



INTERNATIONAL TOOL STEEL

The World's Finest Tool Steel

H-13

PRODUCT INFORMATION

TYPICAL PARTS

Use this grade for application where drastic cooling is required during the operation, and where high red hardness and resistance to heat checking are important. This grade has found wide acceptance for die casting for zinc, white metals, aluminum and magnesium. It is widely used for extrusion dies, trimmer dies, gripper dies, hot shear blades and other hot work applications.

ADVANTAGES

High resistance to heat checking, good red hardness, shock resistance, great machine-ability, dimensional stability and excellent hardening ability.

FORGING/ROLLING

Large pieces of H-13 should be preheated slowly to 1300° F to 1500° F and thoroughly soaked before heating more rapidly to the forging temperature of 2050°F to 2150° F. Must be completely heating before forging operation begins. Never forge below 1650°F, but reheat as many times as needed. Steel should be cooled slowly by burying in a heat-insulated material such as dry ash, lime or Vermiculite.

ANNEALING

H-13 may be annealed by heating to 1600°F. Soak one hour per inch of greatest thickness, and furnace cool at 30 degrees per hour to 900°Fm followed by air cooling. Proper annealing procedure includes packing in a sealed container, using a neutral inert material. Results in maximum Brinell hardness of 207.

HARDENING

In a controlled atmosphere, preheat thoroughly at 1300° F - 1400° F. Then heat to 1850°F and hold for one hour per inch of greatest cross section. Quench in still air and temper immediately. When maximum hardness is the primary requirement, H-13 may be oil quenched, though when oil quenched this grade is vulnerable to cracking and has the same distortional characteristics as an oil hardening tool steel.

TEMPERING

For hot work applications, H-13 is used in the hardness range HRC 38 to 48. Typical hardness range for die casting is HRC 44 to 48 requiring a temper at approximately 1110°F. For improved shock resistance, the steel is often tempered at temperatures approaching 1150°F, resulting in hardness of HRC 40-44. The steel should be held at the tempering temperature for at least two hours per inch of greatest cross section. All hot work steel should be tempered at a minimum of 50 degrees above the expected maximum operating temperature of the tool or die. Double tempering, with the second temper 25 to 50 degrees lower than the first temper is always advisable, especially where heat checking is a problem. Hardness tests were made on 1-inch round specimens of H-13, which were air quenched from 1850°F and tempered for two hours at various temperatures. The results in the tempering chart (see right) may be used as a tempering guide keeping in mind that tools of heavy section or mass may be several points lower in hardness.

Chemical Analysis	
Carbon	.32/.45
Phosphorus	.030 Max
Manganese	.20/.50
Sulfur	.030 Max
Silicon	.80/1.20
Chromium	4.75/5.50
Vanadium	.80/1.20
Tungsten	----
Molybdenum	1.10/1.75
Cobalt	----

Tempering Temperature °f	
As-quenched	
400	54
500	53
600	53
700	53
800	53
900	54
1000	52
1100	46
1200	36

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