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# **HAYNES® HR-120®, UNS N08120**

## **Strip, Foil & Wire, ASTM B408, ASTM B409**

### **Applications**

Used where high strength combined with good resistance to carburizing and sulfidizing environments is required. Heat treating baskets, radiant tubes, wire mesh furnace belts and basket liners, muffles, retorts, recuperators, heat treating fixtures and waste incinerators

### **Description**

Haynes® HR-120® alloy is a solid-solution-strengthened heat-resistant alloy that provides excellent strength at elevated temperature. Its oxidation resistance is comparable to other widely used Fe-Ni-Cr materials, such as alloys 330 and 800H, but its strength at temperatures up to 2000 °F (1095 °C) is significantly higher.

### **Chemistry Typical**

Nickel: 37.0 nom  
Chromium: 25.0 nom  
Cobalt: 3.0 max  
Molybdenum: 2.5 max  
Tungsten: 2.5 max  
Columbium: 0.7 nom  
Aluminum: 0.01 nom  
Manganese: 0.7nom  
Silicon: 0.06 nom  
Carbon: 0.05 nom  
Boron: 0.004 nom  
Nitrogen: 0.50 nom  
Iron: Balance

### **Physical Properties**

Density: 0.291 lb/in<sup>3</sup>, 8.07 g/cm<sup>3</sup>

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Electrical Resistivity:  $\mu\text{ohm-in}$ , ( $\mu\text{ohm-cm}$ )

At 70 °F (20 °C):	41.4 (105.2)
At 200 °F (100 °C):	42.4 (107.8)
At 400 °F (200 °C):	44.4 (112.5)
At 600 °F (300 °C):	45.4 (114.9)
At 800 °F (400 °C):	46.3 (116.7)
At 1000 °F (500 °C):	47.3 (119.3)
At 1200 °F (600 °C):	48.2 (121.4)
At 1400 °F (700 °C):	48.8 (123.1)
At 1600 °F (800 °C):	49.4 (124.5)
At 1800 °F (900 °C):	50.0 (125.7)
At 2000 °F (1000 °C):	50.3 (126.6)
At 2200 °F (1100 °C):	50.7 (127.8)

## Specific Heat: BTU/lb-°F (J/Kg-°K):

At 70 °F (20 °C):	.112 (467)
At 200 °F (100 °C):	.116 (483)
At 400 °F (200 °C):	.121 (500)
At 600 °F (300 °C):	.125 (522)
At 800 °F (400 °C):	.130 (531)
At 1000 °F (500 °C):	.135 (558)
At 1200 °F (600 °C):	.144 (607)
At 1400 °F (700 °C):	.152 (647)
At 1600 °F (800 °C):	.159 (655)
At 1800 °F (900 °C):	.164 (660)
At 2000 °F (1000 °C):	.167 (663)
At 2200 °F (1100 °C):	.169 (667)

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

At 70 °F (20 °C):	78 (11.4)
At 200 °F (100 °C):	84 (12.7)
At 400 °F (200 °C):	96 (14.1)
At 600 °F (300 °C):	108 (15.4)
At 800 °F (400 °C):	121 (17.1)
At 1000 °F (500 °C):	134 (18.7)
At 1200 °F (600 °C):	150 (21.0)
At 1400 °F (700 °C):	168 (23.3)
At 1600 °F (800 °C):	180 (24.59)
At 1800 °F (900 °C):	191 (26.2)
At 2000 °F (1000 °C):	205 (28.0)
At 2200 °F (1100 °C):	216 (29.6)

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

78 - 200 °F (25 - 100 °C): 7.95 ( $14.3 \times 10^{-6}$ )

78 - 400 °F (25 - 200 °C): 8.29 ( $14.9 \times 10^{-6}$ )

78 - 600 °F (25 - 300 °C): 8.56 ( $15.3 \times 10^{-6}$ )

78 - 800 °F (25 - 400 °C): 8.80 ( $15.8 \times 10^{-6}$ )

78 - 1000 °F (25 - 500 °C): 8.98 ( $16.1 \times 10^{-6}$ )

78 - 1200 °F (25 - 900 °C): 9.24 ( $16.4 \times 10^{-6}$ )

78 - 1400 °F (25 - 700 °C): 9.52 ( $16.9 \times 10^{-6}$ )

78 - 1600 °F (25 - 800 °C): 9.72 ( $17.3 \times 10^{-6}$ )

78 - 1800 °F (25 - 900 °C): 9.87 ( $17.6 \times 10^{-6}$ )

Modulus of Elasticity: KSI (MPa)

$28.6 \times 10^3$  ( $197 \times 10^3$ ) in tension

Melting Range: 2375 - 2600 °F (est.), (1300 - 1425 °C)

## Forms

Coil - Sheet, Strip, Foil

Wire - Profile, Round, Flat, Square

## Mechanical Properties at Room Temperature

### Properties: Annealed Typical

Ultimate Tensile Strength: 106.5 KSI (735 MPa)

Yield Strength: 45.6 KSI (375 MPa)

Elongation: 50%

### Properties: Tempered

Haynes® HR-120® can be cold worked 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 – 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 coating on tempered wire to act as lubricant.

*\* Contact Ulbrich Wire with special finish requests.*

### Welding

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

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