

Tool Steel Hardening Furnaces and Salt Bath Working Temperatures

A tool steel is only as good as the furnace cycle that hardens it, and the choice between a salt bath, a vacuum furnace and a controlled atmosphere furnace decides how much distortion, decarburisation and cleaning a die shop has to live with afterwards. The tables below are the salt bath line of that choice. They give six salt mixtures by composition, melting point and recommended working temperature range, grouped by the job the bath does in the cycle, so a shop can match a mixture to the preheat, austenitising or quench stage it is buying it for.

Reference only. This is a reference summary of published practice and not a specification of ours. Each mixture belongs to the bath role named above its table, and the working range is the band the source recommends rather than a guarantee for any particular furnace. Confirm the salt you intend to buy against the supplier data sheet for that product before charging a bath.

Salt mixtures by the job they do in the cycle

Austenitising salts, the high heat bath

Salt mixture No.	BaCl ₂ , %	NaCl, %	KCl, %	CaCl ₂ , %	NaNO ₃ , %	KNO ₃ , %	Melting point, °C	Melting point, °F	Working range, °C	Working range, °F
1	98-100	...	...	...	...	...	950	1742	1035-1300	1895-2370
2	80-90	10-20	...	...	...	...	870	1598	930-1300	1705-2370

Source, Tool Steels (G. A. Roberts and G. Krauss), Table 6-1, Typical compositions and recommended working temperature ranges of salt mixtures used in heat treating of tool steels, printed page 106. The three dots are printed by the source where a mixture contains none of that constituent. This is a reference summary of published practice and not an Aobo Steel specification.

Preheat salts

Salt mixture No.	BaCl ₂ , %	NaCl, %	KCl, %	CaCl ₂ , %	NaNO ₃ , %	KNO ₃ , %	Melting point, °C	Melting point, °F	Working range, °C	Working range, °F
3	70	30	...	...	...	...	335	635	700-1035	1290-1895
4	55	20	25	...	...	...	550	1022	590-925	1095-1700

Source, Tool Steels (G. A. Roberts and G. Krauss), Table 6-1, printed page 106. Mixture 3 is printed with a melting point of 335 °C, below the melting point of either of its two constituents; the figure is reproduced as the source prints it rather than corrected. This is a reference summary of published practice and not an Aobo Steel specification.

Quench and temper salts

Salt mixture No.	BaCl ₂ , %	NaCl, %	KCl, %	CaCl ₂ , %	NaNO ₃ , %	KNO ₃ , %	Melting point, °C	Melting point, °F	Working range, °C	Working range, °F
5	30	20	...	50	...	...	450	842	500-675	930-1250
6	...	...	...	...	55-80	20-45	250	482	285-575	545-1065

Source, Tool Steels (G. A. Roberts and G. Krauss), Table 6-1, printed page 106. The three dots are printed by the source where a mixture contains none of that constituent. This is a reference summary of published practice and not an Aobo Steel specification.

How to read the melting point against the working range

Read the six mixtures as three pairs and the table answers the question a shop actually has, which is which bath to buy for which stage. The austenitising pair runs the top of the range on barium chloride and the sodium chloride in mixture 2 buys 80 degrees of melting point for a band that starts lower. The preheat pair sits below them on the same chloride base, and the quench and temper pair works at 700 degrees and under, where the nitrate mixture is the lowest melting of the six and the one that leaves a clean surface on a part that is already hard.

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 6-1, Typical compositions and recommended working temperature ranges of salt mixtures used in heat treating of tool steels, on printed page 106, the chapter on practical aspects of tool steel heat treatment. The table is reproduced as published and is a reference summary rather than an Aobo Steel specification, so treat it as the practice of one metallurgical textbook rather than as a recipe for a particular furnace. Mixture 3 is printed in the source with a melting point below that of either of its two constituents and that figure is reproduced as printed.

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