Mechanical Requirements for Carbon Steel Externally Threaded Fasteners



Designation in. Treatment Stress ksi ksi Min Mins Max Max A307 Gr. A 1/4 to 4 ovor medium carbon steel - - 60 - B69 B100 307A A307 Gr. A 1/4 to 4 ovor medium carbon steel - - 60 min - B69 B89 307B SAE Gr. 1 1/4 to 1 11/2 own medium carbon steel, cold 55 57 74 - B80 B100 None Specified SAE Gr. 2 1/4 to 1 medium carbon carbon steel, cold 55 57 74 - B80 B100 None Specified A449 1/4 to 1 medium carbon steel, the productis quenched and tempered 74 81 105 - C25 C34 A325 Type 1 1/38 to 1/2 medium carbon steel, the productis quenched and tempered 85 92 120 - C25 C34 A325 1/2 to 1 medium carbon steel, cold setel, the productis quenched and tempered 85 <			Mechanical Requirements							
A307 Gr. A1/4 to 460-B69B100307AA307 Gr. B1/4 to 4low or medium60 min-B69B95307BA307 Gr. B1/4 to 4low or medium60 min-B70B100NoneSAE Gr. 11/4 to 1-1/2wor medium60 min-B70B100NoneSAE Gr. 21/4 to 1intercoid555774-B80B100NoneSAE Gr. 31/4 to 1-medium carbon748110530N50C19C30A4491/4 to 16592120-C25C34Type 11-1/8 to 1-1/2-medium carbon6592120-C25C34Type 11-1/8 to 1-1/2ow carbon boron6592120-C25C34Type 21/4 to 1-ow carbon boron6592120-C25C34Type 31/2 to 1-ow carbon boron6592120-C25C34A4491/4 to 2-1/2C25C34Type 31/2 to 1C25C34A44901/4 to 2-1/2C25C34		of Product	and	Load Stress	Strength	Strength ksi	· Product, Hardness, Rockwell Surface Core		Identification	
A307 Gr. B1/4 to 4low or medium carbon steeliii60 min 100 maxiB69B95307BSAE Gr. 11/4 to 1.1/2333660-B70B100None SpecifiedSAE Gr. 21/4 to 3/4carbon steel, cold worked555774-B80B100None SpecifiedSAE Gr. 31/4 to 1i-1/8 to 1.1/2 1-1/8 to 1.1/2medium carbon specified555774-B80B100None SpecifiedA449 1-1/8 to 1.1/2medium carbon specified859212030N54C25C34 C30I/4A449 1-1/8 to 1.1/2medium carbon specified8592120-C24C35 C31A325Type 11-1/8 to 1.1/2for carbon boron specified8592120-C24C35 C33A325Type 11-1/8 to 1.1/2for carbon boron specified8592120-C24C35 C34A325Type 11-1/8 to 1.1/2for carbon boron specified8592120-C24C35 C34A325Type 21/4 to 1medium carbon specified8592120-C24C35 C33A325Type 31/2 to 1.1/2amospheric quenched and tempered8592120-C19C31A3251/4 to 2.1/2 quenched and tempered120130150-C33<	A 207 C+ A	1/1 to 1								2074
A307 Gr. B 1/4 to 4 low or medium carbon steel - 100 max - B99 B95 3078 SAE Gr. 1 1/4 to 1-1/2 33 36 60 - B70 B100 Specified SAE Gr. 2 1/4 to 1 1/1/2 carbon steel, cold worked 55 57 74 - B80 B100 Specified SAE Gr. 2 1/4 to 1 1/1/2 carbon steel, cold worked 55 57 74 - B80 B100 Specified SAE Gr. 3 1/1/4 to 1 1/1/2 medium carbon steel; the product is quenched and tempered 55 58 90 - B91 B100 A325 1/2 to 1 1/3 to 1/1/2 medium carbon boron 85 92 120 - C24 C35 A325 SAE Gr. 5.2 1/4 to 1 100 carbon boron 85 92 120 - C24 C35 A325 Type 3 1/2 to 1 guenched and tempered 74 81 105 -							-			
SAE Gr. 1 1/4 to 1-1/2 33 36 60 - B70 B100 None Specified SAE Gr. 2 1/4 to 3/4 worked 55 57 74 - B80 B100 None Specified SAE Gr. 5 1/4 to 1 1 1 1/4 to 1 55 57 74 - B80 B100 Specified SAE Gr. 5 1/4 to 1 1 1/4 to 1 1 1/4 to 1 Specified None Specified Specified None	A307 Gr. B	1/4 to 4		-	-		-	B69	B95	307B
SAE Gr. 2 1/4 to 3/4 carbon steel, cold worked 55 57 74 - B80 B100 None Specified SAE Gr. 5 1.1/8 to 1.1/2 1/36 to 1.1/2 1/36 to 1.1/2 1/36 to 1.1/2 1.1/8 to 1.1/2 medium carbon steel; the product is quenched and tempered 85 92 120 $-$ C25 C34 $-$ C35 C34	SAE Gr. 1	1/4 to 1-1/2	carbon steer	33	36	60	-	B70	B100	
SAE Gr. 5 1-1/8 to 1-1/2 1-3/4 to 3 medium carbon steel; the product is quenched and tempered 74 81 81 105 105 20 30N50 C19 C25 C30 C34 C25 C30 C34 C35 C30 C35 C30 C35 <td>SAE Gr. 2</td> <td>1/4 to 3/4</td> <td>carbon steel, cold</td> <td>55</td> <td>57</td> <td>74</td> <td>-</td> <td>B80</td> <td>B100</td> <td></td>	SAE Gr. 2	1/4 to 3/4	carbon steel, cold	55	57	74	-	B80	B100	
A449 1/4 to 1 medium carbon 85 92 120 - C25 C34 C30 Type 1 1-3/4 to 3 steel; the product is 74 81 105 - C19 C30 A325 A325 1/2 to 1 11/8 to 1-1/2 74 81 105 - C19 C31 A325 A325 1/2 to 1 11/8 to 1-1/2 74 81 105 - C19 C31 A325 SAE Gr. 5.2 1/4 to 1 0w carbon boron steel; the product is quenched and tempered 85 92 120 - C25 C34	SAE Gr. 5				-					
Ad49 Type 11-1/8 to 1-1/2 1-3/4 to 3Steel; the product is tempered74 5581 56105 58- 0C19 B100 C30C30 B100 A325A325 Type 11-1/8 to 1-1/2 1-1/8 to 1-1/2we arbon boron steel; the product is quenched and tempered8592120-C26C36 C36A325A449 Type 11/4 to 1low carbon boron steel; the product is quenched and tempered8592120-C25C34Image: C30 C31A325 Type 31/2 to 1atmospheric corrosion resistant aloy steel; the product is quenched and tempered8592120-C24C35 C34A325A325 Type 31/4 to 1-1/2 1-1/8 to 1-1/2medium carbon aloy steel; the product is quenched and tempered12013015030N58.6C33C39Image: C33 A325A326 Type 31/4 to 1-1/2 1-1/2medium carbon aloy steel; the product is quenched and tempered120130150-C33C39Image: C33 A490Image: C33 A490A326 Type 11/4 to 2-1/2 2-3/4 to 4medium carbon aloy steel; the product is quenched and tempered120130150-C33C39Image: C33 A490A327 Type 11/4 to 2-1/2 1-1/2medium carbon quenched and tempered120130150-C33C38A490SAE Gr. 8.21/4 to 1ow carbon boron steel; the produc			medium carbon				30N50			L I
A325 Type 11-1/8 1-1/8 to 1-1/2tempered55 85 85 92 7458 92 120 120 105 105910 - 	A449						-			~~
A3251/2 to 18592120-C24C35A325Type 11-1/8 to 1-1/2T481105C19C31A325SAE Gr. 5.21/4 to 1steel; the product is quenched and tempered859212030N56C26C361A449 Type 21/4 to 1atmospheric corrosion resistant steel; the product is quenched and tempered8592120-C25C341A325 Type 31/2 to 1atmospheric corrosion resistant steel; the product is quenched and tempered7481105-C24C35A325A3251/4 to 1-1/2quenched and tempered7481105-C24C35A325A3251/4 to 1-1/2medium carbon alloy steel; the quenched and tempered12013015030N58.6C33C39\$\$A354 Gr. BD Type 11/4 to 2-1/2 2-3/4 to 4medium carbon alloy steel; the product is quenched and tempered120130150-C33C38A490SAE Gr. 8.21/4 to 1low carbon boron steel; the product is quenched and tempered12013015030N58.6C33C39\$\$SAE Gr. 8.21/4 to 1low carbon boron steel; the product is quenched and tempered12013015030N58.6C33C39\$\$SAE Gr. 8.21/4 to 1low carbon boron steel; the product is <b< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td>-</td><td>-</td><td></td><td></td></b<>							-	-		
SAE Gr. 5.21/4 to 1low carbon boron steel; the product is quenched and tempered859212030N56C26C36JA449 Type 21/4 to 1atmospheric corrosion resistant steel; the product is quenched and tempered8592120-C25C34JA325 Type 31/2 to 1atmospheric corrosion resistant steel; the product is quenched and tempered8592120-C24C35JA325 Type 31/4 to 1-1/2atmospheric corrosion resistant tempered7481105-C19C31JSAE Gr. 81/4 to 1-1/2medium carbon alloy steel; the product is quenched and tempered12013015030N58.6C33C39BDA354 Gr. 8D1/4 to 2-1/2 2-3/4 to 4medium carbon alloy steel; the product is quenched and tempered120130150-C33C39BDA490 Type 11/2 to 1-1/2low carbon boron steel; the product is quenched and tempered12013015030N58.6C33C39A490SAE Gr. 8.21/4 to 1low carbon boron steel; the product is quenched and tempered12013015030N58.6C33C33C39A490Type 31/2 to 1-1/2low carbon boron steel; the product is quenched and tempered12013015030N58.6C33C33C39A490 <tr <td="">A4901/2 to 1-1/2a</tr>					-	-	-	-		A325
SAE Gr. 5.2 1/4 to 1 steel: the product is quenched and tempered 85 92 120 30N56 C26 C36 A449 Type 2 1/4 to 1 quenched and tempered 85 92 120 - C25 C34 A325 Type 3 1/2 to 1 corrosion resistant steel; the product is quenched and tempered 74 81 105 - C24 C35 A325 Type 3 1/4 to 1-1/2 medium carbon alloy steel; the product is quenched and tempered 74 81 105 - C19 C31 SAE Gr. 8 1/4 to 1-1/2 medium carbon alloy steel; the product is quenched and tempered 120 130 150 30N58.6 C33 C39 BD A354 Gr. 8D 1/4 to 2-1/2 medium carbon alloy steel; the product is quenched and tempered 120 130 150 - C33 C39 BD A490 1/2 to 1-1/2 low carbon boron steel; the product is quenched and tempered 120 130 150 30N58.6 C33 C39 J/4 so SAE Gr. 8.2 1/4 to 1 low carbon boron steel; the product is quenched and tempered 130 150 30N58.6			low carbon boron				-			_
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A325 Type 3 $1/2$ to 1corrosion resistant steel; the product is quenched and 	A449 Type 2	1/4 to 1		85	92	120	-	C25	C34	
Type 31-1/8 to 1-1/2quenched and tempered7481105-C19C31SAE Gr. 81/4 to 1-1/2medium carbon alloy steel; the product is 	A325	1/2 to 1	corrosion resistant	85	92	120	-	C24	C35	A325
A354 Gr. BD1/4 to 2-1/2 2-3/4 to 4alloy steel; the product is quenched and tempered120130150 140-C33C39 C31BDA490 Type 11/2 to 1-1/21/2 to 1-1/2120130150 min 170 max-C33C38A490SAE Gr. 8.21/4 to 1low carbon boron steel; the product is quenched and tempered12013015030N58.6C33C39JSAE Gr. 8.21/4 to 1low carbon boron steel; the product is quenched and tempered12013015030N58.6C33C39JA490 Type 31/2 to 1-1/2low carbon boron steel; the product is quenched and tempered120130150anno steelC33C39JA490 Type 31/2 to 1-1/2low carbon boron steel; the product is quenched and tempered120130150anno steelC33C39JA490 Type 31/2 to 1-1/2low carbon boron steel; the product is quenched and tempered120130150 min 170 max-C33C38A490	Туре 3	1-1/8 to 1-1/2	quenched and	74	81	105	-	C19	C31	
A354 Gr. BD1/4 to 2-1/2 2-3/4 to 4quenched and tempered120130150-C33C39BDA490 Type 11/2 to 1-1/21/2 to 1-1/2120130150 min 170 max-C33C38A490SAE Gr. 8.21/4 to 1low carbon boron steel; the product is quenched and tempered12013015030N58.6C33C39JVSAE Gr. 8.21/4 to 1low carbon boron steel; the product is quenched and tempered12013015030N58.6C33C39JVA490 Type 31/2 to 1-1/2atmospheric corrosion resistant steel; the product is quenched and tempered120130150 min 170 max-C33C38A490	SAE Gr. 8	1/4 to 1-1/2	alloy steel; the	120	130	150	30N58.6	C33	C39	>¦<
2-3/4 to 4105115140-C31C38A4901/2 to 1-1/2120130150 min-C33C38A490Type 11/2 to 1-1/210w carbon boron steel; the product is quenched and tempered12013015030N58.6C33C39M/2A4901/4 to 1Image: Carbon boron steel; the product is quenched and tempered12013015030N58.6C33C39M/2A4901/2 to 1-1/2atmospheric corrosion resistant steel; the product is quenched and tempered120130150 min 170 max-C33C38A490		1/4 to 2-1/2	•	120	130	150	-	C33	C39	PD
Type 11/2 to 1-1/2120130170 maxC33C38A490SAE Gr. 8.21/4 to 1low carbon boron steel; the product is quenched and tempered12013015030N58.6C33C39IIIIA490 Type 31/2 to 1-1/2atmospheric corrosion resistant steel; the product is quenched and tempered120130150min 170 maxC33C39IIIIIA490 Type 31/2 to 1-1/2atmospheric corrosion resistant steel; the product is quenched and tempered120130150 min 170 maxC33C38A490		2-3/4 to 4		105	115		-	C31	C38	во
SAE Gr. 8.21/4 to 1Iow carbon boron steel; the product is quenched and tempered12013015030N58.6C33C39VVA490 Type 31/2 to 1-1/2atmospheric corrosion resistant steel; the product is quenched and tempered120130150 min 170 maxC33C38A490		1/2 to 1-1/2		120	130		-	C33	C38	A490
corrosion resistant A490 1/2 to 1-1/2 steel; the product is 120 130 150 min - C33 C38 <u>A490</u> Type 3 quenched and tempered	SAE Gr. 8.2	1/4 to 1	steel; the product is quenched and	120	130			C33	C39	シド
See Notes 1, 4 2 2 2 3, 5	А490 Туре 3	1/2 to 1-1/2	corrosion resistant steel; the product is quenched and	120	130		-	C33	C38	<u>A490</u>
	See Notes 1, 4			2	2	2				3, 5

NOTES:

1. For titles and sources of availability for referenced ASTM and SAE standards, refer to page N-38. For ASTM A307, see page B-90. For ASTM A449, see page B-97. For ASTM A325, see page E-28. For ASTM A354, see page B-139. For ASTM A490, see page E-37. For SAE J429, see page B-79.

2. To compute the proof load, yield strength or tensile strength, in pounds, for a bolt, screw or stud, multiply the stress value, ksi, as given in Table 2 to the strength grade by 1000 and multiply this answer by the tensile stress area of the product's screw thread as given in Tables 1, 2 and 3 of ASME B1.1, pages A-36 thur A-38.

3. In general, identification markings shall be located on the top of the product head and preferably shall be raised.

4. SAE Grade 2 products are available in lengths 6 in. and shorter only.

5. Six radial lines as for SAE Grade 8 are optional in addition to the mandatory BD mark for ASTM A354.