ASTM SAE AISI H-13 Tool Steel Heat Treatment, Chemical Composition, Properties

SAE AISI H-13 Steel

H13 tool steel is a chromium hot-work tool steel widely used in both hot work and cold work tool applications. It is classified as an H-group steel in the AISI classification system. The series of steel types in this group range from H1 to H19.

Applications

The typical applications of H13 tool steel include forging dies, die inserts for forging molds, hot tooling molds, hot nut tools, hot extrusion dies, brass forging and stamping dies, aluminum-based molds, aluminum casting and extrusion molds, zinc die-casting molds, extrusion mandrels, plastic molds, cores, mold base blocks, hot pressing molds, and hot work punches.

Data sheet & Specification

The following table provides the AISI SAE ASTM H13 steel data sheet, including chemical composition, physical properties, mechanical properties, etc.

Chemical Composition

ASTM A681	C	Mn	P	S	Si	Cr	V	Mo
H13	0.32-0.45	0.2-0.6	0.03	0.03	0.8-1.25	4.75-5.5	0.8-1.2	1.1-1.75
DIN ISO 4957	C	Mn	P	S	Si	Cr	V	Mo
1.2344 /X40CrMoV5-1	0.35-0.42	0.25-0.5	0.03	0.02	0.8-1.2	4.8-5.5	0.85-1.15	1.1-1.5

JIS G4404	C	Mn	P	S	Si	Cr	V	Mo
SKD61	0.35-0.42	0.25-0.5	0.03	0.02	0.8-1.2	4.8-5.5	0.8-1.15	1-1.5

H-13 Steel Heat Treatment

Annealing

Slowly heat to 1550°-1650°F and hold until the entire material is heated, then slowly cool in the furnace at a rate of 40°F per hour until approximately 1000°F. Afterward, the cooling rate can be increased. Proper precautions must be taken to prevent excessive carburization or decarburization.

Stress Relieving

When it is necessary to relieve machining stresses, heat the workpiece slowly to 1050°-1250°F, allow it to reach a uniform temperature, and then cool it in still air (stress relieving).

Hardening

H13 tool steel has very high hardenability and should be hardened by cooling in still air. To minimize decarburization, it is recommended to use a salt bath or a controlled atmosphere furnace for processing. If these facilities are not available, pack hardening in spent pitch coke is suggested. The temperature typically used is 1800°-1850°F, depending on the size of the section.

Quenching

Quench in still air or dry air blast. If complex shapes need to be hardened, an interrupted oil quench can be used. Immerse the workpiece in oil and remove it when it loses its color (1000°-1100°F). Cool it in air to below 150°-125°F, and then immediately temper it.

Tempering

The tempering process may vary depending on the size and application, but it is typically carried out within the range of maximum secondary hardness or higher. Double tempering is recommended.

H13 steel grade comparison

The equivalent comparisons of ASTM AISI SAE H13 tool steel to European standards Germany DIN EN, and Japanese JIS standards are as follows:

Country	USA	German	Japan
Standard	ASTM A681	DIN EN ISO 4957	JIS G4404
Grades	H13	1.2344/X40CrMoV5-1	SKD61