MIM-440C Stainless Steel

Metal Injection Molding Powders

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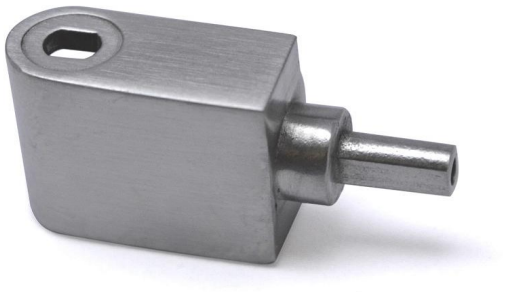
Technical Data: MIM-440C Stainless Steel

Product Description

Martensitic 440C stainless steel metal injection molded parts offer exceptional hardness, strength, and corrosion resistance. The high carbon and chromium contents enable excellent wear resistance with the ability to reach hardness levels over HRC 60. However, 440C maintains sufficient toughness and impact strength to avoid brittle behavior. However, 440C has a lower ability to withstand dynamic loads.

The fine carbide distribution and refined microstructure from the metal injection molding (MIM) process improve fatigue strength and ductility versus the precision casting process. Post-sintering heat treatment allows ultimate tensile strengths over 2000 MPa to be achieved.

The balanced properties of MIM 440C make it well suited for applications requiring high hardness for wear resistance combined with excellent corrosion performance. The material is also applied in surgical tools, cutlery, and other applications needing keen, hardened cutting edges.



Chemical Composition

Element	Carbon (C)	Manganese (Mn)	Phosphorus (P)	Sulfur (S)	Silicon (Si)	Chromium (Cr)	Molybdenum (Mo)	Iron (Fe)
MIM-430	1.05	0.75	0.03	0.03	1	17	0.75	Balance

Physical and Mechanical

Alloys	Status	Tensile Strength	Yield Strength	Impact Strength	Hardness	Young's Modulus	Poisson's Ratio	Elongation	Density
		Mpa	Mpa	J	HRC	Gpa	Ratio	% in 25.4 mm	g/cm³
MIM-430	Annealed	1100	850	25	54	200	0.27	13	7.7

Typical Properties

Hardness

MIM-440C stainless steel can attain excellent hardness levels through heat treatment and tempering, typically reaching over 60 HRC. The high carbon martensitic structure enables maximum hardness over other stainless grades. Specific hardness levels can be dialed in based on tempering temperature. This outstanding hardness makes MIM-440C ideal for applications requiring wear resistance and long service life.

Typical applications requiring the hardness of 440C stainless MIM include cutting tools, bearings, molds, valves, and medical instruments.

Note

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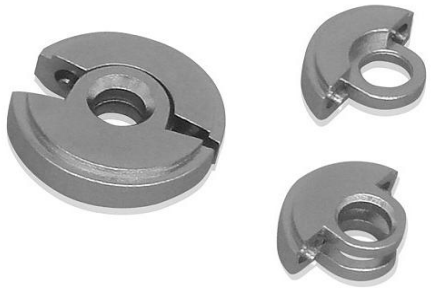
Typical Properties

Strength

In the hardened and tempered condition, MIM-440C stainless steel achieves very high strength levels, with tensile strength exceeding 2000 MPa. The high carbon martensitic structure substantially increases strength over other stainless grades. Heat treatment enhances strength through the precipitation of fine carbides. The high strength gives MIM-440C excellent load-bearing capabilities and resistance to failure.

The high strength makes MIM-440C parts well-suited for highly stressed components like lock cores, bearings, powder tool parts, nozzles, surgical instruments, and other highly loaded components needing hardness and durability.



Toughness

Despite its high hardness, MIM-440C maintains sufficient toughness and impact strength to avoid brittle behavior in service. MIM's refined carbide size and distribution increase fracture resistance compared to conventionally processed 440C. Tempering treatment also enhances the toughness. Depending on the condition, typical harpy V-notch impact values range from 25-40 J,

While lower than austenitic grades, the toughness is adequate for most applications involving high stresses and dynamic loading conditions. The balance of hardness and toughness makes MIM-440C suitable for plastic injection molds, bearings, valves, surgical instruments, knives, and other components where resistance to impact damage is needed.

The combination of hardness and sufficient toughness makes 440C stainless MIM suitable for injection molds, bearing parts, valves, power tool parts, and components needing impact resistance.

Dimensional Stability

MIM-440C stainless steel exhibits excellent dimensional stability during heat treatment and tempering processes compared to other high-carbon martensitic grades. Distortion, warpage, and shape changes are minimized. It is attributed to the fine dispersion of carbides and lower residual stress levels from the MIM process.

Dimensional variations are typically held to under 0.5% during hardening and tempering. vThis makes MIM-440C suitable for precision components that cannot tolerate shape changes after sintering. Applications dimensions and geometry must be tightly controlled, benefiting from this ability.

Dimensional stability makes 440C stainless MIM advantageous for high-precision molds, gear racks, measuring tools, instrument accessories, and components needing shape retention.

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