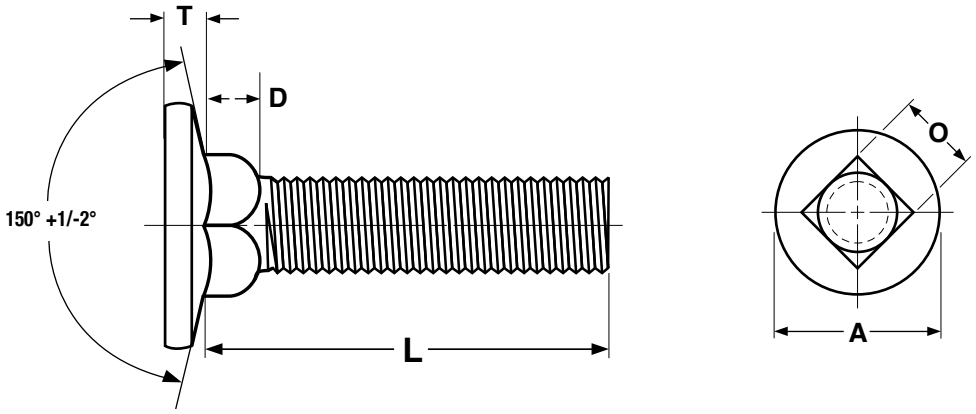
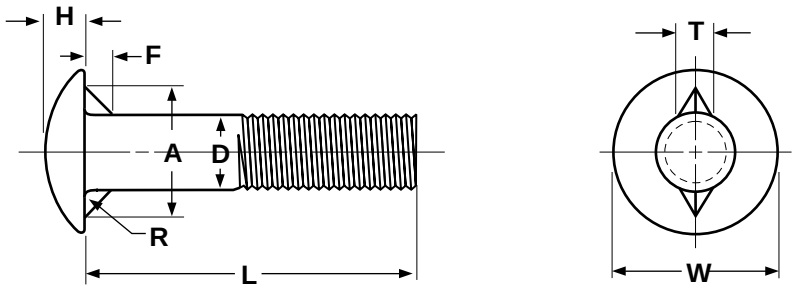
Bolts & Cap Screws — *Flat Head Carriage Bolts* — Low Carbon & Grade-5



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, FIN NECK

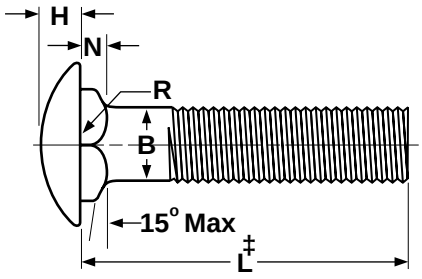
ASME B18.5-1990

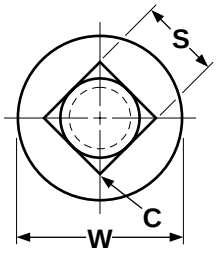
Nominal Size or Basic Bolt Diameter		D		W		H		T		A		F		R	
		Body Diameter		Head Diameter		Head Height		Fin Thickness		Distance Across Fins		Fin Depth		Fillet Radius	
		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
10	0.1900	0.199	0.182	0.469	0.438	0.114	0.094	0.098	0.078	0.395	0.375	0.088	0.076	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.

Cap Screws & Bolts — *Carriage Bolts* — Short Neck





Carriage Bolts, Short Neck

ANSI/ASME B18.5

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	MIn	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

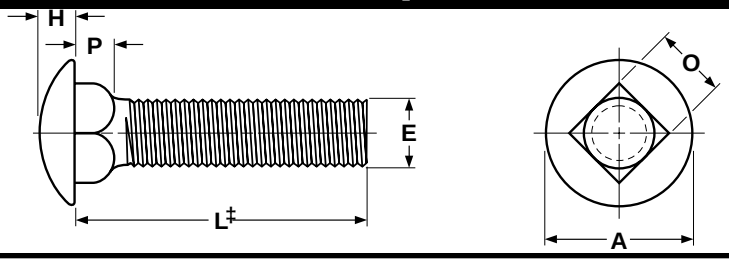
Tolerance on Length	Nominal Bolt Size	Nominal Screw Length									
		Up to 1 in., incl.		Over 1 in. to 2 1/2 in., incl.		Over 2 1/2 in. to 4 in., incl.		Over 4 in. to 6 in., incl.		Over 6 in.	
	No. 10 thru 3/8	+0.02	-0.03	+0.02	-0.04	+0.04	-0.06	+0.06	-0.10	+0.10	-0.18
	7/16 and 1/2	+0.02	-0.03	+0.04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

Carriage Bolts, Square Neck

Low Carbon & Hot-Dip Galvanized



Carriage Bolts - Square Neck

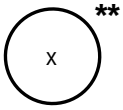
ASME B18.5-1990

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
•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	0.182	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	0.237	0.594	0.563	0.145	0.125	0.260	0.245	0.156	0.125
5/16	0.3125	0.324	0.298	0.719	0.688	0.176	0.156	0.324	0.307	0.187	0.156
3/8	0.3750	0.388	0.360	0.844	0.782	0.208	0.188	0.388	0.368	0.219	0.188
7/16	0.4375	0.452	0.421	0.969	0.907	0.239	0.219	0.452	0.431	0.250	0.219
1/2	0.5000	0.515	0.483	1.094	1.032	0.270	0.250	0.515	0.492	0.281	0.250
5/8	0.6250	0.642	0.605	1.344	1.219	0.344	0.313	0.642	0.616	0.344	0.313
3/4	0.7500	0.768	0.729	1.594	1.469	0.406	0.375	0.768	0.741	0.406	0.375

	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.
Tolerance on Length	No. 8 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 carriage bolt is measured from the underhead bearing surface to the extreme end of the bolt.

• ASME B18.5-1990 does not specify dimensions for the #8 or #12 diameters. Data listed for these sizes is independent of the ASME specification.



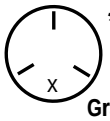
LOW CARBON & HOT-DIP GALVANIZED CARRIAGE BOLT

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.

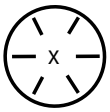
**Product standards require the manufacturer's head marking to appear on the top of all bolts 1/4" diameter and larger. "X" represents one location such a marking may appear.

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



Grade-5

GRADES-5 & 8 CARRIAGE BOLTS



Grade-8

Description	*Grade-5*	*Grade-8*
	Carriage bolt made from medium carbon steel and heat-treated.	Carriage bolt made from medium carbon alloy 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 BOLT -- 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.