



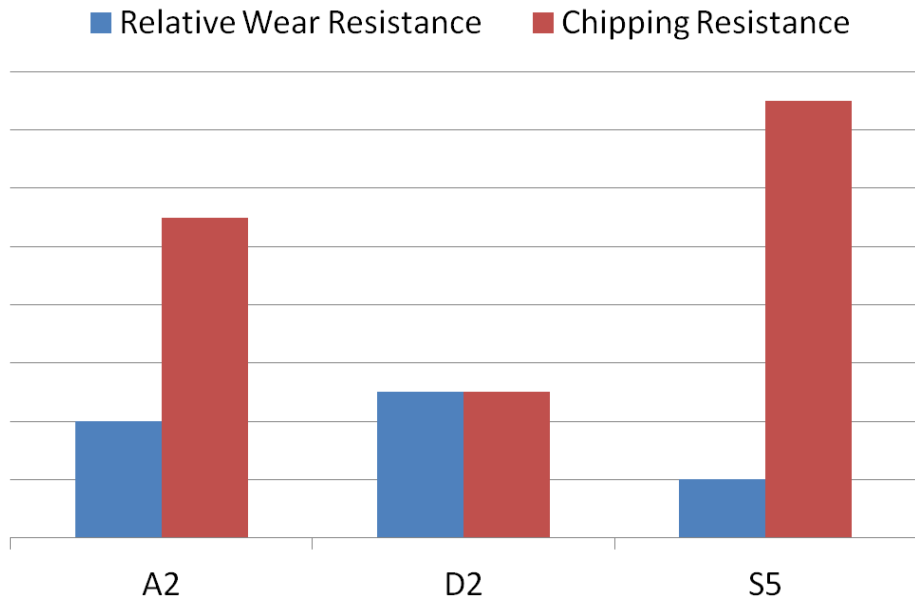
## Technical Information: S5

**S5 IS AN OIL HARDENING, COLD WORK TOOL STEEL. THE GRADE IS CHARACTERIZED BY HIGH TOUGHNESS AND RELATIVELY HIGH HARDNESS. S5 IS USED IN APPLICATIONS REQUIRING A HIGH LEVEL OF IMPACT TOUGHNESS.**

### TYPICAL CHEMICAL COMPOSITION

<b>CARBON</b>	<b>0.60%</b>	<b>CHROMIUM</b>	<b>0.25%</b>
<b>MOLYBDENUM</b>	<b>0.30%</b>	<b>SILICON</b>	<b>1.90%</b>
<b>VANADIUM</b>	<b>0.20%</b>	<b>MANGANESE</b>	<b>0.85%</b>

### SBSM TOOL STEEL PROPERTIES COMPARISON



### PHYSICAL PROPERTIES

**MODULUS OF ELASTICITY**.....30 PSI X 10<sup>6</sup> .....(207 GPA)  
**DENSITY**..... 0.281 LB/IN<sup>3</sup>  
**ANNEALED HARDNESS**.....200-229 BRINELL HARDNESS (BHN)  
**MACHINABILITY**.....SIMILAR TO O1 TOOL STEEL



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### HEAT TREATMENT

#### ANNEALING

HEAT TO 1450°F, HOLD TWO HOURS  
SLOW COOL 20°F/HOUR TO 1100°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

OIL QUENCHING REQUIRED.

#### HIGH HEAT (AUSTENITIZING)

1550/1650°F FOR 20 MINUTES AT HEAT.

#### QUENCH

QUENCH IN OIL TO 150°F .

TO MINIMIZE DISTORTION, PARTS MAY BE REMOVED AT 400°F THEN AIR COOLED.  
TEMPER IMMEDIATELY FOLLOWING QUENCH WHEN MATERIAL REACHES 150°F OR BELOW.

#### TEMPERING

MINIMUM 400°F TEMPERING TEMPERATURE REQUIRED.  
DOUBLE TEMPERING IS REQUIRED.  
AIR COOL TO ROOM TEMPERATURE BETWEEN TEMPERS.

### TYPICAL HEAT TREAT RESPONSE

TEMPERING TEMP		HARDENING
°F	°C	TEMP
As QUENCHED		1650°F (900°C)
		63/64 HRC
400	205	60 HRC
500	260	59 HRC
600	315	58 HRC
700	371	57 HRC
800	427	52 HRC
900	510	49 HRC
1000	538	45 HRC