Z-Wear5 PM^{cold}, PM Tooling Steel
Data Sheet – Tooling Alloys

Zapp is certified to ISO 9001

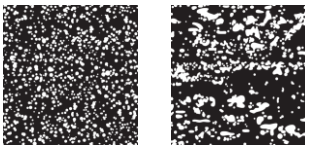
Key features of Zapp's powder metallurgical tooling steel Z-Wear5 PM^{cold}

- Produced using powder metallurgical processes
- Excellent ratio between toughness and wear resistance
- Pressure-resistant and stable
- Safe and easy heat treatment
- Upgrade to Z-Wear PM (US 2000 MC)
- Case hardness up to 64 HRC possible

Typical areas of application

- Cutting, punching, and fine blanking tools
- Pressing and forming tools
- Thread rolling and roll tools
- Plastics industry

Powder metallurgical and conventional microstructure



The homogeneous microstructure which is obtained by using powder metallurgical processes vs. the coarse carbide structure of a conventionally produced steel

Physical properties

Modulus of elasticity E [GPa]	220
Density [kg/dm³]	7.8
Thermal expansion coefficient [mm/(mm/K)] in a temperature range up to 20 – 200 °C	11.3 x 10^{-6}
Thermal conductivity [W/(m*K)]	24.2

Delivery condition

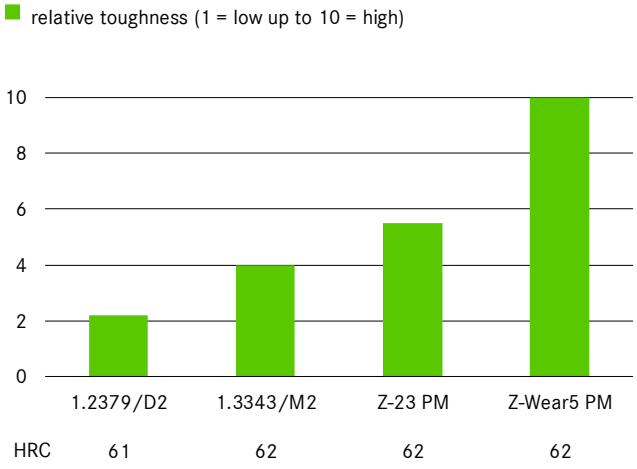
As-delivered condition	Soft-annealed, approx. 300 HB
Product form	Round bars, flat bars, sheets
Surface finish	Mechanically machined

Typical chemical composition (weight %)

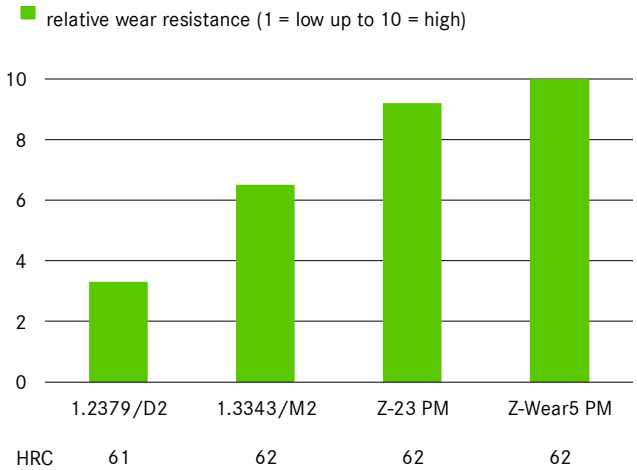
C	Cr	Mo	W	V	Other
1.45	4.5	2.3	+	3.9	+

Qualitative comparison of the most important properties

Toughness



Wear resistance



Heat treatment

Soft annealing

- In neutral atmosphere at ~ 870 °C and ~ 4 h exposure time (after through-heating)
- Followed by furnace cooling (optimum cooling rate max. 10 °C/h up to 540 °C)
- Soft annealing hardness ~ 300 HB

Stress-relief annealing

~ 650 °C/ ~ 2 h exposure time (after through-heating) followed by furnace cooling

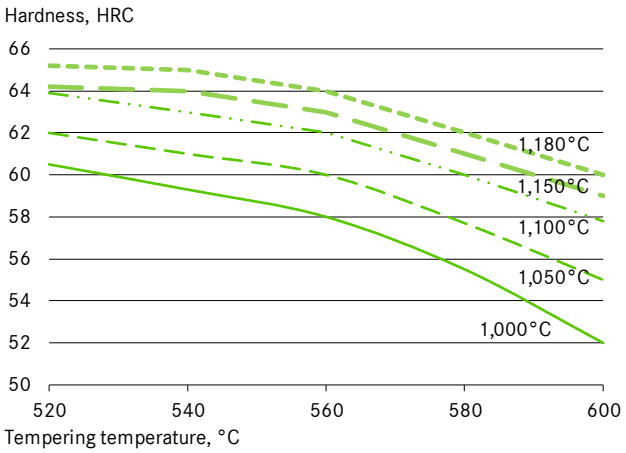
Surface treatments

Tempering temperatures of ≥ 560 °C provide the prerequisite for subsequent nitriding or PVD coating.

You can find more materials at:
www.zapp.com/en-uk/materials/powder-metallurgical-tool-steel

Zapp Precision Metals GmbH ensures professional execution of all heat treatment steps as well as their preparation and post-processing (e.g., charging, hardness testing, straightening processes, etc.) – always with the aim of obtaining the optimum component properties!
We are happy to assist you with constructive advice!

Tempering diagram



Vacuum heat treatment instructions

Pre-heating	professional heating, 3 pre-heating stages recommended
Vacuum heating	from 1,000 to 1,180 °C, see table
Exposure time	from 5 to 30 minutes after through-heating, see table
Cooling	In vacuum a quenching pressure of at least 6 bar is required
Tempering	at least 3 times for 2 hours each according to table, fourth tempering recommended, allow to equilibrate to room temperature in between

Desired hardness HRC ± 1	Hardness temperature °C	Exposure time at hardness temperature minutes	Tempering °C
58	1,000	30	560
60	1,050	30	560
61	1,080	30	560
62	1,100	15	560
63	1,150	10	560
64	1,180	5	560

The maximum specified hardening temperature of 1180 °C should not be exceeded.
Hardening with further heat treatment processes is possible, but should be discussed in advance!

TOOLING ALLOYS

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