

M4 Tool Steel Heat Treatment

The chemistry, the hardening cycle and the tempering response of M4 molybdenum high speed steel, from the reference page on aobosteel.com. A reference summary of published practice and not an Aobo Steel specification.

Reference only. The chemistry, the hardening cycle and the tempering response are reproduced from the source named at the foot of this sheet. The figures are shop reference values rather than a specification, and the card carries no tolerances. Run a trial part before committing production work to this cycle.

Chemistry of M4

Source, heat treating reference information for M4, printed page 191.

Element	Percent
Carbon	1.30
Manganese	0.30
Silicon	0.30
Chromium	4.00
Molybdenum	4.50
Vanadium	4.00
Tungsten	5.50
Sulfur	0.27

The card prints one figure for each element rather than a specification range. Cobalt is listed on the card with no figure against it, so that row is left out of the table instead of being printed as a blank. Sulfur at 0.27% is the figure the card prints for the grade.

Hardening M4

Source, heat treating reference information for M4, printed page 191.

Step	M4
Preheat	1500 °F (815 °C)
Harden	2225 °F (1220 °C)
Quench	Oil or salt quench

The card prints one preheat temperature, one hardening temperature and two quench media for the grade, with no section-size condition against any of them, so the figures stand for the load as written. The hardening and tempering temperature chart on this site gives the M3 and M4 group a hardening window of 2200 to 2250 °F (1205 to 1230 °C) and lists oil, air or salt as the quench media, so the single figure on this card sits inside that window and the two media it prints are two of the three the chart allows.

Tempering response of M4

Source, heat treating reference information for M4, printed page 191.

Temper, °F	°C	M4, HRC
As quenched	No temper	64
900	480	62
950	510	66
1000	540	65
1050	565	65
1100	595	64
1150	620	62
1200	650	58

The card prints one Rockwell C figure on each row. This card carries a figure on the as quenched row, 64 HRC, so that row is shown with no tempering temperature against it. The line dips to 62 HRC at 900 °F (480 °C) before it climbs to its peak of 66 HRC at 950 °F (510 °C), and it falls away to 58 HRC at the 1200 °F (650 °C) end of the table. The card says nothing about the number of tempering cycles.

The card carries 1.30% carbon and 4.00% vanadium, hardens at 2225 °F (1220 °C) from a 1500 °F (815 °C) preheat into oil or salt, and steps the tempering line from 64 HRC as quenched to 62 HRC at 900 °F (480 °C), 66 HRC at 950 °F (510 °C) and 58 HRC at 1200 °F (650 °C), with cobalt left without a figure on the card.

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, M2, L6, P20 and 420 and 440C stainless. Forged or hot rolled, annealed or pre-hardened, cut to your sizes, with test certificates.

Reference data compiled from Heat Treatment, Selection, and Application of Tool Steels (William E. Bryson, second edition, Hanser). The chemistry, the hardening cycle and the tempering response for M4 come from the heat treating reference information on printed page 191.

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