

Material

Hardness and yield strength information on the alloys below.

Steel Alloy Performance Characteristics

Machinability	Weldability	Toughness	Wear Resistance	Formability
Excellent 12L14 and 1215 for carbon and alloy steels; W1 for tool steels	Good A36, 1018, 4130, 4150, 4340, 8620, O1	Excellent 41L40, H13, S7, S2	Excellent 8620, E52100, D2, M2/M7, M4	Good 41L40, 4130, 8620, O1, S7
Very Good 1144 and 41L40 for carbon and alloy steels only	Fair 1045, 4140/4142, A2, A6, H13, S7	Good 4140/4142, 4340, 8620, E52100, O1, P20, W1	Good 41L40, A2, A6	Fair 12L14, 4140/4142, A6
Good A36, 1018, 1045, 1065, 4130, 4140/4142, and 8620 for carbon and alloy steels; O1 and P20 for tool steels	Difficult 1065, 1144, 12L14, 1215, E52100, D2, M2/M7, W1	Fair A2, A6	Fair 1144, 4140/4142, 4340, W1, O1, H13, S7, S2, P20	Difficult 1045, 1144, E52100, A2, D2, M2/M7
Fair 4150, 4340 and E52100 for carbon and alloy steels; A2, A6, D2, H13, M2/M7, M4, and S7 for tool steels	Not Rated 1074/1075, 1095, 41L40, M4, P20, S2	Poor 1144, 12L14, D2, M2/M7, M4	Poor 12L14	Not Recommended 1215
Not Rated 1074/1075, 1095		Not Rated A36, 1018, 1045, 1065, 1074/1075, 1095, 1215, 4130, 4150	Not Rated A36, 1018, 1045, 1065, 1074/1075, 1095, 1215, 4130, 4150	Not Rated A36, 1018, 1065, 1074/1075, 4150, 4340, H13, M4, P20, S2, W1

<p>Material Selector Packs</p> <p>Available in small sizes. Choose from the following: Bearing-Quality Aircraft-Grade E52100 Alloy Steel, Ultra-Machinable 12L14 Carbon Steel, High-Strength 1045 Medium-Carbon Steel, High-Strength Easy-to-Machine 1144 Carbon Steel, and Easy-to-Form 8620 Alloy Steel.</p>	<p>General-Purpose Low-Carbon Steel</p> <p>1006 to 1018 carbon steel. Easy to cold form, bend, braze, and weld.</p>	<p>Ultra-Machinable 12L14 Carbon Steel</p> <p>The addition of lead, which acts as an internal lubricant, provides superior machining characteristics, including improved surface appearance. Commonly used for high-speed screw machine products.</p>
<p>Easy-to-Machine 41L40 Alloy Steel</p> <p>Similar to 4140 alloy steel. The addition of lead, which acts as an internal lubricant, provides increased machinability.</p>	<p>High Strength 1045 Medium-Carbon Steel</p> <p>Highest strength carbon steel we offer. It has fair machinability and is often used for bolts, studs, and shaft parts.</p>	<p>General Purpose 1074/1075 Spring Steel</p> <p>Easily formed and heat treated. Often used for less exacting requirements, it is more formable than 1095 Spring Steel but does not have the same degree of bounce-back in the heat-treated condition.</p>
<p>Tough Wear-Resistant 1095 Spring Steel</p> <p>Good wear resistance due to its high carbon content. Commonly used to make spring clips, washers, and parts that are repeatedly stressed. The annealed material is easy to form and can be heat treated for springlike properties. The spring-tempered material, also known as blue-tempered, is the most common spring steel.</p>	<p>Machinable 1117 Low-Carbon Steel</p> <p>Material has a high manganese and sulfur content to increase hardness and strength while maintaining better machinability than other low-carbon steel.</p>	<p>High-Strength Easy-to-Machine 1144 Carbon Steel</p> <p>Also known as stressproof. This medium-carbon steel offers good strength, while added sulfur gives it good machinability.</p>
<p>Easy-to-Machine 1215 Carbon Steel</p> <p>Similar to 12L14 steel without the lead.</p>	<p>Easy-to-Weld Aircraft-Grade 4130 Alloy Steel</p> <p>Very similar to 4140, but has a lower carbon content, giving it better weldability and formability while retaining good fatigue, abrasion, and impact resistance. Use it when military specifications must be met and for your most demanding structural applications.</p>	<p>Multipurpose 4140/4142 Alloy Steel</p> <p>Also called “chrome-moly” steel because of its main alloying elements (chromium and molybdenum), which give it good fatigue, abrasion, and impact resistance. Readily formed and machined in its annealed state and can be heat treated to increase toughness and wear resistance. Material is a good choice for crankshafts, gears, axles, and shafts.</p>

<p>Wear-Resistant 4150 Alloy Steel</p> <p>Similar to 4140 alloy steel. Has a higher carbon content, which makes it harder and more wear resistant.</p>	<p>High-Strength Shock-Resistant 4340 Alloy Steel</p> <p>Specially designed for applications involving severe impact, wear, heat, and stress, this highly alloyed steel (nickel, chromium, and molybdenum) is stronger and more shock resistant than 4140.</p>	<p>Fatigue-Resistant 5160 Spring Steel</p> <p>Due to its high carbon content this material is often used for a variety of spring applications where fatigue resistance is required, such as the manufacturing of flat springs. It is sometimes called chrome-silicon because these are its main alloying elements.</p>
<p>Easy-to-Form 8620 Alloy Steel</p> <p>Added nickel, chromium, and molybdenum give this lower-carbon steel improved formability and weldability compared to 4140 alloy steel.</p>	<p>Bearing-Quality Aircraft-Grade E52100 Alloy Steel</p> <p>E52100 is considered bearing quality because of its high carbon content, which gives it high hardness. It is often called chrome steel as chromium is the primary alloying element, which makes it very wear resistant.</p>	<p>Multipurpose Air-Hardened A2 Tool Steel</p> <p>A very fine grain structure results in a superior-quality steel. Compared to O1 tool steel, this material has better wear resistance, which means it can hold a sharper cutting edge. Compared to D2 tool steel and other high-carbon/high-chromium steels, this material offers better machinability. Ideal for making thin parts that are usually prone to cracking during heat treating.</p>
<p>Mold-Quality A6 Tool Steel</p> <p>Often used for making plastic molds as it won't lose its shape and is easily heat treated, A6 also has good strength, wear resistance, and toughness.</p>	<p>Wear-Resistant Air-Hardened D2 Tool Steel</p> <p>Versatile high-carbon/high-chromium tool steel that has great wear and abrasion resistance. Offers high hardness and is commonly used for long-run dies and blanking, as well as shear blades, burnishing tools, and gauges.</p>	<p>High-Temperature Air-Hardened H13 Tool Steel</p> <p>Because it is alloyed with chromium, molybdenum, tungsten, and vanadium, this steel is able to withstand the heat, pressure, and abrasion associated with high-temperature (up to 1000° F) applications.</p>
<p>Very Hard M2/M7 High-Speed Tool Steel</p> <p>A high molybdenum content increases this material's hardness, it will resist softening and maintain sharp cutting edges even at elevated temperatures. Great choice for high-speed cutting operations such as drilling, reaming, tapping, milling, and piercing.</p>	<p>Ultra-Wear-Resistant M4 High-Speed Tool Steel</p> <p>Also known as CPM Rex M4. Has a high vanadium content and is made from powdered metal, leading to excellent wear resistance. Ideal for cold work punches, die inserts, and cutting applications involving high speed and fine cuts.</p>	<p>Ultra-Hard M42 High-Speed Tool Steel</p> <p>Often called cobalt steel. It also contains molybdenum, making it suitable for working the hardest metals.</p>

<p>Bearing-Quality High-Temperature M50 Tool Steel</p> <p>Alloyed with chromium, molybdenum, and vanadium, this bearing-quality steel is suitable for applications requiring high wear resistance and strength at elevated temperatures.</p>	<p>Multipurpose Oil-Hardened O1 Tool Steel</p> <p>One of the original tool steels. Has a good combination of machinability and resistance to wear and abrasion. It is used extensively in dies and punches for blanking, forming, and trimming, as well as in cams, bushings, guides, and gauges.</p>	<p>Easy-to-Machine Mold-Quality P20 Tool Steel</p> <p>Furnished in a hardened condition and is readily machinable. Often used to make molds for plastics and die-casting dies for low-temperature alloys such as zinc.</p>
<p>Shock-Resistant Water-Hardened S2 Tool Steel</p> <p>An extremely rugged tool steel, S2 is used in applications requiring hardness, toughness, and resistance to shock and wear.</p>	<p>Shock-Resistant Air-Hardened S7 Tool Steel</p> <p>Even under repeated shock loads, this tool steel will retain its high strength and toughness, which makes it an ideal choice for tools such as chisels, rivet sets, punches, and driver bits.</p>	<p>General Purpose Water-Hardened W1 Tool Steel</p> <p>Not heavily alloyed, it is one of the easiest tool steels to machine. Its high carbon content makes it suitable for many applications even without heat treating. Heat treatment results in a tough core and a hard, wear-resistant surface. Can be used for hammers and files.</p>
<p>Spring-Temper Carbon Steel</p> <p>Also known as music wire. Hard temper. Difficult to bend.</p>	<p>Tungsten Steel</p> <p>Contains 12 tungsten for longer edge life, good wear resistance, and hardness. Rockwell hardness is R/C 64/66.</p>	