

Material Information



Alloy Steel 4140

Introduction

Alloy Steel 4140, also known as AISI 4140 or UNS G41400, is a chromium-molybdenum low-alloy steel known for its high strength, toughness, fatigue resistance, wear resistance, and torsional strength. It can be heat-treated to achieve different combinations of hardness and mechanical performance, making it suitable for demanding CNC-machined components.

Advantages

High strength, good toughness, excellent fatigue and impact resistance, and good hardenability. Alloy Steel 4140 also has good machinability in the annealed condition and can be heat-treated to achieve higher hardness and strength for demanding mechanical applications.

Disadvantages

Alloy Steel 4140 has limited corrosion resistance compared with stainless steels and can require protective treatment in corrosive environments. Its machinability also decreases as hardness increases, so hardened or tempered material can require more demanding cutting conditions and tooling.

Tolerance

3DSPRO can manufacture and inspect to tight tolerances, including sub +/- 0.001" tolerances, per your drawing specifications and GD&T callouts.

Recommendation

The combination of strength, toughness, fatigue resistance, wear resistance, and hardenability makes Alloy Steel 4140 suitable for CNC-machined components used in automotive, aerospace, industrial, energy, and general engineering applications. It is particularly appropriate for shafts, gears, couplings, machine components, and other parts subjected to high mechanical loads or repeated stresses.

Material Specifications (For reference only.)	
Tensile strength	675MPa
Shear modulus	80GPa
Elongation at Break	17.8%
Hardness	302 HB

Density	7.85 g/cm ³
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Attention

Alloy Steel 4140 is available in annealed, normalized, and hardened-and-tempered conditions, and its mechanical properties can vary significantly with heat treatment. When machining hardened material, tooling and cutting conditions should be selected according to the material hardness. Welding also requires greater care than with low-carbon steels, and suitable preheating and post-weld stress relief may be necessary depending on the material condition and section size.

Applications

3DSPRO finds people using Alloy Steel 4140 to make functional parts and prototypes in the following industries and applications.

Automotive parts and supplies:

Crankshafts, axle shafts, connecting rods, gears, sprockets, spindles, and other high-strength mechanical components.

Aerospace components:

Shafts, fittings, structural components, fasteners, tool bodies, and other precision parts requiring high strength and fatigue resistance.

Industrial equipment:

Gears, couplings, machine shafts, pump shafts, hydraulic components, tool holders, and other heavily loaded mechanical parts.

General engineering and machinery:

Pins, bushings, fixtures, molds, dies, bolts, studs, spindles, and other CNC-machined components requiring a combination of strength, toughness, and wear resistance.