

## CRA 2535E (UNS N08535)

CRA 2535E (UNS N08535) is a premium, electro-slag re-melted version of alloy 2535. The performance and consistency are enhanced through tightly controlled compositional limits and microstructural cleanliness. 2535 is a cold hardened nickel-based alloy intended for corrosion resistance in highly sour (H<sub>2</sub>S) environments with moderate chloride content, requiring high strength up to 350°F. 2535 offers increased resistance to the effects of H<sub>2</sub>S relative to stainless steels allowing its use as downhole tubular components, packers, and other subsurface equipment in sour wells with high-pressure and high-temperature (HPHT) conditions and Acid Gas Injection (AGI) wells. However, all environmental factors, including H<sub>2</sub>S, CO<sub>2</sub>, temperature, pH, and chloride concentration, should be considered before final material selection.

The alloy is classified in MR0175/ISO15156 as a type 4c alloy, with no restrictions to a partial pressure of H<sub>2</sub>S below 270°F and resistant to 200 psi H<sub>2</sub>S at 350°F.

### NOMINAL COMPOSITION

Chromium 25%

Nickel 32%

Molybdenum 3%

Iron Balance

### SPECIFIED MECHANICAL PROPERTIES - API 5CRA / ISO 13680 Group 3 Category 25-32-3

Grade	Yield Strength min. (ksi)	Tensile Strength min. (ksi)	Elongation min. (%)	NACE MR0175/ISO 15156 Environmental Limits
110	110	115	11	Table A.14 Type 4c
125	125	130	10	Table A.14 Type 4c
140	140	145	9	N/A

### TYPICAL MECHANICAL PROPERTIES

Grade	Yield Strength (ksi)	Tensile Strength (ksi)	Charpy V-Notch Toughness (ft-lbs at 14F)
110	120	128	125
125	132	139	105

### TYPICAL PHYSICAL PROPERTIES

		70°F	200°F	400°F
Density	lbs/in <sup>3</sup>	0.29	0.29	0.29
Thermal Expansion	X10 <sup>-6</sup> / °F	8.3	8.3	8.4
Elastic Modulus	psi x 10 <sup>6</sup>	28.3	27.6	26.3
Poisson Ratio		0.29	0.29	0.29
Thermal Conductivity	Btu/ft h °F	5.0	6.0	6.4
Specific Heat	Btu/lb °F	0.09	0.09	0.09