



## Technical Information: H13

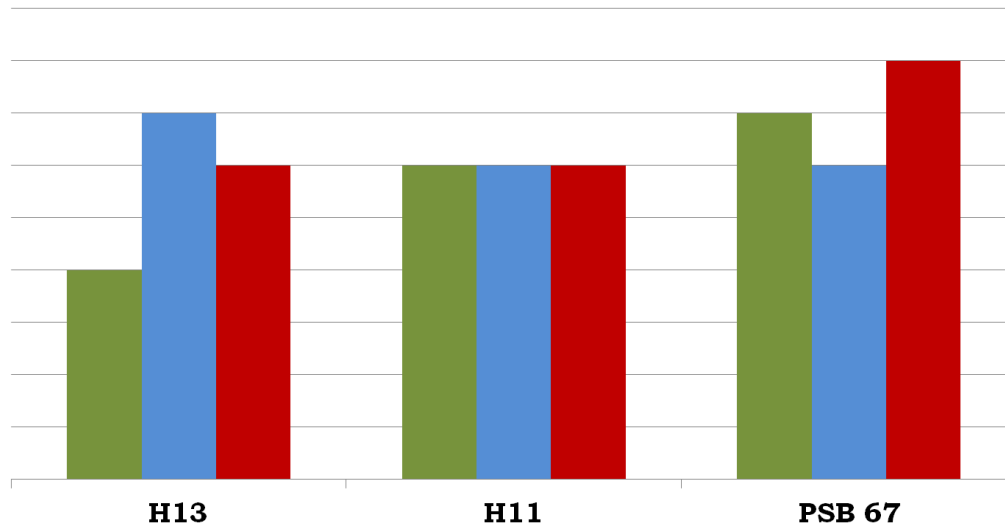
H13 IS A HOT WORK TOOL STEEL WITH A GOOD COMBINATION OF HOT HARDNESS, HOT TOUGHNESS, AND TEMPER RESISTANCE  
H13 IS USED IN GENERAL PURPOSE HOT FORGING AND FORMING APPLICATIONS

### TYPICAL CHEMICAL COMPOSITION

CARBON	0.40%	CHROMIUM	5.20%
MOLYBDENUM	1.40%	SILICON	1.00%
VANADIUM	0.95%	MANGANESE	0.40%

### SBSM TOOL STEEL PROPERTIES COMPARISON

■ High Temperature Toughness ■ High Temperature Wear Resistance ■ Temper Resistance



### PHYSICAL PROPERTIES

MODULUS OF ELASTICITY.....30 PSI X 10<sup>6</sup> .....(207 GPa)  
 DENSITY..... 0.283 LB/IN<sup>3</sup>  
 ANNEALED HARDNESS.....200-229 BRINELL HARDNESS (BHN)  
 MACHINABILITY.....SIMILAR TO H11 TOOL 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 TO 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)

1850°F FOR 30 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 TEMPER.

### TYPICAL HEAT TREAT RESPONSE

HARDENING TEMP °F    °C	TEMPERING TEMP		HARDNESS HRC	
	°F	°C		
1940    1060	1000	555	53	
	1050	570	50	
	1100	595	47	
	1150	620	30	
THERMAL CONDUCTIVITY  W/M*K	Room T	660 F 350 C	1262 F 700 C	
		30.8	33.5	35.1
THERMAL EXPANSION  10 <sup>-6</sup> M/M*K	Room T-100C	Room T-300C	Room T-500C	Room T-700C
		11.9	12.6	13.1