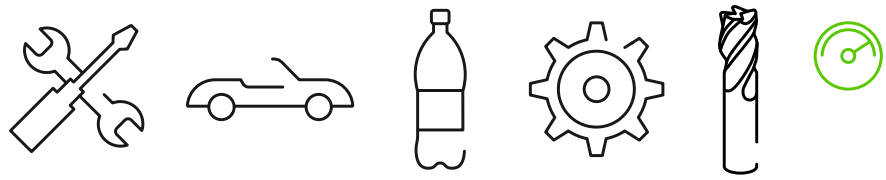
Z-M48 PM^{speed}, PM High Speed Steel

Data Sheet - Tooling Alloys

Zapp is certified to ISO 9001



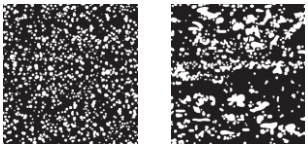
Key Features of Zapp's Powder Metallurgical High Speed Steel Z-M48 PM^{speed}

- PM 10-5-3-8
- Produced using powder metallurgical processes
- Excellent resistance to pressure and wear
- increased toughness and edge stability compared to comparable Co - alloyed PM high speed steels
- High thermal stability
- Case hardness up to 70 HRC possible

Typical Areas of Application

- Cutting, punching, and fine blanking tools
- Thin, high-strength strip steel cutting tools
- Cold forging
- Pressing and forming tools
- Bulk metal forming tools
- Warm forming tools
- Machining tools

Powder metallurgical vs. conventional microstructure



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

Physical properties

Modulus of elasticity E [GPa]	214
Density [kg/dm³]	8.26
Thermal expansion coefficient [mm/(mm/K)] in a temperature range up to	
20 – 100 °C	10.7 x 10^{-6}
20 – 200 °C	10.8 x 10^{-6}
20 – 300 °C	11.1 x 10^{-6}
20 – 425 °C	11.4 x 10^{-6}
20 – 540 °C	11.7 x 10^{-6}
Thermal conductivity [W/(m*K)]	24.2

Delivery condition

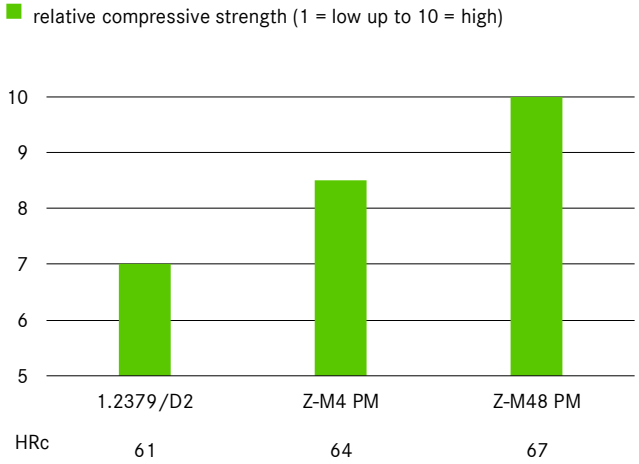
As-delivered condition	Soft-annealed, approx. 310 HB
Product form	Round bars, flat bars
Surface finish	Mechanically machined

Typical chemical composition (weight %)

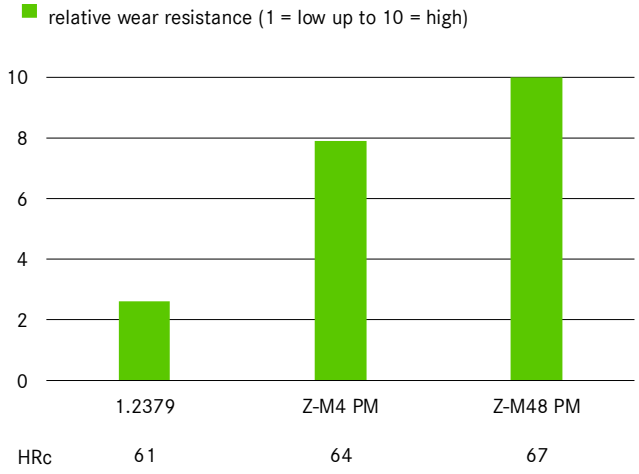
C	Cr	Mo	W	V	Co
1.5	3.8	5.3	9.7	3.1	8.5

Qualitative comparison of the most important properties

Compressive strength



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 ~ 310 HB

Stress Relief Annealing

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

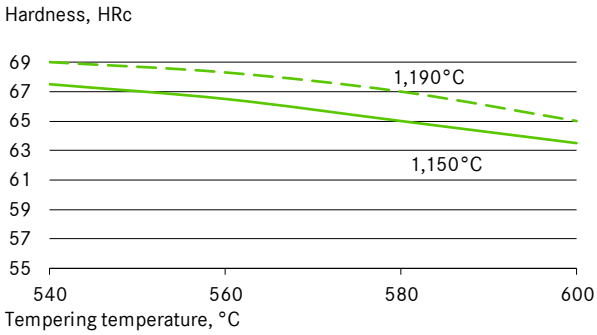
Surface Treatments

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 1,150 to 1,200 °C, see table
Exposure time	from 5 to 10 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	Hardening temperature °C	Exposure time at hardening temperature minutes	Tempering °C
67	1,150*	10	550
66	1,150*	10	560
68	1,170	5	540
67	1,170	5	560
69	1,190	5	540
68	1,190	5	565
70	1,200	3	540

* optimum combination of toughness/wear resistance

The maximum specified hardening temperature of 1200 °C should not be exceeded.
Hardening with further heat treatment processes is possible, but should be discussed in advance!

TOOLING ALLOYS

Zapp Precision Metals GmbH
Balcke-Dürr-Allee 1
40882 Ratingen
Phone +49 2304 79-566
Sales.TA@zapp.com
www.zapp.com

Further information regarding our products and locations are available in our image brochure and on our homepage at www.zapp.com

The information, illustrations, drawings, dimensional and weight data, and other data included in this data sheet are intended only for the purposes of describing our products and represent non-binding average values. They do not constitute quality data, nor can they be used as the basis for any guarantee of quality or durability. The applications presented serve only as illustrations and can be construed neither as quality data nor as a guarantee in relation to the suitability of the materials. This cannot substitute for comprehensive consultation on the selection of our products and on their use in a specific application. This brochure is not subject to change control. Subject to prior sale.
Last revision: March 2023