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L6 Tool Steel Tensile Properties After Tempering

L6 is a low-alloy tool steel that is chosen where a die has to absorb shock rather than resist abrasion. The first table carries one L6 heat, austenitized at 815 C (1500 F) and oil quenched, through five tempering temperatures with the tensile strength, elongation, reduction of area and hardness measured at each one. The second table compares the same L2 grade with and without 0.20 per cent vanadium after one identical treatment.

Reference only. This is a reference summary of published practice and not a specification of ours. Each row belongs to the exact hardening and tempering condition named in the caption above it, on one heat of one steel, and a die run at a different tempering temperature will sit somewhere else on these scales. Confirm the working values for a particular die against the material test certificate of the heat you buy before ordering.

Tensile properties of L6 tool steel after tempering

Austenitized at 815 °C (1500 °F), oil quenched and tempered 2 h

Tempering temperature, °C	Tempering temperature, °F	Tensile strength, MPa	Tensile strength, ksi	Elongation in 50 mm (2 in.), %	Reduction of area, %	Hardness, HRC
205	400	2055	298	1.3	2.0	57
315	600	2004.72	290.75	4.3	9.3	53.5
425	800	1591.02	230.75	8.5	24.7	47
540	1000	1341.97	194.63	12.5	34.0	42
650	1200	966.2	140.13	18.8	47.2	32

Source, Tool Steels (G. A. Roberts and G. Krauss), Table 8-10, Tensile properties of L6 tool steel, printed page 158 of the copy consulted. Composition 0.68% C, 0.60% Mn, 0.65% Cr, 1.40% Ni, 0.20% Mo; austenitizing temperature 815 °C (1500 °F), oil quenched, tempered 2 h. Figures from Allegheny Ludlum Steel Corp. The source prints the two temperature columns with their headings interchanged, and the pairing used here follows the equivalent temperatures on the axis of Fig. 8-24 on the same page. This is a reference summary of published practice and not an Aobo Steel specification.

What the two tables cover

This is a reference summary of published practice and not a specification of ours. Each row belongs to the exact hardening and tempering condition named in the caption above it, on one heat of one steel, and a die run at a different tempering temperature will sit somewhere else on these scales. Confirm the working values for a particular die against the material test certificate of the heat you buy before ordering.

L2 tool steel with and without vanadium

Both steels oil quenched from 840 °C (1545 °F) and tempered at 425 °C (800 °F)

Property	Steel A, L2 without vanadium	Steel B, L2 with vanadium
Tensile strength, MPa (ksi)	1523 (220.9)	1605 (232.8)
Yield point, MPa (ksi)	1384 (200.7)	1546 (224.2)
Yield to tensile ratio	0.911	0.963
Elongation, %	9.6	10.4
Reduction of area, %	35.9	43.1
Hardness, HV	457	481
Izod impact, J (ft·lbf)	16.3 (12.0)	16.3 (12.0)

Source, Tool Steels (G. A. Roberts and G. Krauss), Table 8-7, Mechanical properties of medium-carbon L2 steels with and without vanadium, printed page 148 of the copy consulted. Both steels oil quenched from 840 °C (1545 °F) and tempered at 425 °C (800 °F). Steel A composition 0.49% C, 0.76% Mn, 0.21% Si, 1.07% Cr. Steel B composition 0.50% C, 0.79% Mn, 0.31% Si, 0.98% Cr, 0.20% V. The impact figure is an Izod value in joules with the foot pound figure in brackets. This is a reference summary of published practice and not an Aobo Steel specification.

Reading the two tables together

Read the two tables together and the family reads consistently. L6 and L2 are both low-alloy steels chosen where a tool has to survive impact, and in both cases hardness, strength and ductility move in step with the tempering temperature.

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, P20+Ni and 420 and 440C stainless. Forged or hot rolled, annealed or pre-hardened, cut to your sizes, with test certificates. Compiled from Tool Steels (G. A. Roberts and G. Krauss), Table 8-10 and Table 8-7, on printed pages 158 and 148, the chapter on low-alloy special purpose tool steels. The source prints the temperature columns of Table 8-10 with their headings interchanged and the values here are paired as the equivalent temperatures printed on the same page. The tables are reproduced as published and are a reference summary rather than an Aobo Steel specification.

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