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## Petro-chemical Bolting

### ASTM, SAE AND ISO GRADE MARKINGS AND MECHANICAL PROPERTIES FOR STEEL FASTENERS



Identification Grade Mark	Specification	Fastener Description	Material	Nominal Size Range (in.)	Mechanical Properties			
					Proof Load (psi)	Yield Strength Min (psi)	Tensile Strength Min (psi)	
 No Grade Mark	SAE J429 Grade 1	Bolts, Screws, Studs	Low or Medium Carbon Steel	1/4 thru 1-1/2	33,000	36,000	60,000	
	ASTM A307 Grades A&B		Low Carbon Steel	1/4 thru 4	--	--		
	SAE J429 Grade 2		Low or Medium Carbon Steel	1/4 thru 3/4 Over 3/4 to 1-1/2	55,000 33,000	57,000 36,000	74,000 60,000	
 No Grade Mark	SAE J429 Grade 4	Studs	Medium Carbon Cold Drawn Steel	1/4 thru 1-1/2	--	100,000	115,000	
 B5	ASTM A193 Grade B5	Bolts, Screws, Studs for High-	AISI 501	1/4 Thru 4	--	80,000	100,000	
 B6	ASTM A193 Grade B6		AISI 410			85,000	110,000	
 B7	ASTM A193 Grade B7		AISI 4140, 4142, OR 4105	1/4 thru 2-1/2 Over 2-1/2 thru 4	--	105,000 95,000 75,000	125,000 115,000 100,000	
 B16	ASTM A193 Grade B16		CrMoVa Alloy Steel	Over 4 thru 7	--	105,000 95,000 85,000	125,000 115,000 100,000	
 B8	ASTM A193 Grade B8		AISI 304	1/4 and larger	--	30,000	75,000	
 B8C	ASTM A193 Grade B8C		AISI 347					
 B8M	ASTM A193 Grade B8M		AISI 316					
 B8T	ASTM A193 Grade B8T			AISI 321	1/4 and larger	--	30,000	75,000












 B8	ASTM A193 Grade B8	Temperature Service	AISI 304 Strain Hardened	1/4 thr 3/4 Over 3/4 thru 1 Over 1 thru 1-1/4 Over 1-1/4 thru 1-1/2	-- -- -- --	100,000	125,000
 B8C	ASTM A193 Grade B8C		AISI 347 Strain Hardened			80,000	115,000
 B8M	ASTM A193 Grade B8M		AISI 316 Strain Hardened			65,000	105,000
 B8T	ASTM A193 Grade B8T		AISI 321 Strain Hardened			50,000	100,000
 L7	ASTM A320 Grade L7	Bolts, Screws, Studs for Low- Temperature Service	AISI 4140, 4142 or 4145	1/4 thru 2- 1/2	--	105,000	125,000
 L7A	ASTM A320 Grade L7A		AISI 4037				
 L7B	ASTM A320 Grade L7B		AISI 4137				
 L7C	ASTM A320 Grade LC7		AISI 8740				
 L43	ASTM A320 Grade L43		AISI 4340	1/4 thru 4	--	105,000	125,000
 B8	ASTM A320 Grade B8	Bolts, Screws, Studs for Low- Temperature Service	AISI 304	1/4 and larger	--	30,000	75,000
 B8C	ASTM A320 Grade B8C		AISI 347				
 B8T	ASTM A320 Grade B8T		AISI 321				
 B8F	ASTM A320 Grade B8F		AISI 303 or 303Se				
 B8M	ASTM A320 Grade B8M		AISI 316				
 B8	ASTM A320 Grade B8		AISI 304				

 B8C	ASTM A320 Grade B8C		AISI 347	thru 1 Over 1 thru 1-1/4 Over 1-1/4 thru 1-1/2	--	50,00	50,00
 B8F	ASTM A320 Grade B8F		AISI 303 or 303Se				
 B8M	ASTM A320 Grade B8M		AISI 316				
 B8T	ASTM A320 Grade B8T		AISI 321				
	SAE J429 Grade 5	Bolts, Screws, Studs	Medium Carbon Steel, Quenched and Tempered	1/4 thru 1 Over 1 to 1-1/2	85,000 74,000	92,000 81,000	120,000 105,000
	ASTM A449			1/4 thru 1 Over 1 to 1-1/2 Over 1-1/2 thru 3	85,000 74,000 55,000	92,000 81,000 58,000	120,000 105,000 90,000
	SAE J429 Grade 5.1	Sems	Low or Medium Carbon Steel, Quenched and Tempered	No. 6 thru 3/8	85,000	--	120,000
	SAE J429 Grade 5.2	Bolts, Screws, Studs	Low Carbon Martensitic Steel, Quenched and Tempered	1/4 thru 1	85,000	92,000	120,000
 A325	ASTM A325 Type 1	High Strength Structural Bolts	Medium Carbon Steel, Quenched and Tempered	1/2 thru 1 1-1/8 thru 1-1/2	85,000 74,000	92,000 81,000	120,000 105,000
 A325	ASTM A325 Type 2		Low Carbon Martensitic Steel, Quenched and Tempered	1/2 thru 1	85,000	92,000	120,000
 <u>A325</u>	ASTM A325 Type 3		Atmospheric Corrosion Resisting Steel, Quenched and Tempered	1/2 thru 1 1-1/8 thru 1-1/2	85,000 74,000	92,000 81,000	120,000 105,000
 BB	ASTM A354 Grade BB	Bolts, Studs	Alloy Steel, Quenched and Tempered	1/4 thru 2- 1/2	80,000 75,000	83,000 78,000	105,000 100,000
 BC	ASTM A354 Grade BC			2-3/4 thru 4	105,000 95,000	109,000 99,000	125,000 115,000
	SAE J429 Grade 7	Bolts, Screws,	Medium Carbon Alloy Steel, Quenched and Tempered <sup>4</sup>	1/4 thru 1- 1/2	105,000	115,000	133,000
	SAE J429 Grade 8	Bolts, Screws, Studs	Medium Carbon Alloy Steel, Quenched and	1/4 thru 1- 1/2	120,000	130,000	150,000

			Tempered				
	ASTM A354 Grade BD		Alloy Steel, Quenched and Tempered <sup>4</sup>				
 No Grade Mark	SAE J429 Grade 8.1	Studs	Medium Carbon Alloy or SAE 1041 Modified Elevated Temperature Drawn Steel	1/4 thru 1- 1/2	120,000	130,000	150,000
 A490	ASTM A490	High Strength Structural Bolts	Alloy Steel, Quenched and Tempered	1/2 thru 1- 1/2	120,000	130,000	150,000 min 170,000 max
 No Grade Mark	ISO R898 Class 4.6				33,000	36,000	60,000
 No Grade Mark	ISO R898 Class 5.8		Medium Carbon Steel, Quenched and Tempered		55,000	57,000	74,000
8.8  or  8.8	ISO R898 Class 8.8	Bolts, Screws, Studs		All Sizes thru 1-1/2	85,000	92,000	120,000
10.9  or  10.9	ISO R898 Class 10.9		Alloy Steel, Quenched and Tempered		120,000	130,000	150,000

## FASTENER IDENTIFICATION MARKING

Grade Identification Marking	Specification	Material	Nominal Size In.	Proof Load Stress ksi	Hardness Rockwell		See Note
					Min	Max	
 No Mark	ASTM A563 - Grade 0	Carbon Steel	1/4 thru 1-1/2	69	B55	C32	3,4
	ASTM A563 - Grade A	Carbon Steel	1/4 thru 1-1/2	90	B68	C32	3,4
	ASTM A563 - Grade B	Carbon Steel	1/4 thru 1 over 1 thru 1- 1/2	120 105	B69	C32	3,4
	ASTM A563 - Grade C	Carbon Steel May be Quenched and Tempered	1/4 thru 4	144	B78	C38	5

	ASTM A563 - Grade C3	Atmospheric Corrosion Resistant Steel May be Quenched and Tempered	1/4 thru 4	144	B78	C38	5,9
	ASTM A563 - Grade D	Carbon Steel May be Quenched and Tempered	1/4 thru 4	150	B84	C38	6
	ASTM A563 - Grade DH	Carbon Steel Quenched and Tempered	1/4 thru 4	175	C24	C38	6
	ASTM A563 - Grade DH3	Atmospheric Corrosion Resistant Steel, Quenched and Tempered	1/4 thru 4	175	C24	C38	5,9
	ASTM A194 - Grade 1	Carbon Steel	1/4 thru 4	130	B70	--	7
	ASTM A194 - Grade 2	Medium Carbon Steel	1/4 thru 4	150	159	352	7,8
	ASTM A194 - Grade 2H	Medium Carbon Steel, Quenched and Tempered	1/4 thru 4	175	C24	C38	7
	ASTM A194 - Grade 2HM	Medium Carbon Steel, Quenched and Tempered	1/4 thru 4	150	159	237	7,8
	ASTM A194 - Grade 4	Medium Carbon Alloy Steel, Quenched and Tempered	1/4 thru 4	175	C24	C38	7
	ASTM A194 - Grade 7	Medium Carbon Alloy Steel, Quenched and Tempered	1/4 thru 4	175	C24	C38	7
	ASTM A194 - Grade 7M	Medium Carbon Alloy Steel, Quenched and Tempered	1/4 thru 4	150	159	237	7
See Note 1,2	10						

**NOTES:**

1. In addition to the indicated grade marking, all grades, except A563 grades O, A and B, must be marked for manufacturer identification.
2. The markings shown for all grades of A194 nuts are for cold formed and hot forged nuts. When nuts are machined from bar stock the nut must be additionally marked with the letter 'B'.
3. Nuts are not required to be marked unless specified by the purchaser. When marked, the identification marking shall be the grade letter O, A or B.
4. Properties shown are those of non-plated or non-coated coarse thread hex nuts.
5. Properties shown are those of coarse thread heavy hex nuts.
6. Properties shown are those of coarse thread heavy hex nuts.
7. Properties shown are those of coarse 8-pitch thread heavy hex nuts.
8. Hardness's are Brinell Hardness Numbers.

9. The nut manufacturer, at his option, may add other markings to indicate the use of atmospheric corrosion resistant steel.
10. Specifications --  
ASTM A563 -- Carbon and Alloy Steel Nuts.  
ASTM A194/A194M -- Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service.