

Technical data sheet	Grade	PT-S60 powderTEC®	PM-steel with choice
powderTEC® is a registered trademark of W. Oberste-Beulmann GmbH Co. KG			

Chemical composition (%)	Material properties
Carbon content	<p>PT-S60 powderTEC® is a powder metallurgically produced, highly Co-, V-, Mo- and W-alloyed high-performance high-speed steel with a very fine, uniform, segregation-free microstructure and carbide distribution.</p> <p>PT-S60 powderTEC® has very good wear and heat resistance as well as maximum compressive strength.</p> <p>PT-S60 powderTEC® can be nitrided very well and is also very suitable for PVD and CVD coating thanks to its homogeneous microstructure.</p>
Silicon	
manganese	
chromium	
Molybdenum	
Vanadium	
Tungsten	
Cobalt	
Other	

Intended use	Production programme														
<ul style="list-style-type: none"> Punching, cutting and forming tools Cold working applications Tools for cold forming Powder presses Taps and twist drills Broaching tools milling cutters Gear cutting tools 	<table border="1"> <thead> <tr> <th style="background-color: #d9e1f2;">Delivery form</th> <th style="background-color: #d9e1f2;">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
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Physical properties	Physical properties	20°C	400°C	600°C
Melting	Powder metallurgy			
Delivery condition	soft annealed			
Hardness (HB)	max. 340			
Tensile strength (N/mm²)	-			
Working hardness (HRC)	59 - 71			
Microstructure	-			
Degree of purity (DIN 50602)	K1 max. 15			
	Specific weight (g/cm³)	7,9	7,9	7,8
	Modulus of elasticity E (GPa)	250	222	200
	Thermal conductivity (W / m * K)	24	28	27
	Coefficient of thermal expansion (10 ⁻⁶ m/m.K)		10,3	11,1

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





Heat treatment	
Soft annealing	
Heating	uniformly to 850 - 900 °C
Holding time	3 h
Cooling down	Oven
Cooling rate	approx. 10 °C / h to 700 °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
Preheating stage 3 **)	1050 - 1080 C°
**) depending on the mould geometry and the hardening temperature (> 1150 °C)	
Hardening temperature	1100 - 1180 °C

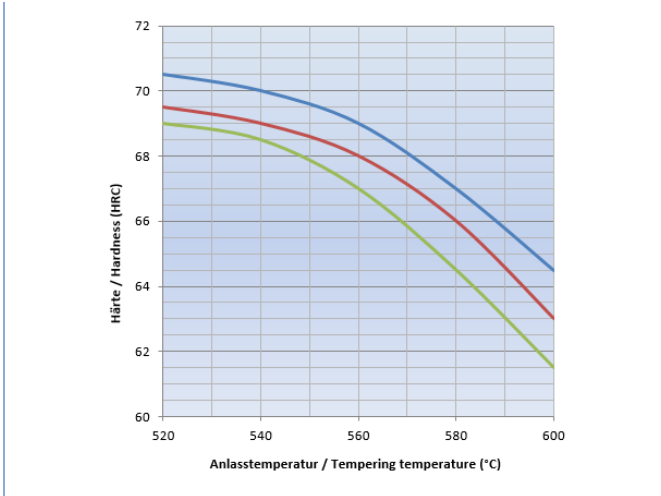
The holding times must be adjusted accordingly for large or very thin-walled tool cross-sections

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
Final cooling	still air - < 50 °C
Recommendation	Best toughness properties through Hot bath cooling

Tempering	
Time	Slow heating to tempering temperature immediately after hardening.
Tempering temperature	520 - 600 °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)	Hardening temperature		
	1100 °C	1150 °C	1180 °C
Tempering temperature			
520 °C	69	70	71
540 °C	68	69	70
560 °C	67	68	69
580 °C	65	66	67
600 °C	62	63	65

Service hardness (depending on the heat treatment parameters)
For cold work applications, tempering should always be carried out at 560° C, regardless of the austenitising temperature used.

Heat treatment instructions	
1st preheating stage	450 - 500 °C
2nd preheating stage	850 - 900 °C
3rd preheating stage **)	1050 - 1080 C°
Hardening	see table
Tempering	560 °C - 3 x 2 hours each
Service hardness	67 - 69 HRc
Remark	**) at hardening temperature > 1150 °C