Applications/ Advantages	This is the most popular type of locknut because of its versatility, cost and ease of installation. Doesn't gall screw threads.	
Material	*Steel*	*Stainless*
	Nuts shall be made from a low carbon steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.58% maximum; ***Manganese***: 0.25% minimum; ***Phosphorous***: 0.060% maximum; ***Sulfur***: 0.150% maximum; ***Washers***-- Spring steel.	***Nuts*** A2 Stainless ***Washers***-- A2 Stainless
Hardness	***Nuts***-- ***M3 - M4***: Vickers HV 180 - 302 (Rockwell B87.1 - C30); ***M5 - M10***: Vickers HV 200 - 302 (Rockwell B91.5 - C30) ***Washers***-- Rockwell C 41 - 47	-
Plating	See Appendix-A for information about the plating of steel nuts.	Stainless nuts are provided with no additional finish.

DIN 980V & ASME B18.16.3
Prevailing Torque
NUTS





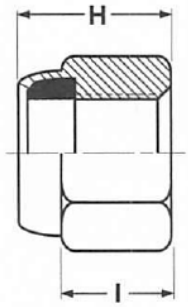
METRIC--PREVAILING-TORQUE TYPE STEEL HEX NUTS				DIN 980V
Nominal Size	Thread Pitch	T	C	W
		Width Across Flats	Width Across Corners	Thickness
		Nom	Min	Min
M6	1.00	10.00	11.05	5.7
M8	1.25	13.00	14.38	7.5
M10	1.25	17.00	18.90	9
M12	1.50	19.00	21.10	11
M20	2.50	30.00	32.95	18

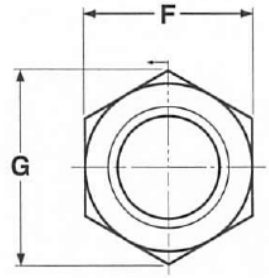
METRIC--PREVAILING-TORQUE TYPE STEEL HEX NUTS							ASME B18.16.3M
Nominal Size	Thread Pitch	T		C		W	
		Width Across Flats		Width Across Corners		Thickness	
		Max	Min	Max	Min	Max	Min
M6	1.00	10.00	9.78	11.55	11.05	5.9	5.4
M8	1.25	13.00	12.73	15.01	14.38	7.10	6.44
M10	1.50	16.00	15.73	18.48	17.77	9.00	8.04
M12	1.75	18.00	17.73	20.78	20.03	11.60	10.37
M24	3.00	36.00	35.00	41.57	39.55	23.00	20.20

Description	An all-metal, one-piece hex nut which derives its prevailing torque characteristics from controlled distortion of its top threads from their normal helical form to a more elliptical shape.
Applications/ Advantages	These nuts are reusable. Can withstand severe vibration and shock loads. Frequently used in farm machinery, plus the automotive and related metalworking industries.
Material	Nuts shall be made from a low-carbon steel which conforms to the following chemical composition requirements-- *Carbon*: 0.58% max.; *Manganese*: 0.27% min.; *Phosphorus*: 0.048% max.; *Sulfur*: 0.058% max. (0.24% max if milled from the bar).
Heat Treatment	Nuts are heat treated to meet the mechanical and performance requirements noted on this page.
Hardness	Rockwell C26 - C36
Proof Load	***M3 through M10:*** 1040 MPa *M12 through M16:* 1050 MPa *M20 through M36:* 1060 MPa
Plating	Parts are typically supplied with a cadmium and wax finish; see Appendix-A for additional information.

NUTS

DIN 985
Nylon Insert Lock Nuts





METRIC - Nylon Insert Stop Nuts, Regular Pattern, Class 8

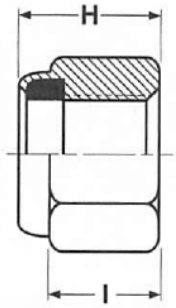
DIN 985

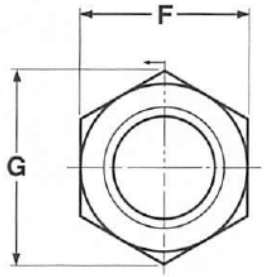
Nominal Size	F		G	H		I
	Width Across Flats		Width Across Corners	Thickness		Wrenching Height
	Max	Min	Min	Max	Min	Min
M3	5.50	5.32	6.01	4	3.7	2.4
M4	7.00	6.78	7.66	5	4.7	2.9
M5	8.00	7.78	8.79	5	4.7	3.2
M6	10.00	9.78	11.05	6	5.7	4
M7	11.00	10.73	12.12	7.5	7.14	4.7
M8	13.00	12.73	14.38	8	7.64	5.5
M10	17.00	16.73	18.90	10	9.64	6.5
M12	19.00	18.67	21.10	12	11.57	8
M14	22.00	21.67	24.49	14	13.3	9.5
M16	24.00	23.67	26.75	16	15.3	10.5
M18	27.00	26.16	29.56	18	17.66	13
M20	30.00	29.16	32.95	20	18.7	14

Description	Hex nut with a metric thread pitch and a nylon-filled collar at its back end. When a screw reaches the collar, the threads and nylon form a tight, frictional fit, restricting movement of the screw when it is subjected to vibration. The nylon insert comes in various colors.	
Applications/ Advantages	Designed to be used with like-material machine screws and bolts. It is able to be reused more times than a two-way reversible nut. It is less expensive than a Grade-C automation lock nut. Nylon insert lock nuts are designed for use in temperatures from -73°C to +120°C.	
Material	*Steel*	*Stainless*
	M3 - M16: AISI 1006, 1010, 1022 or equivalent steel ***M18 and larger:*** AISI 1035 or equivalent steel (Class 8, style 1 nuts of a basic diameter greater than M16 are quenched and tempered).	*18-8:* 18-8 Stainless Steel *A4:* A4 Stainless Steel
Hardness	***Vickers HV 5:*** 302 maximum *Rockwell:* C 30 maximum	-
Proof Load	800 N/mm²	*18-8:* 72,500 psi. *A4-70:* 101,570 psi.
Plating	DIN 985 nylon insert stop nuts are usually supplied zinc plated. See Appendix-A for more information.	-

ISO 7040 Nylon Insert Lock Nuts Regular Pattern

NUTS





METRIC - Nylon Insert Stop Nuts, Regular Pattern, Class 8 Style 1

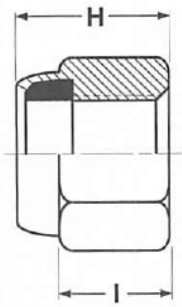
ISO 7040

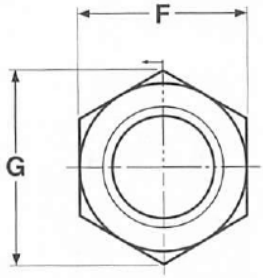
Nominal Size	Thread Pitch	F		G	H		I
		Width Across Flats		Width Across Corners	Thickness		Wrenching Height
		Max	Min	Min	Max	Min	Min
M3	0.5	5.50	5.32	6.01	4.5	4.02	1.72
M4	0.7	7.00	6.78	7.66	6.00	5.52	2.32
M5	0.8	8.00	7.78	8.79	6.80	6.22	3.52
M6	1	10.00	9.78	11.05	8.00	7.42	3.92
M8	1.25	13.00	12.73	14.38	9.50	8.92	5.15
M10	1.5	16.00	15.73	17.77	11.9	11.2	6.43
M12	1.75	18.00	17.73	20.03	14.9	14.2	8.3
M16	2	24.00	23.67	26.75	19.1	17.8	11.28
M20	2.5	30.00	29.16	32.95	22.8	20.7	13.52
M24	3	36	35	39.55	27.1	25.0	16.16
M30	3.5	46	45	50.85	32.6	30.1	19.44
M36	4	55.0	53.8	60.79	38.9	36.4	23.52

Description	Hex nut with a metric thread pitch and a nylon-filled collar at its back end. Class 8, style 1 nuts of a basic diameter greater than M16 are quenched and tempered. When a screw reaches the collar, the threads and nylon form a tight, frictional fit, restricting movement of the screw when it is subjected to vibration. The nylon insert comes in various colors.
Applications/ Advantages	Class 8 metric nylon insert lock nuts are to be used with screw of a Class 8.8 or less. It is able to be reused more times than a two-way reversible nut. It is less expensive than a Grade-C automation lock nut. Nylon insert lock nuts are designed for use in temperatures from -73°C to +120°C.
Material	Class 8 metric nylon insert lock nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.58% maximum; ***Manganese***: 0.25% minimum; ***Phosphorus***: 0.060% maximum; ***Sulfur***: 0.150% maximum.
Hardness	***M3 - M4:*** HV 180 - 302 (Rockwell B 87.1 - C 30) *M5 - M16:* HV 200 - 302 (Rockwell B 91.5 - C 30) *M20 - M36:* HV 233 - 353 (Rockwell C 18 - C 36)
Proof Load (N/mm²)	***M3 - M4:*** 800 *M5 - M7:* 855 *M8 - M10:* 870 *M12 - M16:* 880 *M20 - M36:* 920
Plating	See Appendix-A for plating information

NUTS

ISO 7040 Nylon Insert Lock Nuts Heavy Pattern

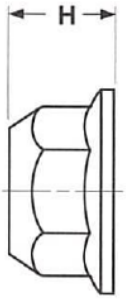


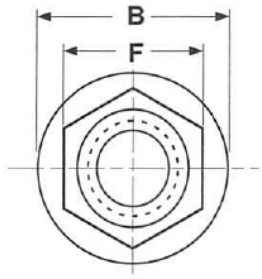


METRIC - NYLON INSERT STOP NUTS, HEAVY PATTERN, CLASS 9 STYLE 2							ISO 7040
Nominal Size	Thread Pitch	F		G	H		I
		Width Across Flats		Width Across Corners	Thickness		Wrenching Height
		Max	Min	Min	Max	Min	Min
M5	0.8	8.00	7.78	8.79	7.20	6.62	3.52
M6	1	10.00	9.78	11.05	8.50	7.92	3.92
M8	1.25	13.00	12.73	14.38	10.2	9.5	5.15
M10	1.5	16.00	15.73	17.77	12.8	12.1	6.43
M12	1.75	18.00	17.73	20.03	16.1	15.4	8.3
M16	2	24.00	23.67	26.75	20.7	19.4	11.28
M20	2.5	30.00	29.16	32.95	25.1	23.0	13.52
M24	3	36	35	39.55	29.5	27.4	16.16
M30	3.5	46	45	50.85	35.6	33.1	19.44
M36	4	55.0	53.8	60.79	42.6	40.1	23.52

Description	Similar in design to a regular nylon insert stop nut except that it is 6-8% thicker. When a screw reaches the collar, the threads and nylon form a tight, frictional fit, restricting movement of the screw when it is subjected to vibration. The nylon insert comes in various colors.
Applications/ Advantages	Provides a greater length of thread engagement than regular nylon insert stop nuts resulting in greater proof load stress properties. Class 9, style 2 metric nylon insert lock nuts are to be used with screw of a Class 9.8 or less. It is able to be reused more times than a two-way reversible nut. It is less expensive than a Grade-C automation lock nut. Nylon insert lock nuts are designed for use in temperatures from -73°C to +120°C.
Material	Class 9 metric nylon insert lock nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.58% maximum; ***Manganese***: 0.25% minimum; ***Phosphorus***: 0.060% maximum; ***Sulfur***: 0.150% maximum. Insert is made of polyamid.
Hardness	***M3 - M4:*** HV 170 - 302 (Rockwell B85 - C30) *M5 - M36:* HV 188 - 302 (Rockwell B89 - C30)
Proof Load (N/mm²)	***M3 - M4:*** 900 *M5 - M7:* 915 *M8 - M10:* 940 *M12 - M16:* 950 *M20 - M36:* 920
Plating	See Appendix-A for plating information

DIN 6923 Hex Flange
Class 8 & Class 10 Steel
NUTS





METRIC DIN 6923 HEX FLANGE NUTS

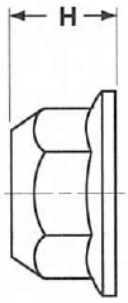
DIN 6923

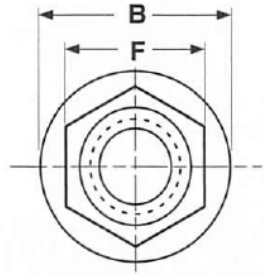
Nominal Size	Thread Pitch	F		H		B
		Width Across Flats		Overall Height		Flange Diameter
		Max	Min	Max	Min	Max
M3	0.5	5.50	5.30	4.0	3.4	8.0
M4	0.7	7.00	6.78	4.65	4.2	10.0
M5	0.8	8.00	7.78	5.0	4.7	11.8
M6	1.0	10.00	9.78	6.0	5.7	14.2
M8	1.25	13.00	12.73	8.0	7.6	17.9
M10	1.5	15.00	14.73	10.0	9.6	21.8
M12	1.75	18.00	17.73	12.0	11.6	26

Description	A hex nut with an enlarged circular base flaring out from the bottom of the nut, and a metric thread pitch. The bearing surface of the flange is smooth.	
Applications/ Advantages	Class 8 nuts are intended for use with screws and bolts of property class 8.8 or lower. The flange design will span oversized or poorly aligned holes. The flange provides a more uniform bearing-stress to clamp-force ratio.	Class 10 nuts are intended for use with screws and bolts of property class 10.9 or lower. The flange design will span oversized or poorly aligned holes. The flange provides a more uniform bearing-stress to clamp-force ratio.
Material	***Class 8***	***Class 10***
	Class 8 nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.58% maximum; ***Manganese***: 0.25% minimum; ***Phosphorus***: 0.060% maximum; ***Sulfur***: 0.150% maximum.	Class 10 nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.58% maximum; ***Manganese***: 0.30% minimum; ***Phosphorus***: 0.048% maximum; ***Sulfur***: 0.058% maximum.
Heat Treatment	Class 8 nuts of diameter less than 18mm do not require heat treatment.	Class 10 nuts shall be heat treated by quenching in a liquid medium from a temperature above the transformation temperature and tempering at a temperature of at least 425°C.
Hardness	***Diameters M5 thru M16:*** Vickers HV 188 - 302	***Diameters M5 thru M20:*** Vickers HV 272 - 353
Proof Load	***Diameters M5 thru M6:*** 117,450 psi. *Diameters M8 thru M10:* 120,350 psi. *Diameters M12 thru M16:* 121,800 psi.	***Diameters M5 thru M10:*** 150,800 psi. *Diameters M12 thru M16:* 152,250 psi.
Plating	Available in various finishes, including to RoHS specifications.	

NUTS

DIN 6923 Hex Flange
Class A2 & A4 70 Stainless





METRIC - DIN 6923 HEX FLANGE NUTS

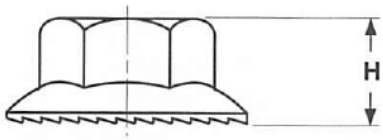
DIN 6923

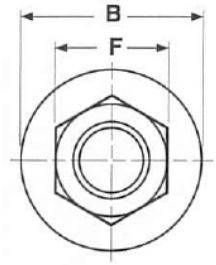
Nominal Size	Thread Pitch	F		H		B
		Width Across Flats		Overall Height		Flange Diameter
		Max	Min	Max	Min	Max
M3	0.5	5.50	5.30	4.0	3.4	8.0
M4	0.7	7.00	6.78	4.65	4.2	10.0
M5	0.8	8.00	7.78	5.0	4.7	11.8
M6	1	10.00	9.78	6.0	5.7	14.2
M8	1.25	13.00	12.73	8.0	7.6	17.9
M10	1.5	15.00	14.73	10.0	9.6	21.8
M12	1.75	18.00	17.73	12.0	11.6	26

Description	A hex nut with an enlarged circular base flaring out from the bottom of the nut, and a metric thread pitch. The bearing surface of the flange is smooth.	
Applications/ Advantages	Class A2-70 nuts are intended for use with screws and bolts of similar material in corrosive environments. The flange design will span oversized or poorly aligned holes. The flange provides a more uniform bearing-stress to clamp-force ratio.	Class A4-70 nuts are intended for use with screws and bolts of similar material where greater resistance to extreme temperatures and greater resistance to corrosion is desired. The flange design will span oversized or poorly aligned holes. The flange provides a more uniform bearing-stress to clamp-force ratio.
Material	***Class A2 70***	***Class A4 70***
	A2 Class 70 Stainless (comparable to 18-8)	A4 Class 70 Stainless (comparable to 316)
Proof Load	101,500 psi.	101,500 psi.
Plating	Stainless DIN 6923 nuts are typically provided without additional coating.	

DIN 6923 Hex Flange—Serrated, Class 8 Steel & Class A2 Stainless

NUTS





METRIC DIN 6923 SERRATED HEX FLANGE NUTS

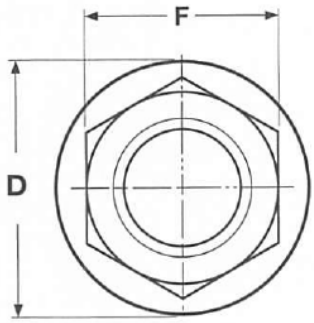
DIN 6923

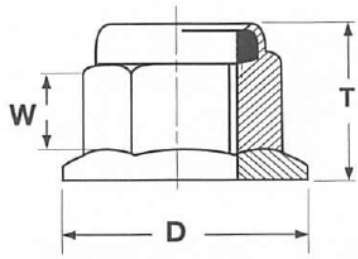
Nominal Size	Thread Pitch	F		H		B
		Width Across Flats		Overall Height		Flange Diameter
		Max	Min	Max	Min	Max
M3	0.5	5.50	5.30	4.0	3.4	8.0
M4	0.7	7.00	6.78	4.65	4.2	10.0
M5	0.8	8.00	7.78	5.0	4.7	11.8
M6	1.0	10.00	9.78	6.0	5.7	14.2
M8	1.25	13.00	12.73	8.0	7.6	17.9
M10	1.5	15.00	14.73	10.0	9.6	21.8
M12	1.75	18.00	17.73	12.0	11.6	26
M16	2	24.00	23.67	16.0	15.3	34.5
M20	2.5	30.00	29.67	20.0	18.9	42.8

Description	Hex nut with an enlarged circular base flaring out from the bottom of the nut. The bearing surface of the flange has serrations which displace material on the mating surface when the nut is wrenched into place, forming a connection which resists loosening.	
Applications/ Advantages	Requires a greater amount of torque to loosen than to tighten the nut. Will span oversized or poorly aligned holes. Flange provides a more uniform bearing-stress to clamp-force ratio than other low carbon lock nuts. Does not gall screw threads.	Class A2 50 nuts are intended for use with stainless screws and bolts. The flange design will span oversized or poorly aligned holes. The flange provides a more uniform bearing-stress to clamp-force ratio.
Material	***Class 8***	***Class A2 50***
	Class 8 nuts shall be made of a steel which conforms to the following chemical composition-- *Carbon*: 0.58% maximum; *Manganese*: 0.25% minimum; *Phosphorus*: 0.060% maximum; *Sulfur*: 0.150% maximum.	A2 Stainless Steel
Heat Treatment	Class 8 nuts of diameter less than 18mm do not require heat treatment.	-
Hardness	*Diameters M5 thru M16:* Vickers HV 188 - 302	-
Proof Load	*Diameters M5 thru M6:* 117,450 psi. *Diameters M8 thru M10:* 120,350 psi. *Diameters M12 thru M16:* 121,800 psi.	72,500 psi.
Plating	Available in various finishes, including to RoHS specifications.	Typically provided without additional finish.

NUTS

DIN 6926 Nylon Insert Flange Style





METRIC - DIN 6926 NYLON INSERT FLANGE STOP NUTS

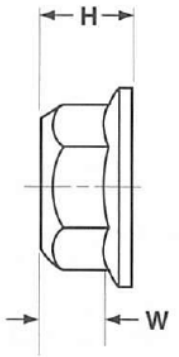
DIN 6926

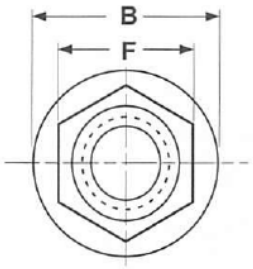
Nominal Size	Thread Pitch	F		D	T		W
		Width Across Flats		Flange Diameter	Total Thickness		Wrenching Height
		Max	Min	Min	Max	Min	Min
M5	0.8	8	7.78	11.8	7.1	6.74	2.2
M6	1	10	9.78	14.2	9.1	8.74	3.1
M8	1.25	13	12.73	17.9	11.1	10.67	4.5
M10	1.5	15	14.73	21.8	13.5	13.07	5.5
M12	1.75	18	17.73	26	16.1	15.67	6.7
M16	2	24	23.67	34.5	20.3	19.46	9
M20	2.5	30	29.16	42.8	24.8	23.96	11.1

Description	Hex nut with a nylon-filled collar at its back end and an enlarged circular base flaring out from the front end of the nut. When an externaly threaded fastener reaches the collar, the threads and nylon form a tight, frictional fit as the nylon applies downward pressure that forces contact between the internal and external threads.
Applications/ Advantages	The nut may be reused up to 50 times, does not damage the threads of the fastener it is used with, withstands extreme vibrations without loosening. The flange design allows the nut to span larger holes than a standard nylon insert stop nut while providing a more uniform bearing-stress to clamp-force ratio.
Material	Class 8 metric nylon insert lock nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.58% maximum; ***Manganese***: 0.25% minimum; ***Phosphorus***: 0.060% maximum; ***Sulfur***: 0.150% maximum. Insert is made of polyamid.
Hardness	HV 195 Minimum
Plating	See Appendix-A for plating information

DIN 6927 Prevailing Torque Flange Class 10 Steel

NUTS



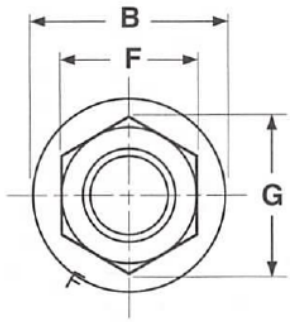


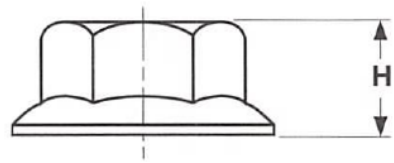
DIN 6927 Prevailing Torque Hex Flange Nuts				
Nominal Size & Thread Pitch	F	B	H	W
	Width Across Flats	Flange Diameter	Overall Thickness	Wrenching Height
	Ref	Max	Max	Ref
M6-1.0	10.00	14.2	7.3	5.7
M8-1.25	13.00	17.9	9.40	7.6
M10-1.5	15.00	21.8	11.40	9.6
M12-1.75	18.00	26	13.80	11.6
M16-2.0	24.00	34.5	18.3	15.3

Description	An all-metal, one-piece hex nut with a flange on the bottom side. The fastener derives its prevailing torque characteristics from controlled distortion of its top threads from their normal helical form to a more elliptical shape.
Applications/ Advantages	The nuts are reusable and can withstand severe vibration and shock loads. Has a low, uniform bearing stress to clamp force ratio. This style reduces inventory (by eliminating a washer) and in-place cost. It is designed to be used specifically, but not exclusively, with alloy flange bolts.
Material	Class 10 steel.
Hardness	HV 272 - 353
Plating	See Appendix-A for plating information.

NUTS

ISO 4161
Hex Flange

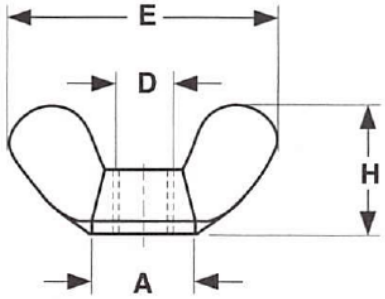


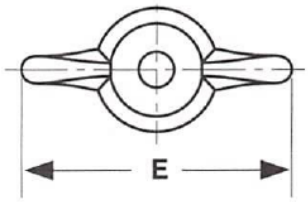


METRIC - HEX FLANGE NUTS, STYLE 1							ISO 4161
Nominal Size	Thread Pitch	F		G	H		B
		Width Across Flats		Width Across Corners	Nut Thickness		Flange Diameter
		Max	Min	Min	Max	Min	Max
M5	0.8	8.00	7.78	8.79	5	4.7	11.8
M6	1	10.00	9.78	11.05	6	5.7	14.2
M8	1.25	13.00	12.73	14.38	8	7.6	17.9
M10	1.5	15.00	14.73	16.64	10	9.6	21.8
M12	1.75	18.00	17.73	20.03	12	11.6	26
M16	2	24.00	23.67	26.75	16	15.3	34.5
M20	2.5	30.00	29.16	32.95	20	18.9	42.8

Description	Hex nut with an enlarged circular base flaring out from the bottom of the nut. The bearing surface of the flange is smooth.	
Applications/ Advantages	Larger bearing surface will span oversized or poorly aligned holes. Flange provides a more uniform bearing-stress to clamp-force ratio than other low carbon lock nuts.	
Material	Class 8 nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.58% maximum; ***Manganese***: 0.25% minimum; ***Phosphorus***: 0.060% maximum; ***Sulfur***: 0.150% maximum.	Class 10 nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.58% maximum; ***Manganese***: 0.30% minimum; ***Phosphorus***: 0.048% maximum; ***Sulfur***: 0.058% maximum.
Hardness	***Diameters M5 through M16:*** Vickers HV 200 - 302 *Diameter M20:* Vickers HV 233 - 353	***Diameters M5 through M20:*** Vickers HV 272 - 353
Proof Load	***Diameters M4 through M7:*** 855 N/mm² *Diameters M8 through M10:* 870 N/mm² *Diameters M12 through M16:* 880 N/mm² *Diameter M20:* 920 N/mm²	***Diameters M4 through M10:*** 1,040 N/mm² *Diameters M12 through M16:* 1,050 N/mm² *Diameter M20:* 1,060 N/mm²
Plating	See Appendix-A for plating information	

Malleable Cast Wing Nuts





METRIC - MALLEABLE CAST WING NUTS

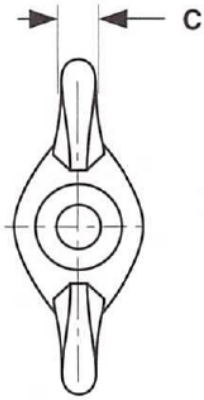
DIN 315

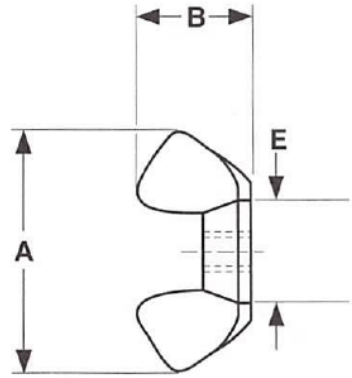
D	Thread Pitch	A	E	H
Nominal Diameter		Boss Diameter	Wing Spread	Wing Height
		Max	Max	Max
M4	0.70	8	20	10.5
M5	0.80	11	26	13
M6	1	13	33	17
M8	1.25	16	39	20
M10	1.50	20	51	25
M12	1.75	23	65	33.5
M14	2	28	72	36
M16	2	29	73	37.5
M20	2.5	35	90	46.5

Description	A nut with a metric thread pitch and two wings protruding 180° from each other which allows the part to be manually turned.
Applications/ Advantages	Wing nuts are used when a part is frequently assembled and disassembled at a place where torque greater than that achieved with finger pressure is not needed. The malleable style nut has been the most common type wing nut used in Europe for many years.
Material	Malleable iron casting
Plating	See Appendix-A for plating information

NUTS

Cold Forged Wing Nuts

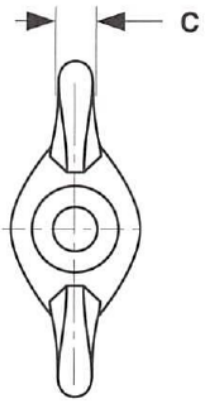


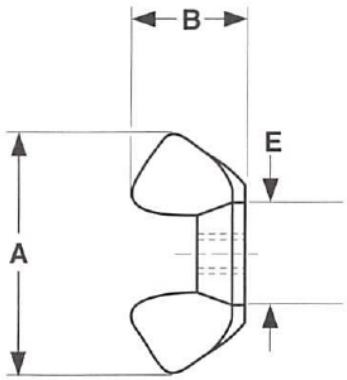


METRIC - COLD FORGED WING NUTS, CLASS 5					No. 3155
Nominal Size	Thread Pitch	A	B	C	E
		Wing Spread	Wing Height	Wing Thickness	Boss Diameter
M3	0.50	17.60	8.60	1.60	8
M4	0.70	17.60	8.60	1.60	8
M5	0.80	22.50	11	2.10	10.30
M6	1	27.80	13.60	2.50	12.70
M8	1.25	30.30	14.80	2.80	13.80
M10	1.50	36.20	17.70	3.30	16.50
M12	1.75	49.40	24.10	4.50	22.50

Description	A nut with a metric thread pitch and wings set 180° apart from each other which allows the part to be manually turned.
Applications/ Advantages	Class 5 metric cold-forged wing nuts are used when a part is frequently assembled and disassembled at a place where torque greater than that achieved with finger pressure is not needed. The cold-forged style nut has been more popular in the United States, especially in the automotive aftermarket. It can also be safer to use than a malleable wing nut which can have sharp burrs that must be filed down prior to installation.
Material	Class 5 metric cold-forged nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.50% maximum; ***Phosphorus***: 0.060% maximum; ***Sulfur***: 0.150% maximum.
Hardness	Rockwell B89 - C30 (Vickers HV 130 - 302)
Plating	See Appendix-A for plating information

Cold Forged Wing Nuts



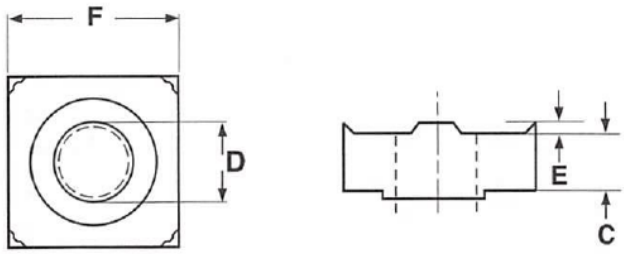


METRIC - Cold Forged Wing Nuts

Nominal Size	Thread Pitch	A		B		C		E	
		Wing Spread		Wing Height		Wing Thickness		Boss Diameter	
		Max	Min	Max	Min	Max	Min	Max	Min
M3	0.50	23.1	19.8	11.9	8.6	3.5	2.5	10.9	9.9
M4	0.70	23.1	19.8	11.9	8.6	3.5	2.5	10.9	9.9
M5	0.80	23.1	19.8	11.9	8.6	3.5	2.5	10.9	9.9
M6	1	27.9	24.6	14.4	10.9	4.5	3.5	12.7	11.4
M8	1.25	31.7	26.4	16.7	13.4	5.3	4.3	14.7	12.9
M10	1.50	36.5	33.2	20.0	16.5	6.0	5.0	17.7	16.2
M12	1.75	49.2	45.9	25.4	22.1	8.3	6.6	23.6	21.8

Description	A nut with a metric thread pitch and wings set 180° apart from each other which allows the part to be manually turned.
Applications/ Advantages	Class 5 metric cold-forged wing nuts are used when a part is frequently assembled and disassembled at a place where torque greater than that achieved with finger pressure is not needed. The cold-forged style nut has been more popular in the United States, especially in the automotive aftermarket. It can also be safer to use than a malleable wing nut which can have sharp burrs that must be filed down prior to installation.
Material	Nuts shall be made of a steel which conforms to the following chemical composition-- ***Carbon***: 0.50% maximum; ***Phosphorus***: 0.060% maximum; ***Sulfur***: 0.150% maximum.
Hardness	Rockwell B89 - C30 (Vickers HV 130 - 302)
Plating	See Appendix-A for plating information

NUTS — DIN 928 Square Weld



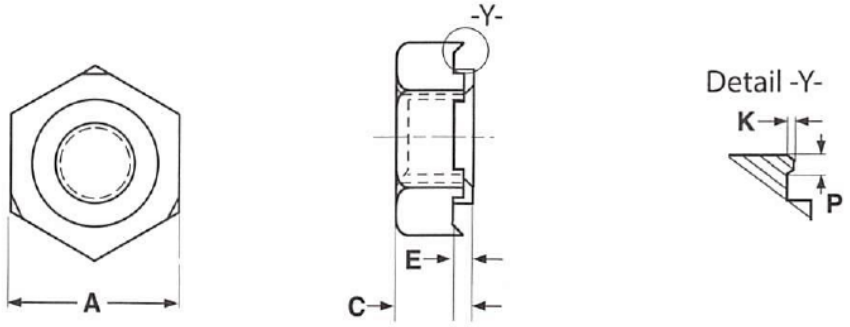
METRIC DIN 928 Weld Nuts - Piloted Square With Multiple Projections

DIN 928

D	F	C	E
Nominal Diameter & Thread Pitch	Nut Width Across Square	Nut Thickness	Projection Height
M5-0.8	9.0 8.64	4.2 3.90	0.9 0.7
M6-1.0	10.0 9.57	5.0 4.70	0.9 0.7
M8-1.25	14.0 13.57	6.5 6.14	1.1 0.9

Description	A four-sided, internally threaded fastener with four uniform, triangular weldable projections on the top surface of each corner of the fastener. The threaded hole runs through the center. This nut has no pilot.	
Applications/ Advantages	This weld nut is easy to set in place for efficient welding speed by a locator pin in the electrode.	
Material	***Steel***	***Stainless***
	Class 8 Steel	A2 Stainless

DIN 929 Piloted Hex Multi-Projection—Weld NUTS



METRIC DIN 929 Weld Nuts - Piloted Hex With Multiple Projections

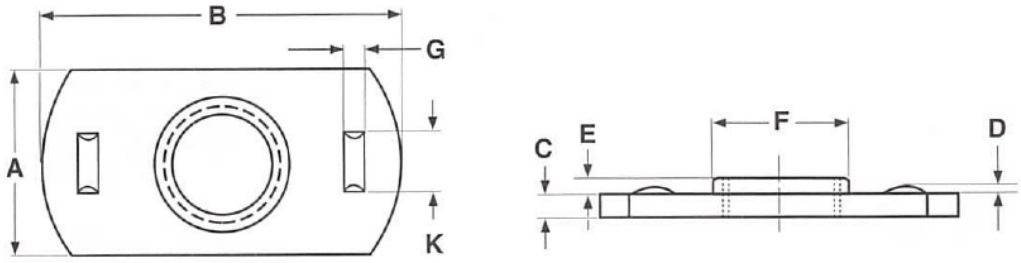
DIN 929

Size	A Nut Width Across Flats	C Nut Thickness	E Pilot Height	P Projection Width	K Projection Height
M5-0.8	10.00 9.78	4.00 3.70	0.70 0.60	1.00 0.60	0.40 0.30
M6-1.0	11.00 10.73	5.00 4.70	0.75 0.60	1.12 0.68	0.40 0.30
M8-1.25	14.00 13.73	6.50 6.14	0.90 0.75	1.25 0.75	0.50 0.35
M10-1.5	17.00 16.73	8.00 7.64	1.15 0.95	1.55 0.95	0.65 0.50

Description	A six-sided, internally threaded fastener with three triangular weldable projections on the top surface of every other corner of the fastener. The threaded hole runs through the center and has a pilot for the entire circumference of the opening which extends above the top surface of the nut and above the projections. The remainder of the top surface of the nut is flat.	
Applications/ Advantages	This weld nut is designed to achieve two ends: (1) the pilot is self-locating so it can be used with an automated feeding mechanism; (2) when the nut is fully tightened, the pilot protects the internal threads from welding residue.	
Material	***Steel***	***Stainless***
	Class 8 Steel	A2 Stainless

NUTS

Multiple Ribbed Projection Weld



METRIC WELD NUTS - CENTER HOLE DESIGN WITH MULTIPLE RIBBED PROJECTIONS

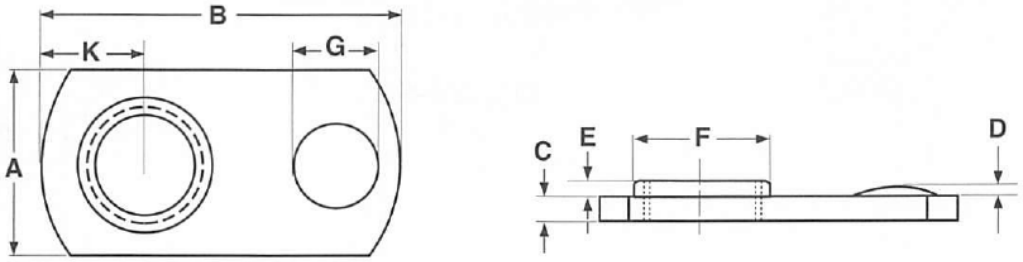
Paulin®

Size	A Nut Width	C Nut Thickness	B Nut Length	F Pilot Diameter	E Pilot Height	G Projection Width	D Projection Height	K Projection Length	Sheet Hole
M6 x 1.0	13.4 12.7	3.3 3.1	21.0 20.2	7.8 7.3	1.5 1.1	3.30 3.05	0.64 0.53	3.6 2.8	8.0

Description	A four-sided, internally threaded fastener with rounded edges at the two ends most opposite each other. The threaded hole runs through the center and has a pilot for the entire circumference of the opening which extends above the flat surface of the nut. At opposite ends on the top surface of the nut are two identical rectangular, ribbed protrusions of less height than the pilot.
Applications/ Advantages	The center hole design enables this nut to bridge corners or depressions offering additional strength. The ribbed projections provide equal welding strength on both sides of the pilot. The height of the pilot eliminates the need for retapping damaged threads.
Material	1006 - 1010 Low Carbon Steel

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Offset Hole, Single Projection—Weld



METRIC Weld Nuts - Center Hole Design With Multiple Ribbed Projections

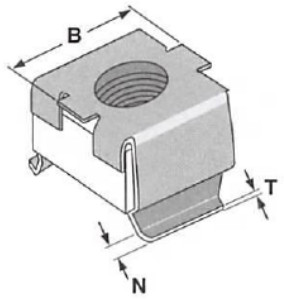
Paulin®

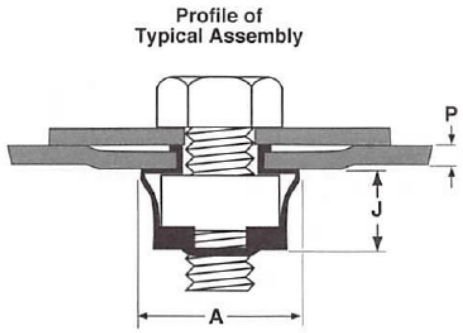
Size	A Nut Width	C Nut Thickness	B Nut Length	F Pilot Diameter	E Pilot Height	G Projection Width	D Projection Height	K Center of Pilot Hole to Outside of Rounded Edge	Sheet Hole
M6 x 1.0	13.4 12.7	3.3 3.1	21.0 20.2	7.8 7.3	1.5 1.1	5.70 5.45	0.64 0.53	6.80 6.00	8.0

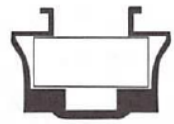
Description	A four-sided, internally threaded fastener with rounded edges at the two ends most opposite each other. The threaded hole is set off to one side and has a pilot for the entire circumference of the opening which extends above the flat surface of the nut. Next to this opening is a single, round, dome-shaped protrusion of a lesser height than the pilot.
Applications/ Advantages	Preferred over other styles of weld nuts when working with heavier gage material. The large, single projection gives a deeper weld than possible with smaller projections. The height of the pilot minimizes the amount of welding residue that could clog the threads.
Material	1006 - 1010 Low Carbon Steel

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NUTS — Cage Style





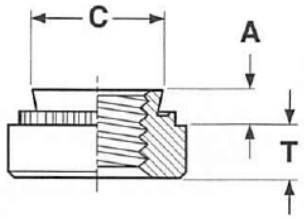


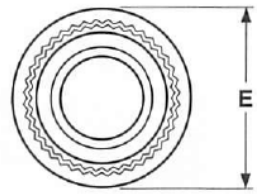
Cage Nuts

Screw Size	Kanebridge Part Number	B		A	J		N		T	P	
		Cage Width (Static)		Cage Width (Assembled)	Cage Height		Foot Width		Material Thickness	Panel Range	
		Max	Min	Ref	Max	Min	Max	Min	Ref	Max	Min
M5 x 0.8	M5-025NCAG	.535	.505	.54	.265	.235	.090	.070	.020	.063	.025
M5 x 0.8	M5-064NCAG	.535	.505	.54	.265	.235	.130	.110	.020	.105	.064
M6 x 1.0	M6-064NCAG	.535	.505	.54	.265	.235	.130	.110	.020	.105	.064
M6 x 1.0	M6-093NCAG	.535	.505	.54	.265	.235	.145	.125	.020	.126	.093
M8 X 1.25	M8-093NCAG	.675	.645	.73	.315	.285	.110	.090	.025	.126	.092
M10 x 1.50	M10-093NCAG	.670	.650	.734	.310	.290	.160	.140	.025	.126	.093
(millimeters)		(dimensions shown in inches)									

Description	A free floating square nut retained within a spring steel cage. The cage has two retaining legs on the same side of the nut, positioned 180° from each other, that hold the nut in place at panel edges or center panel locations.	
Applications/ Advantages	More economical and easier to install than other heavy duty nuts for blind side applications. Free floating nut will compensate for poorly aligned holes. The square cage design keeps the nut from rotating during tightening. Cage nuts are successfully used in heavy duty farm machinery, rail cars, home entetainment components and heating equipment among other applications.	
Material	***Cage***	***Nut***
	SAE 1050 - 1065 spring steel	SAE 1018, 1108 or equivalent steel
Heat Treatment	Parts are quenched from the proper austentizing temperature directly into a salt bath at between 590°F and 710°F. Parts are held at this quench temperature for a recommended period. Parts are then removed from the salt quenched and air cooled to room temperature.	
Hardness	Rockwell C 44 - 51	
Plating	Cage nuts are typically supplied with a zinc plating.	

Round Self-Clinching NUTS





METRIC SELF-CLINCHING NUTS

*PEM®

Size	Catalog Part Number (Steel nuts)	PEM® Part Number (Steel nuts)	A Shank Height Max	Minimum Sheet Thickness	Hole Size in Sheet +0.08 -0.00	C Shank Diameter Max	E Nut Diameter ±0.25	T Nut Height ±0.25	Performance Data in Cold-Rolled Steel: Installation (kN)	Pushout (N)	Torque Out (N·m)
M2x0.4-0	M2-0NCL	S-M2-0-ZI	0.77	0.8 - 1	4.25	4.22	6.3	1.5	11.2 - 15.6	470	1.47
M2x0.4-1	M2-1NCL	S-M2-1-ZI	0.97	1						550	1.7
M2x0.4-2	M2-2NCL	S-M2-2-ZI	1.38	1.4						1010	2.03
M2.5x0.45-0	M2.5-0NCL	S-M2.5-0-ZI	0.77	0.8 - 1	4.25	4.22	6.3	1.5	11.2 - 15.6	470	1.47
M2.5x0.45-1	M2.5-1NCL	S-M2.5-1-ZI	0.97	1						550	1.7
M2.5x0.45-2	M2.5-2NCL	S-M2.5-2-ZI	1.38	1.4						1010	2.03
M3x0.5-0	M3-0NCL	S-M3-0-ZI	0.77	0.8 - 1	4.25	4.22	6.3	1.5	11.2 - 15.6	470	1.47
M3x0.5-1	M3-1NCL	S-M3-1-ZI	0.97	1						550	1.7
M3x0.5-2	M3-2NCL	S-M3-2-ZI	1.38	1.4						1010	2.03
M3.5x0.6-0	M3.5-0NCL	S-M3.5-0-ZI	0.77	0.8 - 1	4.75	4.73	7.1	1.5	13.4 - 26.7	480	1.8
M3.5x0.6-1	M3.5-1NCL	S-M3.5-1-ZI	0.97	1						570	2.3
M3.5x0.6-2	M3.5-2NCL	S-M3.5-2-ZI	1.38	1.4						1210	2.3
*M3.5x0.6-3	M3.5-3NCL	S-M3.5-3-ZI	2.21	2.3						-	-
M4x0.7-0	M4-0NCL	S-M4-0-ZI	0.77	0.8 - 1	5.4	5.38	7.9	2	18 - 27	490	2.95
M4x0.7-1	M4-1NCL	S-M4-1-ZI	0.97	1						645	4
M4x0.7-2	M4-2NCL	S-M4-2-ZI	1.38	1.4						1250	5.1
*M4x0.7-3	M4-3NCL	S-M4-3-ZI	2.21	2.3						1300*	4.2*
M5x0.8-0	M5-0NCL	SS-M5-0-ZI	0.77	0.8 - 1	6.4	6.38	8.7	2	18 - 38	530	3.6
M5x0.8-1	M5-1NCL	SS-M5-1-ZI	0.97	1						800	4.5
M5x0.8-2	M5-2NCL	SS-M5-2-ZI	1.38	1.4						1112	6.8
*M5x0.8-3	M5-3NCL	SS-M5-3-ZI	2.21	2.3						1500*	6*

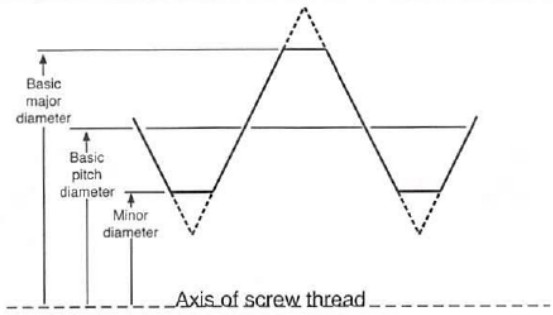
*Dimensions and performance data for these sizes are independent of PEM standards.

Description	A round, internally threaded, one-piece fastener with a shank protruding from the internal circumference, and a knurled clinching ring surrounding the shank. Both the shank and the clinching ring are integrally formed into the bottom side of the nut.
Applications/ Advantages	Designed for use in thin sheet metal when load bearing threads are necessary. The nut is pressed into a pre-drilled or punched hole, then force is applied to the top of the nut until the bearing surface at the outside diameter of the bottom of the nut is flush with the sheet metal to which it is attached.
Material	Carbon steel
Heat Treatment	Nuts are case-hardened.
Plating	See Appendix-A for information on zinc plating.
For Use In	Can be installed into metals of Rockwell hardness of B80 max.

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NUTS

Internal Threads

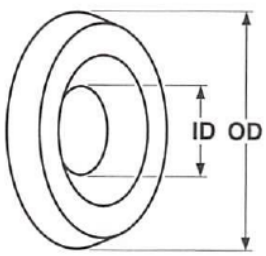


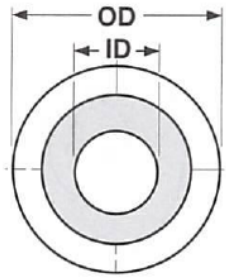
INTERNAL THREADS, CLASS 6H

DIN 13; ISO 68 & ISO R 1501

Nominal Size	Normal Engagement Length		Major Diameter	Pitch Diameter		Minor Diameter	
	From	To	Min	Min	Max	Min	Max
M1.6	0.8	2.6	1.600	1.373	1.458	1.221	1.321
M2	1	3	2.000	1.740	1.830	1.567	1.679
M2.5	1.3	3.8	2.500	2.208	2.303	2.013	2.138
M3	1.5	4.5	3.000	2.675	2.775	2.459	2.599
M4	2	6	4.000	3.545	3.663	3.242	3.422
M5	2.5	7.5	5.000	4.480	4.605	4.134	4.334
M6	3	9	6.000	5.350	5.500	4.917	5.153
M8	4	12	8.000	7.188	7.348	6.647	6.912
M10	5	15	10.000	9.026	9.206	8.376	8.676
M12	6	18	12.000	10.863	11.063	10.106	10.441
M14	8	24	14.000	12.701	12.913	11.835	12.210
M16	8	24	16.000	14.701	14.913	13.835	14.210
M20	10	30	20.000	18.376	18.600	17.294	17.744
M24	12	36	24.000	22.051	22.316	20.752	21.252
M30	15	45	30.000	27.727	28.007	26.211	26.771
M36	18	53	36.000	33.402	33.702	31.670	32.270
M42	21	63	42.000	39.077	39.392	37.129	37.799
M48	24	71	48.000	44.752	45.087	42.587	43.297
M56	28	85	56.000	52.428	52.783	50.046	50.796
M64	32	95	64.000	60.103	60.478	57.505	58.305

Countersunk Finishing WASHERS



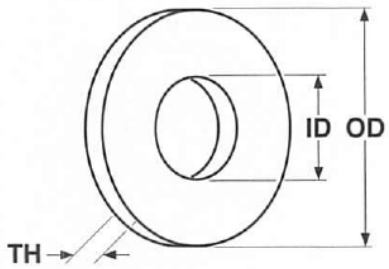


METRIC 90° COUNTERSUNK FINISHING WASHERS			
Screw Size	OD Outside Diameter Max	ID Inside Diameter Min	Overall Height Min
M2.5	9	2.7	1.7
M3	10	3.2	2
M4	14	4.3	2.5
M5	16	5.3	3
M6	18	6.4	3.3
M8	25	8.4	4.8

Description	A formed circular washer designed for use with metric flat or oval head screws. This is a raised type of finishing washer that is convex shaped.
Applications / Advantages	Designed for accomodating the heads of countersunk screws. It provides additional bearing area on the material being fastened and provides a neat, finished appearance.
Material	Washers are punched from hot-rolled hot-rolled and pickled, or cold-rolled steel; or shall be machined from bar stock or tubing; or may be forged, at the manufacturer's option.
Plating	Metric countersunk finishing washers are available in zinc, chrome or plain finish.

WASHERS

DIN 125A Flat





METRIC - STANDARD FLAT WASHERS, PER DIN 125A

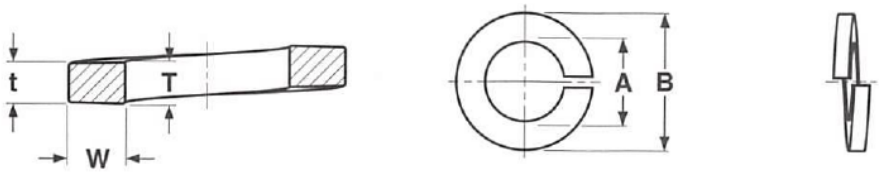
DIN 125A

Nominal Size	ID		OD		T	
	Internal Diameter		Outside Diameter		Thickness	
	Max	Min	Max	Min	Max	Min
3	3.38	3.2	7	6.64	0.55	0.45
3.5	3.88	3.7	8	7.64	0.55	0.45
4	4.48	4.3	9	8.64	0.9	0.7
5	5.48	5.3	10	9.64	1.1	0.9
6	6.62	6.4	12	11.57	1.8	1.4
8	8.62	8.4	16	15.57	1.8	1.4
10	10.77	10.5	20	19.48	2.2	1.8
12	13.27	13	24	23.48	2.7	2.3
16	17.27	17	30	29.48	3.3	2.7
20	21.33	21	37	36.38	3.3	2.7

Description	A thin, flat circular part with a centrally located hole with outside diameter approximately twice the nominal thread diameter of the bolt or screw to be used with it. The A in 125A denotes that this washer is not chamfered.		
Applications/ Advantages	This is the most commonly used flat washer with low carbon bolts, screws and nuts.	Can be used with medium carbon steel bolts, screws and nuts	Suitable for use with A2 (18-8) stainless steel screws, bolts and nuts.
Material	Steel HV-140	Steel HV-200	A2 Stainless HV-140
Hardness	HV 140 - 250	HV 200 - 300	HV 140 min.
Plating	See Appendix-A for information about the plating of flat washers.		Stainless flat washers are typically supplied plain or with black oxide finish.

Spring Lockwasher

WASHERS



METRIC - SPRING LOCKWASHERS

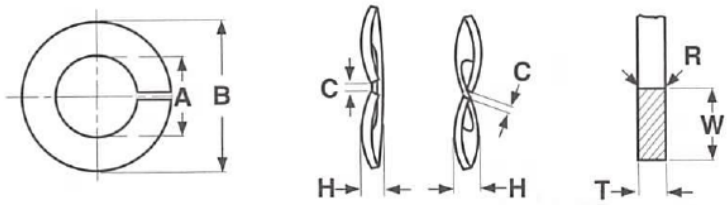
DIN 127B

Nominal Washer Size	A		B	T	W
	Inside Diameter		Outside Diameter	Section Thickness	Section Width
	Max	Min	Ref	Ref	Ref
M2	2.4	2.1	4.4	0.50	0.9
M2.5	2.9	2.6	5.1	0.60	1
M3	3.4	3.1	6.2	0.80	1.3
M4	4.4	4.1	7.6	0.90	1.5
M5	5.4	5.1	9.2	1.20	1.8
M6	6.5	6.1	11.8	1.60	2.5
M8	8.5	8.1	14.8	2	3
M10	10.7	10.2	18.1	2.2	3.5
M12	12.7	12.2	21.1	2.5	4
M16	17.0	16.2	27.4	3.5	5
M20	21.2	20.2	33.6	4	6
M24	25.5	24.5	40	5	7
M30	31.7	30.5	48.2	6	8
M36	37.7	36.5	58.2	6	10
M42	43.7	42.5	68.2	7	12
M48	50.5	49	75	7	12

Description	A coiled, split circular washer with a slightly trapezoidal wire section, for use with metric screws.	
Applications/ Advantages	(A) Applies greater bolt tension per unit of applied torque; (B) Provides a hardened bearing surface, creating more uniform torque control; (C) Provides more uniform load distribution; (D) Resists loosening caused by vibration and corrosion; (E) Is preferred lockwasher for use with hardened bearing surfaces.	(A) Applies greater bolt tension per unit of applied torque; (B) Provides more uniform load distribution; (C) Resists loosening caused by vibration and corrosion; (D) Resists environmental corrosion.
Material	Spring steel	A2 or A4 Stainless Steel
Hardness	Rockwell C 44 - 51	N/A
Plating	See Appendix-A for information about the plating of carbon steel lock washers.	-

WASHERS

Curved Spring Lockwasher



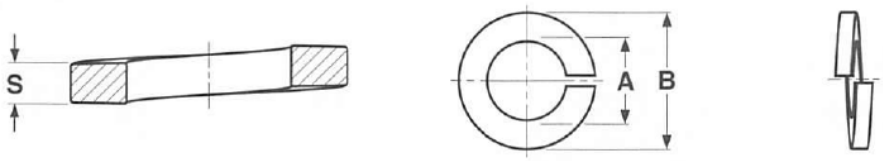
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METRIC - CURVED SPRING LOCKWASHERS										DIN 128A & 128B
Nominal Washer Size	A		B	H		W		T		R
	Inside Diameter		Outside Diameter	Total Wave Height		Section Width		Section Thickness		Radius
	Max	Min	Max	Max	Min	Max	Min	Max	Min	Ref
M2	2.4	2.1	4.4	0.9	0.7	1.0	0.8	0.6	0.4	0.1
M2.3	2.7	2.4	4.9	1.1	0.9	1.1	0.9	0.7	0.5	0.1
M2.5	2.9	2.6	5.1	1.1	0.9	1.1	0.9	0.7	0.5	0.1
M2.6	3.0	2.7	5.2	1.1	0.9	1.1	0.9	0.7	0.5	0.1
M3	3.4	3.1	6.2	1.3	1.1	1.4	1.2	0.8	0.6	0.1
M3.5	3.9	3.6	6.7	1.3	1.1	1.4	1.2	0.8	0.6	0.1
M4	4.4	4.1	7.6	1.4	1.2	1.6	1.4	0.9	0.7	0.2
M5	5.4	5.1	9.2	1.7	1.5	1.9	1.7	1.1	0.9	0.2
M6	6.5	6.1	11.8	2.2	2.0	2.65	2.35	1.4	1.2	0.3
M7	7.5	7.1	12.8	2.2	2.0	2.65	2.35	1.4	1.2	0.3
M8	8.6	8.2	14.9	2.75	2.45	3.15	2.85	1.7	1.5	0.5
M10	10.7	10.2	18.1	3.15	2.85	3.7	3.3	1.9	1.7	0.5

Description	A coiled, hardened, split circular washer with a wave-shaped wire section, for use with metric screws.
Applications/ Advantages	Offers more resistance to vibration than helical split lock washers. Can be used in both left hand and right hand bolting connections.
Material	Spring steel
Hardness	Rockwell C 44 - 51
Plating	See Appendix-A for information about the plating of carbon steel and alloy steel lock washers.

DIN 7980 High-Collar Split Lockwasher

WASHERS



METRIC - DIN 7980 High Collar Lockwashers

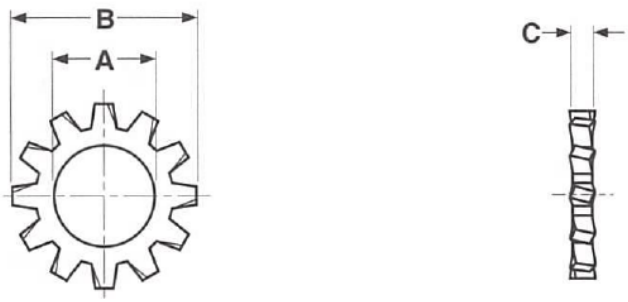
DIN 7980

Nominal Washer Size	A		B	S	
	Inside Diameter		Outside Diameter	Thickness	
	Max	Min	Max	Max	Min
M3	3.4	3.1	5.6	1.1	0.9
M4	4.4	4.1	7	1.3	1.1
M5	5.4	5.1	8.8	1.7	1.5
M6	6.5	6.1	9.9	1.7	1.5
M8	8.5	8.1	12.7	2.1	1.9
M10	10.7	10.2	16	2.6	2.4
M12	12.7	12.2	18	2.6	2.4
M14	14.7	14.2	21.1	3.1	2.9
M16	17.0	16.2	24.4	3.6	3.4
M18	19.0	18.2	26.4	3.6	3.4

Description	A coiled spring lock washer is thicker and has a smaller outside diameter than a regular split lock washer.	
Applications/ Advantages	Designed for use with smaller head screws, particularly sockets. Performs comparably to a regular split lock washer as a greater thickness compensates for smaller outside diameter.	
Material	Spring steel	A2 Stainless Steel
Hardness	Rockwell C 44 - 51	N/A
Plating	See Appendix-A for information about the plating of carbon steel lock washers.	-

WASHERS

External Tooth Lockwasher

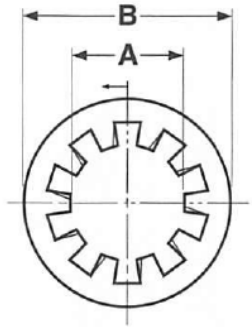


METRIC - EXTERNAL TOOTH LOCKWASHER						DIN 6797 A; JIS B 1255
Nominal Size	A		B		C	Preferred Number of Teeth per DIN spec*
	Inside Diameter		Outside Diameter		Washer Thickness	
	Max	Min	Max	Min	Ref	
M3	3.38	3.2	6	5.7	0.8	6
M3.5	3.88	3.7	7	6.64	1	6
M4	4.48	4.3	8	7.64	1	8
M5	5.48	5.3	10	9.6	1.2	8
M6	6.62	6.4	11	10.5	1.4	8
M8	8.62	8.4	15	14.5	1.6	8
M10	10.77	10.5	18	17.5	1.8	9
M12	13.27	13	20.5	19.98	2	10
M14	15.27	15	24	23.48	2	10
M16	17.27	17	26	25.4	2.4	12
M20	21.33	21	33	32.38	2.8	12

*Slight deviation from the preferred number of teeth is permitted for JIS washers.

Description	A hardened circular washer with twisted prongs or teeth which extend out from the outer edge of the washer.	A soft stainless circular washer with twisted prongs or teeth which extend out from the outer edge of the washer.
Applications/ Advantages	This is the most preferable of all tooth-lock washers. It offers the greatest locking efficiency since the teeth are on the largest radius and provide greater torsional resistance.	
Material	Spring steel	A2 Stainless Steel
Hardness	Vickers 350-425 HV	-
Plating	See Appendix-A for information on the plating of steel lock washers.	Stainless washers are usually provided without additional finish.

Internal Tooth Lockwasher





METRIC - Internal Tooth Lockwashers

DIN 6797 J; JIS B 1255

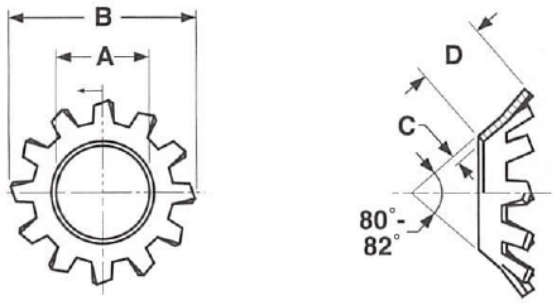
Nominal Size	A Inside Diameter		B Outside Diameter		C Washer Thickness	Preferred Number of Teeth per DIN spec*
	Max	Min	Max	Min	Min	
M2	2.34	2.2	4.5	4.2	0.6	6
M2.5	2.84	2.7	5.5	5.2	0.8	6
M3	3.38	3.2	6	5.7	0.8	6
M3.5	3.88	3.7	7	6.64	1	6
M4	4.48	4.3	8	7.64	1	8
M5	5.48	5.3	10	9.64	1.2	8
M6	6.62	6.4	10	9.64	1.2	8
M8	8.62	8.4	15	14.57	1.6	8
M10	10.77	10.5	18	17.57	1.8	9
M12	13.27	13	20.5	19.98	2	10
M14	15.27	15	24	23.48	2	10
M16	17.27	17	26	25.48	2.4	12
M20	21.33	21	33	32.38	2.8	12

*Slight deviation from the preferred number of teeth is permitted for JIS washers.

Description	A hardened circular washer with twisted prongs or teeth which extend inward from the inside edge of the washer.	A soft stainless circular washer with twisted prongs or teeth which extend inward from the inside edge of the washer.
Applications/ Advantages	This is preferred when finished appearance is crucial and the teeth must be hidden under the head of the screw; also recommended for use with small heads such as fillisters.	
Material	Spring steel	A2 Stainless Steel
Hardness	Vickers 350-425 HV	-
Plating	See Appendix-A for information on the plating of steel lock washers.	Stainless washers are usually provided without additional finish.

WASHERS

Countersunk External Tooth Lockwasher

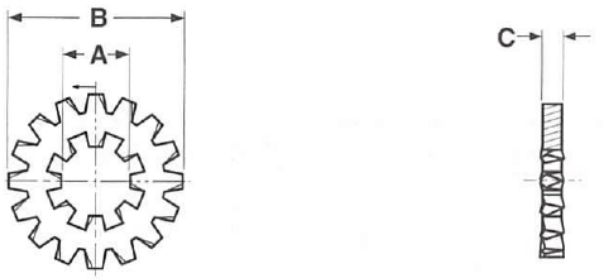


METRIC - COUNTERSUNK EXTERNAL TOOTH LOCKWASHERS							DIN 6797 V; JIS B 1255
Nominal Size	A		B	C		D	Preferred Number of Teeth per DIN spec*
	Inside Diameter		Outside Diameter	Thickness		Length	
	Max	Min	Approx	Max	Min	Max	
M3	3.4	3.2	6	0.43	0.37	1.8	6
M4	4.5	4.3	8	0.43	0.37	2.5	8
M5	5.5	5.3	10	0.535	0.465	3.1	8
M6	6.7	6.4	12	0.535	0.465	3.8	10
M8	8.7	8.4	16	0.64	0.56	5.1	10

*Slight deviation from the preferred number of teeth is permitted for JIS washers.

Description	An external tooth lock washer with a conical shaped bearing surface.
Applications/ Advantages	Designed for use with flat or oval head metric screws with countersunk angles of 82° or 100°.
Material	Spring steel
Hardness	Rockwell C36 - 42
Plating	See Appendix-A for information on the plating of steel lock washers.

Combination External-Internal Tooth Lockwasher WASHERS



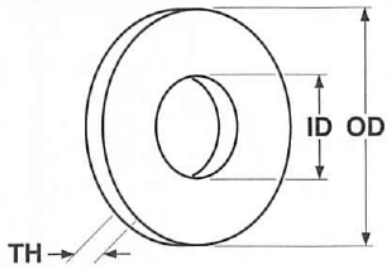
METRIC - INTERNAL EXTERNAL TOOTH LOCKWASHERS								DIN 6999 D; JIS B 1255
Nominal Size	A		B		C		Preferred Number of Teeth*	
	Inside Diameter		Outside Diameter		Thickness			
	Max	Min	Max	Min	Max	Min	Internal	External
M4	4.5	4.3	15	14.5	0.64	0.56	8	12
M5	5.5	5.3	15	14.5	0.64	0.56	8	12
M6	6.7	6.4	17.5	17.0	0.85	0.75	9	12
M8	8.7	8.4	22.5	21.9	0.95	0.85	9	12
M10	10.9	10.5	26	25.4	1.055	0.945	9	14
M12	12.9	12.5	29	28.4	1.055	0.945	10	14
M14	14.9	14.5	32	31.2	1.265	1.135	10	14
M16	16.9	16.5	35	34.2	1.47	1.33	12	16

*Slight deviation from the preferred number of teeth is permitted for JIS washers.

Description	A hardened circular washer with twisted prongs or teeth protruding from both the inside and outer edges of the washer.
Applications/ Advantages	Preferred lockwasher for use with metric screws in the following situations: (1) where a larger bearing surface is desired; (2) for an optimum electrical connection; (3) where the hole is oversized or out of round; (4) as an insert between two adjustable pieces where a longitudinal or rotational adjustment must be maintained.
Material	Spring steel
Hardness	Rockwell C 36 - 42
Plating	See Appendix-A for information about the plating of steel lock washers.

WASHERS

Standard Flat— Normal Series, Grade A



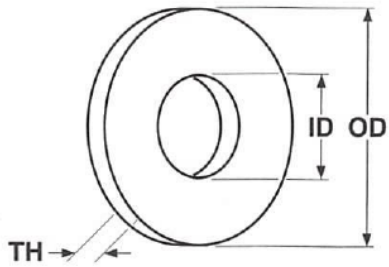
METRIC - STANDARD FLAT WASHERS (NORMAL SERIES, GRADE A) ISO 7089

Nominal Size	ID		OD		T	
	Internal Diameter		Outside Diameter		Thickness	
	Max	Min	Max	Min	Max	Min
1.6	1.84	1.7	4	3.7	0.35	0.25
2	2.34	2.2	5	4.7	0.35	0.25
2.5	2.84	2.7	6	5.7	0.55	0.45
3	3.38	3.2	7	6.64	0.55	0.45
3.5	3.88	3.7	8	7.64	0.55	0.45
4	4.48	4.3	9	8.64	0.9	0.7
5	5.48	5.3	10	9.64	1.1	0.9
6	6.62	6.4	12	11.57	1.8	1.4
8	8.62	8.4	16	15.57	1.8	1.4
10	10.77	10.5	20	19.48	2.2	1.8
12	13.27	13	24	23.48	2.7	2.3
14	15.27	15	28	27.48	2.7	2.3
16	17.27	17	30	29.48	3.3	2.7
20	21.33	21	37	36.38	3.3	2.7
24	25.33	25	44	43.38	4.3	3.7
30	31.39	31	56	55.26	4.3	3.7
36	37.62	37	66	64.8	5.6	4.4

	Steel	***Stainless***
Description	A thin, flat circular part with a centrally located hole. Class 300 HV washers are also hardened and tempered.	
Applications/ Advantages	Washers are for assembly around a bolt or screw, between the bearing surface of the fastener and the part to which it is attached. Flat washers are used to improve stress distribution, and to span large clearance holes. Class 140 HV & Class 200 HV metric washers meet the majority of industrial applications in manufacturing, maintenance and repair. Class 300 HV metric washers are best suited for use with through-hardened cap-screws, bolts and nuts.	Washers are for assembly around a bolt or screw, between the bearing surface of the fastener and the part to which it is attached. Flat washers are used to improve stress distribution, and to span large clearance holes. Stainless washers are for use with austenitic stainless steel screws and nuts in general industrial applications where parts are subject to corrosion.
Material	Low or medium carbon steel	Austenitic stainless steel
Hardness	***Class 140 HV:*** HV 140 minimum (Rockwell B 75 minimum) *Class 200 HV:* HV 200-300 (Rockwell B 91.5 - C 29.8) *Class 300 HV:* HV 300-400 (Rockwell C 29.8 - 40.8)	***Class A 140:*** HV 140 minimum (Rockwell B 75 minimum) *Class A 200:* HV 200-300 (Rockwell B 91.5 - C 29.8) *Class A 350:* HV 350-400 (Rockwell C 35.5 - 40.8)
Plating	See Appendix-A for information about the plating of flat washers.	

Flat Washers, Wider I.D.— Normal Series, Grade C

WASHERS



METRIC - FLAT WASHERS, WIDER I.D. (NORMAL SERIES, GRADE C)

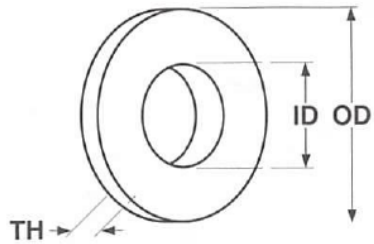
ISO 7091

Nominal Size	ID		OD		T	
	Internal Diameter		Outside Diameter		Thickness	
	Max	Min	Max	Min	Max	Min
5	5.8	5.5	10	9.1	1.2	0.8
6	6.96	6.6	12	10.9	1.9	1.3
8	9.36	9	16	14.9	1.9	1.3
10	11.43	11	20	18.7	2.3	1.7
12	13.93	13.5	24	22.7	2.8	2.2
14	15.93	15.5	28	26.7	2.8	2.2
16	17.93	17.5	30	28.7	3.6	2.4
20	22.52	22	37	35.4	3.6	2.4
24	26.52	26	44	42.4	4.6	3.4
30	33.62	33	56	54.1	4.6	3.4
36	40	39	66	64.1	6	4

Description	A thin, flat circular part with a centrally located hole which is approximately 6% wider than the hole of a like-sized standard metric flat washer.
Applications/ Advantages	Washers are for assembly around a bolt or screw, between the bearing surface of the fastener and the part to which it is attached. Flat washers are used to improve stress distribution, and to span large clearance holes. The wider-ID style is ideal for use with bolts which have over-sized shoulder or body diameters.
Material	Low or medium carbon steel
Hardness	HV 100 minimum (Rockwell B 56.2 minimum)
Plating	See Appendix-A for information about the plating of flat washers.

WASHERS

Flat, Small O.D.— Small Series, Grade A



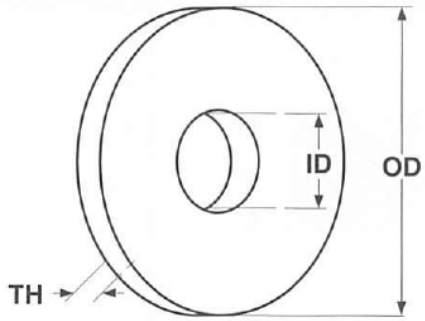
METRIC - FLAT WASHERS, SMALL O.D. (SMALL SERIES, GRADE A) ISO 7092

Nominal Size	ID		OD		T	
	Internal Diameter		Outside Diameter		Thickness	
	Max	Min	Max	Min	Max	Min
1.6	1.84	1.7	3.5	3.2	0.35	0.25
2	2.34	2.2	4.5	4.2	0.35	0.25
2.5	2.84	2.7	5	4.7	0.55	0.45
3	3.38	3.2	6	5.7	0.55	0.45
3.5	3.88	3.7	7	6.64	0.55	0.45
4	4.48	4.3	8	7.64	0.55	0.45
5	5.48	5.3	9	8.64	1.1	0.9
6	6.62	6.4	11	10.57	1.8	1.4
8	8.62	8.4	15	14.57	1.8	1.4
10	10.77	10.5	18	17.57	1.8	1.4
12	13.27	13	20	19.48	2.7	2.3
14	15.27	15	24	23.48	2.7	2.3
16	17.27	17	28	27.48	2.7	2.3
20	21.33	21	34	33.38	3.3	2.7
24	25.33	25	39	38.38	4.3	3.7
30	31.33	31	50	49.38	4.3	3.7
36	37.62	37	60	58.8	5.6	4.4

	Steel	*Stainless*
Description	A thin, flat circular part with a centrally located hole. The outside diameter of this variety washer is approximately 7-12% smaller than that of a like-sized standard flat washer. Class 300 HV washers are also hardened and tempered.	A thin, flat circular part with a centrally located hole. The outside diameter of this variety washer is approximately 7-12% smaller than that of a like-sized standard flat washer.
Applications/ Advantages	Washers are for assembly around a bolt or screw, between the bearing surface of the fastener and the part to which it is attached. Flat washers are used to improve stress distribution, and to span large clearance holes. The small outside diameter variety is used in applications with limited clearance areas on the bearing surface. Class 140 HV & Class 200 HV metric washers meet the majority of industrial applications in manufacturing, maintenance and repair. Class 300 HV metric washers are best suited for use with through-hardened cap-screws, bolts and nuts.	Washers are for assembly around a bolt or screw, between the bearing surface of the fastener and the part to which it is attached. Flat washers are used to improve stress distribution, and to span large clearance holes. The small outside diameter variety is used in applications with limited clearance areas on the bearing surface. Stainless washers are for use with austenitic stainless steel screws and nuts in general industrial applications where parts are subject to corrosion.
Material	Low or medium carbon steel	Austenitic stainless steel
Hardness	***Class 140 HV:*** HV 140 minimum (Rockwell B 75 minimum) *Class 200 HV:* HV 200-300 (Rockwell B 91.5 - C 29.8) *Class 300 HV:* HV 300-400 (Rockwell C 29.8 - 40.8)	***Class A 140:*** HV 140 minimum (Rockwell B 75 minimum) *Class A 200:* HV 200-300 (Rockwell B 91.5 - C 29.8) *Class A 350:* HV 350-400 (Rockwell C 35.5 - 40.8)
Plating	See Appendix-A for information about the plating of flat washers.	

Flat, Large O.D. Large Series, Grades A & C

WASHERS



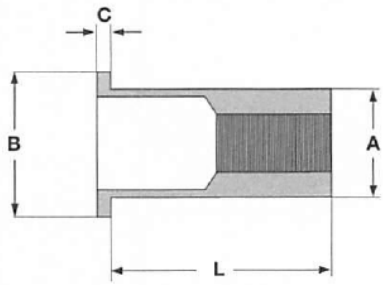
METRIC - FLAT WASHERS, LARGE O.D. (LARGE SERIES, GRADES A & C) ISO 7093

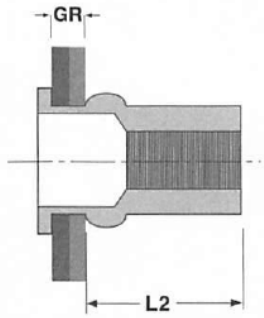
Nominal Size	ID		OD		T	
	Internal Diameter		Outside Diameter		Thickness	
	Max	Min	Max	Min	Max	Min
3	3.38	3.2	9	8.64	0.9	0.7
3.5	3.88	3.7	11	10.57	0.9	0.7
4	4.48	4.3	12	11.57	1.1	0.9
5	5.48	5.3	15	14.57	1.4	1
6	6.62	6.4	18	17.57	1.8	1.4
8	8.62	8.4	24	23.48	2.2	1.8
10	10.77	10.5	30	29.48	2.7	2.3
12	13.27	13	37	36.38	3.3	2.7
14	15.27	15	44	43.38	3.3	2.7
16	17.27	17	50	49.38	3.3	2.7
20	22.52	22	60	58.1	4.6	3.4
24	26.84	26	72	70.1	6	4
30	34	33	92	89.8	7	5
36	40	39	110	107.8	9.2	6.8

	Steel	*Stainless*
Description	A thin, flat circular part with a centrally located hole with outside diameter three times the nominal thread diameter of the bolt to be used with it. Class 300 HV washers are also hardened and tempered.	
Applications/ Advantages	Washers are for assembly around a bolt or screw, between the bearing surface of the fastener and the part to which it is attached. Flat washers are used to improve stress distribution, and to span large clearance holes. This style washer is most similar to inch-sized fender washers.	Washers are for assembly around a bolt or screw, between the bearing surface of the fastener and the part to which it is attached. Flat washers are used to improve stress distribution, and to span large clearance holes. This style washer is most similar to inch-sized fender washers. Stainless washers are for use with austenitic stainless steel screws and nuts in general industrial applications where parts are subject to corrosion.
Material	Low or medium carbon steel	Austenitic stainless steel
Hardness	***Grade A:*** HV 140 minimum (Rockwell B75 minimum) *Grade C:* HV 100 minimum (Rockwell B56.2 minimum)	HV 140 minimum (Rockwell B75 minimum)
Plating	See Appendix-A for information about the plating of flat washers.	

RIVET NUTS (Blind Threaded Inserts)

Large Flange, Smooth Body



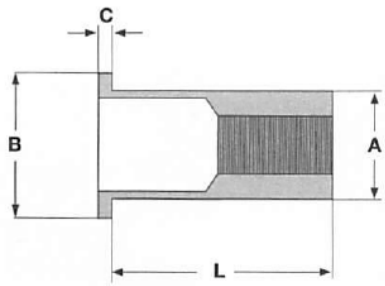


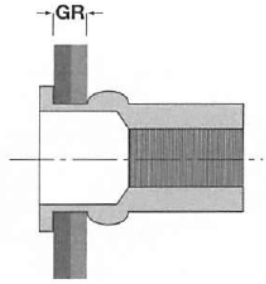
Flat Head, Non-Ribbed Blind Threaded Insert

Thread Size	GR	L		A		B		C	Hole Size		L2
	Grip Range	Body Length		Body Diameter		Head Diameter		Head Height			Installed Length
		Max	Min	Max	Min	Max	Min	Nom	Max	Min	Ref
M3 x 0.5 ISO	0.25 - 1.00	8.38	7.62	3.93	3.83	7.06	6.30	0.63	4.02	3.94	5.61
M3 x 0.5 ISO	1.00 - 1.75	9.13	8.37	3.93	3.83	7.06	6.30	0.63	4.02	3.94	5.61
M4 x 0.7 ISO	0.25 - 2.00	11.38	10.62	5.61	5.51	9.39	8.63	0.81	5.68	5.60	7.08
M4 x 0.7 ISO	2.00 - 3.00	12.38	11.62	5.61	5.51	9.39	8.63	0.81	5.68	5.60	7.08
M5 x 0.8 ISO	2.00 - 3.50	16.38	15.62	7.13	7.03	11.55	10.79	1.22	7.28	7.20	10.09
M5 x 0.8 ISO	3.50 - 5.00	17.88	17.12	7.13	7.03	11.55	10.79	1.22	7.28	7.20	10.09
M6 x 1.0 ISO	2.00 - 3.50	17.38	16.62	8.43	8.33	13.81	13.05	1.47	8.58	8.50	10.58
M6 x 1.0 ISO	3.50 - 5.00	18.88	18.12	8.43	8.33	13.81	13.05	1.47	8.58	8.50	10.58
M8 x 1.25 ISO	3.00 - 5.00	20.38	19.62	10.48	10.38	17.03	16.27	1.57	10.58	10.50	11.83
M8 x 1.25 ISO	5.00 - 7.00	22.38	21.62	10.48	10.38	17.03	16.27	1.57	10.58	10.50	11.83

Description	A cylindrical internally threaded fastener with a thicker wall in the area where the insert collapses. The fastener is open at both ends with a circular flange at one end that can be installed into a prepared hole from the blind side of the ultimate fastening. Insert is threaded onto mandrel of installation tool and positioned into hole. As mandrel is pulled back, the insert is expanded into the base material it is now gripping. Installation is complete when the mandrel of the tool is removed from the set insert.
Applications / Advantages	One popular use is as a leg leveler. Large flange provides a greater bearing surface that increases push-out strength.
Material	**Aluminum:** 6053 or 5056 Aluminum alloy **Steel:** 1108 or 1110 Steel

Large Flange, Ribbed Body RIVET NUTS (Blind Threaded Inserts)



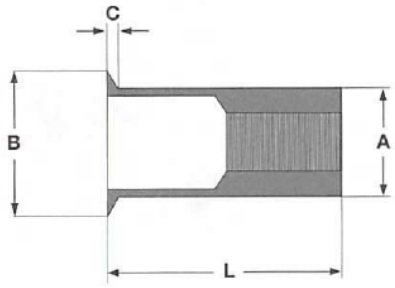


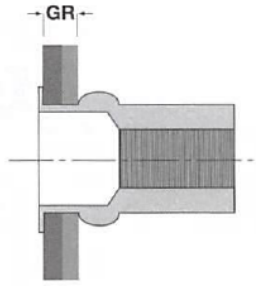
LARGE FLANGE FLAT HEAD, RIBBED BLIND THREADED INSERT									
Thread Size	GR	L		A		B		C	Hole Size	
	Grip Range	Body Length		Body Diameter		Head Diameter		Head Height		
		Max	Min	Max	Min	Max	Min	Nom	Max	Min
M4 x 0.7 ISO	2.0 - 3.3	12.32	11.56	6.73	6.63	10.29	9.53	0.76	6.90	6.75
M5 x 0.8 ISO	0.5 - 3.3	12.45	11.69	7.52	7.42	10.92	10.16	0.76	7.75	7.60
M5 x 0.8 ISO	3.3 - 5.7	15.24	14.48	7.52	7.42	10.92	10.16	0.76	7.75	7.60
M6 x 1.0 ISO	4.2 - 6.6	17.65	16.89	9.91	9.81	13.08	12.32	0.76	10.15	10.00
M8 x 1.25 ISO	0.7 - 3.8	17.91	17.15	13.46	13.36	17.78	17.02	0.89	13.65	13.50
M10 x 1.50 ISO	0.7 - 3.8	17.91	17.15	13.46	13.36	17.78	17.02	0.89	13.65	13.50

Description	A cylindrical internally threaded fastener with ribs that extend longitudinally from underneath the head down the outside of the insert. The fastener is open at both ends with a circular flange at one end that can be installed into a prepared hole from the blind side of the ultimate fastening. Insert is threaded onto mandrel of installation tool and positioned into hole. As mandrel is pulled back, the insert is expanded into the base material it is now gripping. Installation is complete when the mandrel of the tool is removed from the set insert.
Applications / Advantages	Used in electrical engineering, automotive, home appliances and other light-duty applications. Large flange provides a greater bearing surface that increases push-out strength. Ribbed body offers greater torque-to-rotation resistance than non-ribbed bodies.
Material	**Aluminum**: 6053 or 5056 Aluminum alloy **Steel:** 1108 or 1110 Steel

RIVET NUTS (Blind Threaded Inserts)

Thin Head Ribbed Body

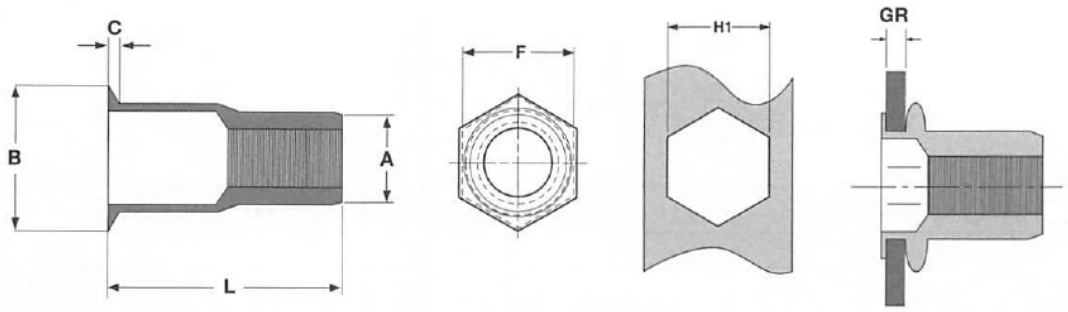




Thin Head, Ribbed Body Blind Threaded Insert										
Thread Size	GR	L		A		B		C	Hole Size	
	Grip Range	Body Length		Body Diameter		Head Diameter		Head Height		
		Max	Min	Max	Min	Max	Min	Nom	Max	Min
M4 x 0.7 ISO	2.0 - 3.3	12.32	11.56	6.73	6.63	10.29	9.53	0.48	6.90	6.75
M6 x 1.0 ISO	0.7 - 4.2	15.11	14.35	9.91	9.81	11.94	11.18	0.55	10.15	10.00
M6 x 1.0 ISO	4.2 - 6.6	17.65	16.89	9.91	9.81	11.94	11.18	0.55	10.15	10.00
M10 x 1.50 ISO	0.7 - 3.8	17.91	17.15	13.46	13.36	15.49	14.73	0.55	13.65	13.50
M10 x 1.50 ISO	3.8 - 7.9	20.83	20.07	13.46	13.36	15.49	14.73	0.55	13.65	13.50

Description	A cylindrical internally threaded fastener with ribs that extend longitudinally from underneath the head down the outside of the insert. The head has a thinner profile and smaller diameter than the large flange variety. The fastener is open at both ends with a circular flange at one end that can be installed into a prepared hole from the blind side of the ultimate fastening. Insert is threaded onto mandrel of installation tool and positioned into hole. As mandrel is pulled back, the insert is expanded into the base material it is now gripping. Installation is complete when the mandrel of the tool is removed from the set insert.
Applications / Advantages	The thin head design enables the fastener to have a flush fit once seated in place. Used in electrical engineering, automotive, home appliances and other light-duty applications. Ribbed body offers greater torque-to-rotation resistance than non-ribbed bodies.
Material	**Steel:** 1108 or 1110 Steel

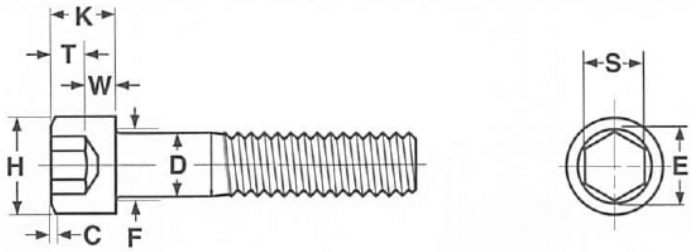
Thin Head Hex Body RIVET NUTS (Blind Threaded Inserts)



THIN HEAD, HEX BODY BLIND THREADED INSERT									
Thread Size	GR	L		A		B	C	Hex Hole Size	
	Grip Range	Body Length		Body Diameter		Head Diameter Across the Flats	Head Height		
		Max	Min	Max	Min	Max	Nom	Max	Min
M4 x 0.7 ISO	2.0 - 3.3	11.55	10.55	6.43	6.27	9.53	0.68	6.45	6.35
M6 x 1.0 ISO	0.7 - 4.2	15.36	14.36	9.58	9.42	12.96	0.76	9.63	9.53

Description	An internally threaded fastener with a low-profile round flange at the part's "head", a hex-shaped body immediately below the head, and a cylindrical body that tapers slightly towards the opposite end. The head has a thinner profile and smaller diameter than the large flange variety. The fastener is open at both ends. Insert is threaded onto mandrel of installation tool and positioned into hole. As mandrel is pulled back, the insert is expanded into the base material it is now gripping. Installation is complete when the mandrel of the tool is removed from the set insert.
Applications / Advantages	When installed into a proper-size hex hole, this insert provides superior resistance to spinning. The thin head design enables the fastener to have a flush fit once seated in place. Used in electrical engineering, automotive, home appliances and other light-duty applications.
Material	**Steel:** 1108 or 1110 Steel

SOCKET CAP SCREWS



METRIC - SOCKET HEAD CAP SCREWS, HEAT TREATED ALLOY STEEL

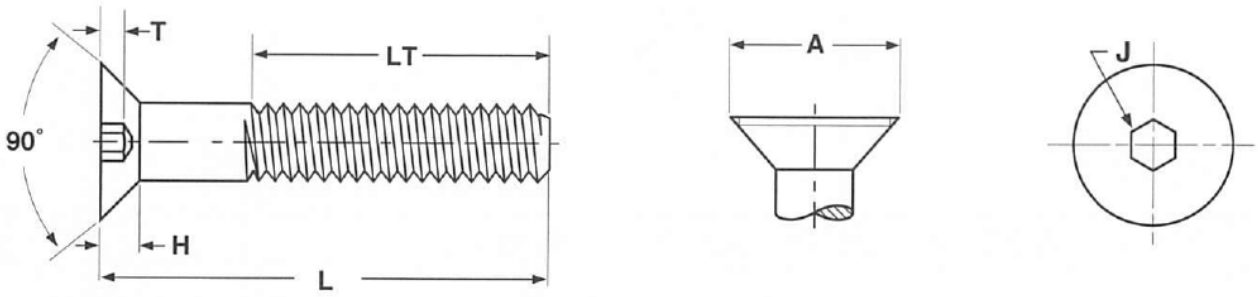
ISO 4762

Basic Screw Diameter	Thread Pitch	D		H		K		C	F	S		E	T	W	Suggested Seating Torque
		Body Diameter		Head Diameter		Head Height		Top Chamfer or Radius	Fillet Transtion Diameter	Socket Size Across the Flats		Socket Size Across the Corners	Key Engage-ment	Wall Thick-ness	
		Max	Min	Max	Min	Max	Min	Max	Max	Max	Min	Min	Min	Min	Lb./in.
M1.6	0.35	1.60	1.46	3.14	2.86	1.60	1.46	0.16	2	1.545	1.520	1.73	0.7	0.55	-
M2	0.4	2.00	1.86	3.98	3.62	2.00	1.86	0.2	2.6	1.545	1.520	1.73	1	0.55	-
M2.5	0.45	2.50	2.36	4.68	4.32	2.50	2.36	0.25	3.1	2.045	2.020	2.3	1.1	0.85	-
M3	0.5	3.00	2.86	5.68	5.32	3.00	2.86	0.3	3.6	2.56	2.52	2.87	1.3	1.15	23
M4	0.7	4.00	3.82	7.22	6.78	4.00	3.82	0.4	4.7	3.071	3.020	3.44	2	1.4	54
M5	0.8	5.00	4.82	8.72	8.28	5.00	4.82	0.5	5.7	4.084	4.020	4.58	2.5	1.9	109
M6	1	6.00	5.82	10.22	9.78	6.00	5.7	0.6	6.8	5.084	5.020	5.72	3	2.3	185
M8	1.25	8.00	7.78	13.27	12.73	8.00	7.64	0.8	9.2	6.095	6.020	6.86	4	3.3	450
M10	1.5	10.00	9.78	16.27	15.73	10.00	9.64	1	11.2	8.115	8.025	9.15	5	4	892
M12	1.75	12.00	11.73	18.27	17.73	12.00	11.57	1.2	13.7	10.115	10.025	11.43	6	4.8	1,554
M16	2	16.00	15.73	24.33	23.67	16.00	15.57	1.6	17.7	14.142	14.032	16	8	6.8	3,964
M20	2.5	20.00	19.67	30.33	29.67	20.00	19.48	2	22.4	17.23	17.05	19.44	10	8.6	7,536
M24	3	24.00	23.67	36.39	35.61	24.00	23.48	2.4	26.4	19.275	19.065	21.73	12	10.4	13,026
M30	3.5	30.00	29.67	45.39	44.61	30.00	29.48	3	33.4	22.275	22.065	25.15	15.5	13.1	-
M36	4	36.00	35.61	54.46	53.54	36.00	35.38	3.6	39.4	27.275	27.065	30.85	19	15.3	-
M42	4.5	42.00	41.61	63.46	62.54	42.00	41.38	4.2	45.6	32.33	32.08	36.57	24	16.3	-
M48	5	48.00	47.61	72.46	71.54	48.00	47.38	4.8	52.6	36.33	36.08	41.13	28	17.5	-
M56	5.5	56.00	55.54	84.54	83.46	56.00	55.26	5.6	63	41.33	41.08	46.83	34	19	-
M64	6	64.00	63.54	96.54	95.46	64.00	63.26	6.4	71	46.33	46.08	52.53	38	22	-

Tolerance on Length						
	2.5-3mm: ±0.2	4-6mm: ±0.24		8-10mm: ±0.29	12-16mm: ±0.35	20-30mm: ±0.42
	35-50mm: ±0.5	55-80mm: ±0.6	90-120mm: ±0.7	130-180mm: ±0.8	200-240mm: ±0.925	260-300mm: ±1.05

Description	An externally threaded fastener with metric threads, a cylindrical head with a flat chamfered top surface, knurled cylindrical sides and hexagonal recess, made from alloy steel.
Applications/ Advantages	High alloy metric socket cap screws are comparable, but not exactly equivalent to U.S. alloy steel socket cap screws. Ideal for precision assembly work with close tolerances and applications needing a well-tooled appearance. Supplies greater tensile strength than equivalent sizes of Class 8.8 or 10.9 hex head cap screws while requiring less surface area or conterbore since the fastener is internally wrenched.
Material	High alloy metric socket cap screws shall be made from an alloy steel which conforms to the following chemical composition requirements-- *Carbon*: 0.20-0.50%; *Phosphorous*: 0.035% maximum; *Sulfur*: 0.035% maximum; and one or more of chromium, nickel, molybdenum or vanadium.
Heat Treatment	High alloy metric socket cap screws shall be heat treated by quenching in oil from above the transformation temperature and reheating to a tempering temperature of 380°C minimum.
Hardness	Rockwell C 39 - 44 (Vickers HV 385 - 435)
Tensile Strength	1220 N/mm² minimum
Proof Load	1100 N/mm² minimum
Elongation	8% minimum
Plating	Metric socket cap screws are usually supplied with a plain, black finish.

Flat Head SOCKET CAP SCREWS



METRIC - Flat Head Socket Cap Screws, High Alloy Steel per ASTM F835M

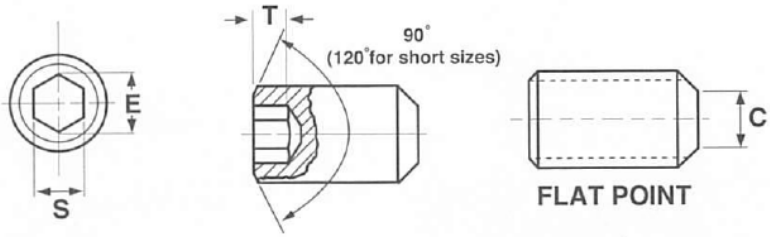
ANSI/ASME B18.3.5M

Nominal Size	Thread Pitch	B		A		H		J	T	W	D
		Body Diameter		Head Diameter		Head Height		Hex Socket Size	Key Engage-ment	Wall Thicness	Drill Allowance
		Max	Min	Theoretical Sharp	Absolute Min.	Ref	Flush Tolerance	Nom	Min	Min	Max
M3	0.5	3.00	2.86	6.72	5.35	1.86	0.30	2.0	1.1	0.25	0.3
M4	0.7	4.00	3.82	8.96	7.80	2.48	0.30	2.5	1.5	0.45	0.4
M5	0.8	5.00	4.82	11.20	9.75	3.10	0.35	3.0	1.9	0.66	0.5
M6	1	6.00	5.82	13.44	11.70	3.72	0.35	4.0	2.2	0.70	0.6
M8	1.25	8.00	7.78	17.92	15.60	4.96	0.40	5.0	3.0	1.16	0.8
M10	1.5	10.00	9.78	22.40	19.50	6.20	0.50	6.0	3.6	1.62	0.9

Tolerance on Length	Up to 16mm, incl.: ±0.3	Over 16mm to 60mm, incl.: ±0.5	Over 60mm to 150mm, incl.: ±0.8

Description	Has a similar design as a metric socket button head screw but has a 90° countersunk flat head.
Applications/ Advantages	Used when a flush mounting, high strength screw is required. Commonly used in tools and dies where moving parts pass over the fastened area.
Material	Metric socket flat head cap screws shall be made from an alloy steel which conforms to the following chemical composition requirements--***Carbon***: 0.28-0.50%; ***Phosphorous***: 0.035% maximum; ***Sulfur***: 0.035% maximum.
Heat Treatment	Metric socket flat head cap screws shall be heat treated by quenching in oil from above the transformation temperature and reheating to a tempering temperature of 380°C minimum.
Hardness	Rockwell C 38 - 44
Tensile Strength	***Full-size screws***: 1040 MPa minimum; ***Machined test specimen***: 1220 MPa minimum
Yield Strength	***Machined test specimen:*** 1100 MPa minimum
Elongation in 5D	8% minimum
Reduction of Area	35% minimum
Plating	Metric socket flat head cap screws are usually supplied with a plain finish.

SOCKET SET SCREWS — Flat Point



METRIC - Socket Set Screw, Flat Point

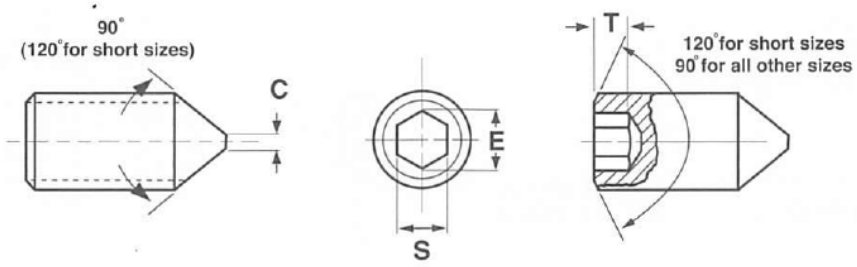
ISO 4026 & 898/5

Nominal Size	Thread Pitch	C		E	S		Screws Below this Length are Short Sizes	T		Min Length of Screw for Torque Test	Test Torque
		Point Diameter		Socket Size Across Corners	Socket Size Across Flats			Key Engagement (Min)			
		Max	Min	Min	Max	Min		Short Sizes	Long Sizes		N. m
M1.6	0.35	0.80	0.55	0.803	0.724	0.711	2.5	0.7	1.5	-	-
M2	0.4	1.00	0.75	1.003	0.902	0.889	3	0.8	1.7	-	-
M2.5	0.45	1.50	1.25	1.427	1.295	1.270	4	1.2	2	-	-
M3	0.5	2.00	1.75	1.73	1.545	1.520	4	1.2	2	4	0.9
M4	0.7	2.50	2.25	2.3	2.045	2.020	5	1.5	2.5	5	2.5
M5	0.8	3.5	3.2	2.87	2.560	2.520	6	2	3	5	5
M6	1	4.0	3.7	3.44	3.071	3.020	8	2	3.5	8	8.5
M8	1.25	5.5	5.2	4.58	4.084	4.020	8	3	5	8	20
M10	1.5	7.00	6.64	5.72	5.084	5.020	10	4	6	10	40
M12	1.75	8.50	8.14	6.86	6.095	6.020	16	4.8	8	16	65
M16	2	12.00	11.57	9.15	8.115	8.025	20	6.4	10	20	160
M20	2.5	15.00	14.57	11.43	10.115	10.025	20	8	12	20	310
M24	3	18.00	17.57	13.72	12.142	12.032	25	10	15	25	520

Tolerance on Length				
	2-3mm: ±0.2	4-6mm: ±0.24	8-10mm: ±0.29	12-16mm: ±0.35
	20-30mm: ±0.42	35-50mm: ±0.5	55-60mm: ±0.6	

Description	A headless screw threaded the entire length with a metric thread pitch. It has a flat surface at the end opposite that of the hexagonal drive.
Applications/ Advantages	Flat point set screws are designed for frequent resetting or relocating on hard steel shafts and where minimal damage to shafts is a concern.
Material	Metric socket set screws shall be made from an alloy steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.19-0.50%; ***Phosphorous***: 0.05% maximum; ***Sulfur***: 0.05% maximum; ***Lead***: 0.35% maximum. Set screws shall also contain one or more of these following elements: chromium, nickel, molybdenum, vanadium or boron.
Heat Treatment	Metric socket set screws shall be heat treated by quenching in oil from above the transformation temperature and then tempered by reheating to meet the hardness requirements listed below.
Hardness	Rockwell HRC 45 - 53 (Vickers HV 450 - 560)
Torsional Strength	Metric socket set screws of a sufficient length to be tested (as listed in the above table) shall withstand application of the test torque specified in said table without evidence of the socket reaming or the screw bursting.
Plating	Metric socket set screws are usually supplied with a thermal black finish.

Cone Point SOCKET SET SCREWS



CONE POINT

METRIC - Socket Set Screws, Cone Point

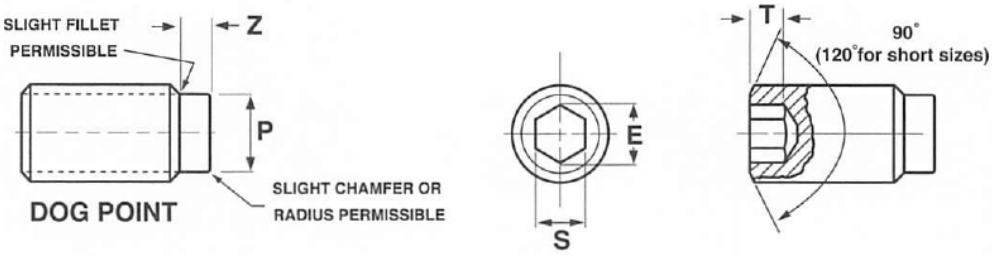
ISO 4027 & 898/5

Nominal Size	Thread Pitch	C	E	S		Screws Below this Length are Short Sizes	T		Min Length of Screw for Torque Test	Test Torque
		Point Diameter	Socket Size Across Corners	Socket Size Across Flats			Key Engagement (Min)			
		Max	Min	Max	Min		Short Sizes	Long Sizes		N. m
M1.6	0.35	0.4	0.803	0.724	0.711	3	0.7	1.5	-	-
M2	0.4	0.5	1.003	0.902	0.889	3	0.8	1.7	-	-
M2.5	0.45	0.65	1.427	1.295	1.270	4	1.2	2	-	-
M3	0.5	0.75	1.73	1.545	1.520	4	1.2	2	5	0.9
M4	0.7	1	2.3	2.045	2.020	5	1.5	2.5	6	2.5
M5	0.8	1.25	2.87	2.560	2.520	6	2	3	8	5
M6	1	1.5	3.44	3.071	3.020	8	2	3.5	8	8.5
M8	1.25	2	4.58	4.084	4.020	10	3	5	10	20
M10	1.5	2.5	5.72	5.084	5.020	12	4	6	12	40
M12	1.75	3	6.86	6.095	6.020	16	4.8	8	16	65
M16	2	4	9.15	8.115	8.025	20	6.4	10	20	160
M20	2.5	5	11.43	10.115	10.025	25	8	12	20	310
M24	3	6	13.72	12.142	12.032	30	10	15	25	520

Tolerance on Length				
	2-3mm: ±0.2	4-6mm: ±0.24	8-10mm: ±0.29	12-16mm: ±0.35
	20-30mm: ±0.42	35-50mm: ±0.5		55-60mm: ±0.6

Description	A headless screw threaded the entire length with a metric thread pitch. It has a sharp conical-shaped point at the opposite end from the hexagonal drive.
Applications/ Advantages	Cone point set screws are for permanent setting on soft or hardened shafts. The deep penetration it offers gives this style set screw the highest torsional & axial holding power. Can also be used as a pivot or hanger.
Material	Metric socket set screws shall be made from an alloy steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.19-0.50%; ***Phosphorous***: 0.05% maximum; ***Sulfur***: 0.05% maximum; ***Lead***: 0.35% maximum. Set screws shall also contain one or more of these following elements: chromium, nickel, molybdenum, vanadium or boron.
Heat Treatment	Metric socket set screws shall be heat treated by quenching in oil from above the transformation temperature and then tempered by reheating to meet the hardness requirements listed below.
Hardness	Rockwell HRC 45 - 53 (Vickers HV 450 - 560)
Torsional Strength	Metric socket set screws of a sufficient length to be tested (as listed in the above table) shall withstand application of the test torque specified in said table without evidence of the socket reaming or the screw bursting.
Plating	Metric socket set screws are usually supplied with a thermal black finish.

SOCKET SET SCREWS — Dog Point



METRIC - Set Screws, Dog Point

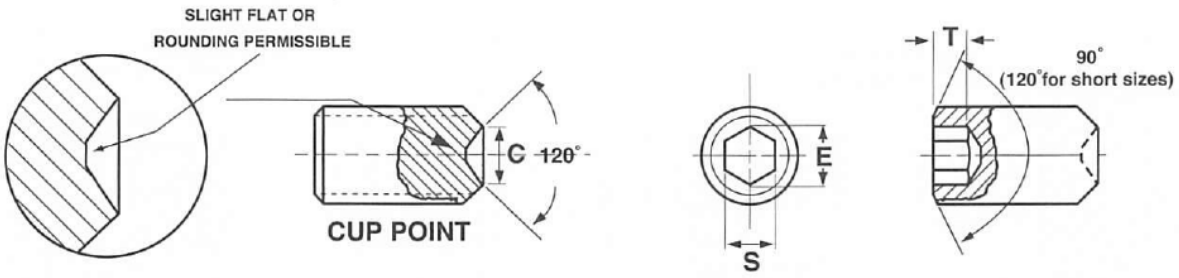
ISO 4028 & 898/5

Nominal Size	Thread Pitch	P		E	S		Screws Below this Length are Short Sizes	T		Z				Min Length of Screw for Torque Test	Test Torque
		Point Diameter		Socket Size Across Corners	Socket Size Across the Flats			Key Engagement (Min)		Dog Point Length (short sizes)		Dog Point Length (long sizes)			
		Max	Min	Min	Max	Min		Short Sizes	Long Sizes	Max	Min	Max	Min		N.m
M1.6	0.35	0.80	0.55	0.803	0.724	0.711	3	0.7	1.5	0.65	0.40	1.05	0.80	-	-
M2	0.4	1.00	0.75	1.003	0.902	0.889	4	0.8	1.7	0.75	0.50	1.25	1.00	-	-
M2.5	0.45	1.50	1.25	1.427	1.295	1.270	5	1.2	2	0.88	0.63	1.50	1.25	-	-
M3	0.5	2.00	1.75	1.73	1.545	1.520	6	1.2	2	1.00	0.75	1.75	1.50	5	0.9
M4	0.7	2.50	2.25	2.3	2.045	2.020	8	1.5	2.5	1.25	1.00	2.25	2.00	6	2.5
M5	0.8	3.5	3.2	2.87	2.560	2.520	8	2	3	1.50	1.25	2.75	2.50	8	5
M6	1	4.0	3.7	3.44	3.071	3.020	10	2	3.5	1.75	1.50	3.25	3.00	8	8.5
M8	1.25	5.5	5.2	4.58	4.084	4.020	12	3	5	2.25	2.00	4.3	4.0	10	20
M10	1.5	7.00	6.64	5.72	5.084	5.020	16	4	6	2.75	2.50	5.3	5.0	12	40
M12	1.75	8.50	8.14	6.86	6.095	6.020	20	4.8	8	3.25	3.00	6.3	6.0	16	65
M16	2	12.00	11.57	9.15	8.115	8.025	25	6.4	10	4.3	4.0	8.36	8.00	20	160
M20	2.5	15.00	14.57	11.43	10.115	10.025	30	8	12	5.3	5.0	10.36	10.00	25	310
M24	3	18.00	17.57	13.72	12.142	12.032	35	10	15	6.3	6.0	12.43	12.00	30	520

Tolerance on Length				
	2-3mm: ±0.2	4-6mm: ±0.24	8-10mm: ±0.29	12-16mm: ±0.35
	20-30mm: ±0.42	35-50mm: ±0.5		55-60mm: ±0.6

Description	A headless screw threaded the entire length with a metric thread pitch. It has a protruding tip with a flat surface at the end opposite that of the hexagonal drive..
Applications/ Advantages	Dog point set screws are intended for permanent setting. The point should fit closely to the diameter of the drilled hole or against the flat. Often used instead of a dowel pin.
Material	Metric socket set screws shall be made from an alloy steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.19-0.50%; ***Phosphorous***: 0.05% maximum; ***Sulfur***: 0.05% maximum; ***Lead***: 0.35% maximum. Set screws shall also contain one or more of these following elements: chromium, nickel, molybdenum, vanadium or boron.
Heat Treatment	Metric socket set screws shall be heat treated by quenching in oil from above the transformation temperature and then tempered by reheating to meet the hardness requirements listed below.
Hardness	Rockwell HRC 45 - 53 (Vickers HV 450 - 560)
Torsional Strength	Metric socket set screws of a sufficient length to be tested (as listed in the above table) shall withstand application of the test torque specified in said table without evidence of the socket reaming or the screw bursting.
Plating	Metric socket set screws are usually supplied thermal black.

Cup Point SOCKET SET SCREWS



METRIC - Socket Set Screws, Cup Point

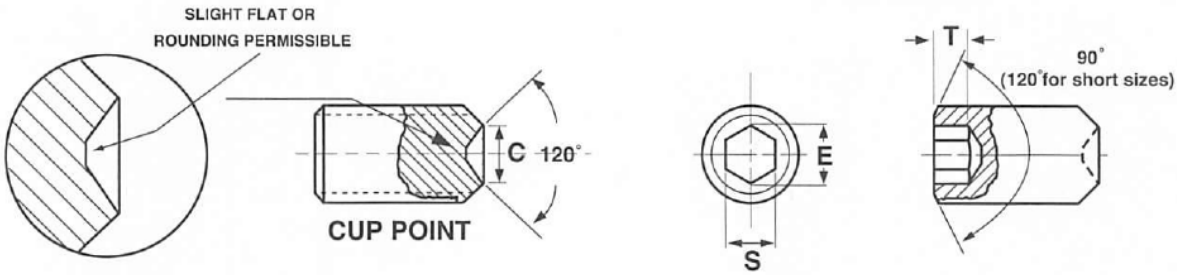
ISO 4029 & 898/5

Nominal Size	Thread Pitch	C		E	S		Screws Below this Length are Short Sizes	T		Min Length of Screw for Torque Test	Test Torque
		Point Diameter		Socket Size Across Corners	Socket Size Across the Flats			Key Engagement (Min)			
		Max	Min	Min	Max	Min		Short Sizes	Long Sizes		N. m
M1.6	0.35	0.80	0.55	0.803	0.724	0.711	2.5	0.7	1.5	-	-
M2	0.4	1.00	0.75	1.003	0.902	0.889	3	0.8	1.7	-	-
M2.5	0.45	1.20	0.95	1.427	1.295	1.270	4	1.2	2	-	-
M3	0.5	1.40	1.15	1.73	1.545	1.520	5	1.2	2	4	0.9
M4	0.7	2.00	1.75	2.3	2.045	2.020	6	1.5	2.5	5	2.5
M5	0.8	2.50	2.25	2.87	2.560	2.520	6	2	3	6	5
M6	1	3.00	2.75	3.44	3.071	3.020	8	2	3.5	8	8.5
M8	1.25	5.0	4.7	4.58	4.084	4.020	10	3	5	10	20
M10	1.5	6.0	5.7	5.72	5.084	5.020	12	4	6	12	40
M12	1.75	8.00	7.64	6.86	6.095	6.020	16	4.8	8	16	65
M16	2	10.00	9.64	9.15	8.115	8.025	20	6.4	10	20	160
M20	2.5	14.00	13.57	11.43	10.115	10.025	25	8	12	25	310
M24	3	16.00	15.57	13.72	12.142	12.032	30	10	15	30	520

Tolerance on Length				
	2-3mm: ±0.2	4-6mm: ±0.24	8-10mm: ±0.29	12-16mm: ±0.35
	20-30mm: ±0.42	35-50mm: ±0.5	55-60mm: ±0.6	

Description	A headless screw threaded the entire length with a metric thread pitch. It has a hexagonal drive at one end and a cup-shaped indentation at the other end.
Applications/ Advantages	The cup point is the most popular type of set screw, designed for fast, permanent and semi-permanent location of parts on shafts with hardness differential of 10-15 Rockwell C points and where cutting in of cup edge on the shaft is acceptable.
Material	Metric socket set screws shall be made from an alloy steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.19-0.50%; ***Phosphorous***: 0.05% maximum; ***Sulfur***: 0.05% maximum; ***Lead***: 0.35% maximum. Set screws shall also contain one or more of these following elements: chromium, nickel, molybdenum, vanadium or boron.
Heat Treatment	Metric socket set screws shall be heat treated by quenching in oil from above the transformation temperature and then tempered by reheating to meet the hardness requirements listed below.
Hardness	Rockwell HRC 45 - 53 (Vickers HV 450 - 560)
Torsional Strength	Metric socket set screws of a sufficient length to be tested (as listed in the above table) shall withstand application of the test torque specified in said table without evidence of the socket reaming or the screw bursting.
Plating	Metric socket set screws are usually supplied thermal black.

SOCKET SET SCREWS — Knurled Cup Point



METRIC - Socket Set Screws, Knurled Cup Point

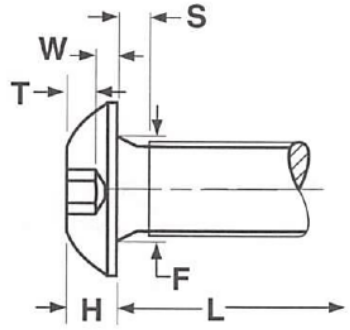
ISO 4029 & 898/5

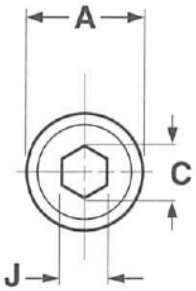
Nominal Size	Thread Pitch	C		E	S		Screws Below this Length are Short Sizes	T		Min Length of Screw for Torque Test	Test Torque
		Point Diameter		Socket Size Across Corners	Socket Size Across the Flats			Key Engagement (Min)			
		Max	Min	Min	Max	Min		Short Sizes	Long Sizes		N. m
M3	0.5	1.40	1.15	1.73	1.545	1.520	5	1.2	2	4	0.9
M4	0.7	2.00	1.75	2.3	2.045	2.020	6	1.5	2.5	5	2.5
M5	0.8	2.50	2.25	2.87	2.560	2.520	6	2	3	6	5
M6	1	3.00	2.75	3.44	3.071	3.020	8	2	3.5	8	8.5
M8	1.25	5.0	4.7	4.58	4.084	4.020	10	3	5	10	20

Tolerance on Length				
2-3mm: ±0.2	4-6mm: ±0.24	8-10mm: ±0.29	12-16mm: ±0.35	
20-30mm: ±0.42	35-50mm: ±0.5	55-60mm: ±0.6		

Description	A headless screw threaded the entire length with a metric thread pitch. It has a hexagonal drive at one end and a knurled, cup-shaped indentation at the other end.
Applications/ Advantages	The cup point is the most popular type of set screw, designed for fast, permanent and semi-permanent location of parts on shafts with hardness differential of 10-15 Rockwell C points and where cutting in of cup edge on the shaft is acceptable.
Material	Metric socket set screws shall be made from an alloy steel which conforms to the following chemical composition requirements-- ***Carbon***: 0.19-0.50%; ***Phosphorous***: 0.05% maximum; ***Sulfur***: 0.05% maximum; ***Lead***: 0.35% maximum. Set screws shall also contain one or more of these following elements: chromium, nickel, molybdenum, vanadium or boron.
Heat Treatment	Metric socket set screws shall be heat treated by quenching in oil from above the transformation temperature and then tempered by reheating to meet the hardness requirements listed below.
Hardness	Rockwell HRC 45 - 53 (Vickers HV 450 - 560)
Torsional Strength	Metric socket set screws of a sufficient length to be tested (as listed in the above table) shall withstand application of the test torque specified in said table without evidence of the socket reaming or the screw bursting.
Plating	Metric socket set screws are usually supplied thermal black.

Button Head SOCKETS





METRIC - Button Head Socket Cap Screws, High Alloy Steel per ASTM F835M

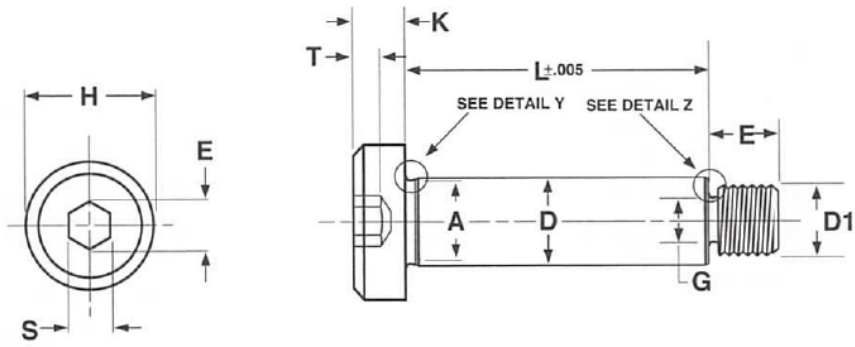
ASME B18.3.4M

Nominal Size	Thread Pitch	A		H		C	J		T	W	S		F	Min Ultimate Tensile Load, N
		Head Diameter		Head Height		Socket Size Across the Corners	Socket Size Across the Flats		Key Engage-ment	Wall Thick-ness	Unthreaded Section Under the Head		Fillet Transition Diameter	
		Max	Min	Max	Min	Min	Max	Min	Min	Min	Max	Min	Max	
M3	0.5	5.7	5.4	1.65	1.40	2.3	2.045	2.020	1.04	0.2	1.0	0.5	3.6	4,910
M4	0.7	7.60	7.24	2.20	1.95	2.87	2.56	2.52	1.3	0.3	1.4	0.7	4.7	8,560
M5	0.8	9.50	9.14	2.75	2.50	3.44	3.071	3.020	1.56	0.38	1.6	0.8	5.7	13,800
M6	1	10.50	10.07	3.3	3.0	4.58	4.084	4.020	2.08	0.74	2	1	6.8	19,600
M8	1.25	14.00	13.57	4.4	4.1	5.72	5.084	5.020	2.6	1.05	2.50	1.25	9.2	35,700
M10	1.5	17.50	17.07	5.5	5.2	6.86	6.095	6.020	3.12	1.45	3.0	1.5	11.2	56,600
M12	1.75	21.00	20.48	6.60	6.24	9.15	8.115	8.025	4.16	1.63	3.50	1.75	14.2	82,400
M16	2	28.00	27.48	8.80	8.44	11.43	10.115	10.025	5.2	2.25	4	2	18.2	154,000

Tolerance on Length	6mm: ±.24	8-10mm: ±.29	12-16mm: ±.35	20-30mm: ±.42	35-50mm: ±.5

Description	Has a similar thread design as a metric socket cap screw but is fully threaded to the head. The dome shaped head is wider and has a lower profile than a socket cap screw.
Applications/ Advantages	Used when a wider bearing surface or a smoother, more finished appearance is desired, or in material too thin to accomodate a countersunk head. Button head cap screws do not afford the strength of socket head cap screws and are designed for light fastening applications.
Material	Metric Button head cap screws may be made from a carbon steel, which conforms to the following chemical composition requirements-- ***Carbon***: 0.25-0.55%; ***Phosphorous***: 0.035% maximum; ***Sulfur***: 0.035% maximum. Metric Button head cap screws may be made from a carbon steel with additives such as Boron, Manganese or Chromium which conforms to the following chemical composition requirements-- ***Carbon***: 0.20-0.55%; ***Phosphorous***: 0.035% maximum; ***Sulfur***: 0.035% maximum. Metric Button head cap screws may be made from an alloy steel which contains one or more of the following: Chromium, Nickel, Molybdenum or Vanadium; and conforms to the following chemical composition requirements-- ***Carbon***: 0.20-0.55%; ***Phosphorous***: 0.035% maximum; ***Sulfur***: 0.035% maximum.
Heat Treatment	Class 10.9 button head cap screws shall be heat treated by quenching in oil from above the transformation temperature and reheating to a tempering temperature of 425°C minimum.
Hardness	Rockwell C 32 - 39 (Vickers HV 320 - 380)
Tensile Strength	1,040 N/mm² minimum
Proof Load	940 N/mm² minimum
Elongation	9% minimum
Plating	Metric Button head screws are usually supplied with a plain finish.

SOCKET SHOULDER SCREWS



†Length of a socket shoulder screw is measured from the underhead bearing surface to the plane of the shoulder at the threaded end.

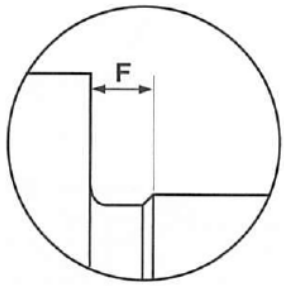
METRIC - SOCKET SHOULDER SCREWS

ISO 7379

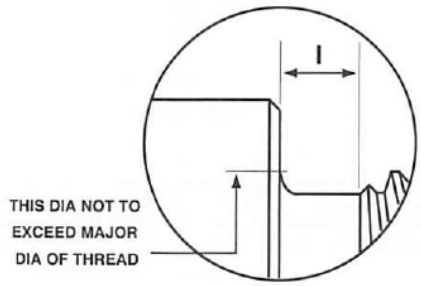
Nominal Size	D		H		K		E	S	
	Shoulder Diameter		Head Diameter		Head Height		Socket Size Across Corners	Hex Socket Size Across the Flats	
	Max	Min	Max	Min	Max	Min	Min	Max	Min
6.5	6.487	6.451	10.22	9.78	4.5	4.32	3.44	3.08	3.02
8	7.987	7.951	13.27	12.73	5.5	5.32	4.58	4.095	4.02
10	9.987	9.951	16.27	15.73	7	6.78	5.72	5.095	5.02
13	12.984	12.941	18.27	17.73	9	8.78	6.86	6.095	6.02
16	15.984	15.941	24.33	23.67	11	10.73	9.15	8.115	8.025
20	19.980	19.928	30.33	29.67	14	13.73	11.43	10.115	10.025
25	24.980	24.928	36.39	35.61	16	15.73	13.72	12.142	12.032

Description	A hex socket screw with metric threads, an enlarged, unthreaded, cylindrical shoulder under the head, the diameter of which serves as the basis for the derivation of the nominal size.
Applications/ Advantages	High alloy metric socket shoulder screws are comparable, but not exactly equivalent to U.S. alloy steel socket cap screws. Intended for rotation or sliding applications such as pulley shafts, in punch and die work, or for use as a bearing pin.
Material	High alloy socket shoulder screws shall be made from an alloy steel which conforms to the following chemical composition requirements--***Carbon***: 0.20-0.50%; ***Phosphorous***: 0.035% maximum; ***Sulfur***: 0.035% maximum; and one or more of chromium, nickel, molybdenum or vanadium.
Heat Treatment	High alloy socket shoulder screws shall be heat treated by quenching in oil from above the transformation temperature and reheating to a tempering temperature of 380°C minimum.
Hardness	Rockwell C 39 - 44
Proof Load	1100 N/mm^2 minimum
Elongation	8% minimum
Plating	Metric socket shoulder screws are usually supplied with a plain finish.

SOCKET SHOULDER SCREWS



ENLARGED DETAIL Y



ENLARGED DETAIL Z

METRIC - SOCKET SHOULDER SCREWS (CONTINUED)

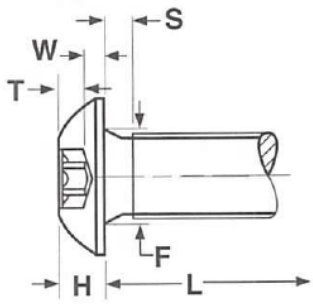
ISO 7379

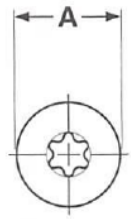
Nominal Size	D1	Thread Pitch	E		G		I	T	A	F
	Nominal Thread Size		Thread Length		Thread Neck Diameter		Thread Neck Width	Key Engagement	Shoulder Neck Diameter	Shoulder Neck Width
			Max	Min	Max	Min	Max	Min	Min	Max
6.5	M5	0.8	9.75	9.25	3.86	3.68	2	2.4	5.92	2.5
8	M6	1	11.25	10.75	4.58	4.40	2.5	3.3	7.42	2.5
10	M8	1.25	13.25	12.75	6.25	6.03	3.1	4.2	9.42	2.5
13	M10	1.5	16.40	15.60	7.91	7.69	3.7	4.9	12.42	2.5
16	M12	1.75	18.40	17.60	9.57	9.35	4.4	6.6	15.42	2.5
20	M16	2	22.40	21.60	13.33	12.96	5	8.8	19.42	2.5
25	M20	2.5	27.40	26.60	16.57	16.30	6.3	10	24.42	3

Tolerance on Length	+0.25

SOCKETS, SIX-LOBE

ISO 7380 Six-Lobe





METRIC - SIX-LOBE ISO 7380 BUTTON HEAD CAP SCREWS

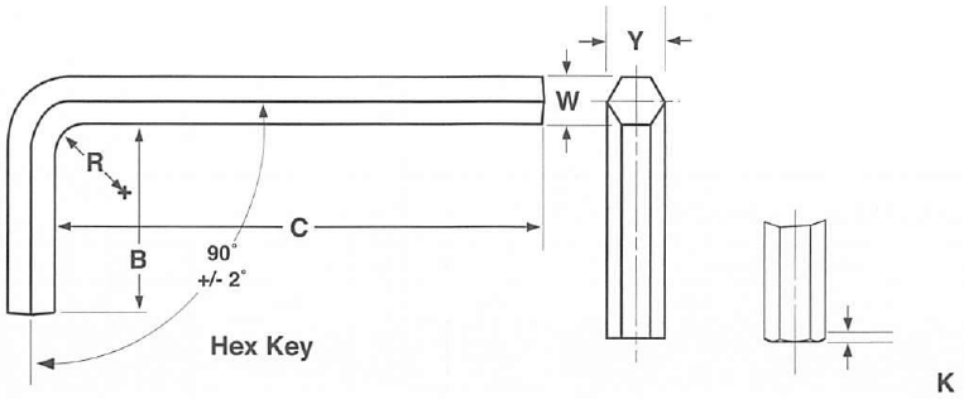
ISO 7380

Nominal Size	Thread Pitch	A Head Diameter		H Head Height		T Recess Protrusion	W Wall Thickness	S Unthreaded Section Under the Head		F Fillet Transition Diameter	Six-Lobe Recess Size
		Max	Min	Max	Min	Min	Min	Max	Min	Max	
M3	0.5	5.7	5.4	1.65	1.40	1.04	0.2	1.0	0.5	3.6	T10
M4	0.7	7.60	7.24	2.20	1.95	1.3	0.3	1.4	0.7	4.7	T20
M5	0.8	9.50	9.14	2.75	2.50	1.56	0.38	1.6	0.8	5.7	T25
M6	1	10.50	10.07	3.3	3.0	2.08	0.74	2	1	6.8	T30
M8	1.25	14.00	13.57	4.4	4.1	2.6	1.05	2.50	1.25	9.2	T40

Tolerance on Length	6mm: ±.24	8-10mm: ±.29	12-16mm: ± .35	20-30mm: ±.42	35-50mm: ±.5

Description	Has a similar thread design as a metric socket cap screw but is fully threaded to the head. The dome shaped head is wider and has a lower profile than a socket cap screw and has a six-lobed recess.	
Applications/ Advantages	Used when a wider bearing surface or a smoother, more finished appearance is desired, or in material too thin to accomodate a countersunk head. Button head screws do not afford the strength of socket head cap screws due to their head geometry and are designed for light fastening applications.	
Material	***Class 10.9 Steel***	***Stainless***
	May be made from a steel, which conforms to any of the following chemical composition requirements-- **Carbon Steel:** ***Carbon***: 0.25-0.55%; ***Phosphorous***: 0.035% maximum; ***Sulfur***: 0.035% maximum. **Carbon Steel with additives such as Boron, Manganese or Chromium:** ***Carbon***: 0.20-0.55%; ***Phosphorous***: 0.035% max; ***Sulfur***: 0.035% max. **Alloy steel which contains one or more of the following: Chromium, Nickel, Molybdenum or Vanadium:** ***Carbon***: 0.20-0.55%; ***Phosphorous***: 0.035% max; ***Sulfur***: 0.035% max.	A2 Class 50 Stainless Steel
Heat Treatment	Class 10.9 button head screws shall be heat treated by quenching in oil from above the transformation temperature and reheating to a tempering temperature of 425°C minimum.	-
Hardness	Rockwell C 32 - 39 (Vickers HV 320 - 380)	-
Tensile Strength	1,040 N/mm² minimum	600 N/mm²
Proof Load	940 N/mm² minimum	450 N/mm²
Plating	Screws are usually provided with a zinc finish.	Stainless screws are provided with a plain finish.

Short Arm SOCKET HEX WRENCHES



METRIC Hex Wrenches, Short Arm

Nominal Key and Socket Size	W		Y		B		C		R	K	Torsional Strength (N/m)
	Hex Width Across the Flats		Hex Width Across the Corners		Length of Short Section		Length of Long Section Short Arm Series		Radius of Bend	Chamfer	
	Max	Min	Max	Min	Max	Min	Max	Min	Min	Max	Min
M1.5	1.500	1.470	1.690	1.640	14	13	45	43	1.5	0.14	1.0
M2	2.000	1.970	2.250	2.200	16	15	50	48	2.0	0.14	2.1
M2.5	2.500	2.470	2.820	2.770	18	17	56	53	2.5	0.14	4.7
M3	3.000	2.960	3.399	3.340	20	18	63	60	3.0	0.18	7.7
M4	4.000	3.960	4.532	4.470	25	23	70	66	4.0	0.24	17.8
M5	5.000	4.960	5.690	5.630	28	26	80	76	5.0	0.30	35.0
M6	6.000	5.950	6.828	6.760	32	30	90	86	6.0	0.36	57.0
M8	8.000	7.950	9.136	9.030	36	34	100	95	8.0	0.49	126.0
M10	10.000	9.950	11.470	11.340	40	38	112	106	10.0	0.62	252.0
M12	12.000	11.950	13.764	13.590	45	43	125	119	12.0	0.76	420.0
M14	14.000	13.930	16.058	15.880	56	53			14.0	0.85	670.0
M17	17.000	16.930	19.499	19.300	63	60			17.0	1.04	1180.0
M19	19.000	18.930	21.793	21.580	70	67			19.0	1.16	1670.0

Description	A hex key is a six-sided shaped bar bent at a 90° angle at one end. A hex bit is an unbent piece of such a bar.
Applications/ Advantages	Designed to be inserted into a like-sized, hollow recess of a socket screw to manually tighten or loosen the fastener.
Material	Alloy steel containing at least two of the following elements: chromium, nickel, molybdenum or vanadium, in sufficient quantity to assure that the minimum surface hardness meets the standards listed below.
Heat Treatment	Hex keys are hardened by quenching from the austenitizing temperature and tempered.
Surface Hardness	***Sizes through 8mm:*** Rockwell C 48 minimum ***Sizes over 8mm:*** Rockwell C 45 minimum

SOCKETS

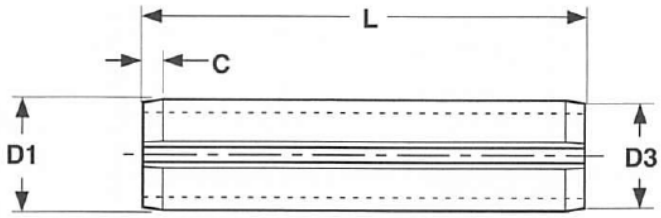
Thread Dimensions

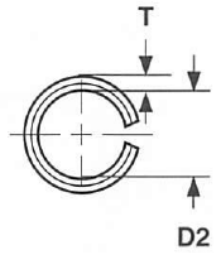
External Threads for Sockets - Class 5g / 6g

ISO 965

Thread	Major Diameter		Pitch Diameter		Minor Diameter	
	Max	Min	Max	Min	Max	Min
M1.6	1.581	1.496	1.354	1.304	1.151	1.088
M2	1.981	1.886	1.721	1.668	1.490	1.421
M2.5	2.480	2.380	2.188	2.132	1.928	1.855
M3	2.980	2.874	2.655	2.595	2.367	2.288
M4	3.978	3.838	3.523	3.452	3.119	3.021
M5	4.976	4.826	4.456	4.381	3.995	3.889
M6	5.974	5.794	5.324	5.234	4.747	4.618
M8	7.972	7.760	7.160	7.065	6.438	6.295
M10	9.968	9.732	8.994	8.888	8.128	7.964
M12	11.966	11.701	10.829	10.711	9.819	9.634
M16	15.962	15.682	14.663	14.538	13.508	13.306
M20	19.580	19.623	18.334	18.202	16.891	16.663
M24	23.952	23.577	22.003	21.843	20.271	19.995
M30	29.974	29.522	27.674	27.504	26.653	25.348
M36	35.940	35.465	33.342	33.162	31.033	30.709
M42	41.937	41.437	39.014	38.824	36.416	36.053
M48	47.929	47.399	44.681	44.481	41.795	41.402
M56	55.925	55.365	52.353	52.141	49.177	48.753
M64	63.920	63.320	60.023	59.799	56.559	56.104

Slotted, Heavy Duty to ISO 8752 SPRING PINS





METRIC SPRING PINS, SLOTTED HEAVY DUTY — ISO 8752

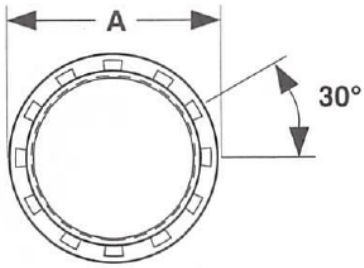
Nominal Pin Diameter	D1		D2	C		T	Double Shear Load, kN
	Outside Diameter, before Mounting		Inside Diameter, before Mounting	Chamfer Length		Stock Thickness	
	Max	Min	Nom	Max	Min	Basic	Min
M2	2.4	2.3	1.5	0.55	0.35	0.4	2.82
M2.5	2.9	2.8	1.8	0.6	0.4	0.5	4.38
M3	3.5	3.3	2.1	0.7	0.5	0.6	6.32
M3.5	4.0	3.8	2.3	0.8	0.6	0.75	9.06
M4	4.6	4.4	2.8	0.85	0.65	0.8	11.24
M4.5	5.1	4.9	2.9	1.0	0.8	1	15.36
M5	5.6	5.4	3.4	1.1	0.9	1	17.54
M6	6.7	6.4	4	1.4	1.2	1.2	26.04
M8	8.8	8.5	5.5	2.0	1.6	1.5	42.76

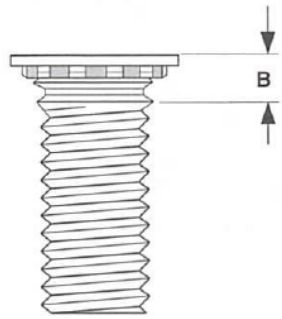
Tolerance on Length	Nominal Pin Length		
	M4 to M10	M12 to M50	M55 to M200
	± 0.25	±0.50	±0.75

Description	A hollow, headless pin, slit longitudinally, having controlled length with chamfered ends, formed to a diameter somewhat greater than that of the hole into which it is to be assembled.
Applications/ Advantages	Will hold its position in an assembly by a predetermined spring tension. Spring pins are economical because they can simplify product design by replacing more expensive fasteners such as taper pins, set screws and straight pins.
Material	***Carbon Steel:*** *Carbon*: 0.65% minimum; *Manganese*: 0.5% minimum
Hardness	Hardened and tempered to a Vickers hardness of 420 HV30 to 560 HV30.
Shear Load	Spring pins shall be capable of withstanding the minimum double shear loads specified in the above table.
Finish	See Appendix-A for information about the coating of spring pins.

ELECTRONIC HARDWARE

Flush Head Self-Clinching Studs





Steel Self-Clinching Studs - 12-Rib Style with Annular Groove

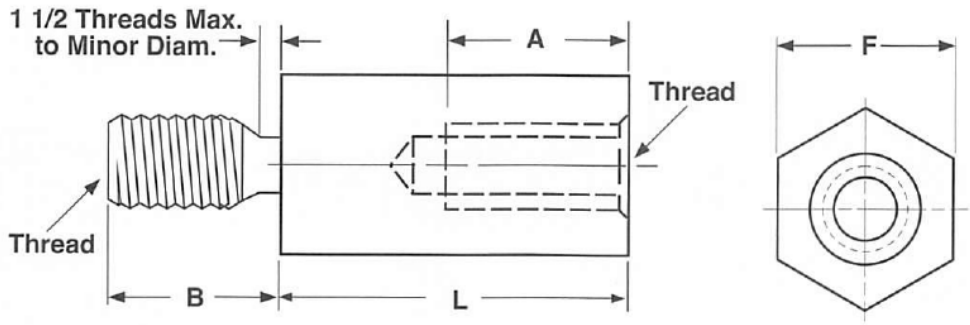
Nominal Diameter & Thread Size	A		B	Minimum Sheet Thickness	Hole in Sheet (+0.08)	Distance to Center of Hole in Panel	Push-Out (N)	Torque-Out (N·m)	Pull Through
	Head Diameter		Unthreaded Length						
	Max	Min	Max			Min	M2.5 thru M5 diam based on 1.5 mm steel plate; M6 diam based on 2.2 mm steel plate; M8 diam based on 2.4 mm steel plate		(N)
M2.5 x 0.45	4.5	3.7	1.95	1	2.5	5.4	740	1.0	2800
M3 x 0.5	5.0	4.2	2.1	1	3	5.6	820	1.7	3840
M4 x 0.7	6.3	5.5	2.4	1	4	7.2	1780	4.2	5650
M5 x 0.8	6.9	6.1	2.7	1	5	7.2	2000	6.5	6270
M6 x 1	8.6	7.8	3	1.6	6	7.9	2560	11.3	11,300
M8 x 1.25	10.0	9.2	3.7	2.4	8	9.6	2890	19.2	15,450

Tolerance on Length	± 0.4

Description	A fastener with unified thread pitch and a cylindrical, low profile head with small, rectangular ribs protruding from the underside of the head. The top of the head is flat and is flush with the mating surface when installation is complete. Below the ribs and above the first thread is an annular groove which helps to hold the fastener in position.
Applications/ Advantages	Intended for metal panel-to-panel applications and well-suited for use in printed circuit boards. A hole is pierced into the circuit board and the unit it is attached to. The stud is inserted using a hand press or by hand, applying parallel squeezing forces. A hex nut is twisted onto the stud, securing it from the back. As the nut is tightened, the ribbed stud head grips the front panel to secure the application from the front as well, eliminating the need for welding. As the application force is applied, part of the sheet cold flows into an undercut under the head, making the fastener an integral part of the sheet.
Material	*Steel*
	Low carbon steel
Heat Treatment	Clinch studs shall be case hardened, oil quenched and tempered.
Case Hardness	Rockwell C 45 minimum
Core Hardness	Rockwell C 29 - 38
For Use In...	...materials with a hardness of Rockwell B80 or less.
Finish	Steel clinch studs are usually furnished with a zinc plating.

Hex Male-Female Standoffs

ELECTRONIC HARDWARE



Hexagon and Round Male-Female Standoffs

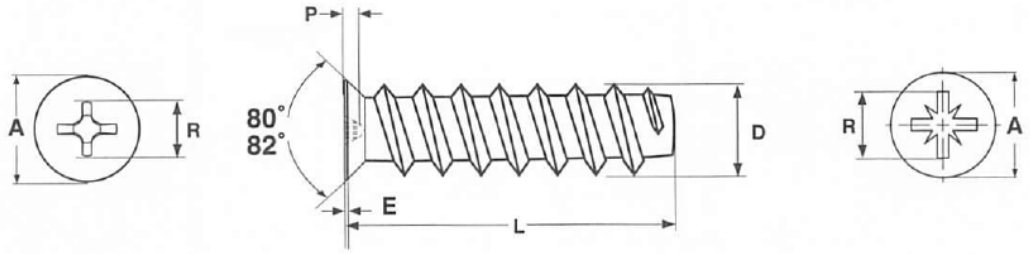
F		B	L	A	F		B	L	A
Width Across the Flats	Thread Size	Male Thread Length ± 0.01	Body Length	Full Thread Depth Min	Width Across the Flats	Thread Size	Male Thread Length ± 0.01	Body Length	Full Thread Depth Min
4.5 mm	M2.5x0.45	3.97	5	1.9	6 mm	M3x0.5	4.76	9	5.8
4.5 mm	M2.5x0.45	3.97	6	2.9	6 mm	M3x0.5	4.76	all longer sizes	6.4
4.5 mm	M2.5x0.45	3.97	7	3.9	6 mm	M4x.07	9.53	6	2.1
4.5 mm	M2.5x0.45	3.97	all longer sizes	4.8	6 mm	M4x.07	9.53	7	3.1
4.5 mm	M3x0.5	4.76	5	1.8	6 mm	M4x.07	9.53	8	4.1
4.5 mm	M3x0.5	4.76	6	2.8	6 mm	M4x.07	9.53	9	5.1
4.5 mm	M3x0.5	4.76	7	3.8	6 mm	M4x.07	9.53	10	6.1
4.5 mm	M3x0.5	4.76	8	4.8	6 mm	M4x.07	9.53	11	7.1
4.5 mm	M3x0.5	4.76	9	5.8	6 mm	M4x.07	9.53	12	8.1
4.5 mm	M3x0.5	4.76	all longer sizes	6.4	6 mm	M4x.07	9.53	13	9.1
6 mm	M3x0.5	4.76	5	1.8	6 mm	M4x.07	9.53	14	10.1
6 mm	M3x0.5	4.76	6	2.8	6 mm	M4x.07	9.53	15	11.1
6 mm	M3x0.5	4.76	7	3.8	6 mm	M4x.07	9.53	all longer sizes	11.1
6 mm	M3x0.5	4.76	8	4.8					

Tolerance on Length	Up to 99mm (incl.): ± .13mm	100mm to 150mm (incl.): ± .20mm	Over 150mm: ± .25mm

Description	A hex shaped, mechanical device which has an opening with a partial internal thread at one end, and an externally threaded post at the opposite end. It is used to hold two components at a given distance from each other.
Applications/ Advantages	Male-female standoffs are used when one of the components is internally threaded. Aluminum is popular for its light weight/ strength compromise. It is non-magnetic, performs well in severe temperatures, and has insulating properties. Stainless is conductive, non-magnetic and has superior resistance to corrosion and chemical fumes. It is costlier than aluminum.
Material	***Aluminum:*** 6061 Aluminum (*Magnesium*: 0.8 - 1.2%; *Copper*: 0.15 - 0.40%; *Silicon*: 0.4 - 0.8%; *Iron*: 0.7% maximum; *Zinc*: 0.25% maximum; *Titanium*: 0.15% maximum; *Manganese*: 0.15% maximum; *Chromium*: 0.04 - 0.35%) ***Stainless:*** Type 303 stainless, passivated

WOODWORKING SCREWS

European Drawer Slide Screws



European Drawer Slide Screws

Size	A		P			P			R		E		D	
	Head Diameter		Phillips			Pozi (Type Z Recess)			Recess Width		Top Edge of Head Thickness		Major Diameter	
			Penetration		Drive Size	Penetration		Drive Size						
	Max	Min	Max	Min		Max	Min		Max	Min	Max	Min	Max	Min
6.3-11	7.30	7.00	3.17	2.59	#2	2.70	2.40	#2	5.18	4.86	0.30	0.10	6.30	6.10
Tolerance on Length						+0, -0.5								

Description	An externally threaded fastener with a short, 82-degree countersunk head, and spaced thread pattern. The part is available with choice of Phillips or Pozi (Type-Z) recess.
Applications / Advantages	Designed for installation of European hinges and European drawer slides into cabinets that use a 32mm line boring layout with pre-drilled holes..
Material	Low Carbon 1010 or equivalent steel
Plating	Screws are typically available in either a zinc or nickel finish.

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APPENDIX A

PLATING

Finish	Description
Electro-Zinc & Clear	Zinc is the most popular of all commercial platings because it is relatively economical and offers good corrosion resistance in environments not subject to excessive moisture. To avoid any reduction in the strength properties of screws with Class 2A thread allowances in sizes No. 8 or smaller, a thinner zinc coating is acceptable. A clear or blueish chromate finish is applied on top of the zinc to provide additional protection against white oxidation spots which can form due to moisture. Electroplating is the most common way of applying zinc coatings to fasteners. It is recommended by certain industry experts that case-hardened parts which are electro-plated should be baked after plating to minimize the risk of hydrogen embrittlement (see below).
Electro-Zinc & Yellow	Yellow chromate offers a greater degree of protection from white corrosion than does clear chromate. Electroplating is the most common way of applying zinc coatings to fasteners.
Zinc Yellow to ASTM B633	The ASTM B633 standard was revised in 2007. One of the changes concerned the amount of time certain fasteners are baked to reduce the effects of hydrogen embrittlement. Prior to this revision, plated Grade-BD cap screws were required to be baked for at least 4 hours at a temperature of 190°C to 220°C. That revised standard calls for these parts to be baked for at least 10 hours at 190°C to 220°C.
Electrodeposited Coatings on Mechanical Fasteners to ASTM F1941	For fasteners manufactured after October 2015, this standard replaces ASTM B633. It addresses the topics of (a) thickness of zinc coating, (b) various chromate coatings, (c) baking requirements for fasteners with a **core** hardness over Rockwell C 39, and (d) salt-spray performance, as well as other standards. For details re: the requirements this standard puts forth for the baking of through-hardened fasteners, see the following page.
Electro Zinc & Black	Black chromate offers a similar appearance to black oxide but with greater degree of protection that black oxide lacks. Electroplating is the most common way of applying zinc coatings to fasteners.
Electro-Zinc & Wax	A wax lubricant is added to the zinc coatings of certain fasteners to improve the ease of assembly. This is the standard plating for thread rolling screws including the Plastite® and Taptite® II, as well as two-way reversible center-lock nuts. Case-hardened parts are still recommended to be baked after plating (see below).
Mechanical Zinc & Clear	Mechanically applying zinc to fasteners reduces the risk of hydrogen embrittlement forming within the parts. This minimizes the need for the precautionary practice of baking the parts soon after plating. A clear or bluish chromate finish is applied on top of the zinc to provide additional protection against white oxidation spots, which can form due to moisture. It is common for lock washers made from spring steel to be plated this way to avoid brittleness after baking.
Mechanical Zinc & Yellow	This finish is identical to mechanical zinc but with a yellow chromate finish. This is the standard plating for high-alloy split lock washers and for tooth lock washers used with zinc yellow machine screws.
Electro-Zinc & Clear for Sockets	Socket cap screws can receive a zinc plating of 0.0002 inches thickness. A clear chromate finish is applied on top of the zinc to provide additional protection against white corrosion. The manufacturer must be told prior to the thread rolling process that the parts are to be plated. The plated parts are then baked at 375°F for 24 hours within one hour of plating then subjected to a 72-hour stress test.
Electro-Zinc & Green	Commercial zinc green is the finish applied to machine screws and thread-cutting screws that will be used a "grounding screws" in electrical applications.
Nickel	Nickel has more of a silver color to it than zinc and has similar corrosion resistant characteristics. It is the standard finish of cap nuts, countersunk finishing washers, brass spacers and standoffs, as well as other parts to achieve a more decorative appearance.
Tin	Tin plating is sometimes used on parts in the food handling industry because it resists organic acid. It improves the lubricity of steel and offers a high degree of corrosion resistance.
Silver	Silver is an excellent conductor of electricity. Its benefits are both decorative and protective as it resists thread galling when mated parts are under extreme pressure or exposed to extreme heat.
Cadmium & Wax	Cadmium plating results in a smoother surface and greater resistance to white oxidation spots than zinc plating. However, cadmium is a much more toxic metal than zinc, which makes the plating process more difficult and costly. The standard most commercial platers use when applying cadmium is a minimum thickness of .0002 inches. A supplemental wax coating is often added as a lubricant when cadmium is used on prevailing torque lock nuts.

PLATING / BAKING / PASSIVATING

Finish	Description
Hot-Dip Galvanized	Hot dip galvanizing is generally the most effective way to apply a sufficient thickness of zinc to threaded fasteners for the zinc to serve as a corrosion protectant is harsh environments. During the galvanizing process, steel reacts with molten zinc, forming layers of zinc-iron alloy layers, which are metallurgical bonded to the steel surface. This hard barrier has a low corrosion rate and resists mechanical damage. Bolts and nuts 3/8 inch diameter and smaller shall have a zinc coating with an average thickness of 0.0017 inches with no individual both having a coating of less than 0.0014 inches. Bolts and nuts over 3/8 inches diameter and all sizes if washers shall have a zinc coating with an average thickness of 0.0021 inches with no individual both having a coating of less than 0.0017 inches.
Black Phosphate	This is the standard finish for most drywall screws, particle board screws and retaining rings. It can have either a dull or bright appearance. No additional oil treatment is required.
Black Phosphate & Oil	The most common standard coating of black phosphate and oil is 1100mg per sq./ft., minimum. The oil serves as a rust inhibitor and a lubricant. Some fasteners with this plating are required to pass a salt-spray test, the duration and cost of which must be agreed upon between buyer and seller prior to the sale. Floorboard screws, frame bolts, Grade-GT locknuts and spring nuts are usually supplied with a black phosphate and oil finish.
Black Oxide	This is a "conversion coating" which means it is formed by a chemical reaction with the metal to form an integral surface, as opposed to an "applied coating" like zinc which bonds to the metal. An oil finish is applied as a rust inhibitor. For more information about black oxide, see next page.
Chrome	Chrome plating can be done in two ways: 1) A "hard chrome" finish deposits a thick layer of chrome on the part. This gives the fastener a very hard finish and superior wear resistance but does not offer much protection to corrosion; 2) A "nickel-chrome" finish is achieved by applying a flash of chrome on top of the nickel plating. This offers resistance to tarnishing and corrosion.
Dacro	Dacro is a pollution-free ceramic coating for fasteners used with treated lumber. The coating offers corrosion protection comparable to hot-dip galvanizing without discoloring the wood. Screws with a proper dacro coating can typically withstand a 500-hour salt-spray test. A dacro finish minimizes greatly the risk of hydrogen embrittlement so baking the part is not required after the finish is applied.
Blue Ruspert	Ruspert metal finish is a high-quality corrosion-resistant coating that is comprised by three layers: (1) metallic zinc; (2) a chemical conversion film (to resist corrosion); and (3) a ceramic surface coating that is baked.
Antique Brass	This is a brass finish that has been chemically darkened to appear similar to aged brass--a moderate brown color with golden hues. It is common in cabinet hardware.
Bright Brass	Bright brass is strictly a decorative finish that is commonly used with cabinet hardware. It offers minimal resistance to corrosion but will not stain when used in acidic woods.
Ceramic	Ceramic finish is also a barrier coating used to offer corrosion resistance. It is used, through not exclusively, on certain types of construction fasteners and typically provides over 500 salt spray hours or more of protection. Green ceramic is a common finish for cement board screws. Flat head deck screws are available in multiple colors of ceramic finish including green, red and tan.

Baking of Case Hardened Parts	Electroplated screws, which are case hardened, should be baked for a minimum of 4 hours within the temperature range of 375-450 F no later than 4 hours after the plating operations. However, this process does not guarantee that hydrogen embrittlement will not still be present after baking or that it will not occur at a later date while in service. Specialized testing or a substitute part may be required, depending on the application. This heat treatment practice is recommended for tapping screws, drywall screws, SEMS screws, clinch nuts and clinch studs.
Baking of Through Hardened Parts	Mechanical fasteners that are through-hardened with a core hardness above Rockwell C 39 and up to C 44 shall be baked for a minimum of 14 hours within a temperature range of 375-450 F. Through-hardened parts with a core hardness above Rockwell C 44 shall be baked for a minimum of 24 hours within a temperature range of 375-450 F. These requirements also apply to parts with hardened steel captive washers. These baking requirements are specified to offer relief from hydrogen embrittlement.
Passivation of Stainless Fasteners	This process enhances stainless steel s corrosion resistance. The fasteners are dipped in a solution, which removes surface imperfections and produces a slight film on the surface of the parts.

APPENDIX A

PLATING / BLACK OXIDE FINISH

Black Oxide Finish

Black oxide is a conversion coating (as opposed to an applied coating) because it results from a chemical reaction with the iron present in the metal fastener and forms and integral protective surface. It is a color of the base metal, which neither removes nor deposits metal; therefore it adds, at the most, 5 to 10 millionths of an inch to the fastener's dimensions. Likewise, it cannot chip, peel or rub off. Also, the item maintains 99% of its conductivity making black oxide a popular finish for electrical parts.

When a black oxide finish is specified, it is interpreted as "Black Oxide and Oil". Other supplementary coatings such as wax or lacquer may be ordered, but fasteners with those finished are usually not available from a distributor's stock.

Typically, the oil after-finish is dry to the touch, which gives the part a lustrous appearance and improved lubricity without excessive residue. The color is a deep black rather than the grayish-black appearance of a black phosphate, and remains consistent at temperatures as high as 900 F. Black oxide also resists abrasions better than phosphate.

One of the most important advantages of black oxide is that there is almost no risk of hydrogen embrittlement because the process does not involve electro-plating nor does it require an acid-activation. Case hardened parts need not be baked after receiving a black oxide finish.

Black oxide neither enhances nor detracts from a fastener s resistance to corrosion. The post-treatment oil application offers good indoor corrosion protection, but a zinc-plated part is more resistant to rust. However, parts with a black oxide finish will not suffer from white corrosion, which can occur over time with electro-plated parts. To avoid the risk of white corrosive particles (which can cause electrical shorts) many in the electronics industry opt for black oxide instead of zinc-plated fasteners.

The popularity of black oxide stainless fasteners is also growing. In addition to being used for decorative purposes, the finish reduces light glare and reflection, and makes the surface of the fastener smoother. The automotive aftermarket utilizes them in tail-light assemblies, luggage racks, grills and windshield wiper assemblies, to name a few.

HEAT TREATING

Notes on Heat Treating Fasteners

Steel fasteners are heat treated to develop the fastening strengths their material structure is capable of reaching. The iron, carbon, manganese and other elements, which form the grains of steel, are transformed during heat-treating to a structure capable of greater load carrying. The as-heat treated hardness and tensile strength are two of several metallurgical measures of the finished heat-treated fastener.

Heat-treating is a "three box" process: *Harden-Quench-Temper*. The raw fasteners travel into the hardening furnace where a high temperature and an atmosphere with a metered amount of carbon molecules alter the fasteners microstructure. Once "soaked" in and transformed in this environment, the fasteners are rapidly cooled, or "quenched" to shift the fastener metal into the martensitic microstructure right for fastening. To relieve the stresses from the rapid temperature changes needed to quench properly, the final step, tempering, draws the fastener back to their final hardness and tensile strength using a temperature lower than used in hardening. By hardening, quenching and tempering a steel fastener, the finished product develops the mechanical properties to provide fastening abilities

APPENDIX B

FASTENER THREAD FITS

Comparing Fine Threaded with Coarse Threaded Fasteners

Fastener threads provide both load holding when tightened and the ability to move during tightening and loosening. A fastener s pitch and lead, determined by whether it has a coarse or fine thread, is a factor in fastener performance. A coarse thread will move a larger distance with each rotation than a finer thread of the same diameter. If speed of assembly is a factor, a coarse thread may be preferred, as it will assemble faster. If adjustment is required, a fine thread will provide a less sensitive adjustment and a greater ability to control adjustment.

Each flank of thread carries a percentage of the clamping load. This load is not distributed equally among the thread pitches in most applications. It is generally thought that a fine pitch thread will have a more uniform load distribution among its engaged pitches when installed.

Finally, starting can be a factor. Fine threads can be more susceptible to cross threading if assembly conditions are not controlled. In general, both coarse and fine threads have advantages depending on the fastening output required.

Differences in Thread Classes 1B, 2B, 3B; and 1A, 2A and 3A

A thread s class is an arbitrary but well-established set of precision measurements established by the United States, The United Kingdom and Canada in the late 1940 s. It is universally used, accepted and maintained more than sixty years later. Its success is testimony to its sound engineering. In general, each diameter and pitch combination have been assigned a set of measurements within which it is to be manufactured for each of the three classes. The B denotes an internal thread such as that found on a nut. A 1A class would be slightly smaller on average than a 2A, which is in turn easier to make than a 3A. Similarly, a 1B would provide a looser fit than a 2B, which in turn, would not be as precise as a 3B. With three external and three internal classes, a total of nine combinations are possible in theory. In practice, only a few are in general application. A 2A/2B is popular for general fastening. 3A/2B finds application in more precision assemblies and 3A/3B serves where high precision is warranted.

EFFECTS OF TEMPERATURE CHANGES ON FASTENERS

Fastener Effects Due to Temperature Changes, Both Elevated and Cryogenic

Out of the box, fasteners come with a set of static and dynamic strengths, which are determined by their grade, material and size. In application, the availability of these strengths are affected by a range of factors. Among these factors, temperature variations can reduce available fastening power in an installed fastener to a large degree. Metal fasteners are made of "building blocks" of steel grains, which are molecules of metallic and other elements. Tensile, yield, impact and the other fastener strength properties are the result of these molecular bonds. As temperatures at an application site rise, these bonds weaken. Fastener strength drops as temperatures rise above ambient levels. At 300 Fahrenheit, an alloy steel fastener s strength is lower. And with continued time at an elevated temperature, a tensile fastener under load will progressively lose its ability to fasten at room temperature strength levels.

At very cold temperatures, these same molecular bonds lose their ability to "flex" or relieve fastening stresses under application load. As a result, fasteners can become brittle at low temperature levels and also provide less than room temperature fastening performance.

APPENDIX C

GLOSSARY

ANSI American National Standards Institute

ASME American Society of Mechanical Engineers

ASTM American Society of Testing and Materials

Aircraft Quality In the fastener industry, this refers to parts that are made to more stringent specifications, and tested more thoroughly, than commercial fasteners because they are used in high-risk and/or high-stress applications requiring near-zero defects.

Alloy Steel A variety of steel, which includes elements in addition to carbon, giving the material the ability to retain its strength at higher temperatures. Additionally, alloy steel has greater tensile and yield strength than medium carbon steel.

Annealed The condition of a fastener when it has been heated, then cooled to make it soft or less brittle.

Bolt An externally threaded rod, headed at one end, designed to pass through an oversized hole and mate with a nut so as to hold two or more objects together.

Carbon Steel – A steel whose only significant alloying material is carbon.

Case Depth That area of a fastener, measured from the surface inward, which has a different hardness requirement than its core.

Case Hardening The process performed on quenched, tempered, ferrous fasteners which makes the surface of those parts harder than the inner core. Case hardness is measured in the threaded section of the fastener.

Core Hardness The resistance a fastener material has to being permanently deformed, measured at a spot deeper than the case depth.

Ductility The ability of material to be permanently bent or stretched without breaking.

Elongation the lengthening of a fastener caused by a tensile force.

Embedment, minimum The minimum depth an anchor must be installed to meet the minimum pull-out values. It is the distance measured from the concrete surface to the bottom of the anchor.

Ferrous – That which contains iron; usually refers to fasteners containing more iron than any other element.

Fillet – The concavely curved Section at the angle formed at two intersecting surfaces of a fastener.

Galvanizing:
Hot-Dip Galvanizing - The process of coating iron or steel with zinc by means of hot-dipping.

Electro-Galvanizing - The process of coating iron or steel with zinc through an electric current. This results in a somewhat smoother, shinier finish than hot-dipping.

Mechanical-Galvanizing - The process of coating iron or steel with zinc at room temperature where the zinc powder becomes cold welded to the metal parts. It results in a more uniform finish than hot-dipping and greatly reduces the chance of hydrogen embrittlement which can occur in electro-galvanizing.

Gimlet Point a conically shaped, threaded point having an angle of 45-50 . Lag screws, wood screws, Type A & AB tapping screws all have gimlet points.

Grip Range The minimum and maximum thicknesses of materials a rivet can join together.

Header Point A blunt point with chamfered edges. Machine screws typically have header points.

Hydrogen Embrittlement The condition of a fastener, which had hydrogen introduced into its steel, causing it to be substantially less ductile and prone to sudden and premature failure.

GLOSSARY

Key engagement The distance from the head surface of a socket to that depth to which the hex wrench will penetrate.

Locknut A nut constructed to resist loosening when subjected to vibration or axial load. A prevailing torque type locknut achieves its locking action without being against another nut or a bearing surface, but by a controlled distortion in its threads or by means of another locking element (e.g. a nylon ring) built into the nut. A free-spinning locknut achieves its locking action when tightened against another surface.

Mandrel Break Load The axially applied load required to break the mandrel while a rivet is being set.

Milled from Bar A description of fasteners made from bar stock on a screw machine or a lathe.

Passivating The process performed on stainless fasteners of removing surface imperfections and producing a slight film on the surface which enhances the parts resistance to corrosion.

Penetration Gauge Depth A range of measurements, which determine the acceptability of a recess in the head of a screw. It is measured from a plane where the edge of the recess wings meet the top of the head s surface, downward into the recess.

Pilot Hole Size – An opening of sufficient size for a specific fastener to be properly installed.

Pitch:
Thread Pitch The distance between corresponding points on adjacent threads in the same plane parallel to the part s axis and on the same side of the axis.

Pitch Cylinder An imaginary cylinder, which sharing the same axis as a fastener, would cut through the threaded portion of that fastener in a way that made the widths of the thread ridge and groove equal, or half way between the major and minor diameters.

Pitch Diameter The diameter of the pitch cylinder.

Plating The application of a metallic deposit on the surface of a fastener for protective and/or decorative purposes.

Point Taper Length The length of the pointed portion of the fastener measured parallel to the axis, from the end of the point to the first full form thread.

Proof Load The tension applied force a fastener must support without any permanent change in size or shape.

Recess Depth The distance measured, axially, from the plane where the edge of the recess wings meet the top of the head s surface to the bottom of the recess.

Reduction of Area One of the tests performed on a cap screw or bolt when determining its tensile and yield strengths. After a test specimen has been broken in a tensile tester, the original diameter of the specimen (d) is compared to its smallest diameter after fracture (t). The formula for determining reduction of area is:
[1.000 (.5 x t)2 / (.5 x d)2] x 100 = % area reduction.

Rockwell Hardness A test performed on fasteners to determine the resistance a fastener material has to being permanently deformed by a specifically shaped object under a specific amount of weight. The test measures how deep an indentation is made in the fastener. That measurement is converted to a reading on the Rockwell hardness scale.

Runout of Thread A threaded portion with incomplete profile generated by chamfering part or leading part of tool. The incomplete threads are generated at the boundary between body and complete thread and also at thread-end portion as for an external threaded fastener with body.
The same are generated at under-head portion and thread end portion as for an external threaded fastener with continuous thread.

SAE Society of Automotive Engineers

APPENDIX C

GLOSSARY

Screw - An externally threaded fastener designed to be tightened or loosened by torquing the head.

Shear Load, Ultimate A minimum amount of force, applied transversely, which a blind rivet must withstand without failing.

Stud A headless fastener with threads at both ends of the shank.

Tensile Strength The greatest longitudinal stress a fastener can withstand prior to, or at the time of breaking apart.

Tolerance The difference between the lower and upper limits between which a fastener s size(s) must be measured.

Torque:
Drive Torque A screw shall form a mating internal thread in a test plate, without damaging its own thread with the application of a rotational force not in excess of the drive torque.

Minimum Torsional Strength The amount of rotational force a fastener must endure before failure occurs. This presumes the screw is driven into a proper size hole.

Tightening Torque The amount of rotational force which is approximately midway between a fastener's "drive torque" and "ultimate torque".

UNC – Unified National Coarse Threads

UNF – Unified National Fine Threads

Washer Face A circular boss on the bearing surface of a screw, bolt or nut.

Yield Strength The tension-applied stress at which a fastener, under strain, is deformed a measurable amount.

INDEX

-A-

Anchors
- Bantam Plugs 436
- Concrete Screw 429-430
- Double Expansion 433
- Drive Pins 460
- Drop-In 431
- Fluted, Light Duty 437
- Hammer Drive, Steel/Zinc Alloy 435
- Hollow Wall, Steel 439-440
- Hollow Wall, Ribbed Plastic 438
- Lag Screw Shields 442
- Lead Wood Screw 443
- Machine Screw 444
- Nylon Nail-In 445
- One-Step 446
- Plastic Toggles 455
- Single Expansion 433
- Sleeve 447-452
- Split Drive 453
- Toggle Bolts 456
- Toggle Wings 457
- Wedge 458-459

ASTM
- A194 Grade 2H Heavy Hex Nuts 184-185
- A325 Heavy Hex Structural Bolts 148-149
- A490 Heavy Hex Structural Bolts 148-149
- A563 Grades DH & DH3 Heavy Hex Nuts 184-185
- F436 Structural Washers 255
- F1941 Zinc Plating 640

-B-

Baking 641

Bit Holders 510

Blind Rivets
- See Rivets

Bolts
- Carriage, Flat Head 109
- Carriage, Round Head
  - Grade 5 110-111
  - Grade 8 110-111
  - Low Carbon Fin Neck 114
  - Low Carbon Short Neck 112
  - Low Carbon Square Neck 110
  - Short Neck, Metric 573
  - Square Neck, Metric 572
- Elevator 116
- Eyebolts
  - Forged 118-119
  - Open-End 117
- Flange, Classes 8.8, & 10.9, Metric 564-565
- Flange, Grade 8 124-125
- Flange, Grades 5 & 8, Serrated 122-123
- Flange, Twelve Point 121
- Frame, Grade 8 124-125
- Hanger 127
- Heavy Hex Bolts & Cap Screws 128-129
- Hex Cap Screw
  - Grade 2 130-131
  - Grade 5 & 8 132-133
  - Stainless 130-131
- Hex Full Threads
  - Classes 8.8 & 10.9, Metric 571
  - Grades A & B, Metric 570
- Hex Tap
  - Grade 2 138-139
  - Grade 5 138-139
  - Grade 8 138-139
- Machine, Galvanized 136-137
- Plow
  - Clipped Head 143
  - Grade 5 144-145
  - Grade 8 144-145
- Slotted Flat Cap Screw 126
- Square 146
- Step 147
- Structural, Heavy Hex 148-149
- T-Head 151
- Tension Control 152-153
- Toggle 456
- Track, Ribbed Neck 154

-C-

Cable Clamps, Nylon 501-502

Cap Screws
- External Threads, Class 2A 155
- Heavy Hex 128
- Hex
  - Grade 2 130-131
  - Grade 5 132-133
  - Grade 8 132-133
  - Stainless, 18-8 & 316 130-131
- Metric
  - DIN 931 566
  - DIN 933 567
  - Full Thread Classes 8.8 & 10.9 571
  - Full Thread Grades A & B 570
  - Partial Thread Classes 8.8 & 10.9 569
  - Partial Thread Grades A & B 568
- Slotted Flat 126
- Socket
  - Button Head 341
  - Button Head, Metric 629
  - Flat Head 342-343
  - Flat Head, Metric 623
  - Low Head 340
  - Metric 622
  - Stainless Steel 335, 337-339
  - Steel 335-336, 338-339

Clinch Nuts 164

Clinch Standoffs 484-488

Clinch Studs 480-482

Clips, U-Type Speed 205

Closed-End Eyescrews 120

Concrete Screws 429-430

Conduit Lock Nuts 166

Cotter Pins 362

-D-

Dacro Finish 641

Deck Screws 72-73

Deep Thread Wood Screws
- Flat Head 381-393
- Low Profile Pan Head 394
- Pan Head 395-399
- Round Washer Head 400-408
- Truss Head 409-413

DIN Standards
- Cross-Reference 514-515
- DIN 13 562-563
- DIN 125A 606
- DIN 127B 607
- DIN 128A & 128B 608
- DIN 315 595
- DIN 439B 582
- DIN 603 572
- DIN 928 598
- DIN 929 599
- DIN 934 576-577
- DIN 934K 584
- DIN 965 547
- DIN 985 586
- DIN 1587 575
- DIN 3155 596
- DIN 6797 A 610
- DIN 6797 J 611
- DIN 6797 V 612
- DIN 6902A 550
- DIN 6905 560
- DIN 6921 564-565
- DIN 6923 589-591
- DIN 6926 592
- DIN 6927 593
- DIN 6999 D 613
- DIN 7500-1 522
- DIN 7500 C 523
- DIN 7500 CE 525
- DIN 7500~D 526
- DIN 7500 M 528
- DIN 7500 ME 529
- DIN 7500 TX 525

DIN Standards (continued)
- DIN 7980 609
- DIN 7985 ..... 538, 550, 553, 560

Dowel Pins 366

Dowel Screws 115

Drive Pin Rivets
- Brazier 302-303
- Countersunk 304-305
- Liner Head 298
- Universal 299-301

Drive Screws
- Round Type U 74

Dry Seal Socket Pipe Plugs 348

Drywall Screws
- Coarse Thread, Sharp Point 71
- Fine Thread, Sharp Point 67
- High-Low Thread 68
- Self-Drilling Style 67
- Trim Head Style 69

-E-

Eye Screws, Closed End 120

Eyebolts, Open End 117

Eyebolts, Forged
- Plain Pattern 118-119
- Shoulder Pattern 119

-F-

Face Framing Screws
- Modified Pan Head 417-419
- Pan Head 414-416
- Round Washer Head 420-421

Fender Washers 244-245

Finished Hex Nuts
- Galvanized 170-171
- Grade 2 170-171
- Grade 5 172-173
- Grade 8 172-173
- Stainless, 18-8 & 316 170-171

Finishing Washers, Countersunk
- Inch-Sized 252
- Metric 605

Flange Bolts
- Inch-Sized 121, 124-125
- Metric 564-565

Flange Nuts
- Grade G Stover® 212
- Large, Grade F 175
- Large, Serrated 178
- Nylon Insert 197
- Regular, Serrated 176-177
- Metric 589-594

Flange Screws
- Serrated Self-Drilling 50-51
- Serrated Type-AB 29
- Serrated Whiz-Lock® Alternatives 122-123
- Twelve Point 121

Flat Washers
- See Washers

FlexLoc® Nuts
- Heavy Hex, Full Height 181
- Heavy Hex, Thin Height 182
- Light Hex, Full Height 179
- Light Hex, Thin Height 180

Floorboard Screws 35

-G-

Gaging of Threads 104

Grooved Pins 367

-H-

Hanger Bolts 127

Heat Treating 643

Hex Head Cap Screws
- Grade 2 130-131
- Grade 5 132-133
- Grade 8 132-133
- Metric, Full Thread
  - Classes 8.8 & 10.9 571
  - Grades A & B 570
- Metric, Partial Thread
  - Classes 8.8 & 10.9 569
  - Grades A & B 568
- Stainless 130-131

Hex Lag Screws 140-142

Hex Nuts
- Cap
  - Closed End 159, 161
  - Metric 575
  - Open End 160, 162
- Castle 163
- Conduit 166
- Coupling 167-168
- Domed Cap, Metric 575
- Finished
  - Galvanized 170-171
  - Grade 5 172-173
  - Grade 8 172-173
  - Stainless 170-171
- FlexLoc®
  - Heavy Hex, Full Height 181
  - Heavy Hex, Thin Height 182
  - Light Hex, Full Height 179
  - Light Hex, Thin Height 180
- Heavy 184-185
- Heavy Jam 187
- Jam 186
- Jam, Metric 582-583
- K-Lock 188-189
- K-Lock, Metric 584
- Machine Screw 190-191
- Machine Screw Small Pattern 191

Hex Nuts (continued)
- Metric
  - Domed Cap 575
  - DIN 934 576-577
  - Flange, DIN 6923 589-590
  - Flange, DIN 6926 592
  - Flange, DIN 6927 593
  - Flange, ISO 4161 594
  - Full, ISO 4032 578-579
  - Jam, DIN 439B 582
  - Jam, ISO 4035 583
  - K-Lock, DIN 934K 584
  - Nylon Insert, DIN 985 586
  - Nylon Insert, ISO 7040
    - Heavy Pattern 588
    - Regular Pattern 587
- Nylon 498
- Nylon Insert Stop
  - Flange, Low Carbon & Grade 8 197
  - Heavy Hex, Full Height 194
  - Heavy Hex, Thin Height 195
  - Light Hex, Full Height 192
  - Light Hex, Grades 5 & 8 196
  - Light Hex, Thin Height 193
- Panel 198
- Serrated Flange 176-178
- Serrated Large Flange 178
- Slotted 202-203
- Stover® Grade B 214
- Stover® Grade C 212-213
- Stover® Grade G 212
- Two-Way Reversible 200-201

Hex Spacers 490

Hex Standoffs
- Female, Threaded 492
- Male-Female, Threaded 493

High-Low Screws
- Drywall 58
- Installation 425
- Self-Drilling 58
- Thread Forming 23-26

Hinge Screws 422-424

Hole Preparation
- Thread Forming Screws 4-5
- Thread Rolling Screws 38-41

Hook, S 204

-I-

Insert Bits
- Magnetic Holder 510
- Magnetic Power Nut Setter 511
- Phillips 505
- Pozidriv® Alternative 508
- Reduced Phillips 505
- Six-Lobe 507
- Slotted 506
- Square Recess 509
- Torx® 507

Installation Screws, High-Low 425

ISO 1478 Gimlet & Blunt Point 517

ISO 1479 Indented Hex Head 518

ISO 1481 Pan Tapping Screw 519

ISO 1482 Flat Tapping Screw 520

ISO 1483 Oval Tapping Screw 521

ISO 1580 Pan Head 539

ISO 2009 Flat Head 540

ISO 2010 Oval Head 541

ISO 4026 Socket Set Screws, Flat Point 624

ISO 4027 Socket Set Screws, Cone Point 625

ISO 4028 Socket Set Screws, Dog Point 626

ISO 4029 Socket Set Screws, Cup Point 627

ISO 4032 Hex Nuts 578-579

ISO 4033 Hex Nuts 580-581

ISO 4035 Hex Jam Nuts 583

ISO 4161 Hex Flange Nuts 594

ISO 4762 Socket Head Cap Screws 622

ISO 7040 Nylon Insert Lock Nuts 587-588

ISO 7045 Pan Phillips SEMS
- Conical Washer 561
- External Tooth 554
- Helical Split Lockwasher 551
- Internal Tooth 552

ISO 7045 Pan Machine Screw
- Phillips 539
- Six-Lobe 547
- Slotted 539

ISO 7046-1 Flat Head 540

ISO 7047 Oval Head 541

ISO 7049 Pan Head 519

ISO 7050 Flat Head 520

ISO 7051 Oval Head 521

ISO 7089 Flat Washers 614

ISO 7091 Flat Washers 615

ISO 7092 Flat Washers 616

ISO 7093 Flat Washers 617

ISO 7379 Socket Shoulder Screws 630-631

ISO 7380 6-Lobe Button Cap Screws 632

ISO 7500-1 Thread Rolling Screws 522

ISO 8677 Carriage Bolts, Square Neck 572

ISO 8678 Carriage Bolts, Short Neck 573

ISO 14581 Machine Screws 542

ISO 14583 Machine Screws 543

ISO Standards, Cross-Reference 514-515

-J-

Jam Nuts
- Heavy Hex....187
- Metric....582-583
- Regular, Unified (Inch) Threads....186

JIS-B1111 Phillips Machine Screw
- Pan....545
- Small Pan....544
- Truss....546

JIS-B1187 Double Washer SEMS....555

JIS-B1188 Double Washer SEMS....559

JIS-B1188 Single Washer SEMS
- External Tooth....556
- Helical Lock....558
- Internal Tooth....557

JIS Standards, Cross-Reference....514-515

-K-

K-Lock Nuts
- Metric....584
- Unified (Inch) Threads....188-189

-L-

Lag Screws
- Full Body, Trimmed Hex....140
- Full Thread, High Profile....141
- Full Thread, Indented Hex....141
- Hex Flange....142

Lock Nuts
- Conduit....166
- Flange, Prevailing Torque Metric....593
- FlexLoc®
  - Heavy Hex, Full Height....181
  - Heavy Hex, Thin Height....182

Lock Nuts (continued)
- FlexLoc® (continued)
  - Light Hex, Full Height....179
  - Light Hex, Thin Height....180
- K-Lock, Metric....584
- K-Lock, Unified....188-189
- Keps® Equivalent....188-189
- Nylon Insert Stop, Metric
  - DIN 985....586
  - Flange....592
  - Heavy Pattern....588
  - Regular Pattern....587
- Nylon Insert Stop, Unified (Inch)
  - Flange....197
  - Heavy Hex, Full Height....194
  - Heavy Hex, Thin Height....195
  - Light Hex, Full Height....192
  - Light Hex, Grade 8....196
  - Light Hex, Thin Height....195
- Serrated Flange, Metric....591
- Serrated Flange, Unified....176-177
- Serrated Large Flange....178
- Stover® Flange Grade G....212
- Stover® Grade B....214
- Stover® Grade C....212-213
- Two-Way....200-201

Lockwashers
- Countersunk External Tooth, Unified....230
- Countersunk External Tooth, Metric....612
- Curved Spring, Metric....608
- External Tooth, Unified....228
- External Tooth, Metric....610
- External-Internal
  - Combination Tooth, Unified....231
  - Combination Tooth, Metric....613
- Heavy Split....234
- Helical Split....232-234
- Hi-Collar Split, Metric....609
- Hi-Collar Split, Unified....233
- Internal Tooth, Metric....611
- Internal Tooth, Unified....229
- Regular Split
  - 18-8 & 316 Stainless....232
  - High-Alloy....232
  - Metric....607
  - Steel....232

-M-

Machine Screw Nuts
- Hex, Steel & Stainless 190-191
- Small Pattern, Steel & Stainless 191
- Square 190-191

Machine Screw Washers
- Stainless, 18-8 251
- Steel 251

Machine Screws
- Binding Phillips 84
- Binding Slotted 85
- External Thread Dimensions 98
- Fillister Phillips 90
- Fillister Slotted 90
- Flat
  - 82° Phillips 78
  - 82° Six-Lobe 80
  - 82° Undercut Phillips 79
  - 82° Undercut Six-Lobe 80
  - 82° Undercut Slotted 79
  - 90° Phillips, Metric 540
  - 100° Phillips 81
  - 100° Six-Lobe 93
  - 100° Undercut Phillips 94
  - Pozidriv® 91
  - Six-Lobe 80
  - Slotted 78
  - Slotted, Metric 540
  - Square Recess 92
- Hex Slotted & Unslotted 88
- Hex Washer Combination 83
- Hex Washer Phillips 89
- Hex Washer Serrated Slotted 88
- Hex Washer Unslotted 88
- Oval
  - Phillips 86
  - Phillips, Metric 541
  - Slotted 86
  - Slotted, Metric 541
  - Undercut Phillips 87
  - Undercut Slotted 87
- Pan
  - Combination 82
  - Phillips 85
  - Phillips, Metric 538-539, 545
  - Phillips, Small Head, Metric 544
  - Pozidriv® 91

Machine Screws (continued)
- Pan (continued)
  - Six-Lobe 90
  - Six-Lobe, Metric 547
  - Slotted 82
  - Slotted, Metric 539
  - Slotted, Nylon 497
  - Square Recess 92
- Round
  - Combination 83
  - Phillips 84
  - Slotted 84
- Round Washer, Phillips 93
- SEMS
  - Hex 100, 102
  - Hex Washer 100, 102
  - Metric 550-561
  - Pan Phillips Double Washer 97
  - Pan Phillips External 100-101
  - Pan Phillips Internal 100-101
  - Pan Phillips Split-Lock 100-101
  - Pan Phillips Square-Cone® 100-101
  - Pan Slotted External 100-101
  - Pan Slotted Internal 100-101
- Truss
  - Combination 81
  - Phillips, Metric 546
  - Phillips, Unified 85
  - Slotted 85

Medium Split Lock Washers
- Carbon Steel 232
- High-Alloy 232
- Metric 607
- Stainless, 18-8 & 316 232

Metric Fasteners
- Carriage Bolts, Square Neck, Large 572
- Carriage Bolts, Short Neck 573
- Hex Cap Screw
  - Full Thread 567, 570-571
  - Partial Thread 566, 568-569
- Hex Flange Bolts 564-565
- Machine Screws
  - Flat Head 540, 547
  - Oval Head 541
  - Pan Head 539, 545
  - Truss Head 546
- Nuts
  - Cold Forged Wing 596-597
  - Domed Cap 575

Metric Fasteners (continued)
- Nuts (continued)
  - Hex, Classes 6, 8 & 10 578-579
  - Hex, Class 9 580
  - Hex, Class 12 581
  - Hex, Flange 589-594
  - Hex Jam 582-583
  - Hex Style 1 578-579
  - Hex Style 2 580-581
  - K-Lock 584
  - Malleable Cast Wing 595
  - Nylon Insert Lock, DIN 985 586
  - Nylon Insert Lock, ISO 7040
    - Heavy Pattern 588
    - Regular Pattern 587
  - Prevailing Torque 585
  - Self-Clinching 603
  - Weld 598-601
- Rivet Nuts 618-621
- Self-Clinching Nuts 603
- Self-Clinching Studs 636
- Self-Tapping Screws
  - Flat Head 520
  - Indented Hex Head 518
  - Oval Head 521
  - Pan Head 519
- SEMS
  - Conical Washer 561
  - Double Washer 555, 559
  - External Tooth 554, 556
  - Flat Washer 550
  - Internal Tooth 552-553, 557
  - Spring Lockwasher 551, 558
- Serrated Flange Nuts 591
- Serrated Flange Screws 564
- Socket Button Head Cap Screws 629
- Socket Flat Head Cap Screws 623
- Socket Head Cap Screws 622
- Socket Set Screws
  - Cone Point 625
  - Cup Point 627
  - Dog Point 626
  - Flat Point 624
- Socket Shoulder Screws 630-631
- Spring Pins 635
- Standoffs, Hex Male-Female 637
- Thread Forming Screws
  - Plastite®/Plas-Fix®-45 Alternatives 535-537
  - Type-PT® Alternatives 530-534
- Thread Rolling Screws 522-529

Metric Fasteners (continued)
- Washers
  - Combination Tooth Lock 613
  - Countersunk External Tooth Lock 612
  - Countersunk Finishing 605
  - Curved Spring Lock 608
  - External Tooth Lock 610
  - Flat 615-617
  - Internal Tooth Lock 611
- Weld Nuts 598-601

Monobolt® Rivets 325

Multi-Grip Rivets
- See Rivets

-N-

Nuts
- Acorn, Closed-End, Steel & Stainless 159, 161
- Automotive, Light Hex 158
- Cage 206
- Cap, Closed-End, Steel & Stainless 159, 161
- Cap, Open-End 160, 162
- Castle 163
- Clinch 164
- Cold Forged Wing, Metric 596-597
- Cold Forged Wing, Unified 221
- Conduit 166
- Coupling
  - Reducing 167
  - Standard 168
- Finished Hex
  - 18-8 & 316 Stainless 170-171
  - Galvanized 170-171
  - Grade 2 170-171
  - Grade 5 172-173
  - Grade 8 172-173
- Flange
  - Large, Grade F 175
  - Large, Serrated 178
  - No Serrations, Standard Width 174
  - Serrated 176-177
- FlexLoc®
  - Heavy Hex, Full Height 181
  - Heavy Hex, Thin Height 182
  - Light Hex, Full Height 179
  - Light Hex, Thin Height 180
- Heavy Hex Jam 187

Nuts (continued)
- Heavy Hex, Stainless & Steel 184-185
- Hex Coupling.....167-168
- Hex Jam, Metric.....582-583
- Hex Jam, Unified 186
- Hex Machine Screw
  - Small Pattern.....191
  - Standard Pattern 190-191
- Hex Panel.....198
- High Hex, Grade-8.....183
- Internal Thread, Class 2B 224-225
- Jam, Metric.....582-583
- Jam, Unified 186
- K-Lock, Metric 584
- K-Lock, Unified.....188-189
- Keps® Alternatives 188-189
- Machine Screw
  - Small Pattern.....191
  - Standard Pattern 190-191
- Malleable Cast Wing, Metric 595
- Metric
  - Cage 602
  - Domed Cap 575
  - Flange 589-594
  - Full Hex Class 6 576
  - Full Hex Class 8 576
  - Full Hex Class 9 580
  - Full Hex Class 10 576
  - Full Hex Class 12 581
  - Full Hex Classes A2 & A4 577
  - Full Hex Style 1 578-579
  - Full Hex Style 2 580-581
  - Hex Din 934.....576
  - Jam 582-583
  - K-Lock.....584
  - Nylon Insert, Din 985 586
  - Nylon Insert Flange, Din 6926.....592
  - Nylon Insert, ISO 7040
    - Heavy Pattern.....588
    - Regular Pattern 587
  - Self-Clinching 603
  - Tee 574
  - Weld.....598-601
  - Wing, Cold-Forged.....596-597
  - Wing, Malleable Cast.....595
- Nylon, Hex.....498
- Nylon Insert Stop
  - Flange 197
  - Heavy Hex, Full Height 194
  - Heavy Hex, Thin Height.....195
  - Light Hex, Full Height 192
  - Light Hex, Grade 5 193

Nuts (continued)
- Nylon Insert Stop (continued)
  - Light Hex, Grade 8 196
  - Light Hex, Thin Height 193
- Open-End Cap.....160, 162
- Panel.....198
- Pipe.....198
- Self Clinching 164
- Serrated Flange Lock 176-177
- Serrated Large Flange Lock.....178
- Slotted.....202-203
- Speed.....207-209
- Spring
  - Cage 206
  - Flat Type 207
  - J Type.....208
  - U Type.....209
- Square
  - Heavy Style 210
  - Machine Screw 190-191
  - Regular Style.....211
- Stamped Wing 222
- Stover® Flange Lock 212
- Stover® Grade B Lock.....214
- Stover® Grade C Lock.....212-213
- Tee, Metric.....574
- Tee, Unified 215-217
- Thick Hex, Grade 9.....218
- Tinnerman ® Alternatives
  - Cage 206
  - Flat Type 207
  - J Type.....208
  - U Type.....209
- Top Lock, Grade 9 219
- Two-Way Lock 199-201
- Washer-based Cap 161-162
- Washer-based Wing 223
- Weld, Hex Metric 599
- Weld, Hex Unified.....475
- Weld, Round-Base.....476-477
- Weld, Tab Style
  - Inch Sized 468-474
  - Metric 600-601
- Wheel.....220
- Whiz-Lock® Alternative.....176-178
- Wing.....221-223
- Wing, Metric 595-597

Nylon Fasteners
- Anchors, Hollow Wall 436-438
- Anchors, Nail-In 445

Nylon Fasteners (continued)
- Anchors, One-Step 446
- Anchors, Toggle 455
- Cable Clamps 501-502
- Flat Washers 499
- Hex Nuts 498
- Machine Screws, Pan Head 497
- Rivets, Drive Pin 307-310
- Shoulder Washers 500
- Spacers and Standoffs 489-493

Nylon Insert Stop Nuts
- See Nuts

-O-

Open End Cap Nuts 160, 162

Open End Eye Bolts 117

Orlock® High-Strength Double Lock Rivets
- Countersunk 323
- Dome 322, 324

-P-

Panel Nuts 198

Pem® Alternative Fasteners
- See Self-Clinching Fasteners

Pins
- Clevis 365
- Coiled 364
- Cotter, Extended Prong 362
- Dowel 366
- Drive (Rivets) 298-310
- Grooved 367
- Roll 363
- Slotted 363
- Split 363
- Spring 363-364
- Taper 369

Pipe Nuts 198

Pipe Plugs
- Dry Seal 348
- Flush Seating 349
- Phillips, with NPT Thread 350
- Slotted, with NPT Thread 351

Plastic Anchors
- Bantam Plugs 436
- Fluted, Light Duty 437
- Ribbed White 438

Plating 640-642

Plastite® Alternative Thread Rolling
- See Thread Rolling Screws

Plow Bolts
- Clipped Head 143
- Grade 5 144-145
- Grade 8 144-145

Pop® alternative Rivets
- See Rivets

Prevailing Torque Lock Nuts
- See Nuts

-R-

Retaining Clips
- See Retaining Rings

Retaining Rings, Steel & Stainless
- E Type 360
- External 358-359
- Internal 356-357

Rivets
- Aluminum / Aluminum
  - Countersunk 288
  - Dome 260-261
  - Large Flange 272-273
- Aluminum / Aluminum, Closed End 278
- Aluminum / Steel
  - Countersunk 286-287
  - Dome 262-263
  - Large Flange 272-273

Rivets (continued)
- Aluminum / Steel, Closed End
  - Countersunk 289
  - Dome 280-281
- Bulbing Style, All Aluminum 297
- Copper / Brass Dome 271
- Copper / Steel Dome 270
- Drive Pin
  - Brazier 302-303
  - Countersunk 304-305
  - Liner Head 298
  - Tamper-Resistant 306
  - Universal 299-301
- Drive Pin Anchor
  - Countersunk 310
  - Mushroom 309
  - Round 307
  - Truss 308
- Full Tubular 311
- Monobolt® 325
- Multi-Grip, Aluminum Body / Steel Mandrel
  - Countersunk 292
  - Dome 290
  - Large Flange 293
  - Low-Profile 291
- Multi-Grip, Steel Body / Steel Mandrel
  - Countersunk 295-296
  - Dome 295-296
  - Dome "Type US" 294
  - Large Flange 295-296
- Orlock® Double Locking, Countersunk 323
- Orlock® Double Locking, Dome 322, 324
- Semi-Tubular
  - 120° Flat Head 314
  - 150° Flat Head 315
  - Oval Head 312
  - Truss Head 313
- Solid
  - Button Head 316
  - Flat Head 318
  - Flat Countersunk 319
  - Pan Head 317
- Split, Flat Countersunk Head 321
- Split, Oval Head 320
- Stainless Steel / Stainless Steel
  - Dome 266-267
  - Large Flange 276-277
- Stainless Steel / Steel
  - Countersunk 286-287
  - Dome 268-269
  - Large Flange 274-275

Rivets (continued)
- Steel / Steel
  - Countersunk 286-287
  - Dome 264-265
  - Large Flange 274-275
- Steel / Steel, Closed End Dome 282-283
- Structural, Protruding Head 326-327
- Tubular, Full 311

Rivet Nuts
- Flat Head, Large Flange 330
- Flat Head, Ribbed Body, Large Flange 328-329
- Metric 618-621
- Small Flange, Ribbed Body 332-333
- Small Head, Smooth Body 331

-S-

S.A.E. Washers
- Extra Thick, Through-Hardened 241
- For Grade-9 Applications 242
- Low Carbon 237
- Stainless 237
- Through-Hardened 239

S Hook 204

Self-Clinching Fasteners
- Nuts 164
- Standoffs 484-488
- Studs, Flush Head, Metric 636
- Studs, Flush Head, Unified 480-482

Self-Drilling Screws
- Bugle Phillips Drywall 67
- Hex Washer
  - High Head 49
  - With Serrations 50-51
- Modified Truss 55-56
- Number 1 Point 48
- Number 4 & 5 Points 46-47
- Reamers with Wings 45
- Sealing Screw w/ Neo-EPDM Washers 53, 62
- Trim Head Phillips 43
- Trim Head Square Recess 43
- Type BSD 44-45
- Type BSD with Serrations 50
- Type CSD 44-45

Self-Drilling Screws (continued)
- Type CSD with Serrations 51
- Wafer Phillips with Nibs
  - Drill Point 59
  - Spade Point, High-Low Thread 58

Self-Piercing Screws 63-66

Self-Piercing Screws with Neo-EPDM Washers 63-64

Self-Tapping Screws
- High-Low 23-26
- Self-Piercing 63-66
- Type A 27
- Type AB 28
- Type AB Serrated 29
- Type B 30
- Type B Serrated 29
- Type C Metric (Gimlet Point) 516
- Type F Metric (Blunt Point) 517
- Type U-Drive 74

Semi-Tubular Rivets
- See Rivets

SEMS - Machine Screws
- Hex Head 100, 102
- Hex Washer Head 100, 102
- Pan
  - Phillips External 100-101
  - Phillips Internal 100-101
  - Phillips Split Lock 100-101
  - Phillips Split Lock/Flat 100-101
  - Phillips Square Cone® 100-101
  - Slotted External 100-101
  - Slotted Internal 100-101

SEMS - Machine Screws, Metric
- DIN 7985 w/DIN 6902A Flat Washer 550
- ISO 7045 Conical Washer 561
- ISO 7045 External Tooth 554
- ISO 7045 Helical Split 551
- JIS B1187 Hex Double Washer 555
- JIS-B1188 Double Washer 559
- JIS B1188 External Tooth 556
- JIS B1188 Internal Tooth 557
- JIS B1188 Split Washer 558

Serrated Flange Lock Nuts
- Large 178
- Regular 176-177

Serrated Flange Screws
- Case-Hardened w/Unified Thread 122-123
- Grade-5 & 8 122-123
- Stainless Steel 122-123

Serrated Machine Screws
- Hex and Hex Washer 89, 98
- Truss 96, 98

Serrated Self-Tapping Screws
- Hex and Hex Washer 13
- Pan Head 18
- Self-Drilling 50-51
- Type AB 29
- Type B 29

Shoulder Socket Screws
- Metric 630-631
- Unified (Inch Sizes) 346-347

Shoulder Washers, Nylon 500

Slotted Flat Cap Screws 126

Slotted Nuts
- Heavy Hex 203
- Hex 202

Slotted Pins 363

Socket Products
- Cap Screws, Metric
  - Alloy Steel 622
  - Button Head 629
  - Flat Head 623
- Cap Screws, Unified
  - Alloy Steel 335
  - Button Head 341
  - Flat Head 342-343
  - Low Head 340
  - Stainless Steel 335, 337-339
- Hex Keys, Long and Short Arm
  - Metric 633
  - Unified 352-353
- Pipe Plug Dry Seal, Steel 348
- Pipe Plug Flush Seating, Steel 349

Socket Products (continued)
- Set Screws, Metric
  - Cone Point....625
  - Cup Point....627
  - Dog Point....626
  - Flat Point....624
- Set Screws, Unified
  - Cone Point....344-345
  - Cup Point....344-345
  - Flat Point....344-345
  - Half Dog Point....344-345
  - Oval Point....344-345
- Shoulder Screws, Metric....630-631
- Shoulder Screws, Unified....346-347

Solid Rivets
- Button Head....316
- Countersunk Flat Head....319
- Flat Head....318
- Pan Head....317

Spacers
- Hex....490
- Hex Swage....495
- Round....489
- Round Swage....494

Speed Clips
- See Clips, Type-U Speed

Speed Nuts
- See Tinnerman®-Type Nuts

Split Pins....363

Split Rivets
- Flat Countersunk Head....321
- Oval Head....320

Spring Nuts
- Cage, Metric....602
- Cage, Unified....206
- Flat Type....207
- J-Type....208
- U-Type....209

Spring Pins
- Coiled....364
- Split, Inch....363
- Split, Metric....635

Square Cone® SEMS....100-101

Square Head Bolts....146

Square Nuts
- Heavy Style....210
- Machine Screw....190-191
- Regular Style....211

Stamped Wing Nuts....222

Standoffs, Inch
- Hex Threaded Female....492
- Hex Threaded Male-Female....493
- Round Threaded Female....491
- Round Threaded Male-Female....493
- Self-Clinching....484-488

Standoffs, Metric
- Hex Threaded Male-Female....637

Step Bolts....147

Stover® Lock Nuts
- See Automation Style Nuts

Stripper Bolts
- See Socket Products, Shoulder Screws

Structural Bolts
- A325 Heavy Hex....148-149
- A490 Heavy Hex....148-149
- F1852 Tension Control....152-153

Structural Rivets
- Monobolt®....325
- Protruding Head, Generic....326-327

Structural Washers
- F436 Round....255
- F959 Tension Indicator....256

Studs
- B7....150
- Broaching....483
- Self-Clinching, Metric....636
- Self-Clinching, Unified....480-482

Swage Spacers
- See Spacers

-T-

T-Head Bolts 151

Tab-Style Weld Nuts
- See Weld Nuts

Tap Bolts
- Grade 2 138-139
- Grade 5 138-139
- Grade 8 138-139
- Stainless 138-139
- Metric DIN 933 567
- Metric ISO 4017 570

Taper Pin 369

Tapping Screws
- See Self-Tapping Screws

Taptite® II Alternative Thread Rolling
- See Thread Rolling Screws

Tee-Nuts
- Inch 215-217
- Metric 574

Tension Control Bolts 152-153

Thread Cutting Screws
- Type 1 33
- Type 23 32
- Type 25 31
- Type F 34-35

Thread Forming Screws
- High-Lows 23-26
- Metric, Type C 516
- Metric, Type F 517
- Type A 27
- Type AB 28
- Type AB & B, Serrated 29
- Type B 30

Thread Rolling Screws
- DIN 7500 522-529
- Plastite® 36
- Plastite® /Plas-Fix®-Alternatives 535-537
- Taptite® II 37

Thumb Screws
- Knurled 372
- Knurled with Washer Face 373
- Plain Pattern 371
- Shoulder Pattern 371
- Wing, Cold-Formed 374
- Wing, Stamped 375

Tinnerman® Alternatives
- Cage Nuts, Inch 206
- Cage Nuts, Metric 602
- Flat Type Nuts 207
- Type J Nuts 208
- Type U Clips 205
- Type U Nuts 209

Toggle Bolts, Steel 456

Toggle Wings, Steel 457

Toggles, Plastic 455

Tooth Lockwashers
- See Lockwashers

Track Bolts, Ribbed Neck 154

Trilobular Thread Forming Screws
- See Thread Rolling Screws

Trim Head Screws
- Drywall 69
- Self-Drilling 43

Tubular (Full) Rivets 311

Two-Way Lock Nuts 200-201

Type 1 33

Type 17
- Deck Screws 72-73
- Deep Thread Wood Screws
  - Flat Head 383, 385-391, 393
  - Pan Head 395, 397, 399
  - Round Washer Head 401, 403, 405
  - Round Washer Head, Large 407-408
  - Truss Head 411-412
- Face Framing Screws 414-421
- Installation Screws 425
- Pole Barn Screws 426
- Type-A Tapping Screws 427

Type 23 32

Type 25 31

Type A
- Self-Tapping Screws 27
- Wing Screws 374

Type AB 28-29

Type B Flat Washers 248-250

Type B Tapping Screws 29-30

Type BSD 44, 62

Type C, Metric 516

Type CSD 44-45, 62

Type F, Thread Cutting Screws 34-35

Type F, Metric 517

Type J Speed Nuts 208

Type PT®-Alternatives 530-534

Type U Drive Screws 74

Type U Speed Clips 205

Type U Speed Nuts 209

Type Z (1A), Metric 523, 537

-U-

U Drive Screws, Round 74

Universal Head Drive Pin Rivets 299-301

-W-

Washer-Based Cap Nuts 161-162

Washer-Based Wing Nut 223

Washers, Inch-sized
- Beveled 254
- Countersunk External Tooth Lock 230
- Countersunk Finishing 252
- Direct Tension Indicator
  - For Grades 5 & 8 257
  - For Structural Applications 256
- Dock 235
- EPDM Bonded 53, 62-64, 253
- External Tooth Lock, Steel & Stainless 228
- Fender, Extra Heavy 245
- Fender, Standard 244
- Flat
  - 18-8 Stainless 246
  - 316 Stainless 247
  - Nylon 499
- Heavy Split Lock 234
- Helical Split Lock 232-234
- Hi-Collar Split Lock 233
- Internal Tooth Lock, Steel & Stainless 229
- Machine Screw 251
- Medium Split Lock
  - 18-8 & 316 Stainless 232
  - Carbon Steel 232
  - High Alloy 232
- S.A.E.
  - For Grade-9 Applications 243
  - Low Carbon & Stainless 237
  - Through-Hardened 239
  - Through-Hardened, Extra Thick 241
- Shoulder, Nylon 500
- Structural F436 255
- Type B Flat 248-250

Washers, Inch-Sized (continued)
- U.S.S.
  - For Grade-9 Applications 242
  - Low Carbon & Stainless....236
  - Through-Hardened....238
  - Through-Hardened, Extra Thick 240

Washers, Metric
- Countersunk Finishing 605
- Countersunk External Tooth Lock....612
- Curved Spring Lock 608
- External-Internal Combination Lock 613
- External Tooth Lock 610
- Flat with Larger O.D., ISO 7093....617
- Flat with Smaller O.D., ISO 7092 616
- Flat with Wider I.D., ISO 7091....615
- Internal Tooth Lock 611
- Regular Split Lock 607
- Standard Flat
  - DIN 125A....606
  - ISO 7089 614

Weld Nuts, Hex Style, Inch
- Six Projections....475
- Three Projections 475

Weld Nuts, Hex Style, Metric 599

Weld Nuts, Round Base, Inch
- With Projections....477
- Without Projections....476

Weld Nuts, Square Style, Metric 598

Weld Nuts, Tab Style, Inch
- Multiple Projections, Center Hole....469
- Ribbed Projections, Center 474
- Single Projection, Offset Hole 468
- Thin Target Area, Offset Hole....473
- Without Projections, Center Hole 470
- Without Projections, Offset Hole 471

Weld Nuts, Tab Style, Metric
- Ribbed Projections, Center Hole....600-601

Weld Screws
- Bottom Projection Style 464-465
- Flat 90° Spade, No Projections....466-467
- Top Projection Style....462-463

Wing Nuts
- Cold Forged, Metric 596-597
- Cold Forged, Steel & Stainless 221
- Malleable Cast, Metric 595
- Stamped....222
- Washer-Based, Zinc Alloy 223

Wing Screws
- Cold Formed....374
- Stamped....375
- Type A....374

Wood Screws, Deep-Thread
- Flat Head....381-393
- Low-Profile Pan Head....394
- Pan Head 395-399
- Round Washer Head....400-405
- Round Washer Head, Large....406-408
- Truss Head....409-413

Wood Screws, Standard Full-Body
- Flat Head....378, 380
- Oval Head 379-380
- Round Head 379-380

Wrenches, Socket
- Inch-sized....352-353
- Metric....633

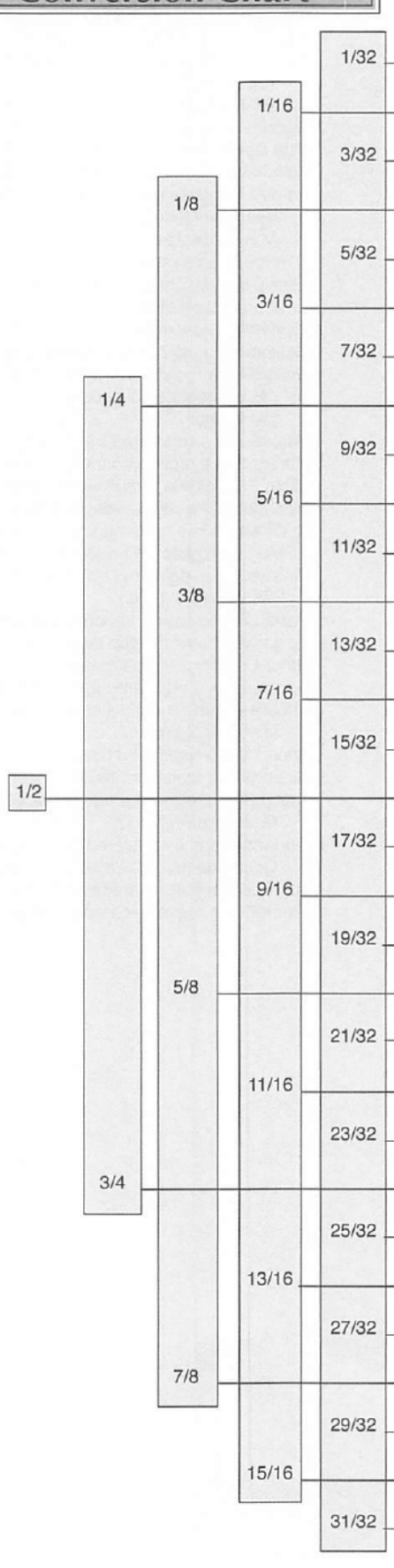
-Z-

Zip Screws.... 63-66

Zinc Plating
- Hot Dip Galvanized....641
- Mechanical Zinc & Clear....640
- Mechanical Zinc & Yellow 640
- Sockets, Electroplating of 640
- Zinc & Clear....640
- Zinc & Green 640
- Zinc & Wax....640
- Zinc & Yellow....640

Decimal Equivalents

Decimal Equivalent Conversion Chart



Working Equivalent	Exact Decimal
1/64 ..... .0156	.015625
.0312	.031250
3/64 ..... .0469	.046875
.0625	.062500
5/64 ..... .0781	.078125
.0938	.093750
7/64 ..... .109	.109375
.125	.125000
9/64 ..... .141	.140625
.156	.156250
11/64 ..... .172	.171875
.188	.187500
13/64 ..... .203	.203125
.219	.218750
15/64 ..... .234	.234375
.250	.250000
17/64 ..... .266	.265625
.281	.281250
19/64 ..... .297	.296875
.312	.312500
21/64 ..... .328	.328125
.344	.343750
23/64 ..... .359	.359375
.375	.375000
25/64 ..... .391	.390625
.406	.406250
27/64 ..... .422	.421875
.438	.437500
29/64 ..... .453	.453125
.469	.468750
31/64 ..... .484	.484375
.500	.500000
33/64 ..... .516	.515625
.531	.531250
35/64 ..... .547	.546875
.562	.562500
37/64 ..... .578	.578125
.594	.593750
39/64 ..... .609	.609375
.625	.625000
41/64 ..... .641	.640625
.656	.656250
43/64 ..... .672	.671875
.688	.687500
45/64 ..... .703	.703125
.719	.718750
47/64 ..... .734	.734375
.750	.750000
49/64 ..... .766	.765625
.781	.781250
51/64 ..... .797	.796875
.812	.812500
53/64 ..... .828	.828125
.844	.843750
55/64 ..... .859	.859375
.875	.875000
57/64 ..... .891	.890625
.906	.906250
59/64 ..... .922	.921875
.938	.937500
61/64 ..... .953	.953125
.969	.968750
63/64 ..... .984	.984375

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