



## Technical Information: Micro-Melt® PD#1

PD#1 IS A COLD WORK TOOL STEEL PRODUCED USING THE MICRO-MELT® (POWDERED METAL) STEEL MAKING PROCESS. THE GRADE HAS EXCELLENT WEAR RESISTANCE AND TOUGHNESS COMBINED WITH MODERATE HARDNESS

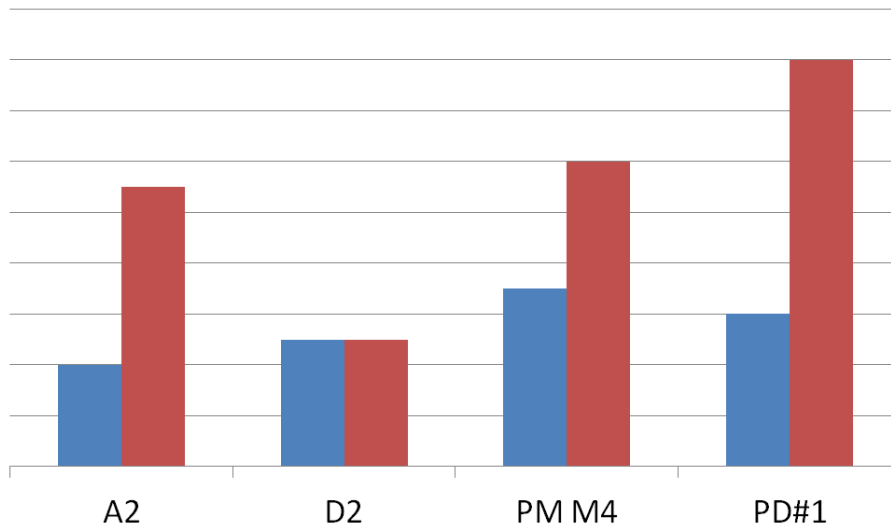
PD#1 IS IDEAL FOR COLD WORK APPLICATIONS NEEDING A HIGH DEGREE OF TOUGHNESS

### TYPICAL CHEMICAL COMPOSITION

CARBON	1.10%	CHROMIUM	7.75%
MOLYBDENUM	1.60%	SILICON	1.20%
VANADIUM	2.35%	MANGANESE	0.25%
SULFUR	0.03%		

### SBSM PM STEEL PROPERTIES COMPARISON

■ Relative Wear Resistance    ■ Chipping Resistance



### PHYSICAL PROPERTIES

**MODULUS OF ELASTICITY**.....30 PSI X 10<sup>6</sup> .....(207 GPa)  
**DENSITY**..... 0.277 LB/IN<sup>3</sup>  
**ANNEALED HARDNESS**.....225-255 BRINELL HARDNESS (BHN)  
**MACHINABILITY**.....SIMILAR TO M4 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 950°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	62	61
950	63	64.5
1000	60.5	64
1050	55	59.5
1100	47.5	52.5

LONGITUDINAL  
SIZE CHANGE

APPROXIMATELY: PLUS 0.10%