

Compressor Valve Spring Materials and Properties

| Alloy type | Magnetic | Relative Cost | Max Service Temperature | *Modulus of Elasticity | *Modulus of Torsion | Description |
|-------------------------------|----------|---------------|---|-----------------------------|----------------------------|---|
| Stainless Steel 17-7PH | Yes | \$ | 570 °F (300 °C) | 27,195 ksi (187,500 MPa) | 10,196 ksi (70,300 MPa) | 17-7 PH stainless steel is a precipitation hardened stainless steel which provides high strength and hardness, excellent fatigue properties, good corrosion resistance, good formability, and minimal distortion upon heat treatment. This alloy makes a good high strength and good corrosion resistant spring. |
| Stainless Steel Duplex | Yes | \$+ | 570 °F (300 °C) | 29,008 ksi (200,000MPa) | 11,154 ksi (76,900 MPa) | Duplex steels have improved strength over Stainless steel 17-7PH and also some improved resistance to localized corrosion, particularly pitting, crevice corrosion and stress corrosion cracking. Duplex grades are characterized into groups based on their alloy content and corrosion resistance such as lean, super, and hyper duplex. |
| Inconel X-750 | No | \$\$\$+ | 700°F - 1020°F (370°C - 550°C) | 31,000 ksi (213,737MPa) | 10,994 ksi (75,800 MPa) | Inconel X750 is a Nickel-Chromium alloy that's widely used in high temperature applications. Inconel alloys are oxidation and corrosion resistant materials well suited for service in extreme environments. When heated, Inconel forms a thick, stable oxide layer protecting the surface from further attack. |
| Nimonic 90 | No | \$\$\$ | 660°F - 1020°F (350°C - 550°C) | 32,920 ksi (226,975 MPa) | 11,966 ksi (82,502 MPa) | Nimonic 90 is a Nickel-Chromium-Cobalt alloy that's used in high temperature applications when better strength properties are needed compared to Inconel. Nimonic 90 and Inconel have equivalent corrosion resistance properties. |
| Hastelloy C-276 | No | \$\$\$ | 750°F (400 °C) | 29,800 ksi (205,464 MPa) | 11,400 ksi (78,600 MPa) | Hastelloy C-276 is a Nickel-Molybdenum-Chromium alloy with Tungsten which gives it excellent corrosion resistance. Hastelloy is especially resistant to pitting and crevice corrosion. While more corrosion resistant than Inconel or Nimonic 90, Hastelloy is not as strong as either one. |
| Elgiloy | No | \$\$\$ | 840°F (450 °C) | 29,500 ksi (203,395 MPa) | 11,168 ksi (77,000 MPa) | Elgiloy is a Cobalt-Chromium-Nickel resulting in a spring with a combination of high strength, ductility and good corrosion resistance. This combination of properties allows Elgiloy springs to retain their mechanical force-deflection properties over a longer time (more cycles) after being exposed to extreme temperatures and corrosive environments. |

*Modulus of Elasticity and Modulus of Torsion are measurements of material strength.

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