

Hot Work Tool Steel Physical Properties

Specific heat capacity, thermal conductivity, density, electrical resistivity and modulus of elasticity measured in four chromium hot work tool steels, in the annealed and the heat treated condition. A reference summary of published practice and not an Aobo Steel specification.

Reference only. The physical property 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. Values apply to the four grades printed here only, and the heat treated state means quenched and tempered to 43 to 44 HRC.

Specific heat capacity in the annealed condition, J per kg per K

Source, specific heat capacity in the annealed condition, item 1 of the physical property set, printed page 4-26 of the report (PDF page 87).

Steel grade	100 °C	150 °C	200 °C	250 °C	300 °C	350 °C	400 °C	500 °C	600 °C	700 °C	800 °C	900 °C	1000 °C
1.2343	523	525	530	532	535	540	540	544	544	544	544	536	536
1.2344	523	545	555	580	595	600	607	615	615	620	624	628	628
1.2365	481	490	505	520	530	535	545	553	553	553	553	553	553
1.2367	536	550	565	575	585	595	610	620	607	599	595	582	584

Values are in J per kg per K and apply to the annealed condition, as stated by the source. A reference table only, it is not an Aobo Steel specification.

Thermal conductivity in the annealed and heat treated states, W per m per K

Source, thermal conductivity, item 4 of the physical property set, printed page 4-27 of the report (PDF page 88).

Steel grade	State	100 °C	200 °C	300 °C	400 °C	500 °C	600 °C	700 °C
1.2343	Annealed	29.85	30.73	30.98	31.02	31.48	32.32	33.41
1.2343	Heat treated	26.80	27.84	27.47	27.30	28.26	29.31	30.35
1.2344	Annealed	27.21	28.09	29.22	30.14	31.74	34.08	36.51
1.2344	Heat treated	25.47	27.10	28.86	29.89	30.99	32.45	34.25
1.2365	Annealed	32.87	34.96	35.50	34.12	32.49	32.24	33.20
1.2365	Heat treated	31.40	33.91	33.08	31.40	30.14	29.73	29.31
1.2367	Annealed	30.56	31.82	32.66	33.49	34.12	34.75	35.17
1.2367	Heat treated	29.94	31.19	32.24	33.08	33.91	34.75	35.17

Values are in W per metre per kelvin. Heat treated means quenched and tempered to 43 to 44 HRC, which is the state the source quotes its own figures in. A reference table only, it is not an Aobo Steel specification.

Density in three conditions, kg per cubic metre divided by 1000

Source, density, item 2 of the physical property set, printed page 4-26 of the report (PDF page 87).

Steel grade	Annealed	Hardened	Heat treated
1.2343	7.751	7.740	7.741
1.2344	7.735	7.730	7.718
1.2365	7.847	7.843	7.823
1.2367	7.817	7.805	7.799

Values are in kg per cubic metre, divided by 1000, so 7.751 reads as 7751 kg per cubic metre. A reference table only, it is not an Aobo Steel specification.

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Specific electrical resistivity at 20 °C, micro-ohm metre

Source, specific electric resistivity, item 5 of the physical property set, printed page 4-27 of the report (PDF page 88).

Steel grade	Annealed	Heat treated
1.2343	0.471	0.481
1.2344	0.520	0.532
1.2365	0.303	0.308
1.2367	0.366	0.397

Values are in micro-ohm metre, one millionth of an ohm metre. The source prints the same set as 4.71, 4.81, 5.20, 5.32, 3.03, 3.08, 3.66 and 3.97, each times ten to the minus seven ohm metre, and the order of the eight values is unchanged here. A reference table only, it is not an Aobo Steel specification.

Modulus of elasticity at 20 °C, N per square mm divided by 1000

Source, modulus of elasticity at 20 °C, item 6 of the physical property set, printed page 4-27 of the report (PDF page 88).

Steel grade	Annealed	Hardened	Heat treated
1.2343	217.3	206.6	215.6
1.2344	216.9	207.8	216.2
1.2365	217.9	208.0	213.2
1.2367	227.1	205.8	215.7

Values are in N per square millimetre, divided by 1000, so 217.3 reads as 217300 N per square millimetre. A reference table only, it is not an Aobo Steel specification.

Modulus of elasticity against test temperature in the heat treated state

Source, modulus of elasticity against test temperature in the heat treated state, item 7 of the physical property set, printed page 4-27 of the report (PDF page 88).

Steel grade	20 °C	100 °C	200 °C	300 °C	400 °C	500 °C	600 °C	700 °C
1.2343	215.6	211.2	205.2	198.8	192.2	184.3	173.6	n/a
1.2344	216.2	211.6	205.8	199.5	193.0	184.9	173.6	161.0
1.2365	213.2	209.4	202.7	196.5	191.0	183.0	173.1	160.9
1.2367	215.7	212.1	205.5	199.4	193.5	185.0	174.4	n/a

Values are in N per square millimetre, divided by 1000. The source prints no value for two cells and they are marked n/a here. A reference table only, it is not an Aobo Steel specification.

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, M42, 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 Improved Life of Die Casting Dies of H13 Steel by Attaining Improved Mechanical Properties and Distortion Control During Heat Treatment (J. F. Wallace and D. Schwam, US Department of Energy final report DOE/ID/13320-3, October 1998). The physical property set is printed on pages 4-26 and 4-27 of that report, which are PDF pages 87 and 88. Every figure on this page was read from the page images rather than from an automatic text layer.

CONTACT

EMAIL
sales@aobosteel.com

WHATSAPP
[+86 180 6294 5370](https://api.whatsapp.com/send?phone=62945370)

WEB
aobosteel.com



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