



Technical Information: H13

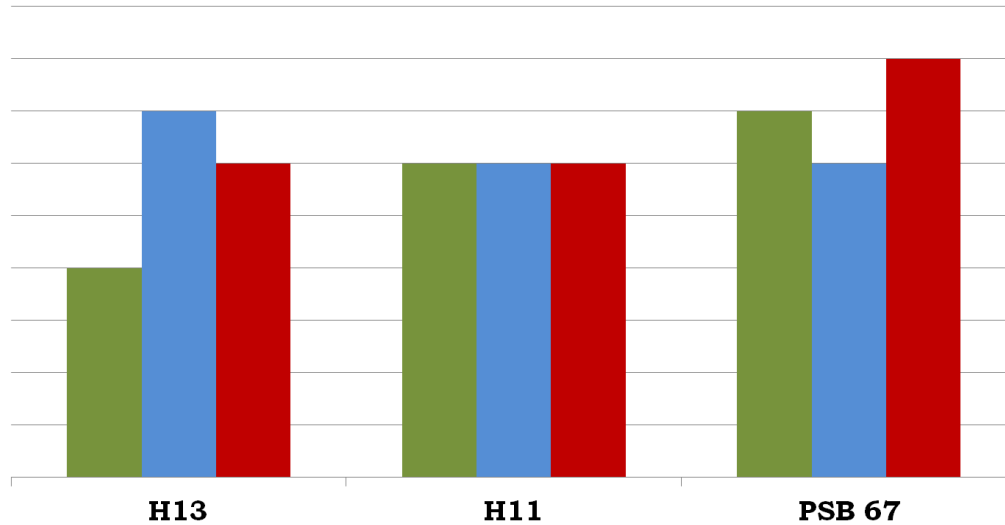
**H13 IS A HOT WORK TOOL STEEL WITH A GOOD COMBINATION OF HOT HARDNESS, HOT TOUGHNESS, AND TEMPER RESISTANCE
H13 IS USED IN GENERAL PURPOSE HOT FORGING AND FORMING APPLICATIONS**

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 10⁶(207 GPa)
DENSITY..... 0.283 LB/IN³
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 TEMPERS.

TYPICAL HEAT TREAT RESPONSE

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