



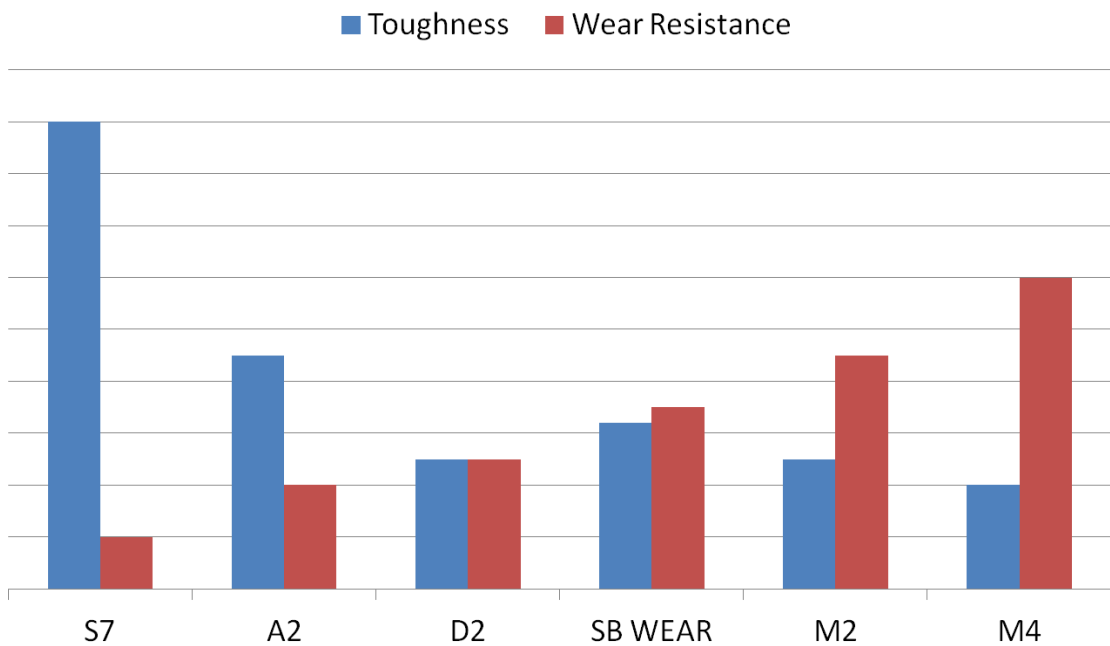
Technical Information: M4

M4 IS A GENERAL PURPOSE HIGH SPEED STEEL
M4 HAS A GOOD BALANCE OF TOUGHNESS, WEAR RESISTANCE, AND RED HARDNESS
M4 IS USED AS AN UPGRADE TO M2 FOR WEAR RESISTANCE.

TYPICAL CHEMICAL COMPOSITION

CARBON	1.35%	CHROMIUM	4.15%
MOLYBDENUM	5.00%	SILICON	0.30%
VANADIUM	4.15%	MANGANESE	0.30%
TUNGSTEN	6.00%	SULFUR	0.03% MAX

SBSM TOOL STEEL PROPERTIES COMPARISON



PHYSICAL PROPERTIES

MODULUS OF ELASTICITY.....30 PSI X 10⁶(207 GPa)
 DENSITY.....0.294 LB/IN³
 ANNEALED HARDNESS.....215-255 BRINELL HARDNESS (BHN)
 MACHINABILITY.....SIMILAR TO D2 TOOL STEEL



Technical Information: M4

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)

2150/2250°F FOR 10-15 MINUTES 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 2150°F	HARDENING TEMP 2250°F
As QUENCHED	65	65
1000	65	65
1025	64	65
1050	63	64
1075	62	63
1100	60	62

LONGITUDINAL SIZE CHANGE

APPROXIMATELY: PLUS 0.22%