Common Markings on Nuts and Bolts

When it comes to nuts and bolts, there are many markings that you may come across. Common markers include letters, numbers, dashes, slashes, dots, and many more. Many nuts and bolts follow SAE or Metric standards ensuring strength and reliability.

SAE vs. Metric Markings

SAE Bolt Head Markings

The Society of Automotive Engineers created a system of grades to identify valuable information about the fastener. The grades of a fastener can represent what material it is made out of, its hardness range, and its strength characteristics. SAE grades use the imperial measurement system. The imperial measurement system uses inches.

The SAE J429 standard has specific requirements for bolts, screws, studs, sems, and U-bolts up to 1-1/2" in diameter. Bolts meeting SAE J429 standards have radial lines engraved on the bolt head.

Grade 2, 5, and 8 are the most common grades of fasteners according to the Society of Automotive Engineers standard. The higher the grade is, the stronger the material that makes up the fastener. The grade also represents the tensile strength, yield strength, and proof load of a fastener.

SAE Grade 2

- Does not have any radial line markings
- Lowest SAE grade with the least strength
- Comprised of low or medium carbon steel

SAE Grade 5

- Have three radial lines engraved

- Medium level strength
- Comprised of medium quenched and tempered carbon steel

SAE Grade 8

- Have six radial lines engraved
- Highest SAE grade with the most strength
- Comprised of medium quenched and tempered carbon alloy steel

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Metric Bolt Head Markings

Metric classes are set by the ISO (International Standards Organization). Metric markings combine two numbers separated by a dot. The number markings are engraved on the top or side of the bolt head. Common metric classes are 5.8, 8.8, 10.9, and 12.9. The higher the numbers are, the stronger the material of the fastener is.

The number that appears before the decimal, when multiplied by 100, will provide the approximate minimum tensile strength of the bolt. The number after the decimal, when multiplied by 10, will provide the approximate yield strength percentage in relation to the minimum tensile strength.

304 Stainless Steel Bolt Head Markings

Metric bolts made of 304 stainless steel are marked on the bolt head with A2-70. The A2 represents 304 stainless steel and 70 represents the tensile strength. The tensile strength equals 700 MPA general-purpose stainless steel. The number after the A2 will vary depending on the tensile strength of the bolt. 304 stainless steel has decent corrosion resistance.

316 Stainless Steel Bolt Head Markings

Metric bolts made of 316 stainless steel are marked on the head of the bolt with A4-70. The A4 represents 316 stainless steel and the 70 represents the tensile strength. The tensile strength equals 700 MPA marine grade stainless steel. The number after the A4 will vary depending on the tensile strength of the bolt.

The 316 stainless steel grade has high resistance to corrosion. The 316 stainless steel bolt is commonly used near salt water and a variety of other exterior applications.

Tensile Strength

Before using any fastener, being aware of its tensile strength, proof load, and yield strength is crucial so the fastener doesn't break or lose its elasticity during use.

Tensile strength is the amount of stress or load that the fastener can withstand by a material before it stretches and breaks. The tensile strength is tested by applying mechanical loads to the fastener. This amount of pressure determines its resilience. Understanding tensile strength is incredibly important when choosing hardware so it is clear if it is strong enough for the application.

Proof Load

Proof load is the limit of the elastic range of a bolt. If a bolt is tensioned beyond its specified proof load, it can't be used as it experiences plastic deformation. If it is tensioned within its specified proof load and has kept its original size and shape, it can be reused. Once the proof load is exceeded, it starts to yield and lose ductility.

Yield Strength

Lastly, yield strength is the maximum amount of stress a fastener can withstand before its shape is sufficiently deformed. Any deformation caused by stress greater than the yield strength results in the hardware being nonrecoverable for use.

Bolt Head Markings Chart

US Bolts

Head Marking	Grade and Material	Nominal Size Range (inches)	Mechanical Properties		
			Proof Load (psi)	Min. Yield Strength (psi)	Min. Tensile Strength (psi)
	**307A** Low carbon steel	1/4" thru 4"	N/A	N/A	60,000
No Markings	**GRADE 2** Low or medium carbon steel	1/4" thru 3/4"	55,000	57,000	74,000
		Over 3/4" thru 1-1/2"	33,000	36,000	60,000
 3 Radial Lines	**GRADE 5** Medium carbon steel, quenched and tempered	1/4" thru 1"	85,000	92,000	120,000
		Over 1" thru 1-1/2"	74,000	81,000	105,000
 6 Radial Lines	**GRADE 8** Medium carbon alloy steel, quenched and tempered	1/4" thru 1-1/2"	120,000	130,000	150,000

	**GRADE A325** Carbon or alloy steel with or without boron	1/2" thru 1-1/2"	85,000	92,000	120,000
Stainless Markings Vary	**18-8 & 316 STAINLESS** Steel alloy with chromium and nickel	All sizes thru 1"	N/A	20,000 Min. 65,000 Typical	65,000 Min. 100,000 – 150,000 Typical
	**651 SILICON BRONZE** An alloy of mostly copper and tin with a small amount of silicon	1/4" thru 3/4"	N/A	55,000	70,000
		7/8" thru 1-1/2"	N/A	40,000	55,000
	**ALUMINUM 2024** Aluminum alloy with copper, magnesium and manganese; solution heat treated and age hardened	All sizes	N/A	36,000	55,000

Metric Bolts

Head Marking	Class and Material	Nominal Size Range (mm)	Mechanical Properties		
			Proof Load (MPa)	Min. Yield Strength (MPa)	Min. Tensile Strength (MPa)
	**CLASS 8.8** Medium carbon steel, quenched and tempered	All sizes below 16mm	580	640	800
		16mm - 72mm	600	660	830
	**CLASS 10.9** Alloy steel, quenched and tempered	5mm - 100mm	830	940	1040
	**CLASS 12.9** Alloy steel, quenched and tempered	1.6mm - 100mm	970	1100	1220
Usually Stamped A-2 or A-4	**A-2 & A-4 STAINLESS** Steel alloy with chromium and nickel	All sizes thru 20mm	N/A	210 Min. 450 Typical	500 Min. 700 Typical

Tensile Strength: The maximum load in tension (pulling apart) which a material can withstand before breaking or fracturing.

Yield Strength: The maximum load at which a material exhibits a specific permanent deformation.

Proof Load: An axial tensile load which the product must withstand without evidence of any permanent set.

1MPa = 1N/mm^2 = 145 pounds/inch^2