QUINCAILLERIE INDUSTRIELLE / INDUSTRIAL FASTENERS
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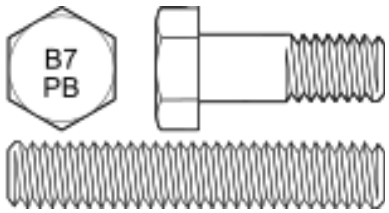
SPECIFICATIONS ASTM A193

There are several grades within the A193 specification. Each grade possesses unique chemical requirements, strength requirements, testing requirements, and applications. This document summarizes the similarities and differences between many of the grades. For more specific information, please refer to the actual ASTM A193 specification which can be purchased directly from ASTM International.



Grade B7

ASTM A193 Grade B7 bolts and threaded studs are manufactured from a chromium-molybdenum steel and are quenched and tempered (heat treated) to develop the desired mechanical properties (strength). Grade B7 is the most common grade of A193 bolts used in construction. B7 threaded studs and short, headed bolts are readily available in the marketplace. Grade B7 bolts are commonly used in pipe flange connections. These bolts are typically bought and sold in a plain, bare metal finish but are often hot-dip galvanized, zinc plated, Xylan coated, PTFE coated, or otherwise coated for corrosion resistance. Note that coated bolts may not be able to withstand the high temperatures that uncoated B7 bolts can be subjected to.

Grade	Size	Tensile ksi, min	Yield, ksi, min	Elong, %, min	RA % min	HBW	HRC
B7	Up to 2-1/2	125	105	16	50	321 max	35 max
	2-5/8 - 4	115	95	16	50		
	4-1/8 - 7	100	75	18	50		

Grade B8

ASTM A193 Grade B8 Class 1 bolts and threaded studs are manufactured from AISI 304 stainless steel. Type 304 is the most common grade of stainless steel used in the fastener industry. Fasteners manufactured using this austenitic stainless steel require carbide solution treatment on bars to be threaded or after the heading operation for bolts with forged heads. Carbide solution treatment, also referred to as solution annealing, is a process in which fasteners or stainless bars are heated and then water-quenched to assure maximum corrosion resistance. A193 Grade B8 Class 2 bolts are strain hardened after carbide solution treatment to achieve increased strength characteristics and reduce the potential for galling. Class 2 bolts are marked “B8SH” with the grade symbol underlined.

Grade	Size	Tensile ksi, min	Yield, ksi, min	Elong, %, min	RA % min	HBW	HRC
B8M Class 1	All	75	30	30	50	223 max	96 max
B8M Class 2	Up to 3/4	110	95	15	45	321 max	35 max
	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		

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Grade B8M

ASTM A193 Grade B8M Class 1 fasteners are similar to Grade B8 but instead are manufactured from AISI 316 stainless steel as opposed to AISI 304 stainless steel. Type 316 stainless offers superior corrosion resistance to type 304 stainless due to the added molybdenum. Grade B8M Class 1 fasteners require carbide solution treatment, while Class 2 fasteners require an additional strain hardening operation which increases the strength and reduces the susceptibility to galling. Class 2 fasteners are marked "B8MSH" with the grade symbol underlined.

Grade	Size	Tensile ksi, min	Yield, ksi, min	Elong, %, min	RA % min	HBW	HRC
B8M Class 1	All	75	30	30	50	223 max	96 max
B8M Class 2	Up to 3/4	110	95	15	45	321 max	35 max
	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		

Grade B7M

ASTM A193 Grade B7M bolts and studs are identical in chemistry to Grade B7 (quenched and tempered medium carbon alloy steel), but have lower strength requirements and require 100% hardness testing of all fasteners manufactured in the lot. Grade B7M bolts resist chloride, sulfide, and hydrogen stress corrosion cracking (SCC) and are frequently used in sour gas service.

Grade	Diameter	Tensile ksi, min	Yield, ksi, min	Elong, %, min	RA % min	HBW	HRC
B7	Up to 4	100	80	18	50	235 max	-
	Over 4 - 7	100	75	18	50		

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Grade B16

ASTM A193 Grade B16 bolts and threaded studs are manufactured from a chromium-molybdenum-vanadium alloy steel. Although A193 Grade B16 bolts and studs have similar strength requirements as Grade B7, the vanadium and higher tempering temperature helps the fasteners retain their molecular structure and strength under higher ambient temperatures than Grade B7. Grade B16 bolts and studs are used in the power and petrochemical industries on boilers, turbines, and other pressurized equipment with elevated temperatures. Unlike the stainless steel grades within the A193 specification, Grade B16 has no corrosion-resistant properties unless they are coated.

Grade	Diameter	Tensile ksi, min	Yield, ksi, min	Elong, %, min	RA % min	HBW	HRC
B16	Up to 2-1/2	125	105	18	50	321 max	35 max
	Over 2-1/2 to 4	110	95	17	45		
	Over 4 to 8	100	85	16	45		

Grade B5

ASTM A193 Grade B5 bolts and threaded studs are manufactured from AISI 501 stainless steel which has been quenched and tempered to increase strength. These bolts and studs are often used in high temperature flanged connections in highly corrosive environments.

Grade	Diameter	Tensile ksi, min	Yield, ksi, min	Elong, %, min	RA % min	HBW	HRC
B5	Up to 4, incl	100	80	16	50	-	-

Grade B6

ASTM A193 Grade B6 bolts and threaded rods are manufactured from AISI 410 stainless steel which has been quenched and tempered to increase strength. Because these bolts are manufactured from stainless steel, they are used in highly corrosive environments with elevated ambient temperatures.

Grade	Diameter	Tensile ksi, min	Yield, ksi, min	Elong, %, min	RA % min	HBW	HRC
B6	Up to 4, incl	110	85	15	50	-	-
B6X		90	70	16			