TOOLING ALLOYS
DATA SHEET ZAPP Z-WEAR PM

ZAPP IS CERTIFIED TO ISO 9001

TOOLING ALLOYS
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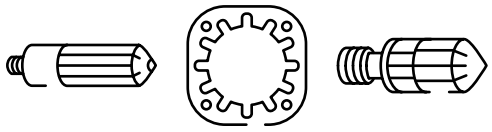


CHEMICAL COMPOSITION

Carbon	1.15 %
Chromium	7.50 %
Vanadium	2.40 %
Tungsten	1.00 %
Molybdenum	1.60 %

DESCRIPTION

Z-Wear PM is a powder metallurgy tool steel intended to provide high value and exceptional versatility. It offers wear resistance superior to conventionally produced tool steel grades like A2 and D2 along with high toughness and resistance to chipping. This unique combination of properties allows consistent and reliable tool performance in a broad range of cold work applications. Z-Wear PM is designed to be "user friendly" and exhibits excellent machinability, heat treat response (up to 64Rc) and grindability. It maintains a high degree of dimensional stability and can serve as an ideal substrate for a variety of common tool coatings and surface treatments.

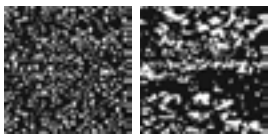
TYPICAL APPLICATIONS

_ Thread Rolling
_ Tactical Knives/Blades
_ Fineblanking
_ Heavy stamping
_ Metal punches

PHYSICAL PROPERTIES

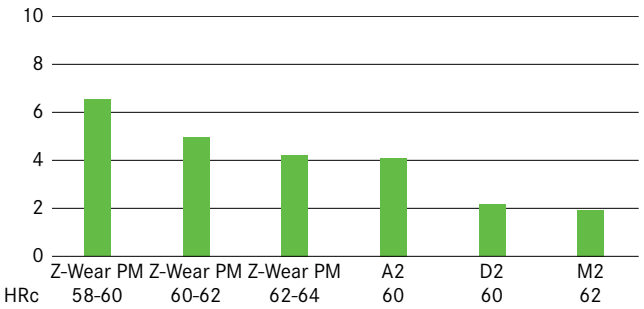
Density [lb/in^3]	0.281

POWDER METALLURGICAL AND CONVENTIONAL MICROSTRUCTURE

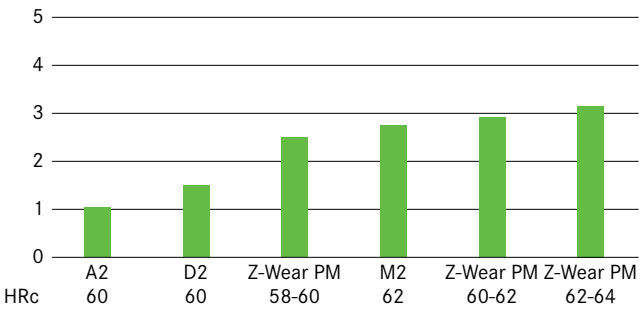


The uniform distribution of smaller spherical carbides in the powder metallurgical structure compared to conventional tool steels with large angular carbides and carbide clusters.

RELATIVE TOUGHNESS



RELATIVE WEAR RESISTANCE



THERMAL PROCESSING

ANNEALING

Heat uniformly in vacuum or a protective atmosphere to 1500°F–1525°F and soak at this temperature for two hours. Slow cool 30°F per hour to 1000°F then furnace cool or cool in still air to room temperature.

STRESS RELIEVING (SOFT)

Rough machined material is stress relieved by heating to 1100°F–1300°F. Soak for two hours and cool in air or furnace.

HARDENING

Vacuum, salt or protective atmosphere methods are generally used. Care should be taken to prevent decarburization.

Preheat: Heat to 1500°F-1550°F until temperature is equalized.

Austenitizing: Temperatures in the range of 1950°F-2025°F are commonly used with the specific temperature and soak time determined by the hardness required. Refer to chart for further information.

Quenching: Methods include use of high-pressure gas (minimum 4 bar preferred), salt bath or oil. Quench rate from the hardening temperature range down to 1300°F is critical to the development of optimum structure and properties. Part temperature can then be equalized at 1000°F–1100°F after which cooling can continue to below 150°F or “hand warm”. Step quenching in this manner will help to minimize distortion in larger section sizes.

TEMPERING

Tempering should be performed immediately after quenching. Heat uniformly to 1000°F and soak for two hours. Triple tempering is essential for optimal mechanical properties. Care must be taken to cool parts fully to room temperature (hand warm) between each temper.

STRESS RELIEVING (HARDENED)

Hardened material should be heated to 50°F–100°F below tempering temperature for two hours then cooled at room temperature in still air.

STRAIGHTENING

Should be done warm (or during quench) using temperatures in the range of 400°F to 800°F.

SIZE CHANGE DURING HARDENING

+.0005 in/in (at 60Rc)

HEAT TREATMENT INSTRUCTIONS

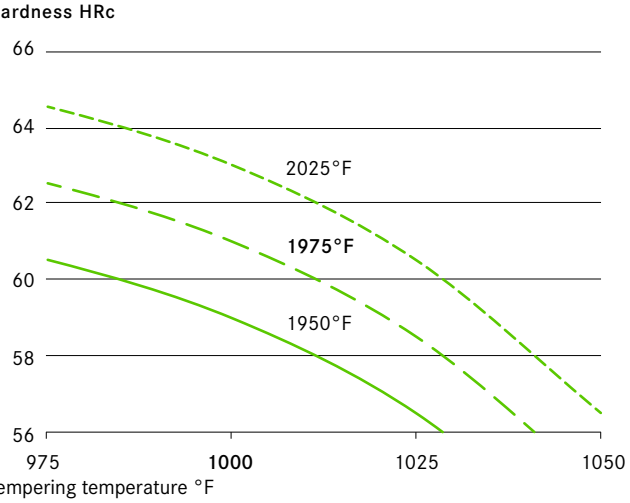
1st preheating	1200°F–1250°F
2nd preheating	1500°F–1550°F
Hardening	Refer to table below
Tempering	3 x 2 hours each – Refer to table below

Quenching after hardening in hot bath at approx. 1000°F or in vacuum at least at 4 bar overpressure.

Required hardness HRc	Austenitizing soak temp [°F]	Austenitizing soak time [Min]*	Tempering temperature [°F]
58-60	1950	30	1000
60-62 (recommended)	1975	25	1000
62-64	2025	20	1000

*Process variation and part section size can affect results. Soak times should be based on actual part tempertures. Use of load thermocouples is highly recommended during batch processing.

TEMPERING DIAGRAM



SURFACE TREATMENT

Z-Wear PM is an excellent substrate material for use with the various commercially available PVD coating processes. Conventional nitriding (.001" maximum depth) and steam tempering are also good options. Coating vendors should be consulted to select the optimum process for a given application. Care must be exercised during CVD and other surface treatment processes that can alter the original heat treatment of the tool.