

## Technical Information: 420 ESR

**420 ESR is an air hardening stainless tool steel**

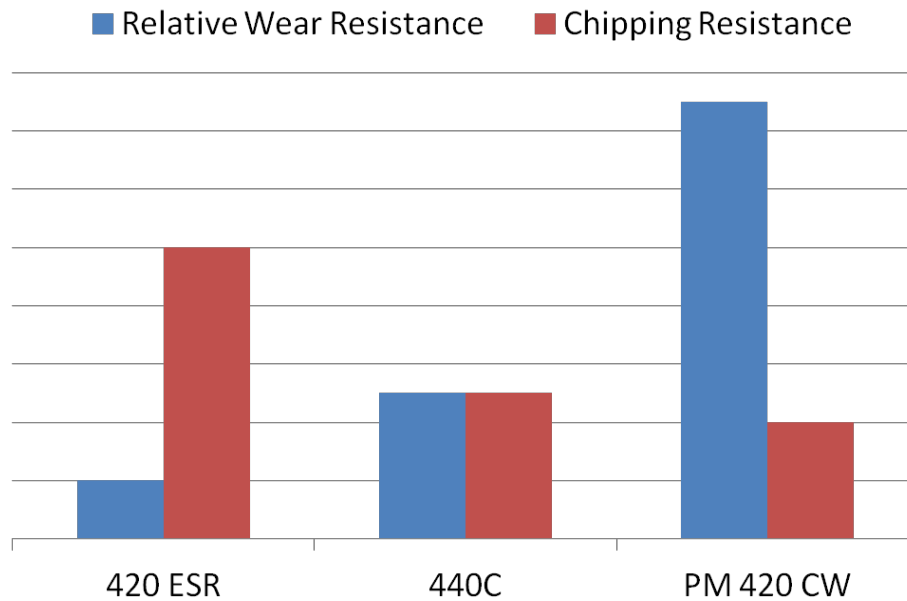
**420 ESR is characterized by moderate wear resistance and excellent corrosion resistance**

**420 ESR is used in plastic molding applications and stainless fixtures**

### Typical Chemical Composition

Carbon	0.40%	Chromium	13.60%
Molybdenum	0.30%	Silicon	0.75%
Vanadium	0.30%	Manganese	0.50%

### Tool Steel Properties Comparison



### Physical Properties

Modulus of Elasticity.....29 psi x 10<sup>6</sup> .....(207 GPa)  
 Density..... 0.275 lb/in<sup>3</sup>  
 Annealed Hardness.....200-240 Brinell Hardness (BHN)

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### Heat Treatment

#### Annealing

Heat to 1600°F, hold six hours  
 Slow cool 20°F/hour to 1200°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 to 1920°F for 30 to 45 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 800°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.

**Note:** Tempering above 800°F is not recommended due to a decrease in toughness and corrosion resistance.

### Typical Heat Treat Response

Tempering Temp °F °C	Hardening Temp	
	1850°F 1010°C	1925°F 1055°C
As Quenched	51 HRC	52 HRC
400 205	50 HRC	51 HRC
500 260	49 HRC	50 HRC
600 315	49 HRC	50 HRC
700 371	48 HRC	50 HRC
800 427	52 HRC	53 HRC
900 480	48 HRC	50 HRC
1000 538	40 HRC	42 HRC
1100 552	36 HRC	38 HRC