

GUIDE TO SELECTION

IMPROVED-MACHINING ALLOY BARS

Ryerson's free machining alloys provide all the benefits of the latest developments in **lead**ed or **resulfurized alloy steels**. Compared to similar non-leaded or non-resulphurized analyses, Ryerson's improved machining alloys machine as much as 50% faster and increase tool life as much as 300%, with improved finish. In addition, all of these alloys develop excellent mechanical properties with heat treatment.

86L20 (Rycut 20) is a case hardening steel. A nickel, chrome, moly steel with excellent free machining characteristics. Develops a uniformly hard case supported by a tough, ductile core and has relatively low distortion in heat treatment.

41L40 Annealed (Rycut 40) is a superior free machining direct hardening alloy. A chrome moly alloy with .40 carbon and .15/.35 lead addition can be quenched and tempered to a broad range of strength levels.

41L40/42/47 Quenched & Tempered (Rycut) is a medium carbon chrome-moly alloy with optimum strength and hardness already in the bar. You save the cost and delay of heat treating, eliminate double handling for rough machining and finishing. In addition, the carbon content is matched to bar size giving uniform properties throughout each section and from bar to bar across the broad size range. Surface hardness ranges between 269 and 321 Brinell. All bars are stress relieved.

41L50 Annealed (Rycut 50) has a higher carbon content to provide deeper hardenability for uniform through-hardening in larger sections with little loss in machinability.

4150 RSCA Annealed. The addition of sulfur along with a CAL-AL treatment to this manganese, chrome, moly .50 carbon alloy provides improved machinability.

4150 RSCA Quenched & Tempered resulfurized and CAL-AL treated machinable steel which has been quenched, tempered, machine-straightened and stress relieved to develop ready-to-use strength and hardness. Surface hardness ranges between 262/311 Brinell on all rounds as well as squares 3" and over. Flats and squares under 3" are normalized, special straightened and stress relieved. (Brake Die Stock) Surface hardness ranges between 241/302 Brinell.

CAL-AL (CA) TREATED

CAL-AL treated bars are fine-grained, calcium-aluminum treated alloy steel with superior benefits for users of carbide tooling as well as high-speed tooling. Speeds and feeds have been doubled and tool life increased as much as 300%. CAL-AL treated bars deliver their machining benefits without sacrificing mechanical properties.

All standard SAE grades, except nitriding and boron analyses, can be produced to a CAL-AL treated practice and to appropriate ASTM specifications. Any condition — hot rolled, cold drawn, annealed or heat treated — is available.

8620 CA is an as-rolled, case hardening, nickel-chrome moly steel. It develops a uniformly hard case supported by a tough ductile core with very low distortion in heat treatment. Users of carbide and high speed tooling can greatly improve productivity and increase tool life over SAE 8620.

4140 CA Annealed is one of the most commonly used medium carbon, direct oil hardening grades. A chrome-moly alloy, its superior machining characteristics offer users of carbide and high speed tooling cost savings over SAE 4140 annealed.

4150 CA Annealed A companion to 4140 annealed with increased carbon content yielding higher hardenability, yet offering superior machinability and tool life compared to SAE 4150 annealed.

4140 CA QTSR A general purpose “improved machining” alloy averaging .95% chromium and .20% molybdenum. Quenched, tempered and stress relieved to provide good hardness penetration, strength, toughness and ductility. Machining comparisons have shown dramatic improvements over non-calcium treated 4140 QTSR when carbide or high speed tools are used.

4150 CA QTSR A medium carbon, chrome-moly alloy, quenched, tempered and stress relieved to provide good hardness penetration and minimum properties higher than 4140 QTSR.



Calcium Treated:
Small, broken chips



Untreated:
Long and stringy chips

LOW CARBON ALLOY BARS – CASE HARDENING

(For carbon manganese steels, 1117, see carbon bar section.)

The ability to develop a hard case supported by a tough, ductile core is characteristic of case hardening alloys — with the exact properties developed, depending on the type of alloy selected and the manner of heat treatment.

8620 — Most widely used of all case hardening alloys — truly general purpose, oil hardening steels with good core properties. Low in cost. Composition is balanced: nominally .55% nickel, .50% chromium, .20% molybdenum. Minimum distortion and growth characteristics.

8620 — CAL-AL Treated — See above.

86L20 — See above.

MEDIUM CARBON ALLOY BARS – ANNEALED

(For carbon manganese bars, 1141 and 1144, see carbon bar section.)

The medium carbon and direct hardening steels in this group offer you the right combination of strength, toughness and hardness after oil quenching and tempering — plus machinability. When increased wear resistance is required in localized areas, they can be flame or induction hardened. Hardenability data is developed for each heat of steel and is furnished with the Ryerson certification document.

4140/4150 are widely used medium carbon steels — truly general purpose alloys, low in cost. Nominal composition: .95% chromium and .20% molybdenum content. A broad range of strength and toughness is attainable through variations in heat treatment. Good hardenability, strength, wear resistance, toughness and ductility.

41L40/4L150 — See above.

4140/4150 CAL-AL Treated — See above.

4150 RS — See above.

4340 is a highly alloyed steel, nominally 1.80% nickel, .80% chromium, .25% molybdenum — assuring deep hardness when oil quenched, with high strength characteristics attained throughout the section. Used for heavily stressed parts operating under heavy-duty conditions.

6150 is an electric furnace alloy, nominally .95% chromium, .15% vanadium content. Has high surface hardness combined with low distortion characteristics and good impact resistance.

HEAT TREATED ALLOY BARS

These alloys have been quenched and tempered (except e.t.d. 150® rounds which are elevated temperature drawn and 4150 Mod. RS flats and squares under 3" which are normalized and stress relieved) so that strength and hardness is already developed, ready for use. Many hot rolled bars are machine straightened and can be furnished with or without stress relieving. All cold drawn bars are fully stress relieved after drawing so that distortion during machining is held to a minimum.

4340 QTSR (Nikrome) has a high nickel/chromium content which gives outstanding depth of hardness with high mechanical properties throughout the section — and has the strength (302 BHN min.) and toughness to withstand severe service conditions. Conforms to ASTM A434 Class BD.

4140/42 QT (Rycrome) is a general purpose alloy, low in cost, nominally .95% chromium and .20% molybdenum. Has good hardness penetration, strength, toughness, and ductility. Sizes thru 7" comply with the chemical and mechanical properties of ASTM-A193-B7, ASME SA193 Class B7 and /or MIL-S-1222 (B7). Sizes over 7" thru 9½" conform to ASTM A434 Class BC.

e.t.d. 150® is made by the elevated temperature drawing process to obtain properties and strengths usually achieved only by quenching and tempering. No heat treating is required — properties are in-the-bar as received. This steel machines faster than heat treated bars and compares favorably with cold drawn 4140 annealed.

41L40/42/47QT — See above.

4130 QT is a general purpose alloy. Low in cost, with a nominal .30% carbon, .95% chromium and .20% molybdenum. Offers good strength and toughness for moderately stressed parts.

4140/4150 QTSR CAL-AL Treated — See above.

4150 RSCA QT — See above.

Stressproof® — See Bars: HR, CF

Fatigue-Proof® — See Bars: HR, CF