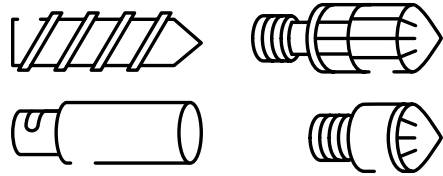


TOOLING ALLOYS DATA SHEET

ZAPP Z-420 PM®



ZAPP IS CERTIFIED TO ISO 9001



TOOLING ALLOYS

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CHEMICAL COMPOSITION

Carbon	2.30 %
Chromium	14.00 %
Vanadium	9.00 %
Molybdenum	1.00 %

DESCRIPTION

Z-420 PM® is a corrosion resistant, high vanadium tooling material produced by powder metallurgy methods. It is a martensitic stainless grade designed to also provide high wear resistance (similar to Z-9 PM) while maintaining good toughness (similar to Z-10 PM). It is intended for use in applications where grades such as D2, 9V, and 10V do not have the needed corrosion resistance, and where stainless grades such as 420 and 440C do not have sufficient wear resistance. Z-420 PM® has been shown to provide equivalent fabricability, wear, and corrosion resistance in CPM S90V* in a broad spectrum of applications.

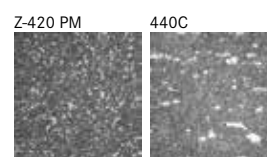
TYPICAL APPLICATIONS

- _ Plastic injection and extrusion feedscrews
- _ Non-return valve components
- _ Palletizing equipment
- _ Injection molds and inserts
- _ Industrial knives, cutters and slitters
- _ Wear parts in food and chemical processing
- _ Gear pumps

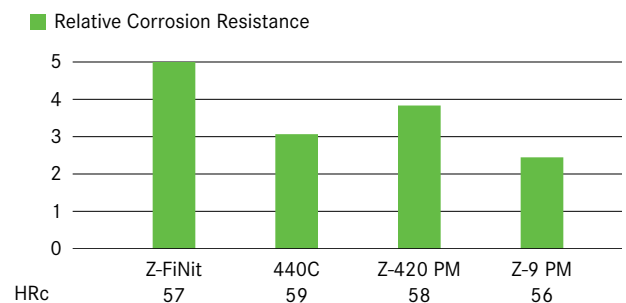
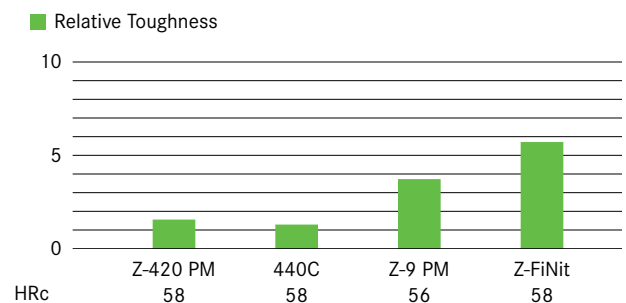
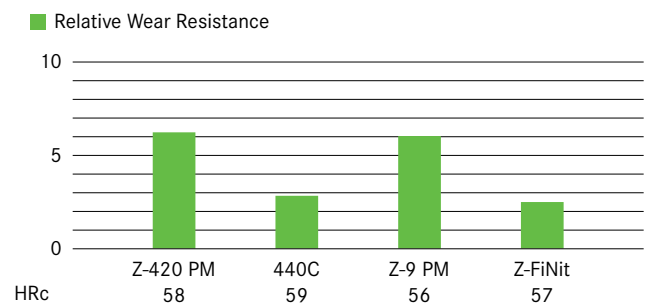
PHYSICAL PROPERTIES

Density [lb/in³]	0.27
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MICROSTRUCTURE



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



Qualitative comparison

THERMAL PROCESSING

ANNEALING

Heat uniformly in a protective atmosphere (or vacuum) to 1650°F (890°C) and soak for two hours. Slow cool 30°F (15°C) per hour until 1000°F (540°C). Parts can then be cooled in air or furnace as desired. Hardness expected by is BHN 277-300.

STRESS RELIEVING (SOFT)

Heat uniformly to 1100–1300°F (595–700°C) soak for two hours and cool in air or furnace.

HARDENING

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

PREHEAT

Heat to 1550–1600°F (845–870°C) until temperature is equalized. Additional preheat steps including 1250–1300°F (680–700°C) and 1850–1900°F (1010–1040°C) are suggested when using programmed control during vacuum processing.

AUSTENITIZING

Temperatures in the range of 1950°F (1040°C) to 2150°F (1180°C) are commonly used with the specific temperature and soak time determined by the hardness required. Higher hardening temperatures will provide maximum wear resistance and hardness while temperatures lower in the range will provide increased toughness. Refer to chart for further information.

QUENCHING

Methods include use of high pressure gas (minimum 5 bar preferred), salt bath, or oil. Quench rate through the temperature range of 1900–1300°F (1040–700°C) is critical to the development of optimum structure and properties. Part temperature can then be equalized at 1000–1100°F (540–595°C) after which cooling can continue to below 150°F (66°C) or “hand warm”. Step quenching in this manner will help to minimize distortion in larger section sizes.

TEMPERING

Immediately temper after the material has cooled down below 40°C. Z-420 PM is normally tempered through two tempering stages, each of two hours duration at 200°C to 400°C. If required, cooling to sub-zero temperatures can be carried out between the first and the second tempering cycle to fully destroy any re-austenitic formation. The first tempering process should always be concluded prior to any sub-zero cooling process.

STRESS RELIEVING (HARD)

Heat to 25°F (15°C) less than the temperature of the last temper and soak for one hour.

SIZE CHANGE DURING HARDENING

+0.0005 in/in (at HRC 60)

HEAT TREATMENT INSTRUCTIONS

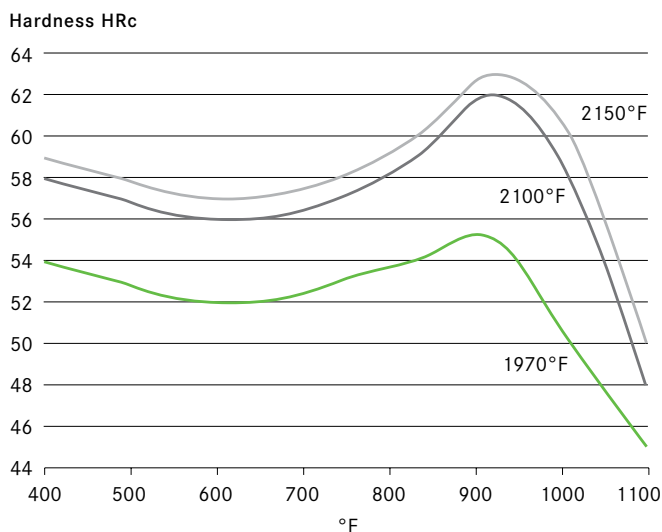
1st preheating	1250–1300°F
2nd preheating	1550–1600°F
Austenitizing	As specified in chart below
Tempering	2x, 2 hours each (see chart below)

Preferred quench method is high-pressure inert gas (minimum 4 bar) or molten salt at 1025° F.

Required hardness HRC ± 1	Austenitizing soak temp [°F]	Austenitizing soak time [Min]*	Tempering temperature [°F]**
56	1950	30	550
57	1950	25	650
58	2050	25	550
59	2150	20	550

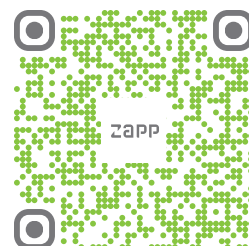
* Process variation and part section size can affect results. Soak times should be based on actual part temperatures. Use of load thermocouples is highly recommended during batch processing.

TEMPERING DIAGRAM



Further information regarding Zapp products and locations is available in the Z-series PM brochure and 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. Last revision: March 2026



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