

4140/42/45/50

UNS G41400, G41420, G41450, G41500

41L40/42, 41L50 (LEADED)

Chromium-Molybdenum Steel

Bars and Plates

Color Marking

- 41 40/42/45: Annealed Bars – Ends painted Black and Red  
Heat Treated Bars – Ends painted Brown and Gold  
Plates – Corner Striped Gray
- 41 L40/42: Annealed Bars – Ends painted Blue and Green  
Heat Treated Bars – Ends painted Gray and Pink
- 41 50: Annealed Bars – Ends painted purple with Olive Stripe  
Heat Treated Bars – Ends painted Orange with Black Stripe
- 41 L50: Annealed Bars – Ends painted Orange with White Stripe  
Heat Treated Bars – Ends painted Orange with Black Stripe

These are oil-hardening steels of relatively high hardenability. Their chromium content provides good hardness penetration, and the molybdenum imparts uniformity of hardness and high strength. These grades are especially suitable for forging because they have self-scaling characteristics. They respond readily to heat treatment and are comparatively easy to machine in the heat treated condition. They resist creep in temperatures up to 1000° F and maintain their properties even after long exposure at these relatively high working temperatures. With a combination of such highly desirable properties as good strength and wear resistance, excellent toughness coupled with good ductility, and the ability to resist stress at elevated temperatures, it is understandable why these are widely used and highly successful alloy steels.

This material is also available as leaded steel. The addition of lead improves machinability without sacrificing other desirable properties, with the exception that the use of this material is not recommended for applications over 400° F, since at elevated temperature ductility is low.

The following specifications are generally applicable for 4140/42 Heat Treated Rounds: ASTM A 193, Grade B7; ASTM A 434, Grades BC and BD.

ANALYSIS

	C	Mn	P Max.	S Max.	Si	Cr	Mo
4140	.38/.43	.75/1.00	.035	.040	.15/.35	.80/1.10	.15/.25
4142	.40/.45	.75/1.00	.035	.040	.15/.35	.80/1.10	.15/.25
4145	.43/.48	.75/1.00	.035	.040	.15/.35	.80/1.10	.15/.25
4150	.48/.53	.75/1.00	.035	.040	.15/.35	.80/1.10	.15/.25

The analyses of the leaded grades are the same as above with the addition of .15/.35 Lead (Pb).

**APPLICATIONS** – Drill collars, kelly bars, bolts, subs, couplings, reamer bodies, rotary table shafting, oil well tool joints, axle shafts, valves, high-temperature bolts, sprockets, trailer axles, winch shafts, piston rods, rams, hydraulic machinery shafts, precision lead screws, chain links, spindles, stay bolts, tractor axles, tractor arms, zinc die-casting dies, etc.

**MECHANICAL PROPERTIES and HARDENABILITY** – Refer To Sec. R. Also see Bottom of Page 7 of this section for specific data on heat treated bars.

**MACHINABILITY** – 41L42 has a machinability rating in the annealed condition of approximately 77% of 1212, as compared with 66% for 4142 without lead. Surface cutting speed of 41L42 is approximately 127 feet per minute.

**WELDABILITY** – Difficult to weld, but can be welded by any of the common welding processes providing section is preheated, and stress relieved after welding. The grade of welding rod to be used depends upon thickness of section, design, service requirements, etc. When welding leaded material, adequate ventilation should be provided to prevent accumulation of fumes.

**FORGING** – Heat to 2100°-2200°F.

**NORMALIZING** – Heat to 1600°-1700°F. Cool in air. Average Brinell Hardness, 285.

**ANNEALING** – Heat to 1450°-1550°F. Cool slowly in furnace. Average Brinell Hardness, 187.

**HARDENING** – Hardening range is between 1525° and 1625°F. Quench in oil. A wide range of mechanical properties can be obtained by tempering between 400° and 1300°F.

For 4140 AIRCRAFT QUALITY BARS, refer to Section H.