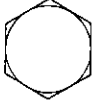
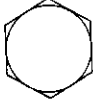
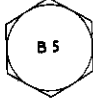
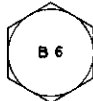
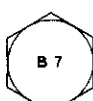

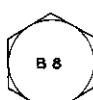
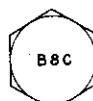
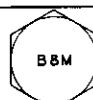




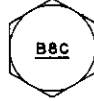
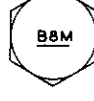


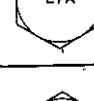

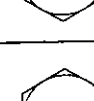
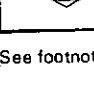
**ASTM, SAE AND ISO GRADE MARKINGS AND
MECHANICAL PROPERTIES FOR STEEL FASTENERS**

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 Med- ium 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 Med- ium 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 Car- bon Cold Drawn Steel	1/4 thru 1-1/2	—	100,000	115,000
 B 5	ASTM A193 Grade B5	Bolts, Screws, Studs for High- Temperature Service	AISI 501	1/4 thru 4	—	80,000	100,000
 B 6	ASTM A193 Grade B6		AISI 410			85,000	110,000
 B 7	ASTM A193 Grade B7		AISI 4140, 4142 or 4145	1/4 thru 2-1/2 Over 2-1/2 thru 4 Over 4 thru 7	— — —	105,000 95,000 75,000	125,000 115,000 100,000
 B 16	ASTM A193 Grade B16		CrMoVc Alloy Steel			105,000 95,000 85,000	125,000 110,000 100,000
 B 8	ASTM A193 Grade B8		AISI 304				
 B 8C	ASTM A193 Grade B8C		AISI 347	1/4 and larger	—	30,000	75,000
 B 8M	ASTM A193 Grade B8M		AISI 316				

See footnotes on Page N-24.



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

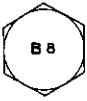

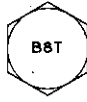
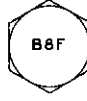
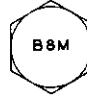





Identification Grade Mark	Specification	Fastener Description	Material	Nominal Size Range (in.)	Mechanical Properties		
					Proof Load (psi)	Yield Strength Min (psi)	Tensile Strength Min (psi)
	ASTM A193 Grade B8T	Bolts, Screws, Studs for High-Temperature Service	AISI 321	1/4 and larger	—	30,000	75,000
	ASTM A193 Grade B8		AISI 304 Strain Hardened	1/4 thru 3/4 Over 3/4 thru 1 Over 1 thru 1-1/4 Over 1-1/4 thru 1-1/2	—	100,000 80,000 65,000 50,000	125,000 115,000 105,000 100,000
	ASTM A193 Grade B8C		AISI 347 Strain Hardened		—	—	—
	ASTM A193 Grade B8M		AISI 316 Strain Hardened		—	95,000 80,000 65,000 50,000	110,000 100,000 95,000 90,000
	ASTM A193 Grade B8T		AISI 321 Strain Hardened		—	100,000 80,000 65,000 50,000	125,000 115,000 105,000 100,000
	ASTM A320 Grade L7		Bolts, Screws, Studs for Low-Temperature Service		AISI 41 40, 41 42 or 41 45	1/4 thru 2-1/2	—
	ASTM A320 Grade L7A	AISI 4037					
	ASTM A320 Grade L7B	AISI 4137					
	ASTM A320 Grade L7C	AISI 87 40					
	ASTM A320 Grade L43	AISI 4340		1/4 thru 4	—	105,000	125,000

See footnotes on Page N-24.



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


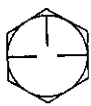
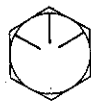






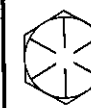
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Identification Grade Mark	Specification	Fastener Description	Material	Nominal Size Range (in.)	Mechanical Properties		
					Proof Load (psi)	Yield Strength Min (psi)	Tensile Strength Min (psi)
	ASTM A320 Grade B8	Bolts, Screws, Studs for Low- Temperature Service	AISI 304	1/4 and larger	-	30,000	75,000
	ASTM A320 Grade BBC		AISI 347				
	ASTM A320 Grade B8T		AISI 321				
	ASTM A320 Grade B8F		AISI 303 or 303Se				
	ASTM A320 Grade B8M		AISI 316				
	ASTM A320 Grade B8		AISI 304	1/4 thru 3/4 Over 3/4 thru 1 Over 1 thru 1-1/4 Over 1-1/4 thru 1-1/2	-	100,000 80,000 65,000 50,000	125,000 115,000 105,000 100,000
	ASTM A320 Grade BBC		AISI 347				
	ASTM A320 Grade B8F		AISI 303 or 303Se				
	ASTM A320 Grade B8M		AISI 316				
	ASTM A320 Grade B8T		AISI 321				

See footnotes on Page N-24.



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)
	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 thru 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
	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
	ASTM A325 Type 2		Low Carbon Martensitic Steel, Quenched and Tempered	1/2 thru 1	85,000	92,000	120,000
	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
	ASTM A354 Grade BB	Bolts, Studs	Alloy Steel, Quenched and Tempered	1/4 thru 2-1/2 2-3/4 thru 4	80,000 75,000	83,000 78,000	105,000 100,000
	ASTM A354 Grade BC				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 ⁴	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 Tempered	1/4 thru 1-1/2	120,000	130,000	150,000
	ASTM A354 Grade BD		Alloy Steel, Quenched and Tempered				

See footnotes on Page N-24.



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

IFI

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 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	Bolts, Screws, Studs	Low or Medium Carbon Steel	All Sizes thru 1-1/2	33,000	36,000	60,000
 No Grade Mark	ISO R898 Class 5.8				55,000	57,000	74,000
 8.8 or  8.8	ISO R898 Class 8.8				85,000	92,000	120,000
 10.9 or  10.9	ISO R898 Class 10.9				120,000	130,000	150,000

NOTES: 1. ASTM Specifications:

- A 193—Alloy-Steel Bolting Materials for High-Temperature Service
- A 307—Low-Carbon Steel Externally and Internally Threaded Standard Fasteners
- A 320—Alloy-Steel Bolting Materials for Low-Temperature Service
- A 325—High-Strength Bolts for Structural Steel Joints, including Suitable Nuts and Plain Hardened Washers
- A 354—Quenched and Tempered Alloy Steel Bolts and Studs with Suitable Nuts
- A 449—Quenched and Tempered Steel Bolts and Studs

A 490—Quenched and Tempered Alloy Bolts for Structural Steel Joints

2. SAE Specification:

J429—Mechanical and Quality Requirements for Externally Threaded Fasteners

3. ISO Recommendations:

No. R898—Mechanical Properties of Fasteners—Part 1 —Bolts, Screws and Studs

4. Grade 7 bolts and screws are roll threaded after heat treatment.

