

# Engineering Center

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

Visit us at [www.fastenerengineering.com](http://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

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## Useful Fastener Data

Thread Size	Tensile Area
	in <sup>2</sup>
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
	<b>mm<sup>2</sup></b>
M6-1.0	20.125
M8-1.25	36.611
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	145.118
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...
<b>Torque</b>	Newton-meter	Foot-pound	0.73756
	Newton-meter	Inch-pound	8.85
<b>Force</b>	Newton	Pound	0.22482
<b>Stress</b>	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)
<b>SAE Grade 5</b> (covers 1/4" - 1" dia)	medium carbon steel, quenched & tempered	85	120	25 - 34
<b>SAE Grade 5.2</b> (covers 1/4" - 1" dia)	low carbon boron steel, quenched & tempered	85	120	26 - 36
<b>SAE Grade 8</b> (covers 1/4" - 1 1/2" dia)	medium carbon alloy steel, quenched & tempered	120	150	33 - 39
<b>SAE Grade 8.2</b> (covers 1/4" - 1" dia)	low carbon boron steel, quenched & tempered	120	150	33 - 39
<b>ASTM A574</b> (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)
<b>8.8</b> (covers M16 - M72)	low carbon martensite, quenched & tempered	600	830	23 - 34
<b>9.8 or 9.8</b> (covers M1.6 - M16)	medium carbon steel, quenched & tempered or <u>low carbon martensite, quenched &amp; tempered</u>	650	900	27 - 36
<b>10.9 or 10.9</b> (covers M5 - M20, covers M5 - M36)	medium carbon or med. carbon alloy steel, quenched & tempered or <u>low carbon martensite, quenched &amp; tempered</u>	830	1040	33 - 39
<b>12.9</b> (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.