



## Specifications

The following specifications cover Alloy Steels 4140

- AISI 4140
- AMS 6349
- AMS 6381
- AMS 6382
- AMS 6390
- AMS 6395
- AMS 6529
- ASTM A193 (B7, B7M)
- ASTM A194 (7, 7M)
- ASTM A29 (4140)
- ASTM A320 (L7, L7M, L7D)
- ASTM A322 (4140)
- ASTM A331 (4140)
- ASTM A506 (4140)
- ASTM A513
- ASTM A513 (4140)
- ASTM A519 (4140)
- ASTM A646 (4140)
- ASTM A711
- ASTM A752 (4140)
- ASTM A829
- SAE J1397 (4140)
- SAE J404 (4140)
- SAE J412 (4140)
- UNS G41400

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## Property Results

**Related Metals:**

- Folder
- Finkl 4140(tm)
- Maxell Tooling Alloy(tm)

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### **Chemistry Data** : [top]

Carbon	0.38 - 0.43
Chromium	0.8 - 1.1
Iron	Balance
Manganese	0.75 - 1

Molybdenum	0.15 - 0.25
Phosphorus	0.035 max
Silicon	0.15 - 0.35
Sulphur	0.04 max

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**Principal Design Features** This is one of the chromium, molybdenum, manganese low alloy steels noted for toughness, good torsional strength and good fatigue strength.

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**Applications** 4140 is used in a tremendous variety of applications, too numerous to mention here.

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**Machinability** Machinability of this alloy is good in the annealed condition. In the heat treated and quenched condition machining is best limited to finish grinding.

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**Forming** As with all the low alloy steels forming may be done by conventional methods with the alloy in the annealed condition. These alloys have good ductility, but are tougher than plain carbon steel and thus usually require more force, or pressure, for forming.

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**Welding** Weldable by all of the conventional methods. Note that welding with the alloy in the heat treated condition will affect the mechanical properties and a post weld heat treatment may be needed.

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**Heat Treatment** This alloy is hardened by heating to 1550 F and quenching in oil. It is best to normalize the alloy by heating at 1675 F for a long enough time to permit thorough heating, followed by air cooling, prior to the hardening treatment.

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**Forging** 4140 may be forged at 2200 F down to 1700 F.

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**Hot Working** Hot working, if required, may be done in the range of 1900 F to 1500 F.

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**Cold Working**      The alloy readily cold works in the annealed condition by conventional methods.

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**Annealing**      Annealing is done at 1600 F followed by slow furnace cooling.

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**Aging**      Not applicable to this alloy.

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**Tempering**      Tempering temperatures range from 400 F to 1200 F depending upon the hardness level desired. The lower the tempering temperature the greater the hardness of the alloy. For example tempering at 600 F gives a tensile strength of 225 ksi while tempering at 1000 F will give 130 ksi.

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**Hardening**      Hardens by cold working, or heating and quenching - also see "Heat Treatment" and "Tempering".

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**Physical Data** : [\[top\]](#)

Density (lb / cu. in.)	0.28
Specific Gravity	7.83
Specific Heat (Btu/lb/Deg F - [32-212 Deg F])	0.114
Melting Point (Deg F)	2580
Thermal Conductivity	23
Mean Coeff Thermal Expansion	7
Modulus of Elasticity Tension	33