



# 321 Stainless Steel, UNS S32100

Shaped, Flat, Square, Round, Fine, Plated and Bare Wire  
ASTM A313, ASTM A240, ASTM 479, ASTM 580, AMS 5510, AMS 5645,  
AMS 5689

## 321 Alloy Description

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Alloy 321 is an austenitic chromium-nickel stainless steel containing Titanium. The titanium addition reduces or prevents carbide precipitation during welding and in 800 – 1500°F (427 – 816°C) service. It also eliminates the need for an anneal after welding. Alloy 321 provides excellent resistance to oxidation and corrosion and possesses good creep strength.

## Applications

Header bars for heat exchangers

Jet Engine parts

Fasteners

Couplings

## Chemistry Typical

Carbon: 0.08 max

Manganese: 2.00 max

Silicon: 0.75 max

Chromium: 17.00-19.00

Nickel: 9.00-12.00

Molybdenum: 0.75 max

Phosphorus: 0.045 max

Sulfur: .030 max

Copper: 0.75 max

Nitrogen: .010 max

Titanium: 5x(Carbon + Nitrogen) min-0.70 max

Iron: Balance

## Physical Properties

Density: 0.29 lbs/in<sup>3</sup>, 9.01 g/cm<sup>3</sup>

Electrical Resistivity: microhm-in (microhm-cm)

68°F (20°C): 28.4 (72)

Specific Heat: BTU/lb/°F (kJ/kg•K)

32-212°F (0-100°C): 0.12 (0.50)

Thermal Conductivity: BTU/hr/ft<sup>2</sup>/ft/°F (W/m•K)

At 212°F (100°C): 9.3 (16.0)

At 932°F (500°C): 12.8 (22.0)

Mean Coefficient of Thermal Expansion: in/in/°F (μm/m•K)

32-212°F (0-100°C):  $9.2 \times 10^{-6}$  (16.6)

32-600°F (0-315°C):  $9.5 \times 10^{-6}$  (17.1)

32-1000°F (0-538°C):  $10.3 \times 10^{-6}$  (18.5)

32-1200°F (0-649°C):  $10.7 \times 10^{-6}$  (19.3)

32-1500°F (0-873°C):  $11.2 \times 10^{-6}$  (20.2)

Modulus of Elasticity: KSI (MPa)

$28.0 \times 10^3$  ( $193 \times 10^3$ ) in tension

$11.2 \times 10^3$  ( $78 \times 10^3$ ) in torsion

Magnetic Permeability: H = 200 Oersteds:

Annealed < 1.02 max.

Melting Range: °F (°C) 2500 – 2550 (1371 – 1400)

## Mechanical Properties at Room Temperature

## **Properties: Annealed**

Ultimate Tensile Strength: 75 KSI min (515 MPa min)

Yield Strength (0.2% Offset): 30 KSI min (250 MPa min)

Elongation: 40% min

Hardness: Rb 95 max

## **Properties Tempered**

Alloy 321 can be cold rolled to achieve the temper properties required by specific customers and/or manufacturing requirements. Contact Ulbrich Wire for details.

## **Additional Properties**

### **Corrosion Resistance**

321 has excellent corrosion resistance equivalent to alloys 302 or 304 in the annealed condition and superior if a weldment in these grades has not been post-weld annealed.

### **Standard Wire Finishes**

Extra Clean: (XC) Extra clean is also referred to as “bright annealed” or “bright annealed and cold rolled”

Grease (round wire only): Drawn in a heavy grease produces an “Ultra bright” finish for decorative application.

Soap (round wire only): Soap is used as a lubricant in the drawing process and is not removed. It acts as a lubricant during customer part forming operation. A soap finish is available in tempered products.

Plated: Many plating options are available.

Special finishes are available: Contact Ulbrich Wire Sales with special finish and plating requests.

### **Forms**

Continuous Coils

Cut to lengths

Precision cutting

### **Cold Forming**

Alloy 321 can be readily formed and drawn.

## Heat Treatment

Alloy 321 is non hardenable by heat treatment. It can only be hardened by cold working.

## Stress Relieving

Heat to 1290°F (700°C) for 1 to 2 hours and then air cool.

## Welding

Alloy 321 is weldable by common fusion and resistance methods. Use type 347 filler rod or electrodes. For best results refer to: SSINA's "Welding of Stainless Steels and Other Joining Methods".

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