

# TECHNICAL BULLETIN

## AISI-A2 Air Hardening Tool Steel Annealed

Typical Analysis:	Carbon 1.00	Chromium 5.25	Moly. 1.10	Mang. 0.60	Vanadium 0.25
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Color Code: White with Red Stripe

### HEAT TREATMENT

**Forging** 2000°F to 2050°F, stop at 1700°F, cool slowly.

**Normalizing** Do not normalize.

**Annealing** 1650°F, furnace-cool, Brinell 212 max.

**Preheating** 1200°F prior to hardening.

**Hardening** 1775°F, air-quench to 150°F.

**Tempering** 350 to 400°F, resulting hardness Rockwell C 60/61.

greatest cross section should be used.

The Rockwell C hardness obtained on specimens 1in. square when quenched in air from 1775°F, and quenched in oil from 1750°F, and tempered at various temperatures, are shown below.

### CHARACTERISTICS

**Machinability** — if properly annealed to Brinell 212 max, A-2 has a machinability of 65, as compared with a 1% carbon tool steel, rated at 100.

**Dimensional Stability** — When air-quenched from the proper hardening temperature, this grade generally expands 0.001 in./in. of cross section.

**Critical Points** — Critical points obtained at a heating and cooling rate of 400 degrees per hour are:

Heating — Ac range 1475 to 1540°F

Cooling — Ar range 1310 to 670°F

### GENERAL INSTRUCTIONS

**Hardening** — Preheat to 1200°F and hold at this temperature until thoroughly soaked. Heat to 1750°F to 1800°F and hold for one hour per inch of greatest cross section. Remove from the furnace and cool in air. Although A-2 is primarily an air-hardening grade, flash oil-quenching is occasionally used on large sections; but tools must be removed from the oil when they reach 1000°F and air-cooled to 150°F. Temper immediately to minimize the possibility of cracking.

**Tempering** — After the pieces have cooled in the quench to about 150°F, they should be tempered immediately. For most applications A-2 should be tempered at 350°F to 400°F. A minimum holding time of two hours per inch of

Tempering Temperature -°F	Rockwell C	
	1775° Air-quench	1750° Oil-quench
None	64	65
300	62	62.5
400	60	61
500	56	57.5
600	56	56
700	56	56
800	56	56
900	56	56
1000	56	55
1100	50	50
1200	43	45
1300	34	34

These results on 1in. diameter specimens may be used as a guide in tempering tools to desired hardness. However, tools of heavy section or mass may be several points lower in Rockwell hardness for a given treatment.



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