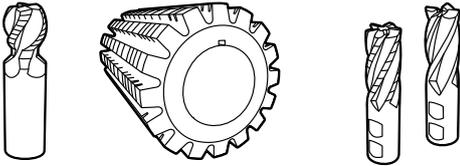


In partnership with



Chemical Composition

C	1.6%	Cr	4.0%
V	4.9%	W	12%
Co	5%	Mn	0.3%
Si	0.3%		



Z-T15 PM

Z-T15 PM is a tungsten-vanadium-cobalt high-speed steel produced by powder metallurgy methods that can be heat treated to a maximum attainable hardness of HRc 66-68. It offers high levels of both wear resistance and red hardness which make it suitable for use in various heavy-duty cutting tool applications involving difficult to machine materials. It can be effective to select cold work applications when under-hardened to optimize toughness. The particle metallurgy processing also provides improved machinability, grindability, heat treat response, and dimensional stability when compared to similar grades produced by conventional methods.

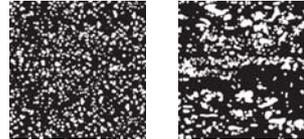
READYMILLED.COM

Rectangular sections from 25mm³ up to 430 x 430 x 150mm can be delivered fine milled on all six faces to -0 +0.1mm and with squareness guaranteed to 0.1mm/m.

Typical Applications

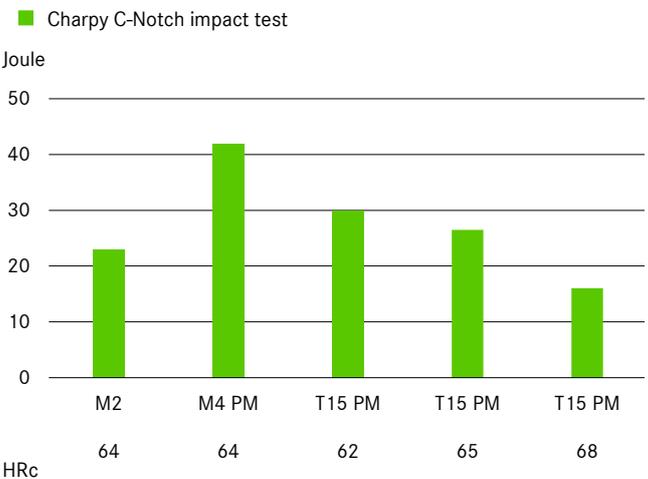
- Form Tools
- Broaches
- Gear Tools
- Milling Cutters
- End Mills
- Taps
- Spade Blades
- Roll Forming Tools
- Punches and Dies

POWDER METALLURGICAL AND CONVENTIONAL MICROSTRUCTURE



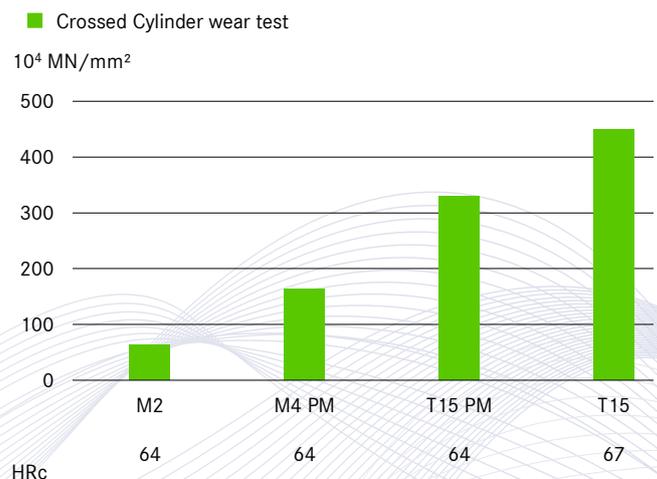
The uniform distribution of carbides in the powder-metallurgical structure compared to conventional tool steels with big carbides and carbide clusters.

TOUGHNESS



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

WEAR RESISTANCE



Reciprocal of wear rate in wear test with non lubricated crossed cylinder in contact with a rotation tungsten carbide cylinder.

HEAT TREATMENT

In partnership with



Soft Annealing

Heat uniformly in a protective atmosphere (or vacuum) to 1600°F (870°C) and soak for 2 hours. Slow cool 30°F (540°C). Parts can then be cooled in air or furnace as desired. Hardness expected is BHN 245-275,

Stress Relieving (Soft)

Heat uniformly to 1100-1300°F (595-700°C), soak for 2 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 2100°F (1180°C to 2250°F (1235°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 of 1900°F (1040°C to 1300°F (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 minimise distortion in larger section sizes.

Tempering

Tempering should be performed immediately after quenching. Temperatures in the range of 1000°F (540°C to 1100°F (595°C) are generally used depending on the hardness required. Heat uniformly to the selected temperature and soak for 2 hours. Triple tempering is required. Tempering temperatures of less than 1000°F (540°C) should not be used, and care must be taken to cool parts fully to room temperature between each temper.

Stress Relieving (Hard)

Heat to 25°F (15°C less than the temperature of the last temper and soak for 1 hour.

Critical Temperature

1550°F (845°C)

Size Change During Hardening

+ .0020 in/in (at HRc 66).

Straightening

Should be done warm (or during quench using temperatures in the range of 400°F (200°C to 800°F (430°C).

Surface Treatments

This grade is an excellent substrate material for use with the various commercially available PVD coating processes. Conventional nitriding (.001" maximum depth) and steam tempering can also be used. 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.