

Mechanical Property Requirements ^A

STAINLESS STEEL BOLTS, HEX CAP SCREWS, AND STUDS



Abstract of ASTM F593 2002

| Stainless Alloy Group | Condition ^B | Alloy Mechanical Property Marking | Nominal Diameter, in. | Full-Size Tests | | Rockwell Hardness | Machined Specimen Tests | | |
|--|------------------------|-----------------------------------|-----------------------|-----------------------------------|-------------------------------------|-------------------|-----------------------------------|-------------------------------------|---------------------|
| | | | | Tensile Strength ksi ^D | Yield Strength, ksi ^{C, D} | | Tensile Strength ksi ^D | Yield Strength, ksi ^{C, D} | Elongation in 4D, % |
| Austenitic Alloys | | | | | | | | | |
| 1 (304,304, 304L,305, 384,XM1, 18-9LW, 302HQ, 303Se) | AF | F593A | 1/4 to 1-1/2, incl. | 65 to 85 | 20 | B85 max | 60 | 20 | 40 |
| | A | F593B | 1/4 to 1-1/2, incl. | 75 to 100 | 30 | B65 to 95 | 70 | 30 | 30 |
| | CW1 | F593C | 1/4 to 5/8, incl. | 100 to 150 | 65 | B95 to C32 | 95 | 60 | 20 |
| | CW2 | F593D | 3/4 to 1-1/2, incl. | 85 to 140 | 45 | B80 to C32 | 80 | 40 | 25 |
| | SH1 | <u>F593A</u> | 1/4 to 5/8, incl. | 120 to 160 | 95 | C24 to C36 | 115 | 90 | 12 |
| | SH2 | <u>F593B</u> | 3/4 to 1, incl. | 110 to 150 | 75 | C20 to C32 | 105 | 70 | 15 |
| | SH3 | <u>F593C</u> | 1-1/8 to 1-1/4, incl. | 100 to 140 | 60 | B95 to C30 | 95 | 55 | 20 |
| | SH4 | <u>F593D</u> | 1-3/8 to 1-1/2, incl. | 95 to 130 | 45 | B90 to C28 | 90 | 40 | 28 |
| 2 (316, 316L) | AF | F593E | 1/4 to 1-1/2, incl. | 65 to 85 | 20 | B85 max | 60 | 20 | 40 |
| | A | F593F | 1/4 to 1-1/2, incl. | 75 to 100 | 30 | B65 to 95 | 70 | 30 | 30 |
| | CW1 | F593G | 1/4 to 5/8, incl. | 100 to 150 | 65 | B95 to C32 | 95 | 60 | 20 |
| | CW2 | F593H | 3/4 to 1-1/2, incl. | 85 to 140 | 45 | B80 to C32 | 80 | 40 | 25 |
| | SH1 | <u>F593E</u> | 1/4 to 5/8, incl. | 120 to 160 | 95 | C24 to C36 | 115 | 90 | 12 |
| | SH2 | <u>F593F</u> | 3/4 to 1, incl. | 110 to 150 | 75 | C20 to C32 | 105 | 70 | 15 |
| | SH3 | <u>F593G</u> | 1-1/8 to 1-1/4, incl. | 100 to 140 | 60 | B95 to C30 | 95 | 55 | 20 |
| | SH4 | <u>F593H</u> | 1-3/8 to 1-1/2, incl. | 95 to 130 | 45 | B90 to C28 | 90 | 40 | 28 |
| 3 (321,347) | AF | F593J | 1/4 to 1-1/2, incl. | 65 to 85 | 20 | B85 max | 60 | 20 | 40 |
| | A | F593K | 1/4 to 1-1/2, incl. | 75 to 100 | 30 | B65 to 95 | 70 | 30 | 30 |
| | CW1 | F593L | 1/4 to 5/8, incl. | 100 to 150 | 65 | B95 to C32 | 95 | 60 | 20 |
| | CW2 | F593M | 3/4 to 1-1/2, incl. | 85 to 140 | 45 | B80 to C32 | 80 | 40 | 25 |
| | SH1 | <u>F593J</u> | 1/4 to 5/8, incl. | 120 to 160 | 95 | C24 to C36 | 115 | 90 | 12 |
| | SH2 | <u>F593K</u> | 3/4 to 1, incl. | 110 to 150 | 75 | C20 to C32 | 105 | 70 | 15 |
| | SH3 | <u>F593L</u> | 1-1/8 to 1-1/4, incl. | 100 to 140 | 60 | B95 to C30 | 95 | 55 | 20 |
| | SH4 | <u>F593M</u> | 1-3/8 to 1-1/2, incl. | 95 to 130 | 45 | B90 to C28 | 90 | 40 | 28 |
| Ferritic Alloys | | | | | | | | | |
| 4 (430,430F) | AF | F593X | 1/4 to 1-1/2, incl. | 55 to 75 | 30 | B85 max | 50 | 25 | ... |
| | A | F593N | 1/4 to 1-1/2, incl. | 55 to 75 | 30 | B85 max | 50 | 25 | ... |
| | CW1 | F593V | 1/4 to 5/8, incl. | 60 to 105 | 40 | B75 to 98 | 55 | 35 | ... |
| | CW2 | F593W | 3/4 to 1-1/2, incl. | 55 to 100 | 30 | B65 to 95 | 50 | 25 | ... |
| Martensitic Alloys | | | | | | | | | |
| 5 (410,416, 416Se) | H | F593P | 1/4 to 1-1/2, incl. | 110 to 140 | 90 | C20 to 30 | 110 | 90 | 18 |
| | HT | F593R | 1/4 to 1-1/2, incl. | 160 to 190 | 120 | C34 to 45 | 160 | 120 | 12 |
| 6 (431) | H | F593S | 1/4 to 1-1/2, incl. | 125 to 150 | 100 | C25 to 32 | 125 | 100 | 15 |
| | HT | F593T | 1/4 to 1-1/2, incl. | 180 to 220 | 140 | C40 to 48 | 180 | 140 | 10 |
| Precipitation Hardening Alloys | | | | | | | | | |
| 7 (603) | AH | F593U | 1/4 to 1-1/2, incl. | 135 to 170 | 105 | C28 to 38 | 135 | 105 | 16 |

^A Minimum values, except where shown as maximum or as a range.

^B Legend of conditions:

- A - Machined from annealed or solution annealed stock thus retaining the properties of the original material, or hot-formed solution annealed.
- AF - Headed and rolled from annealed stock and then reannealed.
- AH - Solution annealed and age-hardened after forming.
- CW - Headed and rolled from annealed stock thus acquiring a degree of cold work; sizes 0.75 in. and larger may be hot worked and solution annealed.
- H - Hardened and tempered at 1050°F minimum.
- HT - Hardened and tempered at 525°F minimum.
- SH - Machined from strain-hardened stock or cold worked to develop the specified properties.

^C Yield strength is the stress at which an offset of 0.2% gage length occurs.

^D The yield and tensile strength values for full-size products shall be computed by dividing the yield and maximum tensile load values by the stress area for the product size and thread series determined in accordance with Test Methods ASTM F606, page B-204 (see Table 4.)