



## Technical Information: PM 9

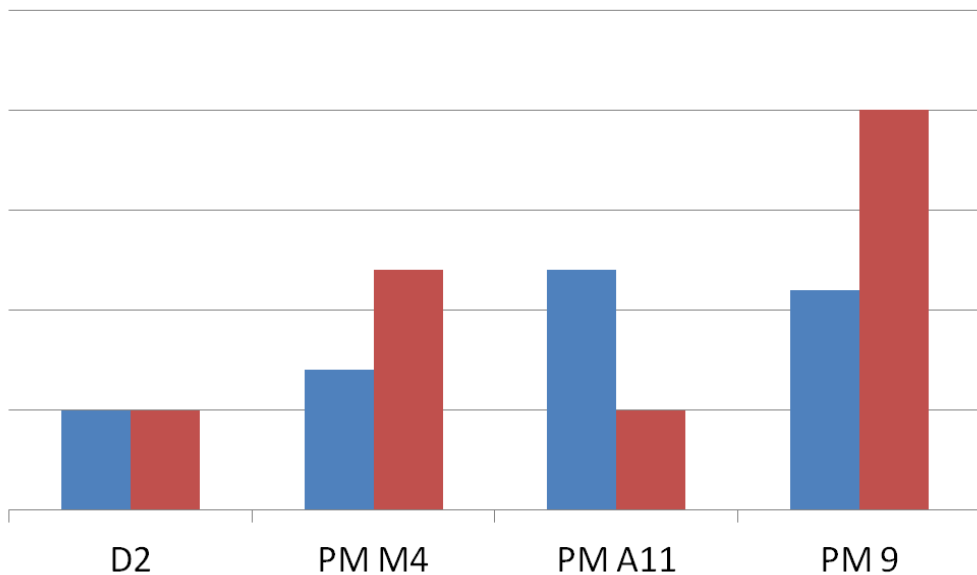
PM 9 IS A HIGH VANADIUM TOOL STEEL PRODUCED USING THE PM (POWDERED METAL) STEEL MAKING PROCESS. THE GRADE HAS EXCELLENT WEAR RESISTANCE AND TOUGHNESS COMBINED WITH MODERATE HARDNESS. PM 9 IS IDEAL FOR APPLICATIONS SUCH AS PLASTICS PROCESSING EQUIPMENT.

**TYPICAL CHEMICAL COMPOSITION**

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

### SBSM PM STEEL PROPERTIES COMPARISON

■ Relative Wear Resistance    ■ Chipping Resistance



### PHYSICAL PROPERTIES

MODULUS OF ELASTICITY.....32 PSI X 10<sup>6</sup> .....(207 GPa)  
 DENSITY..... 0.286 LB/IN<sup>3</sup>  
 ANNEALED HARDNESS.....255-275 BRINELL HARDNESS (BHN)  
 MACHINABILITY.....SIMILAR TO T15 HIGH SPEED STEEL



## Technical Information: PM 9

### 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%