



Torque-Tension Relationship for A307A, Grade 5, 8 & 9 Bolts

| Nominal Dia. (in.) | threads per inch | Tensile Stress Area (sq. in.) | 307A ASTM A307 Grade A | | | SAE J429 Grade 5 | | | SAE J429 Grade 8 | | | FNL Grade 9 | | | | | | |
|-------------------------------------|------------------|----------------------------------|---------------------------|-----------|-----------|-------------------|-------------------|-----------|-------------------|------------|-------------------|-------------------|------------|------------|-------------------|------------|------------|------------|
| | | | Tightening Torque | | | Tightening Torque | | | Tightening Torque | | | Tightening Torque | | | | | | |
| | | | Clamp Load (Lbs.) | K = 0.15 | K = 0.17 | K = 0.20 | Clamp Load (Lbs.) | K = 0.15 | K = 0.17 | K = 0.20 | Clamp Load (Lbs.) | K = 0.15 | K = 0.17 | K = 0.20 | Clamp Load (Lbs.) | K = 0.15 | K = 0.17 | K = 0.20 |
| Unified Coarse Thread Series | | | | | | | | | | | | | | | | | | |
| 1/4 | 20 | 0.0318 | 859 | 32 in-lbs | 37 in-lbs | 43 in-lbs | 2029 | 76 in-lbs | 86 in-lbs | 101 in-lbs | 2864 | 107 in-lbs | 122 in-lbs | 143 in-lbs | 3357 | 126 in-lbs | 143 in-lbs | 168 in-lbs |
| 5/16 | 18 | 0.0524 | 1416 | 66 | 75 | 88 | 3342 | 157 | 178 | 209 | 4719 | 221 | 251 | 295 | 5531 | 259 | 294 | 346 |
| 3/8 | 16 | 0.0775 | 2092 | 10 ft-lbs | 11 ft-lbs | 13 ft-lbs | 4940 | 23 ft-lbs | 26 ft-lbs | 31 ft-lbs | 6974 | 33 ft-lbs | 37 ft-lbs | 44 ft-lbs | 8174 | 38 ft-lbs | 43 ft-lbs | 51 ft-lbs |
| 7/16 | 14 | 0.1063 | 2870 | 16 | 18 | 21 | 6777 | 37 | 42 | 49 | 9568 | 52 | 59 | 70 | 11214 | 61 | 70 | 82 |
| 1/2 | 13 | 0.1419 | 3831 | 24 | 27 | 32 | 9046 | 57 | 64 | 75 | 12771 | 80 | 90 | 106 | 14969 | 94 | 106 | 125 |
| 9/16 | 12 | 0.1819 | 4912 | 35 | 39 | 46 | 11599 | 82 | 92 | 109 | 16375 | 115 | 130 | 154 | 19193 | 135 | 153 | 180 |
| 5/8 | 11 | 0.2260 | 6102 | 48 | 54 | 64 | 14408 | 113 | 128 | 150 | 20340 | 159 | 180 | 212 | 23840 | 186 | 211 | 248 |
| 3/4 | 10 | 0.3345 | 9030 | 85 | 96 | 113 | 21322 | 200 | 227 | 267 | 30101 | 282 | 320 | 376 | 35281 | 331 | 375 | 441 |
| 7/8 | 9 | 0.4617 | 12467 | 136 | 155 | 182 | 29436 | 322 | 365 | 429 | 41556 | 455 | 515 | 606 | 48707 | 533 | 604 | 710 |
| 1 | 8 | 0.6057 | 16355 | 204 | 232 | 273 | 38616 | 483 | 547 | 644 | 54517 | 681 | 772 | 909 | 63899 | 799 | 905 | 1065 |
| 1 1/4 | 7 | 0.9691 | 26166 | 409 | 463 | 545 | 53786 | 840 | 952 | 1121 | 87220 | 1363 | 1545 | 1817 | 102229 | 1597 | 1810 | 2130 |
| 1 1/2 | 6 | 1.4053 | 37942 | 711 | 806 | 949 | 77991 | 1462 | 1657 | 1950 | 126473 | 2371 | 2688 | 3162 | 148237 | 2779 | 3150 | 3706 |
| Fine Thread Series | | | | | | | | | | | | | | | | | | |
| 1/4 | 28 | 0.0364 | 982 | 37 in-lbs | 42 in-lbs | 49 in-lbs | 2319 | 87 in-lbs | 99 in-lbs | 116 in-lbs | 3274 | 123 in-lbs | 139 in-lbs | 164 in-lbs | 3837 | 144 in-lbs | 163 in-lbs | 192 in-lbs |
| 5/16 | 24 | 0.0581 | 1568 | 73 | 83 | 98 | 3702 | 174 | 197 | 231 | 5226 | 245 | 278 | 327 | 6125 | 287 | 325 | 383 |
| 3/8 | 24 | 0.0878 | 2371 | 11 ft-lbs | 13 ft-lbs | 15 ft-lbs | 5599 | 26 ft-lbs | 30 ft-lbs | 35 ft-lbs | 7905 | 37 ft-lbs | 42 ft-lbs | 49 ft-lbs | 9265 | 43 ft-lbs | 49 ft-lbs | 58 ft-lbs |
| 7/16 | 20 | 0.1187 | 3205 | 18 | 20 | 23 | 7568 | 41 | 47 | 55 | 10684 | 58 | 66 | 78 | 12523 | 68 | 78 | 91 |
| 1/2 | 20 | 0.1600 | 4319 | 27 | 31 | 36 | 10197 | 64 | 72 | 85 | 14396 | 90 | 102 | 120 | 16873 | 105 | 120 | 141 |
| 9/16 | 18 | 0.2030 | 5480 | 39 | 44 | 51 | 12940 | 91 | 103 | 121 | 18268 | 128 | 146 | 171 | 21412 | 151 | 171 | 201 |
| 5/8 | 18 | 0.2560 | 6911 | 54 | 61 | 72 | 16317 | 127 | 144 | 170 | 23036 | 180 | 204 | 240 | 27000 | 211 | 239 | 281 |
| 3/4 | 16 | 0.3730 | 10070 | 94 | 107 | 126 | 23776 | 223 | 253 | 297 | 33566 | 315 | 357 | 420 | 39343 | 369 | 418 | 492 |
| 7/8 | 14 | 0.5095 | 13756 | 150 | 171 | 201 | 32479 | 355 | 403 | 474 | 45853 | 502 | 568 | 669 | 53743 | 588 | 666 | 784 |
| 1 | 14 | 0.6799 | 18357 | 229 | 260 | 306 | 43343 | 542 | 614 | 722 | 61190 | 765 | 867 | 1020 | 71720 | 896 | 1016 | 1195 |
| 1 1/4 | 12 | 1.0729 | 28970 | 453 | 513 | 604 | 59548 | 930 | 1055 | 1241 | 96565 | 1509 | 1710 | 2012 | 113182 | 1768 | 2004 | 2358 |
| 1 1/2 | 12 | 1.5810 | 42688 | 800 | 907 | 1067 | 87747 | 1645 | 1865 | 2194 | 142292 | 2668 | 3024 | 3557 | 166778 | 3127 | 3544 | 4169 |

The torque values can only be achieved if nut (or tapped hole) has a proof load greater than or equal to the bolt's minimum ultimate tensile strength.

Clamp load calculated as 75% of the proof load when specified by the standard. ASTM A307 utilized 75% of 36,000 PSI.

Torque values for 1/4 and 5/16-in series are in inch-pounds. All other torque values are in foot-pounds.

Torque values calculated from formula $T=KDF$, where

K = 0.15 for "lubricated" conditions

K = 0.17 for zinc plated and dry conditions; we have also found various forms of customer applied thread lockers to have a similar K value.

K = 0.20 for plain and dry conditions

D = Nominal Diameter

F = Clamp Load

Note: When using Zinc Plated (lubricated with wax) Top Lock Nuts, the K value can vary between 0.12-0.16

Caution: All material included in this chart is advisory only, and its use by anyone is voluntary. In developing this information, Fastenal has made a determined effort to present its contents accurately.

Extreme caution should be used when using a formula for torque/tension relationships. Torque is only an indirect indication of tension. Under/over tightening of fasteners can result in costly equipment failure or personal injury.