

INCOLOY® alloy 908 (UNS N09908) is an age-hardenable nickel-iron alloy which exhibits a low coefficient of thermal expansion, high tensile strength, high fracture and impact toughness, fatigue crack growth resistance, good ductility, metallurgical stability and weldability plus sufficient resistance to stress accelerated grain boundary oxygen embrittlement (SAGBO) to permit hot fabrication without cracking. This cobalt-free, low CTE alloy was designed to meet sheathing material requirements for internally cooled Nb₃Sn superconductor magnets to be used in prototype fusion reactors at cryogenic operating temperatures of -452°F (-269°C/4°K). With low temperature properties it is excellent for cryogenic applications.

Physical Constants & Thermal Properties

Table 2 - Physical Constants & Thermal Properties

Density, lb/in ³	0.295
g/cm ³	8.17
Melting Range, °F.....	2482-2571
°C	1361-1410
Specific Heat, Btu/lb•°F	0.104
J/kg•°K	439
Curie Temperature, °F.....	539
°C	282
Coefficient of Expansion, 10 ⁻⁶ in/in•°F (µm/m•°C)	
70-200°F (21-93°C)	4.77 (8.59)
70-500°F (21-260°C)	4.81 (8.66)
70-800°F (21-427°C)	6.17 (11.11)
70-1000°F (21-538°C)	6.78 (12.20)
70-1200°F (21-649°C)	7.32 (13.18)
70-1400°F (21-760°C)	7.84 (14.11)
Thermal Conductivity ^a , Btu•in/ft ² •h•°F	76.68
W/m•°C	11.05
Young's Modulus ^a , 10 ³ ksi	23.7
GPa	163.3
Shear Modulus ^a , 10 ³ ksi	9.37
GPa	64.6
Poisson's Ratio ^a	0.265
Hardness ^a , HRC	38-40

^a Room temperature, as aged

Table 1 - Limiting Chemical Composition, %

Nickel.....	47.0-51.0
Chromium	3.75-4.5
Manganese	1.0 max.
Carbon	0.03 max.
Copper.....	0.5 max.
Silicon	0.5 max.
Sulfur.....	0.005 max.
Aluminum.....	0.75-1.25
Titanium.....	1.20-1.80
Niobium	2.7-3.3
Phosphorus.....	0.015 max.
Boron	0.012 max.
Cobalt	0.5 max.
Iron.....	Balance*

*Reference to the 'balance' of a composition does not guarantee this is exclusively of the element mentioned but that it predominates and others are present only in minimal quantities.

Typical Mechanical Properties

Table 3- Mechanical Properties

Tensile Strength, ksi.....	170
MPa.....	1172
Yield Strength (0.2% Offset), ksi	120
MPa	827
Elongation, %	12

Available Products and Specifications

INCOLOY alloy 908 is designated UNS N09908. Contact Special Metals for available product forms.

Major Specifications: ASTM B 872

Publication Number SMC-111
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INCOLOY® alloy 908





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