H-10 Hot Work Tool Steel

(AISI H-10)

H-10 is a chromium-molybdenum hot work steel that exhibits excellent resistance to softening at elevated temperatures. In this respect, it is superior to the chromium hot work steels. H-10 is capable of being heat treated to higher hardness than the tungsten hot work steels, and in addition offers greater toughness. It has good thermal fatigue characteristics, and unlike the tungsten hot work steels, may be safely water cooled in service.

Chemical Composition

Carbon	**0.40**
Manganese	**0.55**
Silicon	**1.00**
Chromium	**3.25**
Vanadium	**0.40**
Molybdenum	**2.50**

Typical Applications

Forging dies for steel, mandrels, dies, die holder bolsters and dummy blocks, punches, die inserts, gripper and header dies, hot shears, aluminum die casting dies.

Physical Properties

Critical temperature - (on heating) 1525°F

Specific gravity - 7.80

Coefficient of Thermal Expansion

100 - 800°F	6.78 x 10^{-6} in/in/°F
100 - 1000°F	7.41
100 - 1200°F	7.65

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Forging

Heating for forging must be done slowly and uniformly. Soak through at 1900-2000°F, and reheat as often as necessary, stopping work when the temperature drops below 1650°F. After forging cool slowly in lime, mica, dry ashes or furnace. **H-10** should always be annealed after forging.

Annealing

Heat slowly to 1550-1650°F, hold until the entire mass is heated through, and cool slowly in the furnace (40°F per hour) to about 1000°F, after which the cooling rate may be increased. Suitable precautions must be taken to prevent excessive carburization or decarburization.

Strain Relieving

When desirable to relieve the strains of machining, heat slowly to 1050-1250°F, allow to equalize, and then cool in still air.

Preheat for Hardening

Warm slightly before charging into the preheat furnace, which should be operating at about 1400-1500°F.

Hardening

H-10 is a very deep hardening steel, and although oil quenching may be used where maximum hardness is required, air hardening is recommended for most applications. The use of salt bath or controlled atmosphere furnace is desirable to minimize decarburization, and if not available, pack hardening spent pitch temperature employed is usually in the range of 1800-1900°F.

Tempering

Tempering practice may vary with size and application, but is usually performed in the temperature range of maximum secondary hardness or higher double tempering is recommended, and the response is shown in the following chart.

Double	**Air Cooled from**	
Tempered	**1800°F**	**1900°F**
900°F	55.0RC	55.5RC
950°F	55.5	56.2
1000°F	55.0	55.9
1050°F	54.0	55.0
1100°F	52.0	53.0
1150°F	46.0	48.5
1200°F	38.0	40.0

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