Specialty Metals LLC

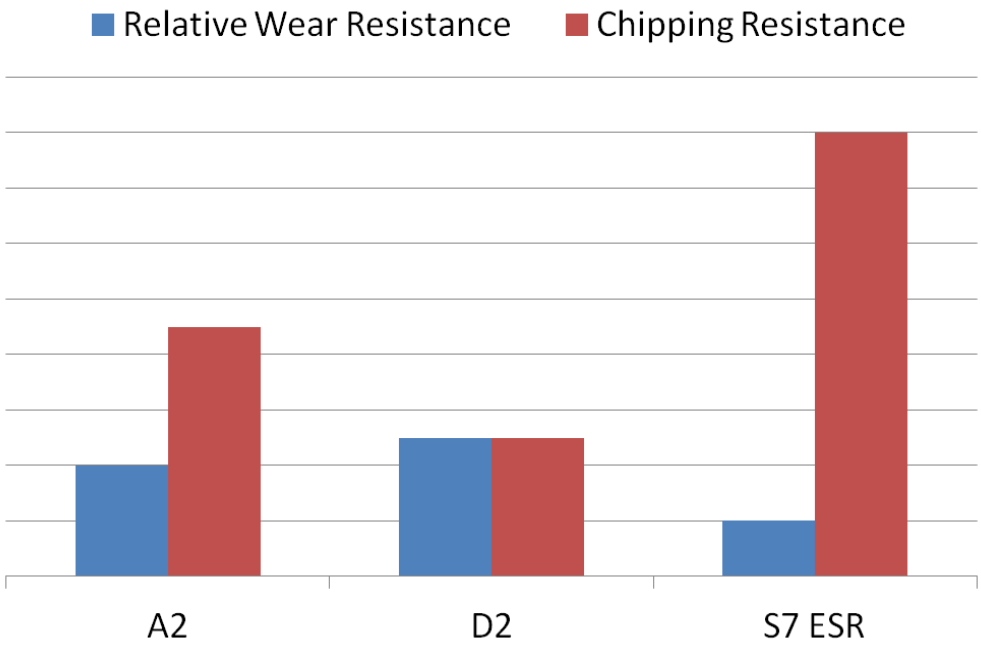
Technical Information: S7 ESR

S7 ESR is an air hardening, shock resistant, cold work tool steel
S7 ESR is characterized by high impact toughness at relatively high hardness levels
S7 ESR is used as an upgrade to conventional S7
S7 ESR will have higher toughness and better cleanliness than standard S7

Typical Chemical Composition

Carbon	0.55%	Chromium	3.25%
Molybdenum	1.40%	Silicon	0.35%
Vanadium	0.25%	Manganese	0.70%

SBSM Tool Steel Properties Comparison



Physical Properties

Modulus of Elasticity. . . . . .30 psi x 10^6 . . . . . (207 GPa)
Density. . . . . 0.283 lb/in^3
Annealed Hardness. . . . . .210-225 Brinell Hardness (BHN)

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Heat Treatment

Annealing

Heat to 1550°F, hold two hours
Slow cool 20°F/hour to 900°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)

1750°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 900°F is critical to achieve best heat treat response.
Temper immediately following quench when material reaches 150°F or below.

Tempering

Minimum 400°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	Tempering Temp °C	Hardening Temp 1750°F 955°C
As Quenched		59 HRC
400	205	57 HRC
500	260	55 HRC
600	315	54 HRC
700	371	53 HRC
800	427	53 HRC
900	480	52 HRC
1000	538	51 HRC
1100	552	47 HRC

1-800-365-1116

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