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# 316L STAINLESS STEEL, UNS S31603

Strip, Coil, Foil, Wire, AMS 5507, ASTM A666

## Applications

Chemical Screens, Storage and Transportation Tanks, Chemical Tubing, Food Processing, Oil Refineries, Paper Mill Processing, Pharmaceutical, Gas Scrubbers, Photographic Handling, Textile Industry Parts, Marine Applications and Flexible Metal Hose

## Description

Type 316L is a low carbon austenitic chromium-nickel stainless steel with corrosion resistance similar to type 316 but with resistance to intergranular corrosion following welding.

## Chemistry Typical

Carbon: 0.030 max  
Manganese: 2.00 max  
Silicon: 1.00 max  
Chromium: 16.00-18.00  
Nickel: 10.00-14.00  
Molybdenum: 2.00-3.00  
Phosphorus: 0.040 max  
Sulfur: 0.030 max  
Copper: 0.75  
Iron: Balance

## Physical Properties

Density: 0.29 lbs/in<sup>3</sup> 7.99 g/cm<sup>3</sup>

Electrical Resistivity: microhm-in (microhm-cm): 68 °F (20 °C): 29.4 (74.0)

Specific Heat: BTU/lb/°F (kJ/kg•K):  
32 - 212 °F (0 - 100 °C): 0.12 (0.50)

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

At 212 °F (100 °C): 9.4 (16.2)

At 932 °F (500 °C): 12.4 (21.4)

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

32 - 212 °F (0 - 100 °C):  $8.9 \times 10^{-6}$  (16.0)

32 - 600 °F (0 - 315 °C):  $9.0 \times 10^{-6}$  (16.2)

32 - 1000 °F (0 - 538 °C):  $9.7 \times 10^{-6}$  (17.5)

32 - 1200 °F (0 - 649 °C):  $10.3 \times 10^{-6}$  (18.5)

32 - 1500 °F (0 - 871 °C):  $11.1 \times 10^{-6}$  (18.5)

Modulus of Elasticity: ksi (MPa)

$28 \times 10^3$  ( $193 \times 10^3$ ) in tension

$11.2 \times 10^3$  ( $77 \times 10^3$ ) in torsion

Magnetic Permeability: H = 200 Oersteds: Annealed < 1.02 max

Melting Range: 2500 - 2590 °F (1371 - 1421 °C)

## Forms

Coil – Strip, Foil, Ribbon

Wire – Profile, Round, Flat, Square

## Mechanical Properties at Room Temperature

### Properties: Annealed

Ultimate Tensile Strength: 70 KSI min (485 MPa min)

Yield Strength (0.2% Offset): 25 KSI min (170 MPa min)

Elongation: 40% min

Hardness: Rb 95 max

### Properties: Tempered

#### 1/16 Hard

Ultimate Tensile Strength: 85 KSI min (585 MPa min)

Yield Strength: (0.2% Offset) 45 KSI min (310 MPa min)

Elongation: 35% Min

#### 1/8 Hard

Ultimate Tensile Strength: 100 KSI min (690 MPa min)

Yield Strength: (0.2% Offset) 55 KSI min (380 MPa min)

Elongation: 25% Min

#### 1/4 Hard

Ultimate Tensile Strength: 125 KSI min (860 MPa min)

Yield Strength: (0.2% Offset) 75 KSI min (515 MPa min)

Elongation: 8% Min

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**Tempered:**

Type 316L can be cold rolled to achieve the temper properties required by specific customers and/or manufacturing requirements. For tempers 1/2 hard or above consult Ulbrich Technical Services for more information.

**Additional Properties****Corrosion Resistance**

Refer to NACE (National Association of Corrosion Engineers) for recommendations.

**Finishes**

# 1 – Hot rolled annealed and descaled. It is available in strip, foil and ribbon. It is used for applications where a smooth decorative finish is not required.

# 2D – Dull finish produced by cold rolling, annealing and descaling. Used for deep drawn parts and those parts that need to retain lubricants in the forming process.

# 2B – Smooth finish produced by cold rolling, annealing and descaling. A light cold rolling pass is added after anneal with polished rolls giving it a brighter finish than 2D.

#BA – Bright annealed cold rolled and bright annealed

#CBA – Course bright annealed cold rolled matte finish and bright anneal

#2 – Cold Rolled

# 2BA – Smooth finish produced by cold rolling and bright annealing. A light pass using highly polished rolls produces a glossy finish. A 2BA finish may be used for lightly formed applications where a glossy finish is desired in the formed part.

Polished – Various grit finish for specific polish finished requirements.

*\* Not all finishes are available in all alloys – Contact Ulbrich Sales for more information.*

**Wire Finishes**

XC – Extra clean bright annealed or bright annealed and cold rolled

Grease – Ultra-bright finish (for decorative applications)

Soap – Soap is not removed from tempered wire to act as a lubricant.

*\* Contact Ulbrich Wire for custom wire finishes.*

**Cold Forming**

Type 316L can be readily formed and drawn.

**Heat Treatment**

Type 316L is non hardenable by heat treatment.

**Welding**

Type 316L is weldable by common fusion and resistance methods.

For best results refer to: SSINA's "Welding of Stainless Steels and Other Joining Methods".

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