

Material Information



Tool Steel O1

Introduction

Tool Steel O1, also known as AISI O1 or UNS T31501, is an oil-hardening cold-work tool steel containing carbon, manganese, chromium, tungsten, and vanadium. It offers good machinability, good dimensional stability during hardening, and a useful combination of surface hardness and toughness after heat treatment, making it suitable for precision CNC-machined tooling.

Advantages

Good machinability, good dimensional stability during hardening, good toughness, and good wear resistance. Tool Steel O1 can be hardened to high surface hardness while retaining useful toughness, making it suitable for a wide range of cold-work tools and precision components.

Disadvantages

Tool Steel O1 generally offers lower wear resistance than higher-alloy cold-work tool steels such as A2 and D2. Because it is an oil-hardening grade, proper heat treatment is important to achieve the required hardness and dimensional stability, and machining becomes more difficult after hardening.

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 machinability, toughness, dimensional stability, and hardenability makes Tool Steel O1 suitable for CNC-machined dies, punches, gauges, blades, pins, and other precision tooling components. It is particularly appropriate for short-run cold-work tooling where a balance between surface hardness, toughness, and production cost is important.

Material Specifications (For reference only.)	
Tensile strength	400MPa
Shear modulus	72GPa
Elongation at Break	20%
Hardness	63 to 65 HRC
Density	7.83 g/cm ³

Attention

Tool Steel O1 is normally supplied in a soft annealed condition and is machined to its required geometry before hardening and tempering. Because heat treatment can affect dimensions, machining allowances and the final finishing process should be considered for precision components. After hardening, O1 can reach high hardness levels, making subsequent machining considerably more demanding and often requiring grinding for final dimensional accuracy.

Applications

3DSPRO finds people using Tool Steel O1 to make functional parts and precision tooling in the following industries and applications.

Cutting and stamping:

Blanking dies, punching dies, piercing tools, trimming tools, shearing blades, and other cold-work cutting components.

Forming and fabrication:

Bending tools, forming dies, coining dies, drawing tools, and other components used for cold forming operations.

Precision tooling:

Gauges, guide bushes, ejector pins, punch holder components, and other tooling requiring dimensional stability after hardening.

Industrial equipment:

Small gears, cams, nozzles, shafts, tooling plates, and other wear-resistant CNC-machined components.