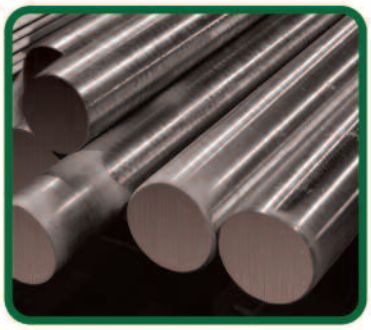
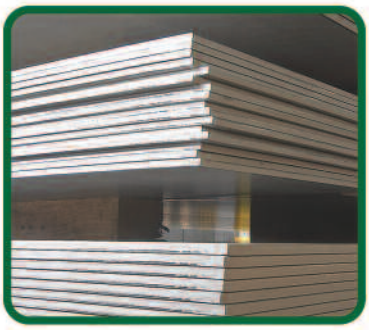
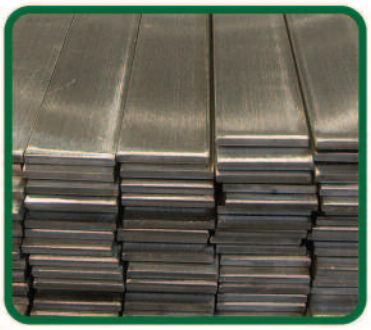
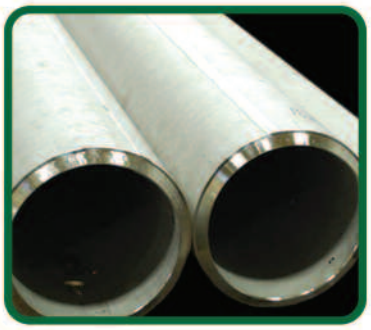
Alloy 440C Specifications: UNS S44000

ALLOY 440C (UNS S44000)

Penn Stainless inventory now includes Alloy 440C (UNS S44000) in sheet, sheet coil, plate, round bar, processed flat bar and tubular products.

GENERAL PROPERTIES

Stainless steels are high-alloy steels which have high corrosion resistance compared to other steels due to the presence of large amounts of chromium. Based on their crystalline structure, they are divided into three types such as ferritic, austenitic, and martensitic steels. Another group of stainless steels are precipitation-hardened steels. They are a combination of martensitic and austenitic steels.

Grade 440C stainless steel is a high carbon martensitic stainless steel. It has high strength, moderate corrosion resistance, and good hardness and wear resistance. Grade 440C is capable of attaining, after heat treatment, the highest strength, hardness and wear resistance of all the stainless alloys. Its very high carbon content is responsible for these characteristics, which make 440C particularly suited to such applications as ball bearings and valve parts.

APPLICATIONS

Applications that generally use Alloy 440C include:

- Rolling element bearings
- Valve seats
- High quality knife blades
- Surgical instruments
- Chisels

STANDARDS ALLOY 416

ASTM/ASME .....UNS S44000
DIN 1.4125

Alloy 440C (UNS S44000) can be processed by Penn Stainless utilizing the following methods:

- Shear Cutting
- Dynamic Water Jet Cutting
- Laser Cutting
- Saw Cutting
- Machine Cutting

Product Offering:

- Sheet
- Plate
- Sheet Coil
- Round Bar
- Processed Flat Bar
- Tubular Products

CORROSION RESISTANCE

- Good resistance to the atmosphere, fresh water, foods, alkalies and mild acids. Best resistance in the hardened and tempered and passivated condition. A smooth polished surface also assists.
- The corrosion resistance of grade 440C approximates that of grade 304 in many environments.

HEAT RESISTANCE

- Not recommended for use in temperatures above the relevant tempering temperature, because of reduction in mechanical properties by over-tempering.

HEAT TREATMENT

- Annealing – Full anneal – 850-900°C, slow furnace cool to about 600°C and then air cool. Sub-critical Annealing – 735-785°C and slow furnace cool.
- Hardening – Heat to 1010-1065°C, followed by quenching in warm oil or air. Oil quenching is necessary for heavy sections. Immediately temper at 150-370°C to obtain a wide variety of hardness values and mechanical properties as indicated in the accompanying table.
- Tempering in the range 425-565°C is to be avoided because of reduced impact resistance and corrosion resistance. Tempering in the range 590-675°C results in lower hardness (the product become machinable) and high impact resistance.

WELDING CHARACTERISTICS

- If welding is necessary pre-heat at 250°C and follow welding with a full anneal. Grade 420 filler will give a high hardness weld (although not as high as the 440C), but 309 or 310 will produce soft welds with higher ductility.

MACHINABILITY

In the annealed condition this grade is relatively easily machined; approximately the same as for high speed steel. Chips are tough and stringy so chip breakers are important. If these grades are hardened machining becomes more difficult and probably impossible.

CHEMICAL PROPERTIES

Type	C	Mn	Si	P	S	Cr	Mo
440C	0.95 min.. 1.20 max.	1.00 max	1.00 max	0.040 max	0.030 max	min: 16.00 max: 18.00	0.075 max

MECHANICAL PROPERTIES

Tempering Temperature (°C)	Tensile Strength (MPa)	Yield Strength 0.2% Proof (MPa)	Elongation (% in 50mm)	Hardness Brinell (HB)	Impact Charpy V (J)
Annealed *	758	448	14	269HB max#	–
204	2030	1900	4	59	9
260	1960	1830	4	57	9
316	1860	1740	4	56	9
371	1790	1660	4	56	9

* Annealed properties are typical for Condition A of ASTM A276# Brinell Hardness is ASTM A276 specified maximum for annealed 440A, B and C.

PHYSICAL PROPERTIES

	Alloy 440C
Density	7650 Kg/ m^3
Specific Heat – at 32 - 212°F (0 - 100°C)	460 J/kg.K
Electrical Resitivity – at 68°F (20°C)	600 **Microhm-cm**
Elastic Modulus	200 **GPa**
Mean Coefficient of Thermal Expansion	
at 32 - 212°F (0 - 100°C)	10.1 µm/m/°C
at 32 - 599°F (0 - 200°C)	10.3 µm/m/°C
at 32 - 1000°F (0 - 600°C)	11.7 µm/m/°C
Thermal Conductivity	**W/mK**
at 212°F (100°C)	24.2
at 932°F (500°C)	–

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