

Technical data sheet	Grade	PT-M39 powderTEC®	
powderTEC® is a registered trademark of W. Oberste-Beulmann GmbH Co. KG			

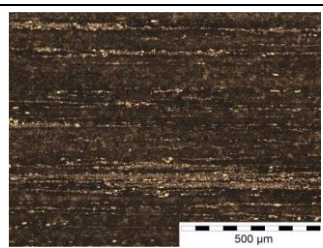
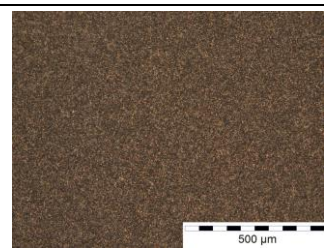
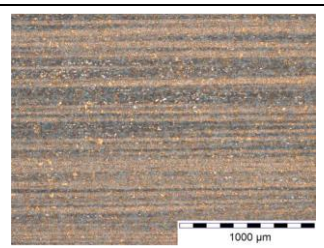
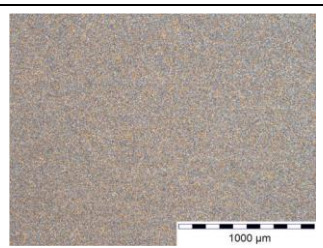
Chemical composition (%)	Material properties
Carbon	1,90
Silicon	0,70
Manganese	0,30
Chromium	20,00
Molybdenum	1,00
Vanadium	4,00
Tungsten	0,60
Cobalt	-
Other	-

PT-M39 powderTEC® is a powder metallurgically produced, martensitic tool steel. It features a very fine, uniform, and segregation-free microstructure and carbide distribution. Its well-balanced alloy composition combines wear resistance, toughness, and corrosion resistance to deliver optimal performance. The exceptional wear resistance is achieved through a high proportion of hard vanadium carbides, while the excellent corrosion resistance results from a chromium-rich matrix. Thanks to its high purity, PT-M39 powderTEC® offers excellent polishability and minimal dimensional changes.

Intended use	Manufacturing program														
<ul style="list-style-type: none"> Granulator knives Wear parts for food and chemical processing Injection and extrusion screws Plastic dies, cylinder liners, screw tips, and mold cavities – especially for plastic resins containing abrasive fillers. 	<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 bis 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 bis 205 x 505 mm	Square	10 – 300 mm	Wire	on request	Sheet metal	on request	Round blanks	on request
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Material properties	Physical properties
Melting	Powder metallurgy
Delivery condition	soft annealed
Hardness (HB)	max. 250
Tensile strength (N/mm²)	-
Working hardness (HRC)	58 – 64
Microstructure	-
Degree of purity (DIN 50602)	K1 max. 15

	20°C	100°C	300°C	500°C
Specific weight (g/cm³)	7,6		7,47	7,41
Modulus of elasticity E (GPa)	227	223	210	193
Thermal conductivity (W / m * K)	16,5	18,0	20,4	22,7
Coefficient of thermal expansion (10 ⁻⁶ m/m.K)		10,38	10,96	11,56

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

Heat treatment			
Soft annealing		Low-voltage annealing	
Heating	Uniformly to approx. 1050 °C	Heating	650 – 700 °C
Holding time	2h	Holding time	At least 4 hours after complete heat penetration.
Cooling down	Oven	Cooling down	Oven – to approx. 300 °C
Cooling rate	approx. 10 °C h to 540 °C		
Final cooling	Calm air	Final cooling	Calm 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)

Austenitizing temperature	1070 – 1170 °C
1070 - 1130 °C	Maximum toughness
1130 - 1170 °C	Highest wear resistance

Hardening temperature	1050 – 1170 °C
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The holding times must be adjusted accordingly for large or very thin-walled tool cross-sections

Cooling

Cooling medium	Salt bath-warm bath (500 – 530 °C), vacuum, interrupted oil quenching
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Cooling vacuum	min. 5 bar overpressure
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Cooling salt bath / oil	Calm air at room temperature
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Recommendation

For austenitizing temperatures above 1150 °C, a cryogenic treatment (-70 °C) is recommended after quenching to approximately 80 °C and before tempering, in order to reduce retained austenite.

Tempering

Time	Slow heating to tempering temperature immediately after hardening.
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Tempering temperature	540 – 560 °C
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Dwell time in the oven	1 Stunde / 20 mm work piece thickness, min. 2 h
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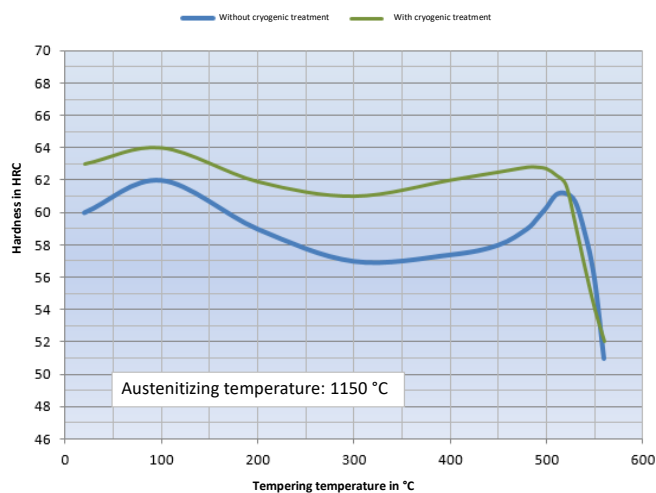
Tempering cycles	min. 3 cycles
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Tools must cool down to room temperature between tempering cycles.

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 1150 °C	
	With cryogenic treatment	Without cryogenic treatment
Tempering temperature		
100 °C	64	62
200 °C	62	59
300 °C	61	57
400 °C	62	58
500 °C	62	60
540 °C	58	59
550 °C	54	54

Service hardness (depending on the heat treatment parameters)

Heat treatment instructions

1st preheating stage	450 – 500 °C
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2nd preheating stage	850 – 900 °C
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3rd preheating stage **)	1050 – 1080 °C
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Hardening	see table
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Tempering	Depending on the requirements – 3 times for 2 hours each.
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Service hardness	57 - 63 HRc
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Wear Resistance	520 – 530 °C	Hardness: 62 – 63 HRC
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Corrosion resistance:	200 – 300 °C	Hardness: 57 – 59 HRC
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Note	**) with a tempering temperature above 1150 °C	
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