



# SB Specialty Metals LLC

Your *First Choice* for Specialty Metals

## S7 ESR - Technical Data

### General Description:

S7 ESR is used as an upgrade to conventional S7. The Electro Slag Remelt (ESR) process provides higher toughness and better cleanliness than conventional S7.

S7 ESR is a shock resistant, cold work tool steel with high impact toughness at relatively high hardness levels. S7 ESR has improved polishability over conventional S7.

### Example of applications:

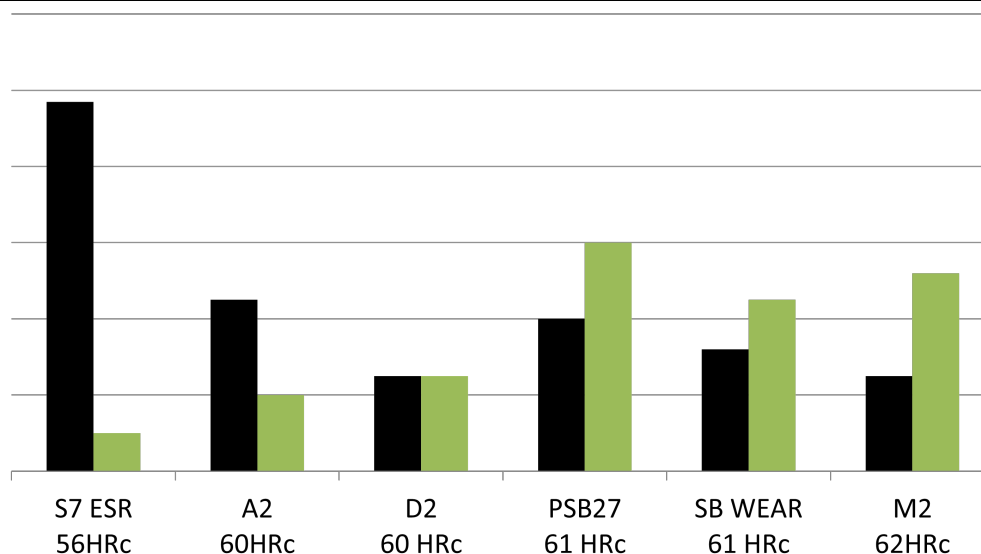
Punches and dies subject to heavy impact, warm forging/heading dies, plastic injection molds and heavy duty shear blades.

### Chemical Composition

Carbon	Molybdenum	Vanadium	Chromium	Silicon	Manganese
0.45 - 0.55%	1.30 - 1.80%	0.35% max	3.00 - 3.50%	0.20 - 1.00%	0.20 - 0.90%

### Comparison Chart

■ Toughness ■ Wear Resistance



### Typical Heat Treat Response

Hardening Temp °F	Tempering Temp °F	Temp	Hardness HRC	Charpy C-Notch Toughness Ft.-lbs
1740	300		59	85
	400		57	125
	500		55	125
	600		54	115
	700		53	105
	800		53	105
	900		52	120
	1000		51	150
	1100		47	190

### Size Changes During Hardening

Hardening Temp °F	Tempering Temp °F	HRC	Longitudinal Size Change %
1740	400	57	+0.04%
1740	1000	51	+0.05%

### Surface Treatment

Because of the low tempering temperatures normally used, S7 is not typically suitable for nitriding or similar treatments.

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### Heat Treatment

#### Annealing

Heat to 1550°F, hold two hours, slow cool (50°F/hour max) to 1000°F, then air cool to room temperature. Typical annealed hardness: 187/220 BHN.

#### Stress Relieving

Annealed Material: Heat to 1200/1250°F, hold two hours, cool in still air.

Hardened Material: Heat to 50°F below tempering temperature, hold two hours, cool in still air.

#### Hardening

Preheat to 1350/1400°F, equalize.

#### High Heat (Austenitizing)

1725/1750°F, hold 30/45 minutes at temperature.

#### Quench

Air, positive pressure vacuum, interrupted oil to 150°F.

Parts with cross sections over 2" thick may require oil quenching to attain full hardness.

#### Tempering

350/1000°F, two hours at tempering temperature per temper, air cool to room temperature between tempers.

Double tempering is recommended.

### Physical Properties

<b>Modulus of Elasticity</b>	30 PSI x 10 <sup>6</sup> .....(207GPa)	<b>Density</b>	0.283 lb/In <sup>3</sup>
<b>Annealed Hardness</b>	187/220 Brinell Hardness (BHN)	<b>Machinability</b>	75% of O1