

The American Society for Testing and Materials is an international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.

ASTM A193 Alloy steel and stainless steel bolting materials for high temperature or high pressure service.

Originally approved in 1936, this specification is heavily utilized in petroleum and chemical construction applications. The ASTM standard covers alloy steel and stainless steel bolting materials for high temperature or high pressure service. This specification includes fasteners intended for use in pressure vessels, valves, flanges, and fittings. Although, this material is often available in national coarse (UNC) thread pitches, if being used in traditional applications, threads are specified 8 threads per inch (TPI) for diameters above one inch.

Below is a basic summary of a few of the common grades. ASTM A193 covers a number of other standard specifications not covered in this description including B5, B6, and B16.

#### A193 Grades

B7	Alloy steel, AISI 4140/4142 quenched and tempered
B8	Class 1 Stainless steel, AISI 304, carbide solution treated.
B8M	Class 1 Stainless steel, AISI 316, carbide solution treated.
B8	Class 2 Stainless steel, AISI 304, carbide solution treated, strain hardened
B8M	Class 2 Stainless steel, AISI 316, carbide solution treated, strain hardened

#### A193 Mechanical Properties

Grade	Size	Tensile ksi, min	Yield, ksi, min	Elong, %, min	RA % min	HBW	HRC
B7	Up to 2-1/2	125	105	16	50	321max	35max
	2-5/8 - 4	115	95	16	50		
	4-1/8 - 7	100	75	18	50		
B8 Class1	All	75	30	30	50	223max	35max
B8M Class1	All	75	30	30	50	223max	96max
B8 Class2	Up to 3/4	125	100	12	35	321max	35max
	7/8 - 1	115	80	15	35		
	1-1/8 - 1-1/4	105	65	20	35		
	1-3/8 - 1-1/2	100	50	28	45		
B8M Class 2	Up to 3/4	110	95	15	45	321max	35max
	7/8 - 1	100	80	20	45		
	1-1/8 - 1-1/4	95	65	25	45		
	1-3/8 - 1-1/2	90	50	30	45		

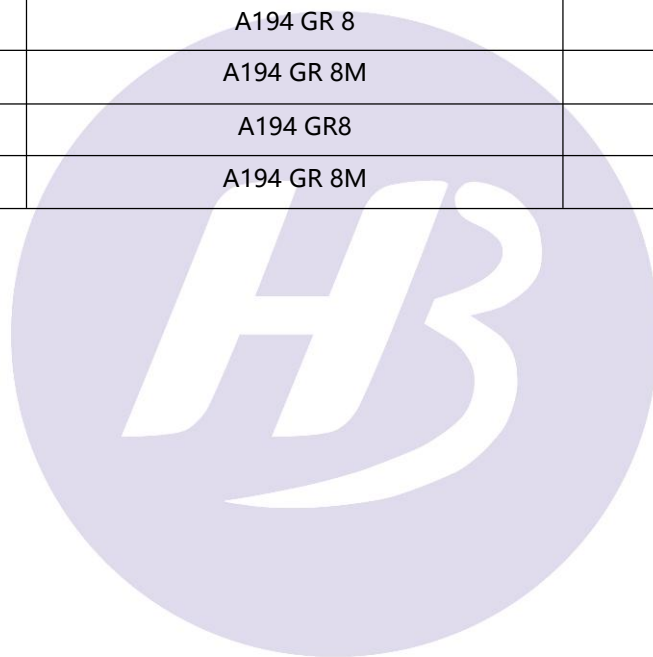
#### A193 Chemical Properties

Element	B7 (AISI 4140)	B8 (AISI 304)	B8M (AISI 316)
Carbon	0.38 - 0.48%	0.08% max	0.08% max
Manganese	0.75 - 1.00%	2.00% max	2.00% max
Phosphorus, max	0.035%	0.045%	0.045%
Sulfur, max	0.040%	0.030%	0.030%

Silicon	0.15 - 0.35%	1.00% max	1.00% max
Chromium	0.80 - 1.10%	18.0 - 20.0%	16.0 - 18.0%
Nickel		8.0 - 11.0%	10.0 - 14.0%
Molybdenum	0.15 - 0.25%		2.00 - 3.00%

A193 Recommended Hardware

Bolt Grade	Nuts	Washers
B7	A194 GR2H	F436
B8 Class 1	A194 GR 8	SS304
B8M Class 1	A194 GR 8M	SS316
B8 Class 2	A194 GR8	SS304
B8M Class 2	A194 GR 8M	SS316



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