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HAYNES® 230, UNS N06230

(Nickel Alloy 230) Strip, Coil, Foil, Wire, ASTM B435, AMS 5878, PWA 1163

Applications

Aerospace gas turbine parts: combustion cans, transistor ducts, flameholders, thermocouple sheaths, honeycomb, chemical processing, grill supports, ducts and bellows, industrial heating, furnace retorts, chains, flame shrouds, grates and trays

Description

Haynes® 230 is a nickel-chromium-tungsten-molybdenum alloy, designed to combine excellent high temperature strength, oxidation resistance (up to 2100 °F), nitriding resistance and long term stability. Alloy 230 is a solid-solution-strengthened material which combines excellent high-temperature strength with good fabricability at room temperature. It is particularly effective for very long-term applications at temperatures of 1200 °F (649 °C) or more, and is capable of outlasting stainless steels and nickel alloys by as much as 100 to 1 depending upon the temperature.

Chemistry Typical

Nickel: 47.00-65.00
Iron: 3.00 max
Chromium: 20.00 – 24.00
Cobalt: 5.00 max
Molybdenum: 1.00 – 3.00
Tungsten: 13.00 – 15.00
Carbon: 0.05-0.15
Manganese: 0.30-1.00
Silicon: 0.25-0.75
Aluminum: 0.20-0.50
Lanthanum: 0.005-0.05
Phosphorus: 0.03 max
Sulfur: 0.015 max
Boron: 0.015 max
Titanium: 0.10 max
Copper: 0.50 max

Physical Properties

Density: 0.327 lbs/in³, 9.05 g/cm³

Specific Heat: BTU/lb/°F (J/kg•K):
At 70 °F (21 °C): .0095 (397)

Mean Coefficient of Thermal Expansion: in/in/°F (mm/m/°C):
70 - 212 °F (20 - 100 °C): 7.0 x 10^{-6} (12.7)

Thermal Conductivity: BTU-in/h-ft-°F (W/m-°K):
70 °F (21 °C): 62 (8.9)

Modulus of Elasticity: ksi (MPa)
30.6 x 10³ (210 x 10³) in tension

Melting Point: 2375 - 2500 °F (1300 - 1374 °C)

Forms

Coil – Strip, Foil, Ribbon
Wire – Profile, Round, Flat, Square

Mechanical Properties at Room Temperature

Properties: Annealed

Ultimate Tensile Strength: 110 KSI min (760 MPa min)
Yield Strength (0.2% offset): 45 KSI min (310 MPa min)
Elongation: 40% min

Properties: Tempered

Haynes® 230 can be cold rolled to various tempers. Contact Ulbrich Technical Service for additional information.

Additional Properties

Corrosion Resistance

Refer to NACE (National Associate 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.

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#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 – 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 coating on tempered wire to act as lubricant.

** Contact Ulbrich Wire for custom wire finishes.*

Heat Treatment

Haynes® 230 cannot be hardened heat treating.

Welding

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