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## **NITRONIC 33<sup>®</sup>, UNS S24000**

**Strip, Coil, Foil & Wire, ASTM A240 (XM-29), ASTM A276 (XM-29),  
ASTM A313 (XM-29), ASTM A358 (XM-29), ASTM A479 (XM-29),  
ASTM A580 (XM-29), ASTM A688 (XM-29)**

### **Applications**

Cryogenic tanks valves, piping, flanges, structural supports. Abrasion/Wear Resistance screens, racks, and wear plates. Electrical (low magnetic permeability) conduit shielding, MRI scanner supports, fittings, underground transmission risers and pipe and electronic support members. Process equipment, heat exchangers, pressure vessels and piping where 304 is borderline with respect to stress corrosion cracking.

### **Description**

Nitronic 33<sup>®</sup> is a low nickel austenitic stainless steel having an annealed yield strength twice that of 304. Better resistance to stress corrosion cracking than 304. Low magnetic permeability even after severe cold working.

### **Chemistry Typical**

Carbon: 0.08 max  
Manganese: 11.50-14.50  
Silicon: 1.00 max  
Chromium: 17.00-19.00  
Nickel: 2.25-3.75  
Phosphorus: 0.060 max  
Sulfur: 0.030 max  
Nitrogen: 0.20-0.40

### **Physical Properties**

Density: 0.28 lbs/in<sup>3</sup> 7.755 g/cm<sup>3</sup>

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Electrical Resistivity: microhms-cm

At 77 °F (25 °C): 74.0

At 212 °F (100 °C): 80.0

At 392 °F (200 °C): 87.0

At 752 °F (400 °C): 100.0

At 1110 °F (600 °C): 110.0

At 1470 °F (800 °C): 119.0

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

At 212 °F (100 °C): 110 (15.9)

At 392 °F (200 °C): 120 (17.3)

At 572 °F (300 °C): 131 (18.9)

At 752 °F (400 °C): 142 (20.4)

At 932 °F (500 °C): 153 (22.0)

At 1100 °F (600 °C): 162 (23.4)

At 1290 °F (700 °C): 171 (24.7)

At 1470 °F (800 °C): 181 (26.1)

Mean Coefficient of Thermal Expansion:  $\mu\text{in/in-}^\circ\text{F}$  ( $\mu\text{m/m-}^\circ\text{C}$ )

77 - 199 °F (25 - 93 °C): 8.89 (16.0)

77 - 400 °F (25 - 205 °C): 9.22 (16.6)

77 - 599 °F (25 - 315 °C): 9.72 (17.5)

77 - 797 °F (25 - 425 °C): 10.1 (18.2)

77 - 1000 °F (25 - 540 °C): 10.4 (18.7)

77 - 1200 °F (25 - 650 °C): 10.8 (19.4)

77 - 1400 °F (25 - 760 °C): 11.2 (20.2)

77 - 1600 °F (25 - 870 °C): 11.4 (20.5)

Modulus of Elasticity: ksi (MPa)

29 x 10<sup>3</sup> (200 x 10<sup>3</sup>) in tension

Magnetic Permeability: H = 500: Annealed: 1.0014

## Forms

Coil – Sheet, Strip, Foil

Wire – Profile, Round, Flat, Square

## Mechanical Properties at Room Temperature

### Properties: Annealed Typical

Ultimate Tensile Strength: 115 Ksi (793 MPa)

Yield Strength: 68 Ksi (469 MPa)

Elongation: 50% min *Nitronic 33® is a registered Trademark of Armco Inc.*

Hardness: Rb 95

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**Properties: Tempered Typical**10% Cold Work

Ultimate Tensile Strength: 133 Ksi (917 MPa)

Yield Strength: 105 Ksi (724 MPa)

Elongation: 32%

Hardness: Rc 30

20% Cold Work

Ultimate Tensile Strength: 160 Ksi (1103 MPa)

Yield Strength: 140 Ksi (965 MPa)

Elongation: 18%

Hardness: Rc 37

30% Cold Work

Ultimate Tensile Strength: 184 Ksi (1269 MPa)

Yield Strength: 167 Ksi (1152 MPa)

Elongation: 10%

Hardness: Rc 41

40% Cold Work

Ultimate Tensile Strength: 200 Ksi (1379 MPa)

Yield Strength: 181 Ksi (1248 MPa)

Elongation: 7.5%

Hardness: Rc 42

50% Cold Work

Ultimate Tensile Strength: 210 Ksi (1448 MPa)

Yield Strength: 191 Ksi (1317 MPa)

Elongation: 6.5%

Hardness: Rc 44

60% Cold Work

Ultimate Tensile Strength: 222 Ksi (1530 MPa)

Yield Strength: 199 Ksi (1372 MPa)

Elongation: 5%

Hardness: Rc 45

**Properties: Tempered**

Nitronic 33® can be cold worked to various temper ranges. Contact Ulbrich Technical Service for additional information.

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## 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 for All Alloys – Consult Sales for Applicable Finishes.*

### 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 with special finish requests.*

### Heat Treatment

Nitronic 33® is non hardenable by heat treatment.

### Welding

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

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