THE *WORLD* OF SPECIAL STEEL

Oberste-Beulmann
Edelstähle-Special Steels

Technical data sheet

Grade PT-S53 powderTEC®

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

powderTEC® PM-steel with choice

Chemical composition (%)

Carbon content	2,48
Silicon	0,50
manganese	0,40
chromium	4,10
Molybdenum	3,10
Vanadium	7,90
Tungsten	4,00
Cobalt	-
other	-

Material properties

PT-S53 powderTEC® is a powder metallurgically produced, high vanadium-alloyed high-speed steel with a very fine, uniform, segregation-free microstructure and carbide distribution.

PT-S53 powderTEC® has very good wear resistance and high compressive strength.

PT-S53 powderTEC® is easy to nitride and, thanks to its homogeneous microstructure, is also very suitable for PVD and CVD coating.

Intended use

- Tools for cold work
- Fine blanking tools
- punches
- Paper knives
- Textile knives
- Impact extrusion tools
- Woodworking tools
- Rollers

Manufacturing program

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

Physical properties

Melting	Powder metallurgy
Delivery condition	soft annealed
Hardness (HB)	max. 300
Tensile strength (N/mm²)	-
Working hardness (HRc)	54 - 66
Microstructure	-
Degree of purity (DIN 50602)	K1 max. 15

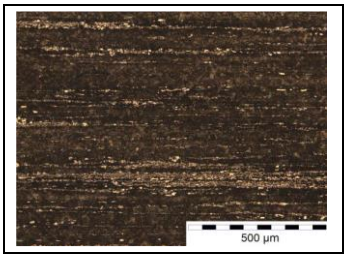
Physical properties

	20°C	400°C	600°C
Specific weight (g/cm³)	7,7	7,6	7,5
Modulus of elasticity E (GPa)	250	220	200
Thermal conductivity (W / m * K)	24	28	27
Coefficient of thermal expansion (10^{-6}m/m.K)		12,1	12,7

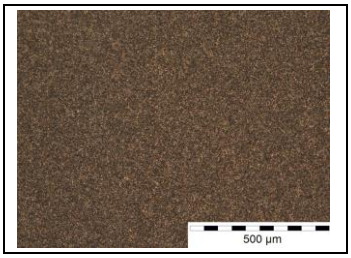
Comparison of microstructure properties

Carbide distribution (V = 100:1)

Conventional

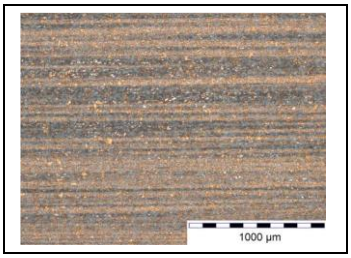


OB powderTEC®



Segregations (V = 50:1)

Conventional



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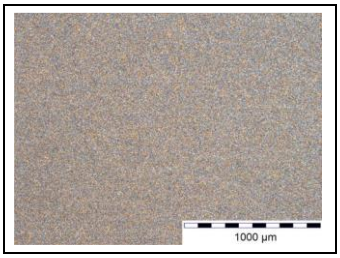
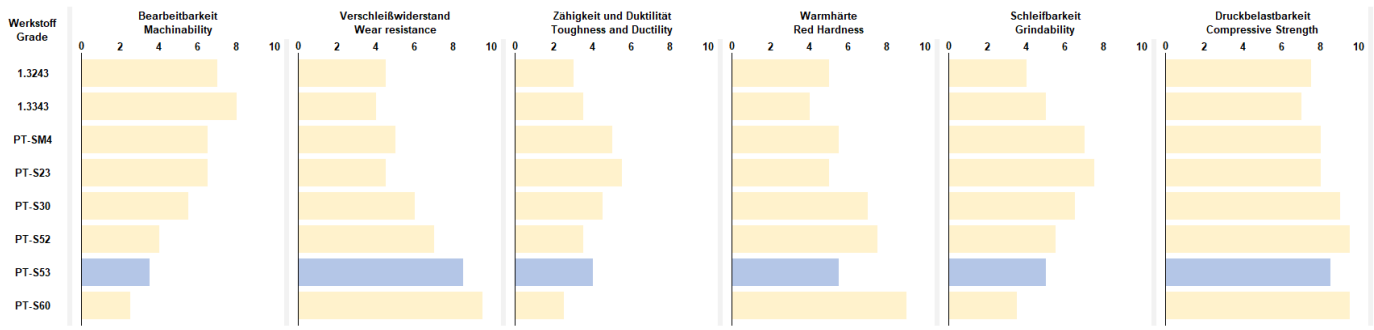


Comparison of properties



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Heat treatment

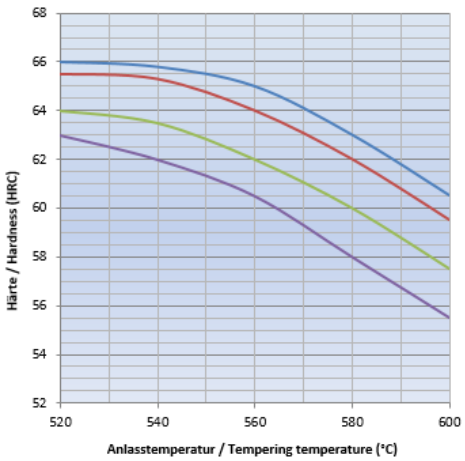
Soft annealing

Heating	uniformly to 850 - 900 °C
Holding time	2 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

Tempering diagram



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	1050 - 1180 °C

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

Hardness (+ /- 1 HRc)	Hardening temperature			
Tempering temperature	1050 °C	1100 °C	1150 °C	1180 °C
520 °C	63	64	65	66
540 °C	62	63	65	65
560 °C	61	62	64	65
580 °C	58	60	62	63
600 °C	55	57	59	61

Service hardness (depending on the heat treatment parameters)

Cooling down

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	59 - 65 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.

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