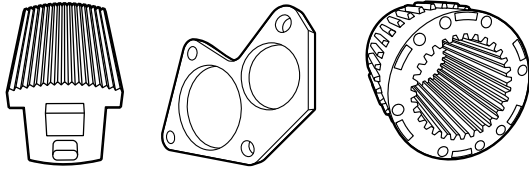


TOOLING ALLOYS

DATA SHEET Z-WEAR PM



ZAPP IS CERTIFIED TO ISO 9001



CHEMICAL COMPOSITION

Carbon	1.1 %
Chromium	7.8 %
Vanadium	2.4 %
Molybdenum	1.6 %
Tungsten	1.1 %
Silicon	1,2 %

Z-WEAR PM

is an air-hardening semi-high speed steel, developed to meet a wide variety of applications and requirements. Z-Wear PM is made by modern metallurgical melting technique.

In comparison to cold work steel D2 (1.2379) and high speed steel M2 (1.3343) Z-Wear PM provides a much higher impact toughness and better wear resistance. The excellent microstructure with very small and evenly distributed Micro Carbides is responsible for the outstanding cutting edge stability.

The typical tool hardness is 58 to 64 HRC. The standard heat treatment of Z-Wear PM allows a wide range of surface treatments like nitriding and PVD or CVD coating.

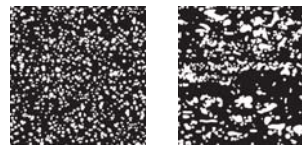
TYPICAL APPLICATIONS

- _ Stamping and Forming Tools
- _ Fineblanking Tools
- _ Cold Extrusion Dies
- _ Thread Rolling Dies
- _ Holepunches
- _ Shear Blades and Industrial Knives
- _ Powder Pressing Tools

PHYSICAL PROPERTIES

Modulus of elasticity E [GPa]	220
Density [kg/dm ³]	7.78
Thermal Conductivity [W/(m*K)]	23.5
Coefficient of thermal expansion [mm/mm/K] over a temperature range of 20-325 °C	11.2 x 10 ⁻⁶

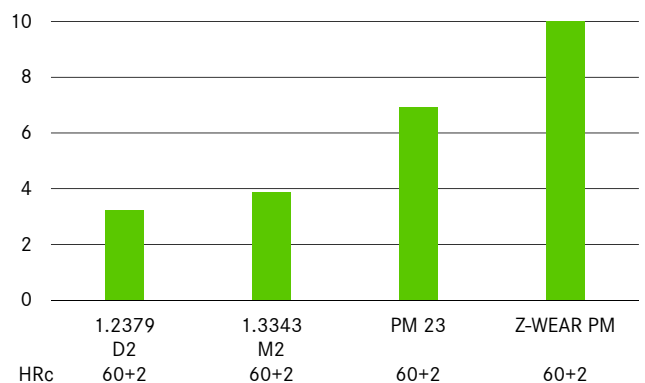
POWDER METALLURGICAL AND CONVENTIONAL MICROSTRUCTURE



The uniform distribution of carbides in the powder-metallurgical structure compared to conventional tool steels with big carbides and carbide clusters.

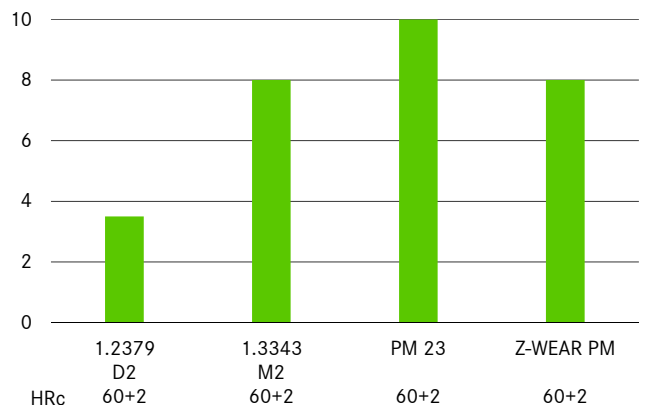
TOUGHNESS

■ Relative impact energy



RELATIVE WEAR RESISTANCE

■ Relative wear resistance



HEAT TREATMENT

SOFT ANNEALING

Z-Wear PM is heated uniformly to 900 °C and hold for 2 hours. Followed by cooling to 540 °C in the furnace at a cooling rate of 5 °C per hour. Then air cool to room temperature. The annealed hardness is about 230 HB.

STRESS RELIEVING

Stress relieving is recommended after rough machining. Z-Wear PM is heated to 600 – 700 °C and hold for 2 hours. Followed by cooling to 500 °C in the furnace. Then air cool to room temperature.

HARDENING

Hardening of Z-Wear PM usually involves the use of two preheating steps according to the table on the right. Depending on furnace and charging, additional preheating steps can be implemented. The material is then rapidly heated from the preheating temperature to the austenitizing temperature of 1010 °C – 1090 °C). 1010 °C is recommended to reach the highest impact toughness. 1090 °C is used for highest hardness. The holding time of 45 minutes should be correspondingly adapted for thick or thin-walled material cross sections.

QUENCHING

Quenching in air, hot bath or oil is possible. When using vacuum treatment, a quenching pressure of min. 6 bar is needed. To reach the highest toughness level, quenching in hot bath is recommended at approximately 550 °C.

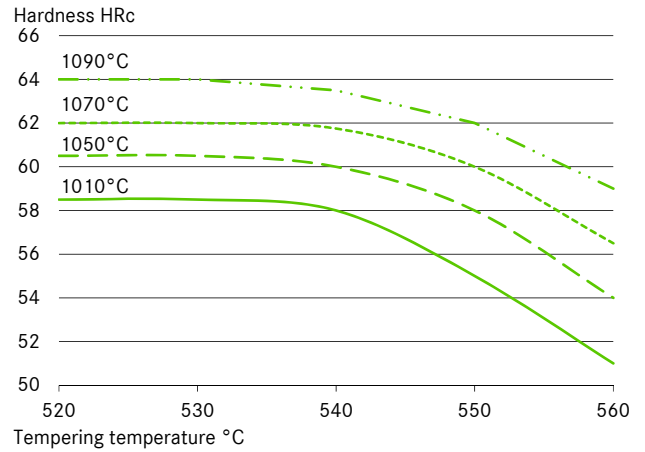
TEMPERING

Tempering should be carried out immediately after the material has cooled down to below 40 °C or when the tool can be held with hands. Triple tempering with a holding time of 2 hours in each stage at the tempering temperature is necessary. It is important to ensure that the tools are cooled down to room temperature between the individual tempering stages.

SURFACE TREATMENTS

Z-Wear PM can be nitrided or PVD/ CVD coated.

TEMPERING CHART



HEAT TREATMENT INSTRUCTIONS

1 st preheating	450-500 °C
2 nd preheating	850-900 °C
Hardening	as specified in table
Tempering	3 x each 2 hours as specified in table

Required hardness HRc ± 1*	Hardening temp. °C	Holding time at hardening temp. min**	Tempering °C
58	1010	45	540
60	1050	45	520
62	1070	45	520
64	1090	45	530

* Results may vary with hardening method and section size. Salt or oil quenching will give maximum response. Vacuum or atmosphere cooling may result in up to 1-2 HRc points lower.

** Holding time in minutes, depending on tool sizes.

MACHINING DATA

TURNING

Cutting parameter	Turning with cemented carbide		HSS
	medium turning	finish turning	
Cutting speed (V _c) m/min.	70-90	90-130	12-15
Feed (f) mm/U	0.2-0.4	0.05-0.2	0.05-0.3
Cutting depth (a _p) mm	2-4	0.05-2	0.5-3
Tools according ISO	P 10-P 20*	P 10*	-

* Use wear resistant coated cemented carbide, e.g. Coromant 4015 or Seco TP 100.

MILLING

FACE- AND EDGEMILLING

Cutting parameter	Milling with cemented carbide		HSS
	Medium turning	finish turning	
Cutting speed (V _c) m/min.	70-90	90-130	15
Feed (f) mm/U	0.2-0.3	0.1-0.2	0.1
Cutting depth (a _p) mm	2-4	1-2	1-2
Tools according ISO	K 15*	K 15*	-

* Use wear resistant coated cemented carbide, e.g. Coromant 4015 or Seco TP 100.

END MILLING

Cutting parameter	Solid carbide	Milling cutter w. indexable tips	Coated HSS
	Cutting speed (V _c) m/min.	20-35	50-80
Feed (f) mm/U	0.01-0.20**	0.06-0.20**	0.01-0.30**
Tools according ISO	K 20	P 25***	-

* for TiCN-coated end mills made of HSS V_c ~ 25-30 m/min.

** depends on radial depth of cut and on milling cutter - diameter

*** Use wear resistant coated cemented carbide, e.g. Coromant 3015 or SECO T15M.

DRILLING

SPIRAL DRILL MADE OF HSS

Driller- ϕ mm	Cutting speed (V _c) m/min.	Feed (f) mm/U
0 - 5	5 - 8*	0.05-0.15
5 - 10	5 - 8*	0.15-0.25
10 - 15	5 - 8*	0.25-0.35
15 - 20	8 - 8*	0.35-0.40

* for TiCN-coated end mills made of HSS V_c ~ 25-30 m/min.

CARBIDE METAL DRILLER

Cutting parameter	Drill type	solid carbide tip		Coolant bore driller with carbide tip*
	Insert drill			
Cutting speed (V _c) m/min.	80-110	40	35	
Feed (f) mm/U	0.08-0.14**	0.10-0.15**	0.10-0.20**	

* driller with coolant bores and a soldered on carbide tip

** depends on driller-diameter

GRINDING

Grinding method	soft annealed	hardened
	Surface grinding, straight grinding wheels	A 13 HV
Surface grinding	A 24 GV	3SG 36 HVS**
Cylindrical grinding	A 60JV	B 126 R75 B3* 3SG 60 KVS** A 60 IV
Internal grinding	A 46 JV	B 126 R75 B3* 3SG 80 KVS** A 60 HV
Profile grinding	A 100 LV	B 126 R100 B6* 5SG 80 KVS** A 120 JV

* for these applications we recommend CBN-wheels

** grinding wheel from the company Norton Co.

Zapp Materials Engineering GmbH

TOOLING ALLOYS

Zapp-Platz 1

40880 Ratingen

P.O. Box 10 18 62

40838 Ratingen

Phone +49 2102 710-548

Fax +49 2102 710-596

toolingalloys@zapp.com

SERVICE CENTER

Hochstraße 32

59425 Unna

Phone +49 2304 79-511

Fax +49 2304 79-7652

www.zapp.com

For further information about our products and locations, please refer to our image brochure or consult our website at www.zapp.com.

The illustrations, drawings, dimensional and weight data and other information included in these data sheets 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 material. This cannot substitute for comprehensive consultation on the selection of our products and on their use in a specific application. The brochure is not subject to change control. Subject unsold without engagement.

Last revision: June 2018