OB-PM-K49
COLD-WORKING
TOOL STEEL

OBERSTE-BEULMANN *powderTEC*®: MAXIMUM PERFORMANCE. MAXIMUM PRECISION.

powderTEC®

4TH-GENERATION POWDER-METALLURGICAL STEEL

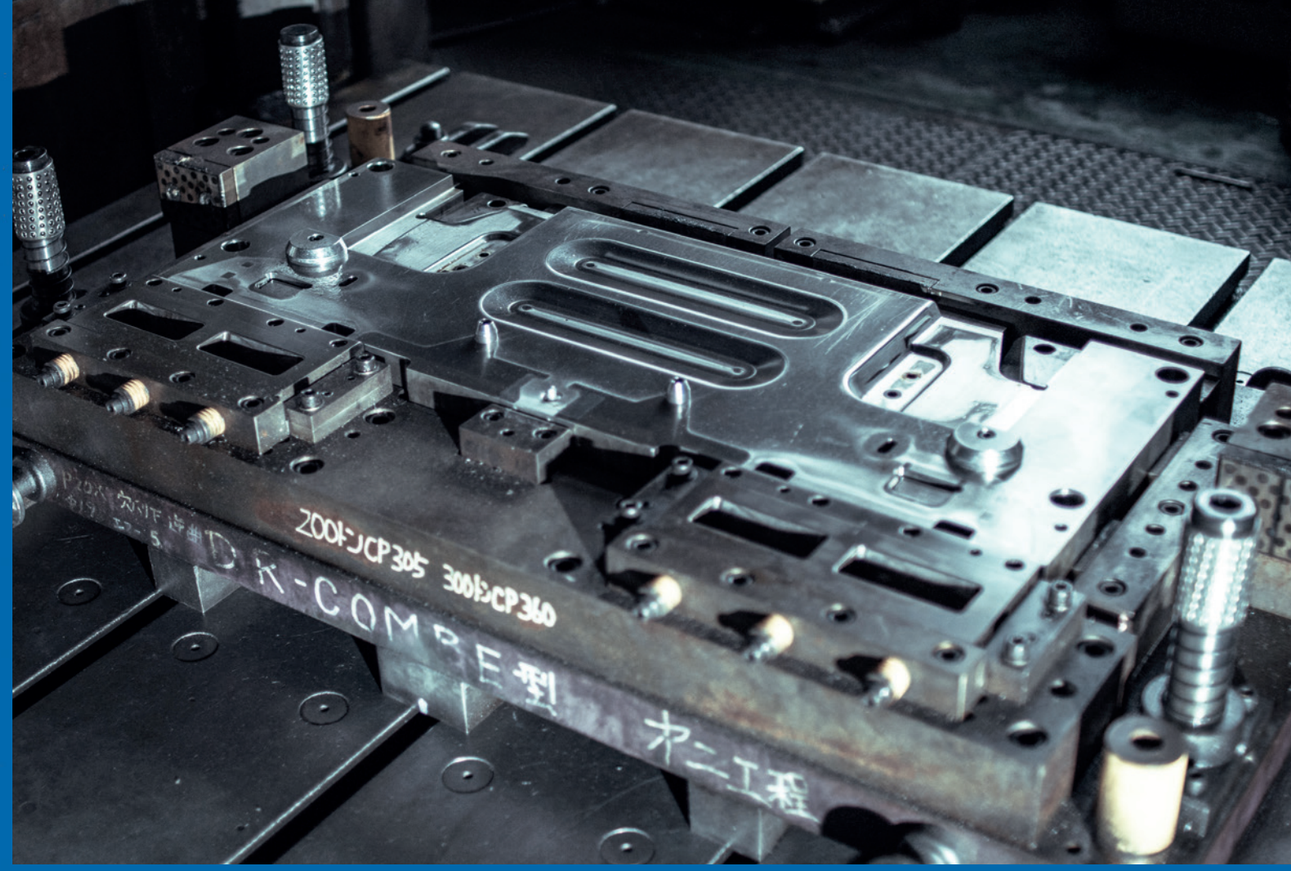
OB-PM-K49 is a cold working tool steel produced by means of a powder metallurgical process which has a very fine, uniform, segregation-free microstructure and carbide distribution. By virtue of its alloy composition, its high carbide content and the interaction of different carbide types it combines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

ADVANTAGES AND BENEFITS

- High working hardness up to 64 HRC
- High toughness
- High compressive strength
- Very good abrasive and adhesive wear resistance
- Excellent hard machinability
- Stable mechanical and technological properties
- Joint heat treatment is possible with common cold working tool steels at hardening temperatures from 1030 to 1080 °C

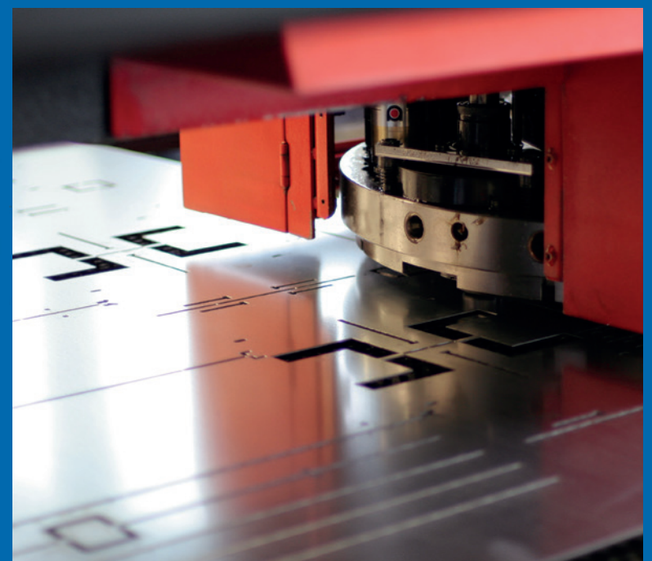
Product merits:
- Optimum machinability
- High flexibility with regard to heat treatment
- No substantial changes to the mechanical and technological properties

Your benefits:
- More flexible tool manufacturing with less risks



Top: Powder-metallurgical steel such as OB-PM-K49 provides for more flexible and reliable production of complex precision punching and blanking tools.

Bottom left: The high wear resistance of OB-PM-K49 enables a longer service life for precision tools without compromising production quality.



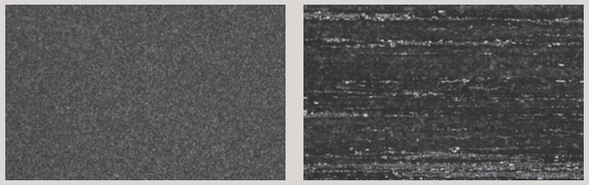
Bottom right: OB-PM-K49 is also ideal for precision stamping dies with a very fine level of detail.

APPLICATIONS

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.

COMPARISON OF MICROSTRUCTURE PROPERTIES



Left: Oberste-Beulmann *powderTEC®*
Right: Conventional steel

COMPOSITION

MATERIAL NO.	ABBREVIATED NAME	CHEMICAL COMPOSITION IN %										ANNEALED HARDNESS	WORKING HARDNESS
		C	Si	Mn	Cr	Mo	W	V	Co	Ni	OTHER	MAX. HB	HRC
OB-PM-K49		1.40	0.60	0.30	6.40	1.50	3.60	3.60			+Nb	280	58–64*

SMELTING	SPEC. WEIGHT	STATE ON DELIVERY	TENSILE STRENGTH (N/MM²)	MICROSTRUCTURE	DEGREE OF PURITY (DIN 50602)
	7.80 g/qm³	Soft-annealed			K1 max. 15

* depending on application

PHYSICAL PROPERTIES

PARAMETERS			TEMPERATURE								
			20 °C	100 °C	200 °C	300 °C	350 °C	400 °C	500 °C	600 °C	700 °C
Coefficient of thermal expansion	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	–	–	–	–	–	–	–	–

HEAT TREATMENT

HEAT TREATMENT	TEMPERATURE (°C)	COOLING	NOTES ON HEAT TREATMENT
Stress-relief annealing	approx. 650	Furnace Air	Stress relief after extensive machining and in case of complex tools. **Holding time:** min. 4 h – slow, controlled furnace cooling.
Hardening	1030–1080		Hardening can be carried out under vacuum, in salt bath or in a furnace with a controlled (neutral) atmosphere..
Pre-heating stage 1 Pre-heating stage 2	approx. 650 approx. 850–900		The hardening temperature corresponds to the temperatures for standard cold working steels.
Quenching	approx. 550	Hot bath Oil Vacuum	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 in still air.

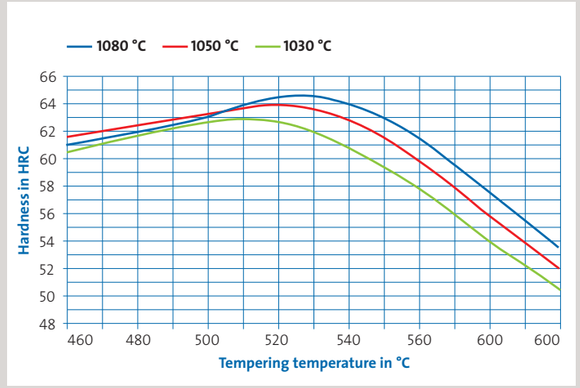
TEMPERING

HARDNESS (HRC) AFTER TEMPERING								
	460 °C	480 °C	500 °C	520 °C	540 °C	560 °C	580 °C	600 °C
1080 °C	61.0	62.0	63.0	64.5	**64.0**	**61.5**	**58.0**	53.5
1050 °C	61.5	62.5	63.5	64.0	**63.0**	**60.0**	**56.0**	52.0
1030 °C	60.5	62.0	63.0	62.5	**61.0**	**58.0**	**54.0**	50.5

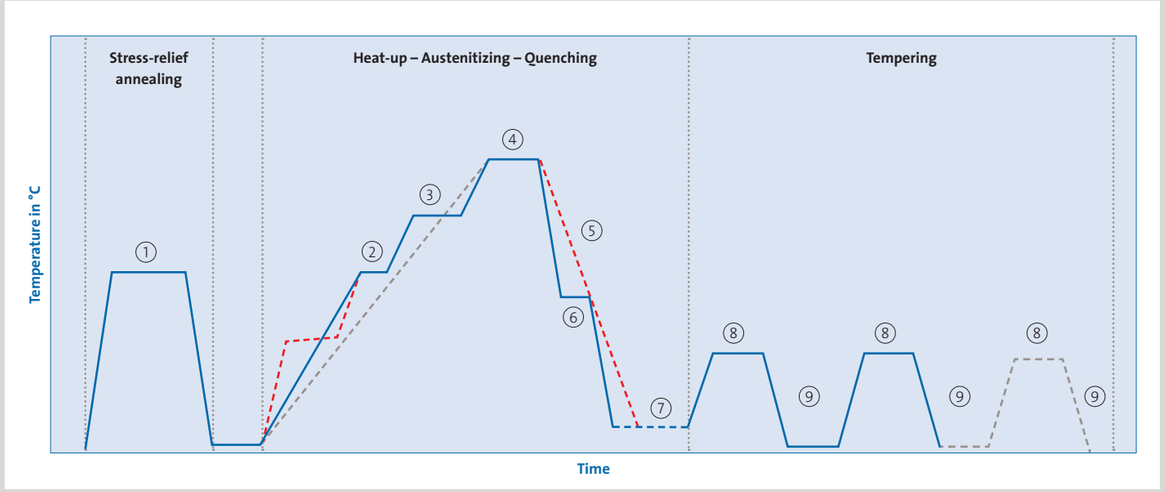
The tempering diagram shows hardness values at different austenitizing and tempering temperatures.

Notes on tempering

- Slow heating to tempering temperature (540–580 recommended) directly after quenching
- Holding time in furnace 1 h per 20 mm of workpiece thickness, but min. 2 h
- Two tempering cycles are necessary, three tempering cycles are recommended



TEMPERATURE TIMELINE (HEAT TREATMENT)

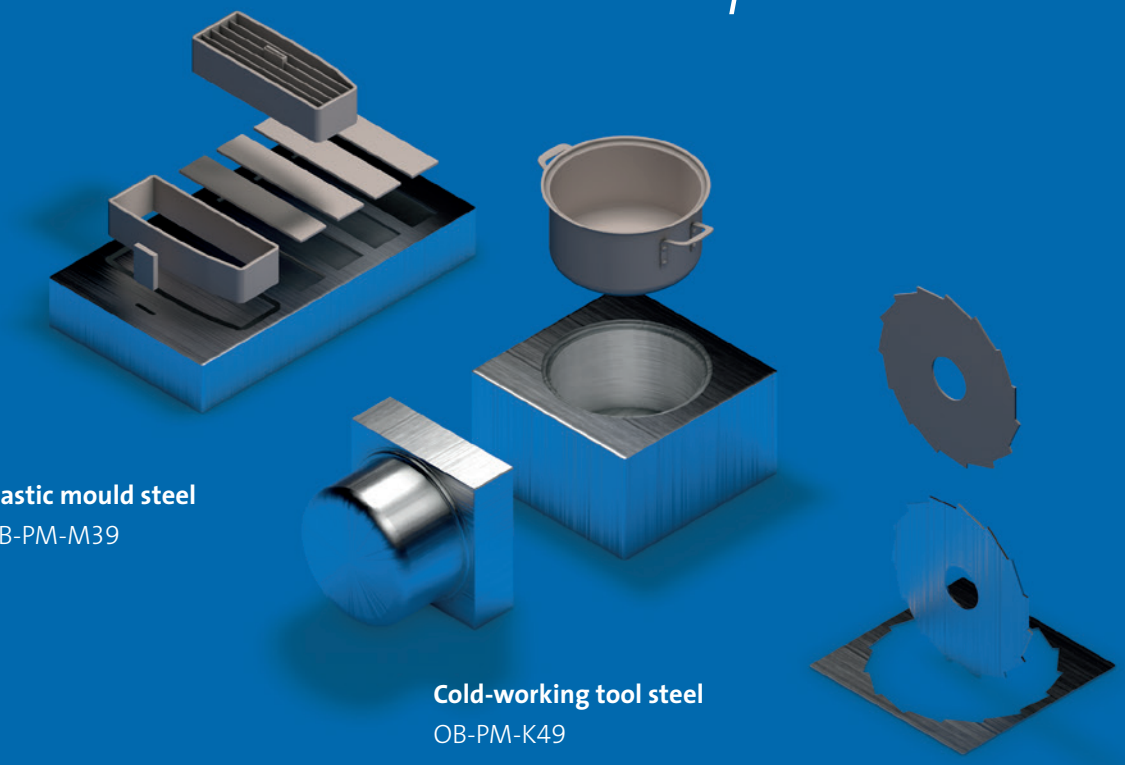


Hardening under vacuum conditions represents the state of the art

1 = Annealing temperature approx. 650 °C
2 = Pre-heating stage 1 – ½ min./mm (approx. 650 °C)
3 = Pre-heating stage 2 – ½ min./mm (approx. 850–900 °C)
4 = Austenitizing temperature approx. 1030–1080 °C
5 = Cooling medium: Pressure gas (N_2)
6 = Hot bath approx. 550 °C (graduated quenching)
7 = Holding temperature 80–100 °C (1 h/100 mm)
8 = Tempering temperature: approx. 540–580 °C (recommendation)
9 = Cooling medium: Air

THE OBERSTE-BEULMANN *powderTEC*® RANGE:

*powder***TEC**®



Plastic mould steel
OB-PM-M39

Cold-working tool steel
OB-PM-K49

High speed steel
OB-PM-S39
OB-PM-S59
OB-PM-S79

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