



Technical Information: PD#1

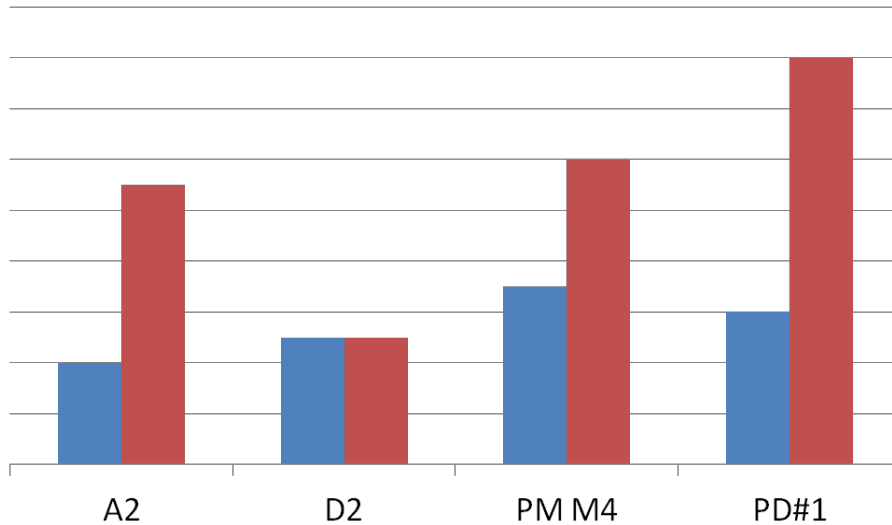
PD#1 IS A COLD WORK TOOL STEEL PRODUCED USING
 (POWDERED METAL) STEEL MAKING PROCESS.
 THE GRADE HAS EXCELLENT WEAR RESISTANCE AND TOUGHNESS
 COMBINED WITH MODERATE HARDNESS
 PD#1 IS IDEAL FOR COLD WORK APPLICATIONS NEEDING A HIGH DEGREE OF TOUGHNESS

TYPICAL CHEMICAL COMPOSITION

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

PM STEEL PROPERTIES COMPARISON

■ Relative Wear Resistance ■ Chipping Resistance



PHYSICAL PROPERTIES

MODULUS OF ELASTICITY.....30 PSI X 10⁶(207 GPa)
DENSITY..... 0.277 LB/IN³
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%