

ASTM SAE AISI H11 Tool Steel Heat Treatment, Chemical Composition, Properties

SAE AISI H11 Steel

Tool Steel H11 is a chromium-based steel alloy that belongs to the "H" family of steels, according to the AISI classification system. Thanks to its outstanding impact toughness, H11 is one of the most commonly used alloys in this group. Compared to other steels in the same series, such as H13, H11 contains less vanadium. The presence of vanadium in H13 provides better wear resistance and temper resistance but sacrifices impact toughness. In conclusion, H11 exhibits excellent impact toughness, while H13, with its higher vanadium content, offers superior wear resistance and temper resistance at the expense of reduced impact toughness.

Applications

Tool Steel H11 is also widely used in the field of hot tooling due to its excellent resistance to cracking, including thermal fatigue cracking, gross cracking, and thermal shock during water cooling. These applications include hot punches, die casting dies, forging dies, hot shear blades, hot gripper dies, and extrusion tooling. Like most steels with high toughness and low carbon content, H11 steel can be utilized for producing hot-work steels using the water-cooling method.

Data sheet & Specification

The following table provides the AISI SAE ASTM H11 steel data sheet, including chemical composition, physical properties, mechanical properties, etc.

Chemical Composition

C	Si	Mn	P	S	Cr	Mo	V
0.38-0.43	0.80-1.00	0.20-0.40	0.015 max	0.015 max	4.75-5.25	1.20-1.40	0.40-0.60

H11 Steel Heat Treatment

Forging

H11 tool steels are forged at temperatures ranging from 900 to 1120°C. If the temperature drops below 900°C, reheat is necessary. During cooling in the furnace, it

is recommended to cool H11 steel as slowly as possible. Annealing is advised after forging.

Annealing

Slowly and uniformly heat H11 tool steel to 845-900°C, then cool it in the furnace at a rate of 10-20°C per hour until it reaches 540°C. This process will result in a maximum hardness of HB 229.

Hardening

Harden H11 tool steel from a temperature of 1000-1040°C, followed by air cooling, oil quenching, or warm bath quenching at temperatures ranging from 500 to 550°C. The hardness after quenching is between 50 and 56 HRC.

Tempering

Temper H11 tool steel at temperatures ranging from 540°C to 650°C to achieve a hardness of 54 to 38 on the Rockwell C scale. Perform a minimum of two tempering cycles, allowing for intermediate cooling to room temperature between each cycle. The steel should be held at the tempering temperature for a minimum of 2 hours.

H11 steel grade comparison

AISI H11 Tool Steel Standard and Relevant Steel Specifications:

Country	USA	German	Japan	British
Standard	ASTM A681	DIN EN ISO 4957	JIS G4404	BS 4659
Grades	H11/T20811	1.2343/X37CrMoV5-1	SKD6	BH11