

Engineering Center

1524 E. Fourteen Mile Road, Madison Heights, MI, USA 48071 * 248-307-0567

Visit us at www.fastenerengineering.com



Product Development
Support
Concept Through
Production

Joint Design Tools &
Experience to Provide Cost
Effective Design Support and
Data Analysis

Current Lab Capabilities Include:

- **Benchtop torque/tension systems:**
 - Up to 1000 ft lbs torque
 - Up to 120,000 lbs load
- Ability to dynamically monitor torque, angle, time, speed, load, and friction coefficients
- Wide range of **DC electric tools** for accurate and tightly controlled fastener installation
- **Portable equipment** available for in-plant product trials, tightening strategy development and assembly verification
- **Ultrasonic** clamp load measurement for true in-place load at time of installation and anytime during the life of the assembly
- **Predictive joint design** analysis using SR1 Bolted Joint Calculation Software
- **Scanning Electron Microscope** (100,000X) with EDS capability
- **MTS 810 Material Fatigue Test System**
 - 250 kN Capacity





MNP
CORPORATION
586-254-1320

**Engineering
Center**
248-307-0567

**GENERAL
FASTENERS
COMPANY**
734-452-2400

www.fastenerengineering.com

Useful Fastener Data

| Thread Size | Tensile Area |
|-------------|-----------------------|
| | in ² |
| 1/4-20 | 0.0318 |
| 1/4-28 | 0.0364 |
| 5/16-18 | 0.0524 |
| 5/16-24 | 0.0580 |
| 3/8-16 | 0.0775 |
| 3/8-24 | 0.0878 |
| 7/16-14 | 0.1063 |
| 7/16-20 | 0.1187 |
| 1/2-13 | 0.1419 |
| 1/2-20 | 0.1599 |
| 9/16-12 | 0.1820 |
| 9/16-18 | 0.2030 |
| 5/8-11 | 0.2260 |
| 5/8-18 | 0.2560 |
| 3/4-10 | 0.3340 |
| 3/4-16 | 0.3730 |
| 7/8-9 | 0.4620 |
| 7/8-16 | 0.5090 |
| 1-8 | 0.6060 |
| 1-12 | 0.6630 |
| | mm² |
| M6-1.0 | 20.125 |
| M8-1.25 | 36.811 |
| M8-1.0 | 39.169 |
| M10-1.5 | 57.994 |
| M10-1.25 | 61.202 |
| M12-1.75 | 84.272 |
| M12-1.5 | 88.131 |
| M12-1.25 | 92.076 |
| M14-2.0 | 115.447 |
| M14-1.5 | 124.552 |
| M16-2.0 | 156.677 |
| M16-1.5 | 167.255 |
| M18-1.5 | 216.242 |
| M20-2.5 | 244.808 |
| M20-1.5 | 271.513 |
| M22-2.5 | 303.415 |
| M22-1.5 | 333.066 |
| M24-3.0 | 352.524 |
| M24-2.0 | 384.431 |

| CONVERSION DATA | | | |
|-----------------|--------------------|-----------------|----------------|
| | To convert from... | to... | Multiply by... |
| Torque | Newton-meter | Foot-pound | 0.73756 |
| | Newton-meter | Inch-pound | 8.85 |
| Force | Newton | Pound | 0.22482 |
| Stress | Mega-Pascal | Pounds/sq. inch | 145.038 |

| COMMON AUTOMOTIVE STRENGTH GRADES (English External Thread) | | | | |
|--|--|--------------------------------------|--------------------------------------|--|
| Strength Classification | Material & Treatment | Proof Stress (ksi) | Tensile Strength (ksi) | Core Hardness (HRC) |
| SAE Grade 5 (covers 1/4" - 1" dia) | medium carbon steel, quenched & tempered | 85 | 120 | 25 - 34 |
| SAE Grade 5.2 (covers 1/4" - 1" dia) | low carbon boron steel, quenched & tempered | 85 | 120 | 26 - 36 |
| SAE Grade 8 (covers 1/4" - 1 1/2" dia) | medium carbon alloy steel, quenched & tempered | 120 | 150 | 33 - 39 |
| SAE Grade 8.2 (covers 1/4" - 1" dia) | low carbon boron steel, quenched & tempered | 120 | 150 | 33 - 39 |
| ASTM A574 (covers 1/4" - 4" dia socket head cap screws, high strength) | medium carbon alloy steel, quenched & tempered | 140 (up to 1/2") 135 (above 1/2") | 180 (up to 1/2") 170 (above 1/2") | 39 - 45 (up to 1/2") 37 - 45 (above 1/2") |

| COMMON AUTOMOTIVE PROPERTY CLASSES (Metric External Thread) | | | | |
|---|--|--------------------|------------------------|---------------------|
| Strength Classification (Property Class) | Material & Treatment | Proof Stress (MPa) | Tensile Strength (MPa) | Core Hardness (HRC) |
| 8.8 (covers M16 - M72) | low carbon martensite, quenched & tempered | 600 | 830 | 23 - 34 |
| 9.8 or 9.8 (covers M1.6 - M16) | medium carbon steel, quenched & tempered or <u>low carbon martensite, quenched & tempered</u> | 650 | 900 | 27 - 36 |
| 10.9 or 10.9 (covers M5 - M20, covers M5 - M36) | medium carbon or med. carbon alloy steel, quenched & tempered or <u>low carbon martensite, quenched & tempered</u> | 830 | 1040 | 33 - 39 |
| 12.9 (covers M1.6 - M100) | alloy steel, quenched & tempered | 970 | 1220 | 38 - 44 |

Due to embrittlement concerns, class 12.9 is not recommended unless the application and fastener fabrication process is fully reviewed. Classes 9.8 and 10.9 are not as common as 8.8 and 10.9.