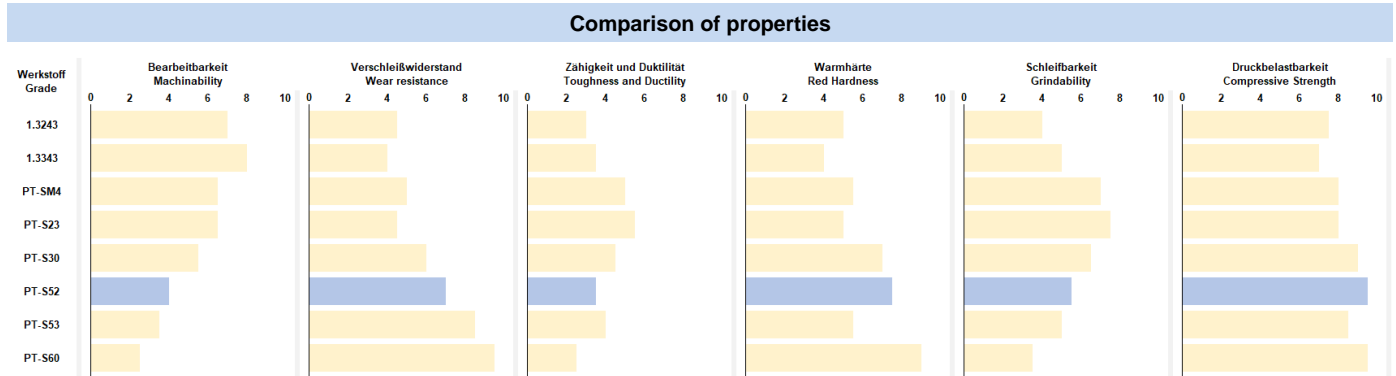
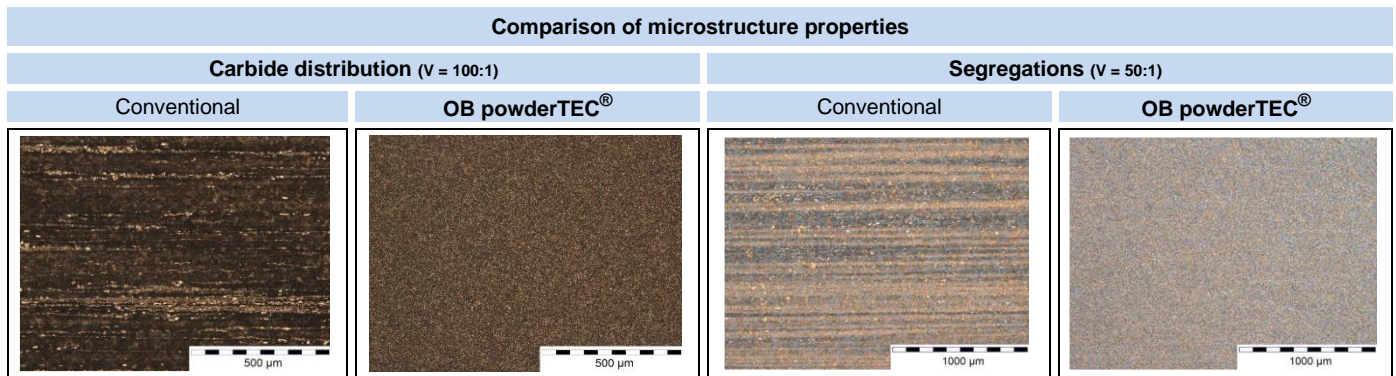


Technical data sheet	Grade	PT-S52 powderTEC®	
	powderTEC® is a registered trademark of W. Oberste-Beulmann GmbH Co. KG		

Chemical composition (%)	Material properties
Carbon content	<p>PT-S52 powderTEC® is a powder metallurgically produced, high W and Co-alloyed highperformance high-speed steel with a very fine, uniform, segregation-free microstructure and carbide distribution.</p> <p>PT-S52 powderTEC® has very good wear and heat resistance as well as very good compressive strength.</p> <p>PT-S52 powderTEC® can be nitrided very well and is also very suitable for PVD and CVD coating due to its homogeneous microstructure</p>
Silicon	
manganese	
chromium	
Molybdenum	
Vanadium	
Tungsten	
Cobalt	
Others	

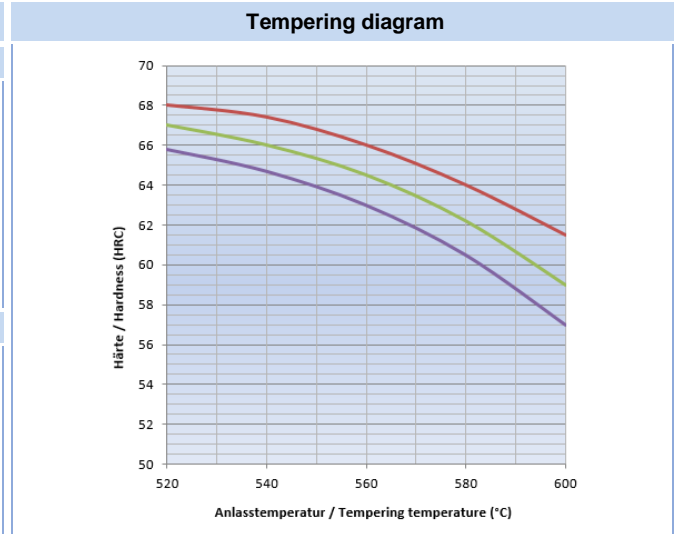
Intended use	Manufacturing program														
<ul style="list-style-type: none"> <li>Punching, cutting and forming tools</li> <li>Highly stressed hobs, cutting punches, dies</li> <li>twist drills</li> <li>taps</li> <li>milling cutters</li> <li>Broaching tools</li> <li>Tools for cold forming</li> </ul>	<table border="1"> <thead> <tr> <th>Delivery form</th> <th>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>Round blanks</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	Round blanks	on request
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Round blanks	on request														

Physical properties	Physical properties	20°C	400 C°	600°C	
Melting	Powder metallurgy				
Delivery condition	soft annealed				
Hardness (HB)	max. 300				
Tensile strength (N/mm²)	-				
Working hardness (HRC)	57 - 69				
Structure	-				
Degree of purity (DIN 50602)	K1 max. 15				
		Specific weight (g/cm³)	8,20	8,1	8,1
		Modulus of elasticity E (GPa)	245	218	196
		Thermal conductivity (W / m * K)	24	28	27
		Coefficient of thermal expansion (10 <sup>-6</sup> /m.K)		11,2	11,7





Heat treatment	
<b>Soft annealing</b>	
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
<b>Low stress annealing</b>	
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 tool geometry and the hardening temperature (> 1150 °C)
Hardening temperature	1100 – 1200 °C

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

Hardness (+/- 1 HRc)	Hardening temperature		
	1100 °C	1150 °C	1200 °C
Tempering temperature			
520 °C	66	67	68
540 °C	65	66	67
560 °C	63	64	66
580 °C	61	62	64
600 °C	57	59	61

Service hardness (depending on the heat treatment parameters)

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

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	63 - 67 HRc
Remark	**): at hardening temperature > 1150 °C

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.