

# Detailed Overview of 420 and 440C Stainless Steel

This document provides an in-depth analysis of 420 and 440C stainless steel, focusing on their chemical composition, mechanical properties, corrosion resistance, machinability, weldability, and typical applications. These grades stand out in the martensitic stainless steel family for their hardness, wear resistance, and corrosion-resistant properties.

---

## 420 Stainless Steel

### Chemical Composition

- **Chromium (Cr):** 12–14%
- **Carbon (C):** 0.15–0.4%
- **Manganese (Mn):**  $\leq 1\%$
- **Silicon (Si):**  $\leq 1\%$
- **Phosphorus (P):**  $\leq 0.03\%$
- **Sulfur (S):**  $\leq 0.03\%$
- **Iron (Fe):** Balance

### Mechanical Properties

- **Tensile Strength:** 515–825 MPa (varies based on heat treatment)
- **Yield Strength:** 240–380 MPa
- **Elongation:** Around 20% in annealed condition
- **Hardness:** 50–58 HRC when fully hardened

### Corrosion Resistance

420 stainless steel offers good corrosion resistance in its hardened and polished state. It works well in environments with mild atmospheric and water exposure but struggles in more aggressive conditions like acidic or chloride-rich environments.

### Machinability

420 is moderately machinable in an annealed condition. Proper tooling and cooling are essential for optimizing performance during machining.

## Weldability

Welding of 420 stainless steel is possible but requires care. Pre-heating and post-weld heat treatment are recommended to avoid cracking and to restore material properties.

## Common Applications

- Cutlery and kitchen tools (knives, scissors)
- Surgical instruments
- Valve components
- Gears and axles
- Household appliances

## Additional Notes

- Capable of achieving very high hardness after heat treatment.
  - Offers a good balance between toughness and corrosion resistance in its martensitic family.
- 

# 440C Stainless Steel

## Chemical Composition

- **Chromium (Cr):** 16–18%
- **Carbon (C):** 0.95–1.2%
- **Manganese (Mn):**  $\leq 1\%$
- **Silicon (Si):**  $\leq 1\%$
- **Phosphorus (P):**  $\leq 0.04\%$
- **Sulfur (S):**  $\leq 0.03\%$
- **Iron (Fe):** Balance

## Mechanical Properties

- **Tensile Strength:** 760–1970 MPa depending on heat treatment

- **Yield Strength:** Approximately 450–1000 MPa
- **Elongation:** Typically around 10–15%
- **Hardness:** 58–65 HRC when fully hardened

## Corrosion Resistance

Compared to 420, 440C offers better corrosion resistance thanks to its higher chromium content. It performs well in moderately corrosive environments, making it suitable for more demanding applications.

## Machinability

440C is more difficult to machine than 420 due to its higher hardness. It is recommended to use carbide tooling and proper lubrication to achieve desirable machining results.

## Weldability

Weldability is limited, as the high carbon content increases the risk of cracking. Pre-heating and post-weld heat treatments are required if welding is unavoidable.

## Common Applications

- Ball bearings and rolling contact bearings
- High-performance cutlery
- Valve parts and seats
- Mold inserts
- Precision instruments

## Additional Notes

- The hardest of all stainless steel grades thanks to its high carbon content.
  - Known for its exceptional wear and abrasion resistance.
- 

## Key Comparison at a Glance

Feature	420 Stainless Steel	440C Stainless Steel
---------	---------------------	----------------------

Chromium Content	12 - 14%	16 - 18%
Carbon Content	0.15 - 0.4%	0.95 - 1.2%
Hardness	Moderate (50 - 58 HRC)	High (58 - 65 HRC)
Corrosion Resistance	Good	Better than 420
Primary Use Case	Kitchen and surgical tools	Bearings and precision components

## Choosing Between 420 and 440C

- Opt for **420 stainless steel** when moderate strength and corrosion resistance are needed at an affordable cost, especially in items requiring long cutting edges like knives or scissors.
- Choose **440C stainless steel** for applications demanding high wear resistance, hardness, or precision, such as bearings and high-end cutlery.

## Contact Us

For more tailored insights or expert guidance in stainless steel selection, download this PDF using the "View More" button or reach out to our support team.

---