



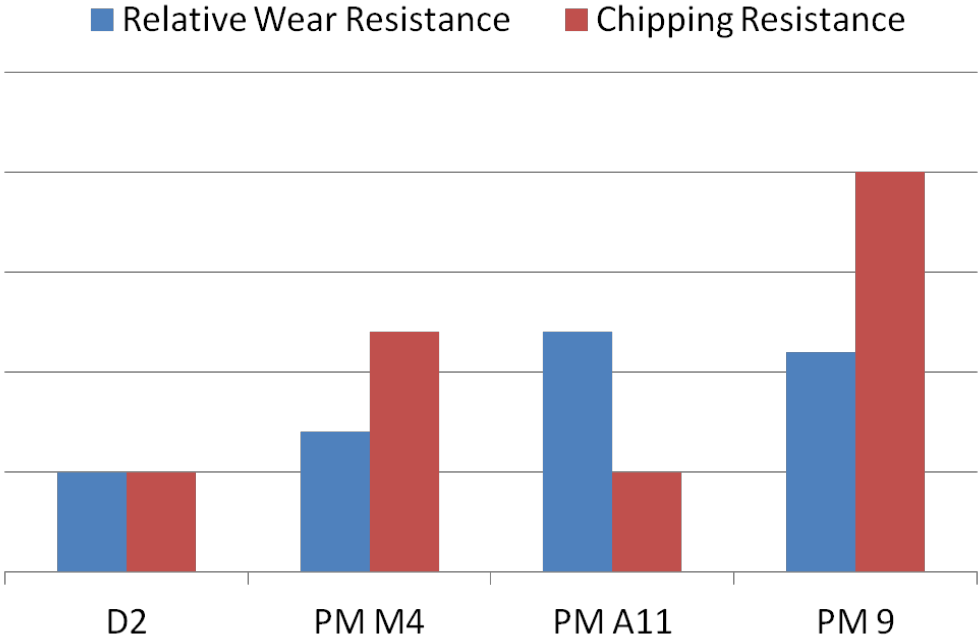
Technical Information: PM 9

PM 9 IS A HIGH VANADIUM TOOL STEEL PRODUCED USING THE PM (POWDERED METAL) STEEL MAKING PROCESS. THE GRADE HAS EXCELLENT WEAR RESISTANCE AND TOUGHNESS COMBINED WITH MODERATE HARDNESS. PM 9 IS IDEAL FOR APPLICATIONS SUCH AS PLASTICS PROCESSING EQUIPMENT

TYPICAL CHEMICAL COMPOSITION

CARBON	1.80%	CHROMIUM	5.30%
MOLYBDENUM	1.30%	SILICON	0.90%
VANADIUM	9.00%	MANGANESE	0.50%
SULFUR	0.03%		

PM STEEL PROPERTIES COMPARISON



PHYSICAL PROPERTIES

MODULUS OF ELASTICITY.....32 PSI X 10⁶(207 GPa)
DENSITY..... 0.286 LB/IN³
ANNEALED HARDNESS.....255-275 BRINELL HARDNESS (BHN)
MACHINABILITY.....SIMILAR TO T15 HIGH SPEED STEEL

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HEAT TREATMENT

ANNEALING

HEAT TO 1600°F, HOLD TWO HOURS
SLOW COOL 20°F/HOUR TO 600°F
THEN AIR OR FURNACE COOL TO ROOM TEMPERATURE

STRESS RELIEVING

PERFORMED PRIOR OR AFTER MACHINING TO MINIMIZE DISTORTION IN HEAT TREATING
1100/1200°F, HOLD TWO HOURS
THEN AIR COOL TO ROOM TEMPERATURE

HARDENING

SALT BATH, PROTECTIVE ATMOSPHERE, OR VACUUM FURNACE EQUIPMENT PREFERRED.

HIGH HEAT (AUSTENITIZING)

1950/2050°F FOR 20 TO 30 MINUTES AT HEAT.
HIGHER AUSTENITIZING TEMPERATURES REQUIRE LESS TIME AT HEAT

QUENCH

SALT BATH QUENCH TO 1000-1100°F, EQUALIZE, THEN AIR COOL TO 150°F.
VACUUM OR ATMOSPHERE QUENCH RATE OF A MINIMUM 50 DEGREES F PER MINUTE DOWN TO 1200F IS
CRITICAL TO ACHIEVE BEST HEAT TREAT RESPONSE.

TEMPER IMMEDIATELY FOLLOWING QUENCH

TEMPERING

MINIMUM 1000°F TEMPERING TEMPERATURE REQUIRED.
DOUBLE TEMPERING IS REQUIRED, TRIPLE TEMPERING RECOMMENDED.
AIR COOL TO ROOM TEMPERATURE BETWEEN TEMPERS.

TYPICAL HEAT TREAT RESPONSE

TEMPERING TEMP °F	HARDENING TEMP 1950°F	HARDENING TEMP 2050°F
As QUENCHED	56	58
1000	54	56
1025	53	55
1050	52	53
1075	50	51
1100	48	49

LONGITUDINAL SIZE CHANGE

APPROXIMATELY: PLUS 0.10%