Technical Data Sheet

Grade	Code (SEL)	
OB-PM-M39	-	Powder metallurgical Plastic Mouls Steel

Steel properties

OB-PM-M39 is a martensitic tool steel produced by means of a powder metallurgical process. It has a very fine, uniform, segregation-free microstructure and carbide distribution. Its well-balanced alloy composition combines an optimum array of properties spanning wear resistance, toughness and corrosion resistance.

Its exceptional wear resistance stems from a high percentage of hard vanadium carbides, while the excellent corrosion resistance is the result of a chromium-rich matrix. Due to its high degree of purity, OB-PM-M39 is suitable for mirror-bright finishing and possesses minimum susceptibility to dimensional change.

Applications

OB-PM-M39 is suitable for tools which require high corrosion resistance, good wear resistance and optimum toughness:

Granulator blades, wearing parts for food and chemical processing, injection and extruder screws and moulds made of plastic, cylinder liners, screw tips and mould cavities, in particular for synthetic resins containing abrasive fillers.

C %	Si %	Mn %	Cr %	Mo %	Ni %	V %	W %	Co %	Sonst. %
1,90	0,70	0,30	20,00	1,00	-	4,00	0,60	-	-

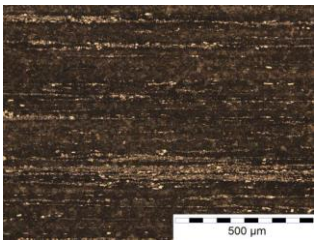
Melting	
Density (g/cm³)	7,60
Supply condition	soft annealed
Hardness (HB)	max. 280
Tensile strength (N/mm²)	-
Work hardness (HRC)	57 – 63 (depending on intended use)
Structure	-
Cleanness (DIN 50602)	K1 max. 15

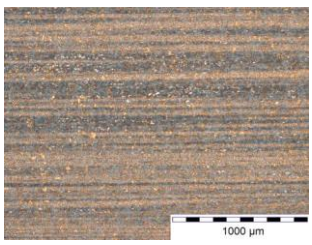
Remarks

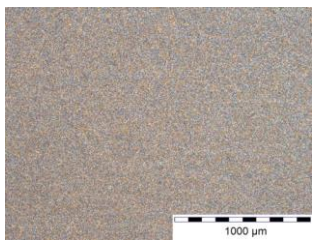
Physical properties			20 °C	100 °C	200 °C	300 °C	350 °C	400 °C	500 °C	600 °C	700 °C
Thermal expansion coefficient	10^{-6} * K	(20 °C to ...)	-	10,9	11,2	11,8	-	12,1	12,3	-	-
Thermal conductivity (W / m * K)	annealed		16,5	18,0	19,4	20,4	-	21,9	22,7	-	-

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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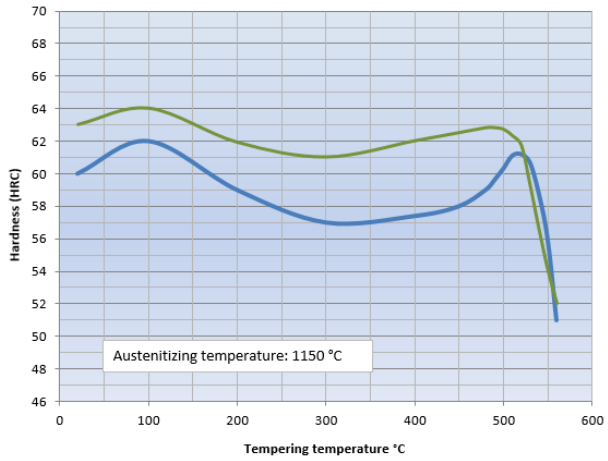
Heat treatment	Temperature (°C)	Cooling	Remarks heat treatment
Hardening	1070 – 1170		Hardening can be carried out under vacuum, in salt bath or in a furnace with a controlled (neutral) atmosphere.
Pre – heating Step 1	ca. 400		
Pre – heating Step 2	ca. 800		**Recommendations:** Austenitizing temperature: 1070–1130 °C increased toughness 1130–1170 °C: maximum wear resistance A competent and experienced heat treatment company should be contacted for further details relating to the process
Deep cooling	- 70	Air	**Holding time:** 1–2 h – warm up to ambient temperature in still air When austenitizing temperatures of over 1150 °C are involved, refrigeration treatment is recommended after quenching to approx. 80 °C and before tempering, in order to reduce any residual austenite.
Quenching	500 – 530	Hot bath	Quench in hot bath and hold. Followed by slow cooling.
		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	100	200	300	400	500	540	550
Without deep cooling	62	59	57	58	60	59	54
With deep cooling	64	62	61	62	62	58	54

Remarks for tempering

Temper directly after quenching or quenching and refrigeration treatment

Slow heating to tempering temperature directly after hardening

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

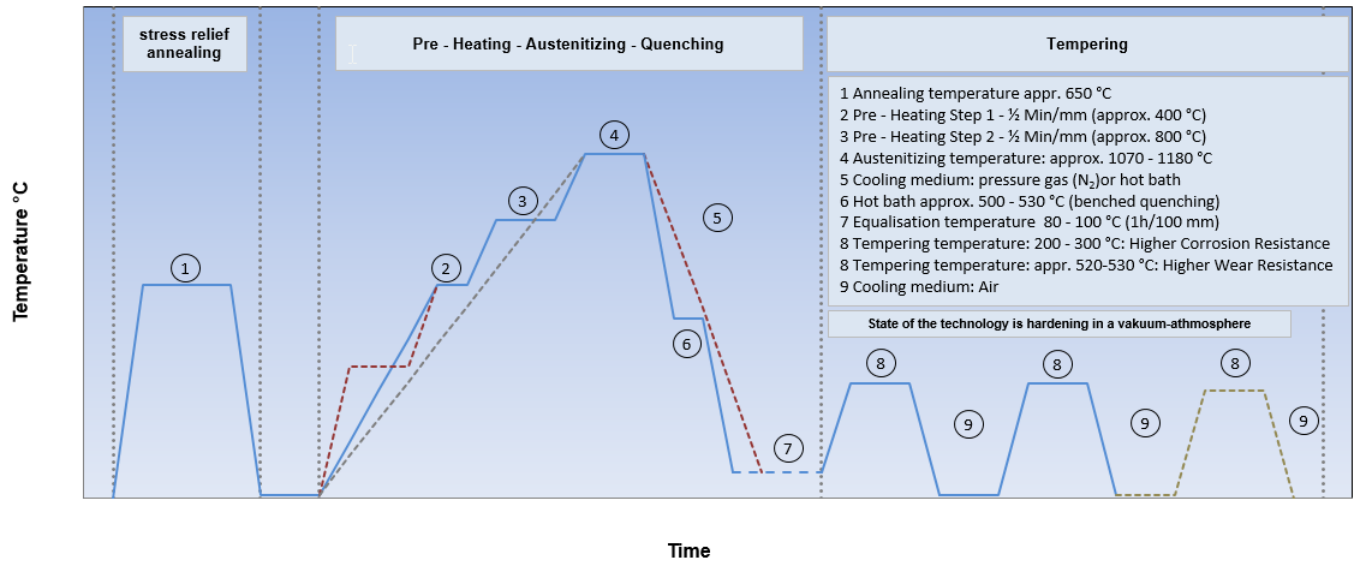
The tempering process is dependent on the given requirements.

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

Tempering temperature:

Corrosion resistance	200 – 300 °C	Hardness: 57–59 HRC
Wear resistance	520 – 530 °C	Hardness: 62–63 HRC

Thermal Cycle Diagram (Heat treatment)



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