

Technical data sheet	Grade	PT-K09 powderTEC®	PM-steel with choice
-----------------------------	--------------	--------------------------	-----------------------------

powderTEC® is a registered trademark of W. Oberste-Beulmann GmbH Co. KG

Chemical composition (%)	Material properties
Carbon content	1,80
Silicon	0,90
manganese	0,50
chromium	5,30
Molybdenum	1,30
Vanadium	9,00
Tungsten	-
cobalt	-
other	-

PT-K09 powderTEC® is a high-performance steel produced by powder metallurgy with a very fine, uniform, segregation-free microstructure and carbide distribution.

PT-K09 powderTEC® is a modified variant of the high-performance steel K10 powderTEC® and is a supplement for highly stressed cold and hot working tools with requirements for maximum wear resistance combined with high toughness and thermal fatigue strength.

Thanks to its optimised alloy concept - based on a tough hot-work tool steel - PT-K09 powderTEC® can be used in applications where high-alloy HSS and tool steels succumb prematurely due to insufficient toughness or where hot-work tool steels (e.g. 1.2343) have insufficient wear resistance.

Intended use	Production programme														
<ul style="list-style-type: none"> Cutting and punching tools for thicker sheets Fine blanking tools for sheet metal (thicker than 8 mm) Cold, hot extrusion and extrusion press inserts Embossing tools Sintering presses Shearing and industrial knives Plasticising units 	<table border="1"> <thead> <tr> <th style="background-color: #0056b3; color: white;">Delivery form</th> <th style="background-color: #0056b3; color: white;">Dimension (mm)</th> </tr> </thead> <tbody> <tr> <td>Round</td> <td>3 - 350 mm</td> </tr> <tr> <td>Flat</td> <td>5 x 50 to 205 x 505 mm</td> </tr> <tr> <td>Square</td> <td>10 - 300 mm</td> </tr> <tr> <td>wire</td> <td>on request</td> </tr> <tr> <td>Sheet metal</td> <td>on request</td> </tr> <tr> <td>discs</td> <td>on request</td> </tr> </tbody> </table>	Delivery form	Dimension (mm)	Round	3 - 350 mm	Flat	5 x 50 to 205 x 505 mm	Square	10 - 300 mm	wire	on request	Sheet metal	on request	discs	on request
Delivery form	Dimension (mm)														
Round	3 - 350 mm														
Flat	5 x 50 to 205 x 505 mm														
Square	10 - 300 mm														
wire	on request														
Sheet metal	on request														
discs	on request														

Characteristics	Relative toughness (guide values)
Melting	Powder metallurgy
Delivery condition	soft annealed
Hardness (HB)	approx. 220 - 250
Tensile strength (N/mm²)	-
Working hardness (HRC)	49 - 58
Microstructure	-
Degree of purity (DIN 50602)	K1 max. 15

	HRC	0	2	4	6	8	10
1.2379	60						
PT-K10	60						
PT-SM4	62						
PT-K09	56						
PT-K03	60						

Physical properties	Relative wear resistance (guide values)								
Modulus of elasticity E (GPa)	221								
Specific weight (g/cm³)	7,40								
Thermal conductivity (W / m * K)									
Coefficient of thermal expansion over a temperature range of 20 - ... °C (mm / mm °C)	<table border="1"> <thead> <tr> <th></th> <th>200°C</th> <th>450°C</th> <th>650°C</th> </tr> </thead> <tbody> <tr> <td></td> <td>11,18</td> <td>11,61</td> <td>11,86</td> </tr> </tbody> </table>		200°C	450°C	650°C		11,18	11,61	11,86
	200°C	450°C	650°C						
	11,18	11,61	11,86						

	HRC	0	2	4	6	8	10
1.2379	60						
PT-K10	60						
PT-K09	56						
PT-SM4	62						

Comparison of microstructural properties			
Carbide distribution (V = 100:1)		Segregations (V = 50:1)	
Conventional	OB powderTEC®	Conventional	OB powderTEC®



Heat treatment

Soft annealing

Heating	uniformly to 870 - 900 °C
Holding time	2 h
Cooling down	Oven
Cooling rate	approx. 15 °C / h to 550 °C
Final cooling	still air

Low stress annealing

Heating	to 600 - 700 °C
Cooling down	After complete heating through Furnace - to approx. 500 °C
Final cooling	still air

Hardening

Preheating stage 1	450 - 500 °C
Preheating stage 2	850 - 900 °C
Austenitising temperature	1070 - 1180 °C
1070 °C - approx. 30 min	Maximum toughness
1180 °C - approx. 10 min	highest wear resistance
Max. Austenitising temperature	1180 °C

The holding times must be adjusted accordingly for large or very thin-walled tool cross-sections

Cooling

Cooling medium	Air, hot bath (at 540 °C), interrupted Oil quenching
Cooling Vacuum	min. 5 bar overpressure
Cooling salt bath / oil	Achieving maximum hardness
Recommendation	Best toughness properties through hot bath cooling

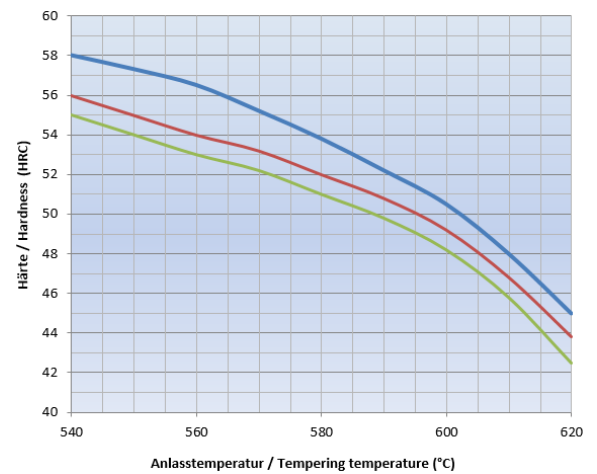
Tempering

Time	Slow heating to tempering temperature immediately after hardening. Temper immediately after the tool has cooled to below 40 °C
Tempering temperature	540 - 620 °C
Dwell time in the oven	1 hour / 20 mm workpiece thickness, min. 2 h
Tempering cycles	at least 3 cycles. Tools must cool down to room temperature between tempering cycles.

Surface treatment

Surface coating using the CVD or PVD process is possible. The use of all common nitriding processes is also possible at any time.

Tempering diagram



Hardness (+/- 1 HRC) Austenitising temperature

Tempering temperature	Austenitising temperature		
	1070 °C	1120 °C	1180 °C
Initial hardness			
540 °C	54 HRc	56 HRc	58 HRc
560 °C	53 HRc	54 HRc	
590 °C	49 HRc	50 HRc	
620 °C	43 HRc	45 HRc	

Service hardness (depending on the heat treatment parameters)

Heat treatment instructions

1st preheating stage	450 - 500 °C
2nd preheating stage	850 - 900 °C
Hardening	see table
Tempering	540 °C 3 x 2 hours each
Service hardness	54 - 58 HRc