RSALLOYS
HOLDING GROUP

AZIENDA CERTIFICATA
ISO 9001

ACCIAI PM

TOOLING ALLOYS

Z-Wear5 PM^{cold}

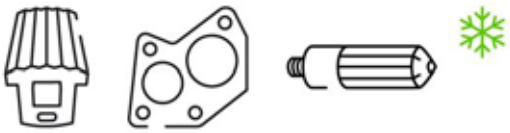
DATA SHEET

RSACCIAI RSENGINEERING KENOTHERM

TOOLING ALLOYS

Z-Wear5 PM^{cold}

DATA SHEET



CHEMICAL COMPOSITION

Carbon	1.5%
Chromium	4.0%
Vanadium	4.0%
Tungsten	2.5%
Molybdenum	2.5%

Z-Wear5 PM^{cold}

Z-Wear5 PMcold is a tough, wear resistant cold work steel. It offers a good combination of high toughness and wear resistance in combination with very good machinability. With a service hardness of approx. 58 – 64 HRc, it offers a high level of fracture resistance combined with good wear resistance.

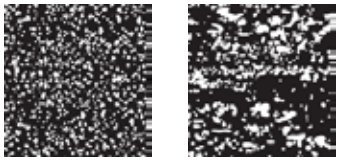
TYPICAL APPLICATIONS

- Cutting and punching tools especially for thicker sheets
- Fine blanking tools
- Pressing and forming tools
- Thread rolling and roller teools
- Punches
- Shear and industrial knives
- Sinter presses
- Wear parts in plastic processing

PHYSICAL PROPERTIES

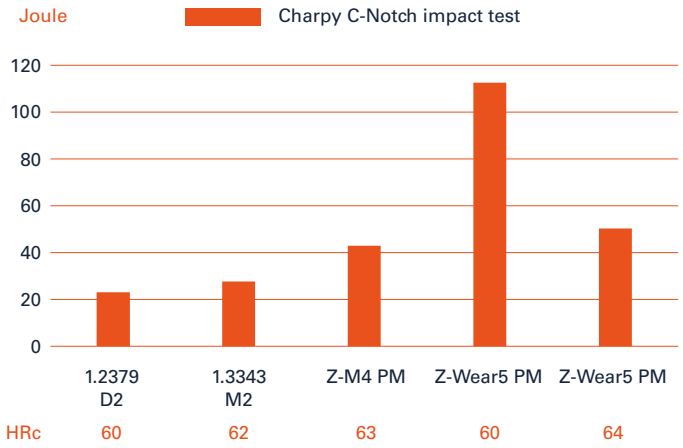
Young`s modulus E [GPa]	220
Density [kg/dm^3]	7.8
Coefficient of thermal expansion [mm/(mm/K)] over temperature range of 20 - 200 °C	11.3 x 10^{-6}
Thermal conductivity [W/(m*K)] at 100°C	24.2

POWDER METALLURGICAL AND CONVENTIONAL MICROSTRUCTURE



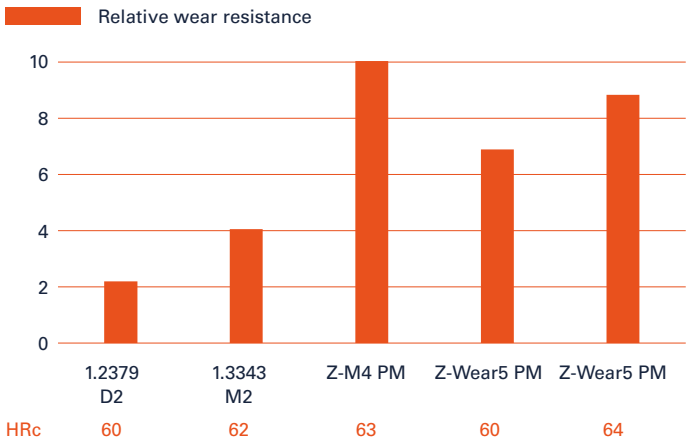
The uniform distribution of carbides in the powder-metallurgical structure compared to conventional tool steels with big carbides and carbide clusters.

TOUGHNESS



Standard size of the Charpy-test-piece with a 12.7 mm notch radius.

WEAR RESISTANCE



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HEAT TREATMENT DATA

SOFT ANNEALING

Z-Wear5 PMcold must be heated uniformly to a temperature of 880 °C. When the material is completely heated, it is kept at this temperature for 3 hours.

With a cooling rate of maximum 15 °C per hour, it is cooled down to 550 °C in the furnace. Final cooling takes place in still air. The hardness achieved by soft annealing is approx. 330 HB.

STRESS RELIEVING

Rough machined material is stress relieved by heating to 600 – 700 °C. Once complete heat penetration has been reached (minimum 2 hours), the material is allowed to cool in the furnace to approximately 550 °C followed by cooling in air.

Hardened material is stress relieved at 15 – 30°C for 2 hours below last tempering temperature followed by cooling in air.

STRAIGHTENING

Straightening should be done in the temperature range of 200 – 430 °C.

HARDENING

Two preheating stages according to the table are used for hardening. Further preheating stages can be added depending on the furnace type and furnace load. For large cross-sections and high hardening temperatures, a further holding stage is recommended.

In order to achieve an appropriate degree of solution of the alloying elements and an adequate degree of hardening and tempering, adapted holding times are recommended in the different temperature ranges.

The holding times should be adapted for large or very thin walled tool cross-sections.

QUENCHING

Quenching after hardening can be done in a hot bath at 550°C, in air or as interrupted oil quenching. Maximum hardness is achieved when cooling in a salt bath or in oil.

Cooling in vacuum or in air can lead to 1 – 2 HRc lower hardness.

For vacuum hardening, a minimum quenching pressure of 6 bar is recommended, the quenching pressure for complex components should be selected in such a way that the component distortion and the risk of cracking are minimized.

TEMPERING

Tempering must be carried out immediately after hardening, when the tool is cooled to below 40 °C. The tool is tempered at 560 °C for 2 hours.

It is carried out at 560 °C for 2 hours. For optimum properties, three to four tempering cycles are recommended.

Make sure that the material is cooled down to room temperature between each tempering step.

SURFACE TREATMENT

Z-Wear5 PM^{cold} is very suitable for PVD and CVD coatings. The coating of a nitriding layer is possible.

HEAT TREATMENT INSTRUCTIONS

1st preheating	450 - 500°C
2st preheating	850 - 900°C
3rd preheating	1,000 - 1,050°C
Hardening	Acc. to table
Tempering	3 x 2 hours each acc. to table

Quenching after hardening in hot bath aat pprox. 550°C or in vacuum at least at 6 bar overpressure.

Required hardness HRc±1	Austenitizing temperature °C	Holding time at austenitizing temperature minutes*	Tempering temperature °C
58	1,000	45	560
60	1,050	30	560
62	1,100	30	560
63	1,150	20	560
64	1,180	20	560

* In case of previous preheating at 870 °C.
The data referred to 13 mm round bar samples.
The holding times at austenitizing temperature should be correspondingly adapted for large and very thin prole dimensions. The maximum permissible austenitizing temperature of 1,200 °C must not be exceeded.

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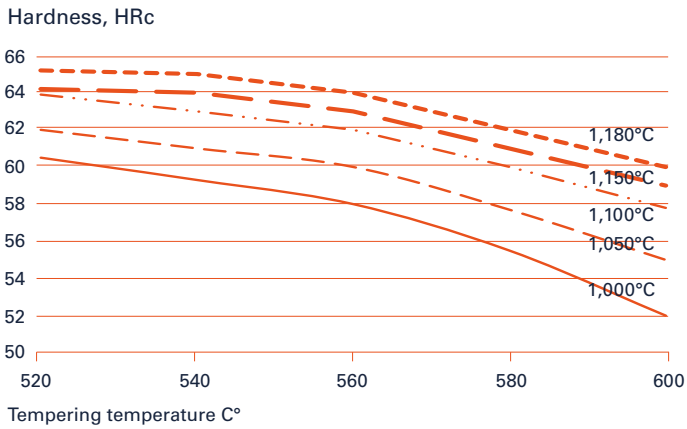
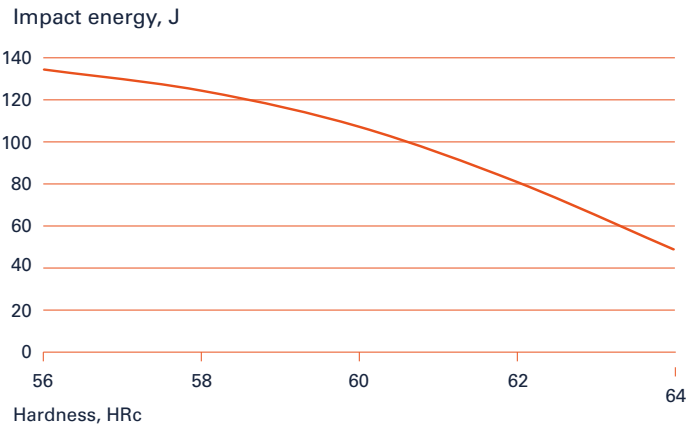
TEMPERING DIAGRAM





MACHINING DATA

Turning

Cutting parameter	Turning with cemented carbide		HSS
	medium turning	finish turning	
Cutting speed (VC) m/min.	70 - 90	90 -130	15
Feed (f) mm/U	0.2 - 0.4	0.05 - 0.2	0.05 - 0.3
Cutting depth (ap) 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	Turning with cemented carbide		HSS
	medium turning	finish turning	
Cutting speed (VC) m/min.	70-90	90 - 130	15
Feed (f) mm/U	0.2 - 0.3	0.1 - 0.2	0.1
Cutting depth (ap) mm	2 - 4	1 - 2	1 - 2
Tools according ISO	K 15*	K 15*	–

* Usewearresistantcoatedcementedcarbide, e.g. Coromant 4015 or Seco TP 100.

End milling

Cutting parameter	Solid carbide	Milling cutter w. indexable tips	Coated HSS
Cutting speed (VC) m/min.	20 - 35	50 - 80	12*
Feed (f) mm/U	0.01 - 0.20**	0.06 - 0.20**	0.01 - 0.30**
Tools according ISO	K 20	P 25***	–

* forTiCN-coatedendmillsmadeofHSSVC 25-30 m/min.
** depends on radial depth of cut and on milling cutter - diameter
*** Usewearresistantcoatedcementedcarbide,e.g. Coromant 3015 or SECOT15M.

Drilling
Spiral drill made ofHSS

Driller - mm	Cutting speed (VC) 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

* forTiCN-coatedendmillsmadeofHSSVC 25-30 m/min.

Carbide metal driller

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

* drillerwithcoolantboresandasolderedoncarbide tip
** depends on drille-rdiameter

Grinding

Grinding method	Soft annealed	Hardened
Surface grinding, straight grinding wheels	A 13 HV	B 107 R75 B3* 3SG 46 GVS** A 46 GV
Surface grinding	A 24 GV	3SG 36 HVS**
Cylindrical grinding	A 60 JV	B126 R75 B3* 3SG 60 KVS** A 60 IV
Internal grinding	A 46 JV	B126 R75 B3* 3SG 80 KVS** A 60 HV
Profile grinding	A 100 LV	B126 R100 B6* 5SG 80 KVS** A 120 JV

* fortheseapplicationswerecommend CBN-wheels
** grinding wheel from the company Norton Co.

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