TOOLING ALLOYS
DATA SHEET ZAPP Z-TUFF PM

ACFI and ZAPP are certified according to ISO 9001 standard

AÇO FERRAMENTA

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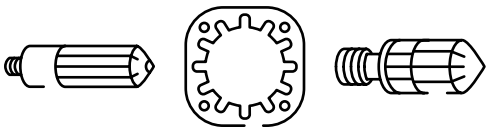


CHEMICAL COMPOSITION

Carbon	0.70 %
Chromium	7.50 %
Vanadium	1.00 %
Molybdenum	2.00 %
Nickel	1.50 %

DESCRIPTION

Z-Tuff PM is a unique tool steel chemistry manufactured using the powder metallurgy process that is engineered for maximum toughness and impact resistance. Its hardness of 58-60Rc gives it excellent compressive strength and added wear resistance over traditional conventional shock grades like AISI A2 and S7. Z-Tuff PM is also a highly effective substrate for a variety of PVD coatings and surface treatments.

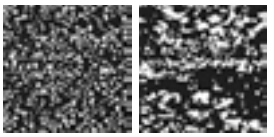
TYPICAL APPLICATIONS

_ Industrial knives and shredders
_ Tactical Knives
_ Fine blanking tooling
_ Heavy stamping
_ Metal punches

PHYSICAL PROPERTIES

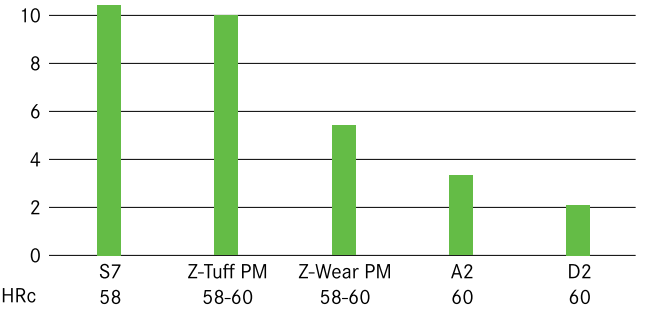
Density [lb/in^3]	0.277

POWDER METALLURGICAL AND CONVENTIONAL MICROSTRUCTURE

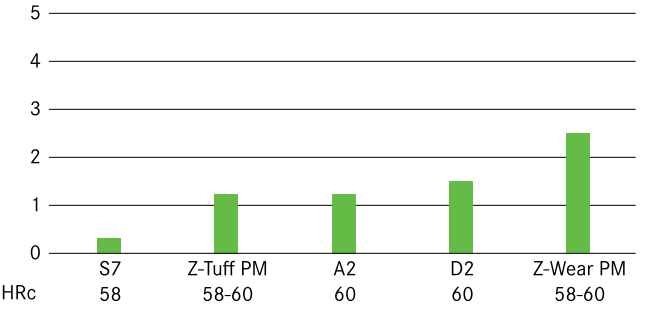


The uniform distribution of smaller spherical carbides in the powder metallurgical structure compared to conventional tool steels with large angular carbides and carbide clusters.

RELATIVE TOUGHNESS



RELATIVE WEAR RESISTANCE



THERMAL PROCESSING

ANNEALING

Heat uniformly in vacuum or a protective atmosphere to 1500–1525°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 1100–1300°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 1925°F–1975°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 aKer 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 aKer 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–800°F.

SIZE CHANGE DURING HARDENING

+.0005 in/in (at 60Rc)

HEAT TREATMENT INSTRUCTIONS

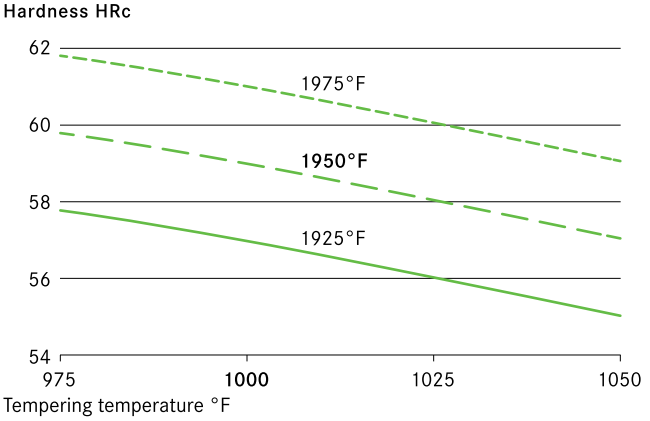
1st preheating	1200°F–1250°F
2nd preheating	1500°F–1550°F
Hardening	Refer to table below
Tempering	3 x 2 hours each – Refer to table below

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

Required Hardness HRc	Austenitizing Temp [°F]	Holding time at Austenitizing Temp [Min]*	Tempering temperature [°F]
57–59	1925	30	1000
58–60 (recommended)	1950	30	1000
59–61	1975	30	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-Tuff 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.