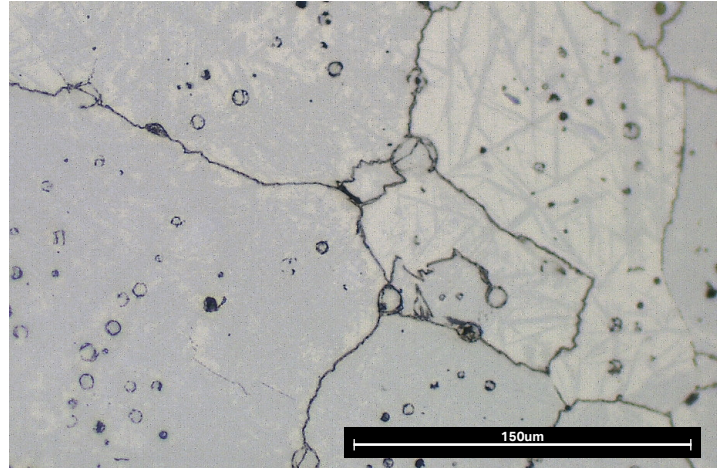


A2 Tool Steel

Other Designations: UNS T30102, DIN 1.2363 , X100CrMoV5, SKD12, BA2

A2 Tool Steel is a highly versatile air-hardening tool steel often regarded as a “universal” cold work steel. It offers a combination of good wear resistance (between O1 and D2) and toughness. Considered relatively easy to machine in the annealed condition, it has a high compression strength and good dimensional stability during hardening and tempering. It’s used for a wide variety of cold-work tools, from forming and cutting equipment to high wear parts.

Composition	Amount
Chromium	4.75-5.5%
Molybdenum	0.9-1.4%
Carbon	0.95-1.05%
Manganese	0.4-1%
Phosphorus	0.3% max
Vanadium	0.15-0.5%
Silicon	0.1-0.5%
Iron	bal



Typical Mechanical Properties	Standard	Markforged Heat-Treated ¹	Wrought Heat Treated
0.2% Compressive Yield Strength	ASTM E9	1170 MPa	—
Elastic Modulus	ASTM E9	160 GPa	190 GPa
Hardness ³	ASTM E18	50 HRC	63 HRC
Relative Density ⁴	ASTM B923	94.5%	100%

Heat Treatment

A2 Tool Steel can be heat-treated to increase hardness and durability. Markforged recommends heat-treating A2 Tool Steel to optimize material properties for target applications.

1. Heat A2 Tool Steel part in a standard (non vacuum) furnace to 970°C (1780°F) . Hold part at temperature for 30-45 minutes.
2. Air quench part to below 65°C (150 °F).
3. Double temper A2 Tool Steel part in a standard furnace. For each temper, heat part to 150-550°C² (302-1022°F) and temper for 2 hours, or 1 hour per inch of thickness. If double tempering, let part cool to room temperature between tempers.

1. Markforged heat-treated A2 Tool Steel was heated to 970°C (1780°F) and single tempered at 200°C (392°F) for 30 minutes.

2. Tempering temperature has a significant effect on final material properties. For higher hardness, temper at low temperatures. For higher toughness, temper at higher temperatures.

3. As-sintered hardness can vary significantly based on furnace loading and ambient environment. Markforged recommends post-sinter heat treatment for maximum hardness and compression strength.

4. Relative density for A2 assumes a density of 7.86 g/cm³.