ASTM A193 / A193M

BOLTING GRADES (STUDBOLTS)

Marking symbol grade of bolting	B7/L7	B16	B8 Class 1	B8M Class 1
Service conditions	-100 °C to 400 °C	0 °C to 520 °C	-250 °C to 575 °C	-250 °C to 600 °C
Material specifications	ASTM-193/A193M AISI 4140	ASTM-A193/A193M Cr-Mo-V	ASTM-A193/A193M AISI Type 304	ASTM-A193/A193M AISI Type 316
Chemical composition (%)				
Carbon	0.37-0.49	0.36-0.47	0.08 Max	0.08 Max
Silicon	0.15-0.35	0.15-0.35	1.00 Max	1.00 Max
Manganese	0.65-1.10	0.45-0.70	2.00 Max	2.00 Max
Nickel	-	-	8.00-10.50	10.00-14.00
Chromium	0.75-1.20	0.80-1.15	18.00-20.00	16.00-18.00
Molybdenum	0.15-0.25	0.50-0.65	-	2.00-3.00
Vanadium	-	0.25-0.35	-	-
Sulphur	0.040 Max	0.040 Max	0.030 Max	0.030 Max
Phosphorus	0.035 Max	0.035 Max	0.045 Max	0.045 Max
Mechanical properties				
Limiting ruling section	2 1/2 and under	2 1/2" and under	-	-
Minimum tensile strength	860 MPa	860 MPa	515 MPa	515 MPa
Yield strength min 0.2% offset	720 MPa (725 MPa for L7)	725 MPa	205 MPa	205 MPa
Minimum elongation in 4D %	16	18	30	30
Minimum reduction of area %	50	50	50	50
Brinell hardness	-	-	223HB or 96HRB	223HB or 96HRB

For guidance only. Always check against the relevant standard.

ASTM A193 / A193M

BOLTING GRADES (STUDBOLTS)

Marking symbol grade of bolting	B5	B6	B8 Class 2				B8M Class 2			
Service conditions		0 °C to 500 °C	-250 °C to 575 °C				-250 °C to 600 °C			
Material specifications	ASTM-193/A193M AISI 501	ASTM-A193/A193M AISI 410	ASTM-A193/A193M AISI Type 304				ASTM-A193/A193M AISI Type 316			
Chemical composition (%)										
Carbon	0.10 Min	0.15 Max	0.08 Max				0.08 Max			
Silicon	1.00 Max	1.00 Max	1.00 Max				1.00 Max			
Manganese	1.00 Max	1.00 Max	2.00 Max				2.00 Max			
Nickel	-	-	8.00-10.50				10.00-14.00			
Chromium	4.00-6.00	11.50-13.50	18.00-20.00				16.00-18.00			
Molybdenum	0.40-0.65	-	-				2.00-3.00			
Vanadium	-	-	-				-			
Sulphur	0.030 Max	0.030 Max	0.030 Max				0.030 Max			
Phosphorus	0.040 Max	0.040 Max	0.045 Max				0.045 Max			
Mechanical properties										
Limiting ruling section			<3/4"	3/4"-1"	>1"-1 1/4"	>1 1/4"-1 1/2"	<3/4"	3/4"-1"	>1"-1 1/4"	>1 1/4"-1 1/2"
Minimum tensile strength	690	760	860	795	725	690	760	690	655	620
Yield strength min 0.2% offset	550	585	690	550	450	345	665	550	450	345
Minimum elongation in 4D %	16	15	12	15	20	28	15	20	25	30
Minimum reduction of area %	50	50	35	35	35	45	45	45	45	45
Brinell hardness	-	-	321	321	321	321	321	321	321	321

For B8 Class 2 and B8M Class 2 the mechanical properties depend on diameter (limiting ruling section, inches). Each value sits under its diameter range.

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ASTM A194 / A194M

NUT GRADES

Marking symbol and grade of nut	2H	4	8	8M
Service conditions	0 °C to 450 °C	-100 °C to 520 °C	-250 °C to 575 °C	-250 °C to 600 °C
Material specifications	ASTM-A 194/A194M Carbon Steel	ASTM-A194/A194M Carbon, Moly	ASTM-A194/A194M AISI Type 304	ASTM-A194/A194M AISI Type 316
Chemical composition (%)				
Carbon	0.40 Min	0.40-0.50	0.08 Max	0.08 Max
Silicon	0.40 Max	0.15-0.35	1.00 Max	1.00 Max
Manganese	1.00 Max	0.70-0.90	2.00 Max	2.00 Max
Nickel	-	-	8.00-10.50	10.00-14.00
Chromium	-	-	18.00-20.00	16.00-18.00
Molybdenum	-	0.20-0.30	-	2.00-3.00
Sulphur	0.050 Max	0.040 Max	0.030 Max	0.030 Max
Phosphorus	0.040 Max	0.035 Max	0.045 Max	0.045 Max
Mechanical properties				
Brinell hardness	<1 1/2": 248-352 >1 1/2': 212-352	248-352	126-300	126-300

Marking symbol and grade of nut	3	6	7	8T
Service conditions		0 °C to 575 °C	-100 °C to 565 °C	-250 °C to 575 °C
Material specifications	ASTM-A194/A194M AISI 501	ASTM-A194/A194M AISI 410	ASTM-A194/A194M AISI Type 4140	ASTM-A194/A194M AISI Type 321
Chemical composition (%)				
Carbon	0.10 Min	0.15 Max	0.37-0.49	0.08 Max
Silicon	1.00 Max	1.00 Max	0.15-0.35	1.00 Max
Manganese	1.00 Max	1.00 Max	0.65-1.10	2.00 Max
Nickel	-	-	-	9.00-12.00
Chromium	4.00-6.00	11.50-13.50	0.75-1.20	17.00-19.00
Molybdenum	0.40-0.65	-	0.15-0.25	2.00-3.00
Sulphur	0.030 Max	0.030 Max	0.040 Max	0.030 Max
Phosphorus	0.040 Max	0.040 Max	0.040 Max	0.045 Max
Ti	-	-	-	5x Carbon Content
Mechanical properties				
Brinell hardness	248-352	228-271	248-352	126-300

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