

High Speed Steel Softening Chart

Brinell hardness of high speed steel after one hour at each softening temperature, cooled in air against cooled in the furnace, and the window in which the steel actually comes back soft enough to machine.

Reference only. The values on this sheet are reproduced from the source named at the foot of it. They are a published reference rather than a specification of ours, and the sheet carries no tolerances. One inch cubes of high speed steel were cooled freely in air from 1100 degrees C to represent a forged bar, held one hour at each temperature, and cooled either in air or for about ninety minutes in a small muffle furnace. A dash means the source gives no figure for that combination.

Brinell hardness of high speed steel, air cooled against furnace cooled

Source, the softening figures for high speed steel on printed page 131 of The Heat Treatment of Tool Steel (Harry Brearley), which is PDF page 149 of the copy consulted.

Condition of the one inch cube	Cooled in air (HB)	Cooled in the furnace (HB)
Works annealed bar	-	196
Cooled in air from 1100 °C	555	-
Reheated to 500 °C	512	-
Reheated to 600 °C	477	-
Reheated to 700 °C	286	-
Reheated to 750 °C	277	269
Reheated to 800 °C	269	248
Reheated to 850 °C	444	207
Reheated to 900 °C	495	-
Reheated to 950 °C	-	235

One inch cubes of high speed steel were cooled freely in air from 1100 °C to represent the condition of a forged bar, then held for one hour at each temperature and cooled either in the air or for about one and a half hours in a small muffle furnace. Figures are Brinell hardness as the source publishes them, and a dash means the source gives no figure for that combination.

Read the furnace column across rather than the air column. A furnace cool from 800 degrees C brings the steel to 248 HB, the softest condition in the table, and 750 degrees C reaches 269 HB. Above that the furnace column loses the advantage in the other direction, since 950 degrees C ends at 235 HB and the air column at 850 and 900 degrees C ends harder again at 444 HB and 495 HB. That rise is the air hardening tendency showing itself, and it is why the useful part of the table is the middle of it.

The air column also explains why soft annealing of an air hardening steel is not a routine job. A bar heated into the hardening range and then left to cool in still air does not soften, and from 850 degrees C upward it finishes harder than the works annealed bar it started from. The source notes the same thing from the other side, that high speed steel is normally supplied in the annealed state so that it can be sawn to length in the customer's shop rather than broken cold or cut hot.

Aobo Steel, tool steel supplier

Aobo Steel supplies tool steel to distributors and mold, tool and die shops, including D2, D3, O1, O2, A2, S7, H13, H11, H10, H21, M2, M42, L6, P20 and 420 and 440C stainless. Forged or hot rolled, annealed or pre-hardened, cut to your sizes, with test certificates.

Compiled from The Heat Treatment of Tool Steel (Harry Brearley), the softening figures on printed page 131. The figures are reproduced from the published table and are a reference summary rather than an Aobo Steel specification.

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