THE *WORLD* OF SPECIAL STEEL

Oberste-Beulmann
Edelstähle-Special Steels

Technical data sheet

Grade PT-K10 powderTEC®

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

powderTEC® PM-steel with choice

Chemical composition (%)

Carbon content	2,45
Silicon	0,90
manganese	0,50
chromium	5,20
Molybdenum	1,30
Vanadium	9,80
Tungsten	-
cobalt	-
other	-

Material properties

PT-K10 powderTEC® is a powder metallurgically produced high-performance steel for cold work with a very fine, uniform, segregation-free microstructure and carbide distribution.

An optimized alloying concept (high proportion of vanadium carbides) results in excellent wear resistance combined with good toughness, high hardness and good cutting edge stability.

PT-K10 powderTEC® is an excellent replacement for hard materials or other highly wear-resistant materials in cold work applications where tool breakage and chipping are a problem or where production is to be made more cost-effective.

Intended use

- Cutting and punching tools
- Fine cutting tools
- Cutting tools for electric sheets
- Hole punches
- Knives for cutting, shearing and deburring
- Paper and foil cutting knives
- Cold extrusion tools
- Tools for powder pressing
- Wear parts in plastics processing

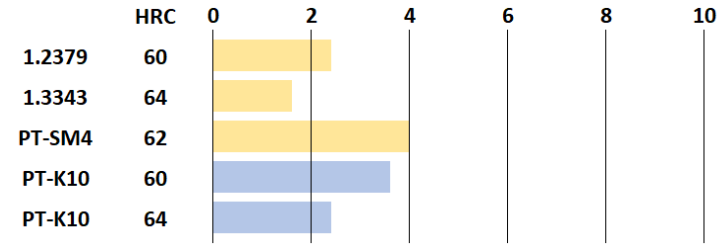
Manufacturing program

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

Material properties

Melting	Powder metallurgy
Delivery condition	soft annealed
Hardness (HB)	approx. 260
Tensile strength (N/mm²)	-
Working hardness (HRc)	56 - 65
Microstructure	-
Degree of purity (DIN 50602)	K1 max. 15

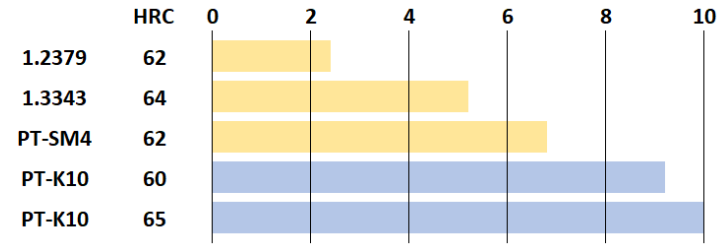
Relative toughness (guide values)



Physical properties

Modulus of elasticity E (GPa)	221
Specific weight (g/cm³)	7,41
Thermal conductivity (W / m * K)	
Coefficient of thermal expansion over a temperature range of 20 - ... °C (mm / mm °C)	600°C: 11,95

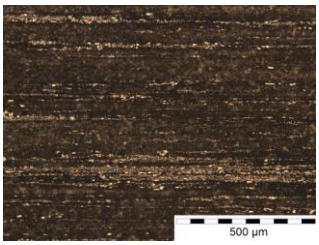
Relative wear resistance (guide values)



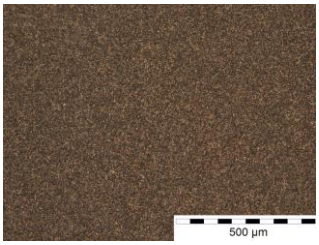
Comparison of microstructural properties

Carbide distribution (V = 100:1)

Conventional

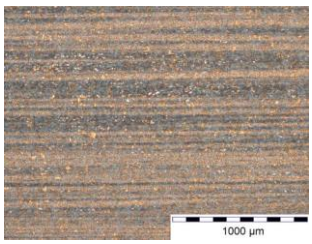


OB powderTEC®



Segregations (V = 50:1)

Conventional



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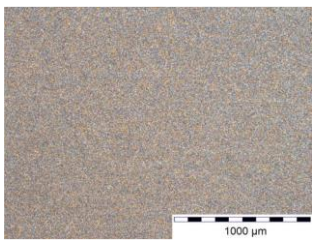

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Heat treatment

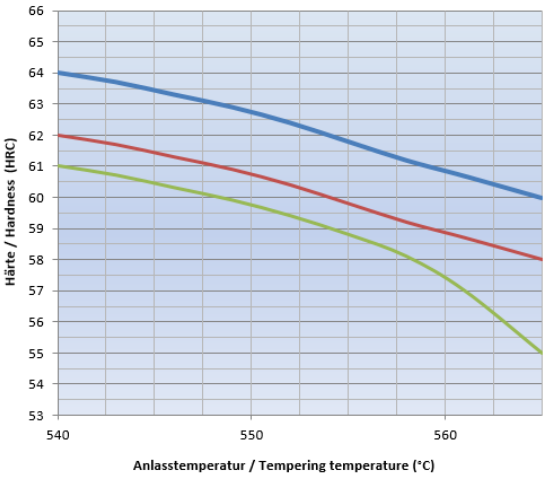
Soft annealing

Heating	uniformly to 870 - 900 °C
Holding time	2 h
Cooling down	Oven
Cooling rate	approx. 10 °C / h to 540 °C
Final cooling	Calm air

Low-voltage 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
Austenitizing temperature	1070 - 1180 °C
1070 °C - approx. 30 min	Maximum toughness
1180 °C - approx. 10 min	highest wear resistance
Max. Austenitizing temperature	1180 °C

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

Hardness (+/- 1 HRc)	Austenitizing temperature		
Tempering temperature	1070 °C	1120 °C	1180 °C
Initial hardness			
540 °C	58 HRc	61 HRc	63 HRc
550 °C	57 HRc	60 HRc	62 HRc
565 °C	56 HRc	59 HRc	61 HRc
	Usual tempering temperature		

Service hardness (depending on the heat treatment parameters)

Cooling

Cooling medium	Air, hot bath (at 550 °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

Heat treatment instructions

1st preheating stage	450 - 500 °C
2nd preheating stage	870 - 900 °C
Hardening	see table
Tempering	540 °C
	3 x 2 hours each
Service hardness	58 - 63 HRc

Tempering

Time	Slow heating to tempering temperature immediately after hardening.
	Temper immediately after the tool has cooled to below 40 °C
Tempering temperature	540 - 565 °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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