

Temper Color Time Chart for Tool Steel

Minutes at a constant temperature before a polished piece of steel reaches straw, brown, purple, dark blue and pale blue, and why a given colour does not mark a single temperature.

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. Similar pieces of steel were held in air at one fixed temperature for each run, and the minutes recorded are those needed to bring the surface to the full colour named at the head of the column. A dash means the source gives no figure for that pair. Results vary with the furnace atmosphere, the surface finish and the section size.

Minutes at one temperature, polished steel heated in air

Source, the tempering table on printed page 61 of The Heat Treatment of Tool Steel (Harry Brearley), which is PDF page 79 of the copy consulted.

Temperature	Straw	Brown	Purple	Dark blue	Pale blue
200° C	6	49	—	—	—
220° C	3	33	63	—	—
250° C	1	10	39	—	—
275° C	0.5	3	11	27	40

Minutes at one temperature before the full colour appears on a polished piece heated in air. A dash means the source gives no figure for that pair. The half minute at 275 degrees C is printed as a fraction in the source. The pieces tested were similar in size, so times scale with section size and with the furnace atmosphere.

Every colour arrives sooner as the temperature rises. Straw takes 6 minutes at 200 degrees C and half a minute at 275. Brown takes 49 minutes at 200 and 3 minutes at 275. Purple does not appear at 200 in these runs at all, needs 63 minutes at 220, and arrives in 11 minutes at 275. Dark blue and pale blue are reached only in the hottest run, at 27 and 40 minutes.

The same page carries a demonstration by Turner that a purple can be produced at 250 degrees C in a few minutes, that the same purple needs about an hour at 220 degrees C, and that it takes roughly twelve hours at 170 degrees C. Three temperatures, one colour. That is why the source concludes that the tempering effect depends on the temperature and is largely independent of time, while the colour is only an empirical guide under definite conditions.

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 temper colour time table on printed page 61, with the Turner demonstration recorded in the same page's footnote. The figures are reproduced from the published table and are a reference summary rather than an Aobo Steel specification.

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