

# Chemical Requirements

Carbon, Alloy Steel and Stainless Steel Nuts for Bolts for High-Pressure and High Temperature Service, or both.

ASTM Designation A 194 & A194M

Grade Symbol	Material	UNS Number	Carbon %	Manganese %	Phosphorus %	Sulfur %	Silicon %	Chromium %	Nikel %	Molydenum %	Titanium %	Columbium & Tantalum %	Selenium %	Vanadium %	Copper %
1	Carbon		0.15 min.	1.00 max.	0.040 max.	0.050 max.	0.40 max.								
2, 2H & 2HM	Carbon		0.40 min.	1.00 max.	0.040 max.	0.050 max.	0.40 max.								
3	AISI 510		0.10 min.	1.00 max.	0.040 max.	0.030 max.	1.00 max.	4.00-6.00		0.40-0.65					
4 & 4L	Carbon, Molybdenum		0.40-0.50	0.70-0.90	0.035 max.	0.040 max.	0.15-0.35			0.20-0.30					
6	AISI 410	S41000	0.15 max.	1.00 max.	0.040 max.	0.030 max.	1.00 max.	11.50-13.50							
6F	AISI 416 + sulfur	S41600	0.15 max.	1.25 max.	0.060 max.	0.15 min.	1.00 max.	12.00-14.00							
6F	AISI 416 + selenium	S41623	0.15 max.	1.25 max.	0.060 max.	0.060 max.	1.00 max.	12.00-14.00					0.15 min.		
7, 7L & 7M	AISI 4140, 4142, 4145, 4140H, 4142H, 4145H		0.37-0.49	0.65-1.00	0.040 max.	0.040 max.	0.15-0.35	0.75-1.20		0.15-0.25					
8 & 8A	AISI 304	S30400	0.08 max.	2.00 max.	0.045 max.	0.030 max.	1.00 max.	18.00-20.00	8.00-10.50						
8C & 8CA	AISI 347	S34700	0.08 max.	2.00 max.	0.045 max.	0.030 max.	1.00 max.	17.00-19.00	9.00-13.00			10 x carbon content min.			
8F & 8FA	AISI 303	S30300	0.15 max.	2.00 max.	0.20 max.	0.15 min.	1.00 max.	17.00-19.00	8.00-10.00						
8F & 8FA	AISI 303 + selenium	S30323	0.15 max.	2.00 max.	0.20 max.	0.060 max.	1.00 max.	17.00-19.00	8.00-10.00				0.15 min.		
8M & 8MA	AISI 316	S31600	0.08 max.	2.00 max.	0.045 max.	0.030 max.	1.00 max.	16.00-18.00	10.00-14.00	2.00-3.00					
8N & 8NA	AISI 304N		0.08 max.	2.00 max.	0.045 max.	0.030 max.	1.00 max.	18.00-20.00	8.00-10.50						
8P & 8PA	AISI 305 + restricted carbon	S30500	0.08 max.	2.00 max.	0.045 max.	0.030 max.	1.00 max.	17.00-19.00	10.50-13.00						
8R & 8RA	XM19	S20910	0.06 max.	4.00-6.00	0.040 max.	0.030 max.	1.00 max.	20.50-23.50	11.50-13.50	1.50-3.00			0.10-0.30	0.10-0.30	
8S & 8SA	S21800 + restricted phosphorus	S21800	0.10 max.	7.00-9.00	0.040 max.	0.040 max.	3.50-4.50	16.00-18.00	8.00-9.00						
8T & 8TA	AISI 321	S32100	0.08 max.	2.00 max.	0.045 max.	0.030 max.	1.00 max.	17.00-19.00	9.00-12.00		5 x carbon content min.				
8LN & 8LNA	AISI 304N + restricted carbon	S30453	0.030 max.	2.00 max.	0.045 max.	0.030 max.	1.00 max.	18.00-20.00	8.00-10.50						
8MN & 8MNA	AISI 316N	S31651	0.08 max.	2.00 max.	0.045 max.	0.030 max.	1.00 max.	16.00-18.00	10.00-14.00	2.00-3.00					
8MLN & 8MLNA	AISI 316LN + restricted carbon	S31653	0.030 max.	2.00 max.	0.045 max.	0.030 max.	1.00 max.	16.00-18.00	10.00-14.00	2.00-3.00					
8MLCuN, 8MLCuNA	S31254	S31254	0.020 max.	1.00 max.	0.030 max.	0.010 max.	0.80 max.	19.50-20.50	17.50-18.50	6.00-6.50					0.50-1.00
9C, 9CA	N08367	N08367	0.030 max.	2.00 max.	0.040 max.	0.030 max.	1.00 max.	20.00-22.00	23.50-25.50	6.00-7.00					0.75 max.
16	Chromium Molybdenum Vanadium		0.36-0.47	0.45-0.70	0.035 max.	0.040 max.	0.15-0.35	0.80-1.15		0.50-0.65				0.25-0.35	

# Hardness Requirements

Grade Symbol	Brinell Hardness	Rockwell Hardness	
		C Scale	B Scale
1	121 min.		70 min.
2	159 to 352		84 min.
2H	248 to 352	24 to 38	
To 1½ in. or M36 included	248 to 352	24 to 38	
Over 1½ in. or M36	212 to 352	38 max.	95 min.
2HM and 7M	159 to 237	22 max.	
3, 4, 7 and 16	248 to 352	24 to 38	
6 and 6F	228 to 271	20 to 28	
8, 8C, 8M, 8T, 8F, 8P, 8N, 8MN, 8LN, 8MLN, and 8MLCuN	126 to 300		60 to 105
8A, 8CA, 8MA, 8TA, 8FA, 8PA, 8NA, 8MNA, 8LNA, 8MLNA and 8MLCuNA	126 to 192		60 to 90
8R, 8RA, 8S and 8SA	183 to 271	B 88 to C25	
9C and 9CA	126 to 192		60 to 90

Grade Symbol	Minimum Tempering Temperature, °F [°C]
2H	850 [455]
2HM	1150 [620]
3	1050 [565]
4 and 4L	1100 [595]
6 and 6F	1100 [595]
7 and 7L	1100 [595]
7M	1150 [620]
16	1200 [650]