Oberste-Beulmann
Edelstähle – Special Steels

Technical Data Sheet	Grade	Code (SEL)	Powder metallurgical Cold-working tool steel
	OB-PM-K49	-	

Steel properties

OB-PM-K49 is a cold working tool steel produced by means of a powder metallurgical process which has a very fine, uniform, segregation-free microstructure and carbide distribution. By virtue of its alloy composition, its high carbide content and the interaction of different carbide types it combines the highest levels of adhesive wear resistance and toughness.

OB-PM-K49 offers twice the toughness of OB-PM-S79 while boasting the same wear resistance. OB-PM-K49 is nitridable and suitable or PVD coating.

OB-PM-K49 is suitable for cold working tools, such as powder metal pressing tools, cold extrusion dies, cold upsetting punches, precision punching dies, plastics injection moulding dies and rollers.

OB-PM-K49 is additionally suitable for tools for hot and warm working applications, such as extrusion dies, forging tools and punches

C %	Si %	Mn %	Cr %	Mo %	Ni %	V %	W %	Co %	Sonst. %

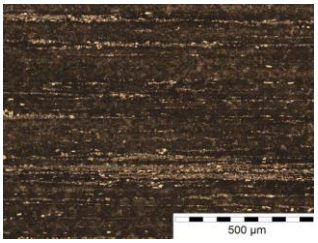
Melting	
Density (g/cm³)	8,00
Supply condition	soft annealed
Hardness (HB)	max. 260
Tensile strength (N/mm²)	-
Work hardness (HRC)	60 – 66 (depending on intended use)
Structure	-
Cleanness (DIN 50602)	K1 max. 15

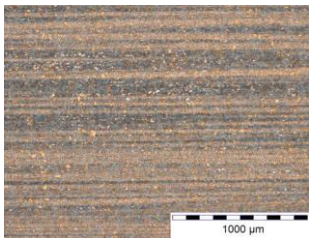
Remarks

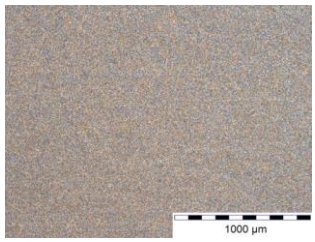
Physical properties			20 °C	100 °C	200 °C	300 °C	350 °C	400 °C	500 °C	600 °C	700 °C
Thermal expansion coefficient	10^{-6} * K	(20 °C to ...)	-	10,6	11,1	11,6	-	11,9	12,3	12,6	12,8
Thermal conductivity (W / m * K)	annealed		19,6	-	-	-	-	-	-	-	-

Comparison of microstructural properties

Carbide distribution (V = 100:1)		Segregation (V = 50:1)	
conventional	OB powderTEC	conventional	OB powderTEC







Heat treatment	Temperature (°C)	Cooling	Remarks heat treatment
Stress-relief annealing	ca. 650	Furnace – Air	Stress relief after extensive machining and in case of complex tools. **Holding time:** min. 4 h - controlled furnace cooling to approx. 300 °C, followed by cooling in still air

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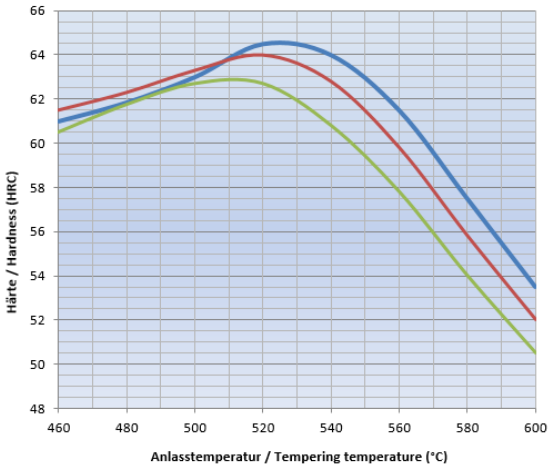
Heat treatment	Temperature (°C)	Cooling	Remarks heat treatment
Hardening	1030 – 1080		Hardening can be carried out under vacuum, in salt bath or in a furnace with a controlled (neutral) atmosphere. The hardening temperature corresponds to the temperatures for standard cold working steels
Pre – heating Step 1	ca. 650		
Pre – heating Step 2	ca. 850 – 900		
Quenching	ca. 550	Hot bath Oil Vakuum	The **mildest quenching medium** is to be preferred, in order to minimise thermal stress, distortion and dimensional changes. To counter the risk of stress cracking, tempering treatment is to begin immediately after attaining a temperature of approx. 80 °C. Quench in **hot bath** and hold. Followed by slow air cooling. **Cooling to room temperature is to be avoided.** **Gas pressure:** Dependent on size of part, but min. 4 bar. Then continue cooling to room temperature in still air.

Tempering Chart



Tempering – Hardness (HRC) after tempering (Reference value)

Temperature °C	460	480	500	520	540	560	580	600
1080	61,0	62,0	63,0	64,5	64,0	61,5	58,0	53,5
1050	61,5	62,5	63,5	64,0	63,0	60,0	56,0	52,0
1030	60,5	62,0	63,0	62,5	61,0	58,0	54,0	50,5

Remarks for tempering

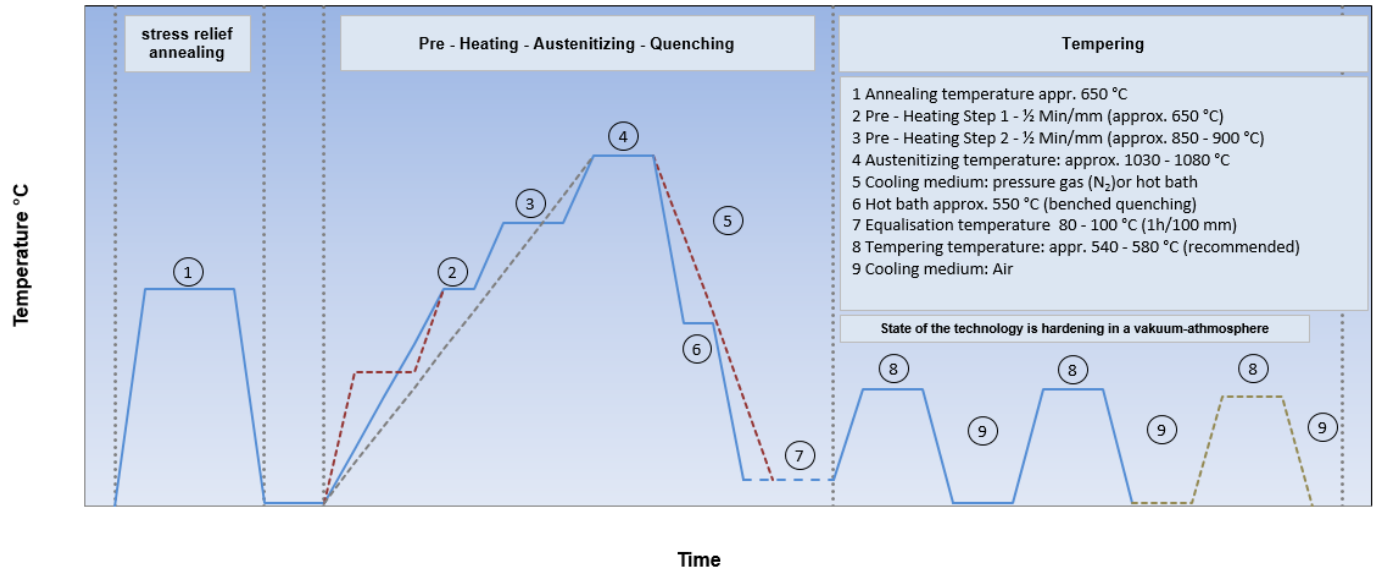
Slow heating to tempering temperature (540–580 recommended) directly after quenching.

A second tempering cycle is necessary, a third cycle is recommended

The tempering process is dependent on the given requirements.

Holding time in furnace 1 h per 20 mm of workpiece thickness, but min. 2 h

Thermal Cycle Diagram (Heat treatment)



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