Oberste-Beulmann
Edelstähle – Special Steels

Technical Data Sheet	Grade	Code (SEL)	Powder metallurgical High Speed Steel
	OB-PM-S39	-	

Steel properties

OB-PM-S39 is a tungsten- and cobalt-alloyed high-speed-steel produced by means of a powder metallurgical process which has a very fine, uniform, segregation-free microstructure and carbide distribution.

It possesses very good wear and heat-resistance as well as good compressive strength and toughness. OB-PM-S39 is very suitable for nitriding and its homogeneous microstructure also makes it ideal for PVD and CVD coating.

Applications

OB-PM-S39 is particularly suitable for high-performance machining tools such as stamping, punching, blanking, cutting and forming tools (heavy-duty hob cutters, punches, dies etc.). Other applications include titanium- or nickel-based alloys.

From spiral drills through screw taps, milling cutters and broaching tools to cold-forming tools, OB-PM-S39 is the ideal grade ideal grade.

C %	Si %	Mn %	Cr %	Mo %	Ni %	V %	W %	Co %	Sonst. %
1,65	0,60	0,30	4,80	2,00	-	4,80	10,50	8,00	-

Melting	
Density (g/cm³)	8,10
Supply condition	soft annealed
Hardness (HB)	max. 300
Tensile strength (N/mm²)	-
Work hardness (HRC)	65 – 69 (depending on intended use)
Structure	-
Cleanness (DIN 50602)	K1 max. 15

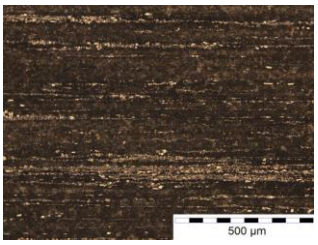
Remarks

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 ...)	-	9,9	10,3	10,6	-	10,9	11,2	11,5	11,9
Thermal conductivity (W / m * K)	annealed		17,1	19,0	21,1	22,9	-	24,3	25,4	26,4	28,5

Comparison of microstructural properties

Carbide distribution (V = 100:1)

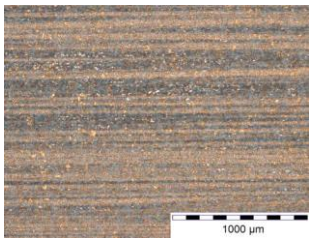
conventional



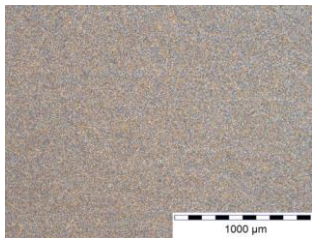
OB powderTEC

Segregation (V = 50:1)

conventional



OB powderTEC



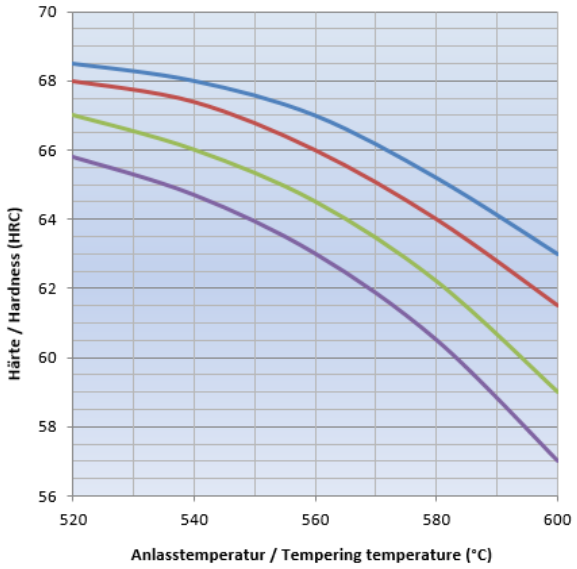
Heat treatment	Temperature (°C)	Cooling	Remarks heat treatment
Stress-relief annealing	ca. 650	Furnace – Air	Stress relief after extensive machining and in case of complex tools. **Holding time:** min. 4 h - controlled furnace cooling to approx. 300 °C, followed by cooling in still air

Wilhelm Oberste-Beulmann GmbH & Co. KG

An der Hasenjagd 2, D-42897 Remscheid | Tel.: +49 (0) 2191 93 60-0 | Fax: +49 (0) 2191 93 60 70 | info@oberste-beulmann.de | www.oberste-beulmann.de

Heat treatment	Temperature (°C)	Cooling	Remarks heat treatment
Hardening	1100 – 1240		Hardening can be carried out under vacuum, in salt bath or in a furnace with a controlled (neutral) atmosphere.
Pre – heating Step 1	450 – 550		
Pre – heating Step 2	850 – 900		*) Essential when high austenitizing temperatures are involved.
Pre – heating Step 3	1050 *)		
Quenching	ca. 550	Hot bath	Quench in hot bath and hold. Followed by slow cooling to lukewarm temperature in the air.
		Vakuum	**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	500	520	540	560	580	600	620
1240	-	68,5	68,0	67,0	65,0	63,0	-
1200	-	68,0	67,5	66,0	64,0	61,5	-
1150	-	67,0	66,0	64,5	62,0	59,0	-
1100	-	66,0	64,5	63,0	60,5	67,0	-

The tempering diagram shows hardness values at different austenitizing and tempering temperatures.

Remarks for tempering

Temper directly after quenching

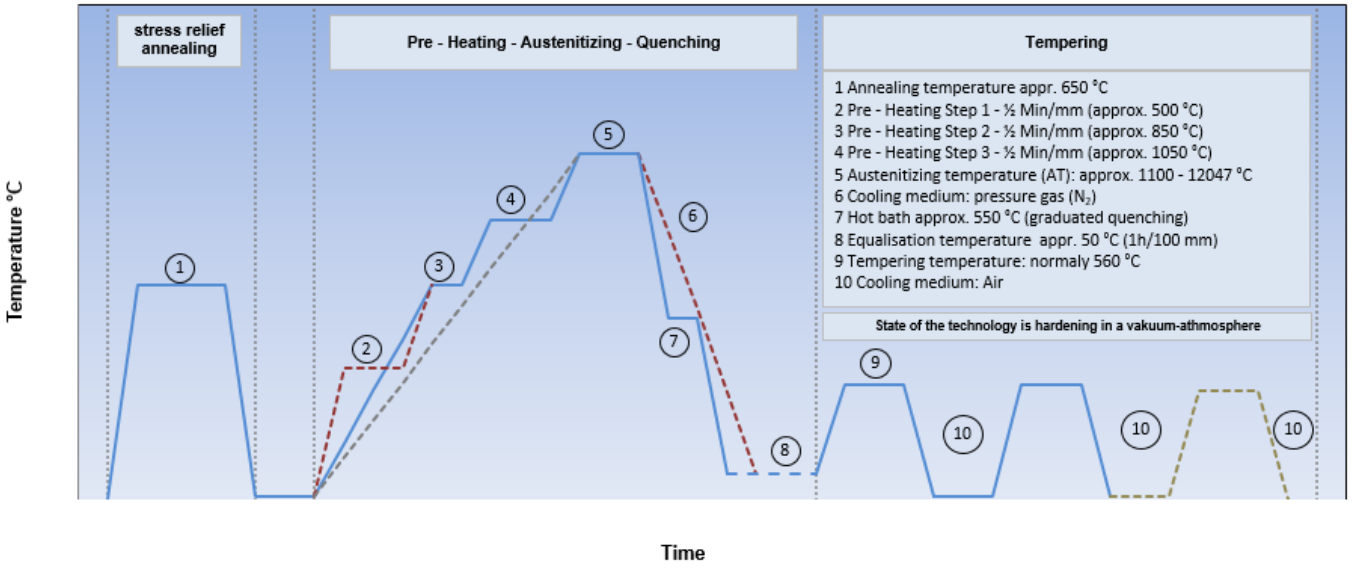
Slow heating to tempering temperature directly after hardening

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

A second tempering cycle (normally at 560 °C) is necessary, a third tempering cycle is recommended

Slow cooling to 50 °C to ensure transformation of residual austenite

Thermal Cycle Diagram (Heat treatment)



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