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PRODUCT DATA SHEET

Incoloy **800/800H/800HT** UNS N08800 / N08810 / N08811

Nickel Alloys

Incoloy 800 is widely used in equipment that must have high strength and resistance to oxidation, carburisation and other harmful effects of high temperature exposure. For service requiring optimum creep and rupture properties, Incoloy 800H or 800 HT are used. The high contents of nickel and chromium in the alloys also give good corrosion resistance.

Chemical Composition, % (ASTM B407, Seamless pipe & tube)

Element	Incoloy 800	Incoloy 800H	Incoloy 800HT
Nickel	30.00 - 35.00	30.00 - 35.00	30.00 - 35.00
Chromium	19.00 - 23.00	19.00 - 23.00	19.00 - 23.00
Iron	39.50 min	39.50 min	39.50 min
Carbon	0.10 max	0.05 - 0.10	0.06 - 0.10
Aluminium	0.15 - 0.60	0.15 - 0.60	0.25 - 0.60
Titanium	0.15 - 0.60	0.15 - 0.60	0.25 - 0.60
Aluminium + Titanium	0.30 - 1.20	0.30 - 1.20	0.85 - 1.20
ASTM Grain size	Not specified	5 or coarser	

	Incoloy 800, 800H, 800HT	Incoloy 800
	Hot finished, annealed	Cold worked, annealed
Yield Strength, MPa	170	205
Tensile Strength, MPa	450	520
Elongation, %	30	30

Specified Minimum Properties (ASTM B407, Seamless pipe & tube)

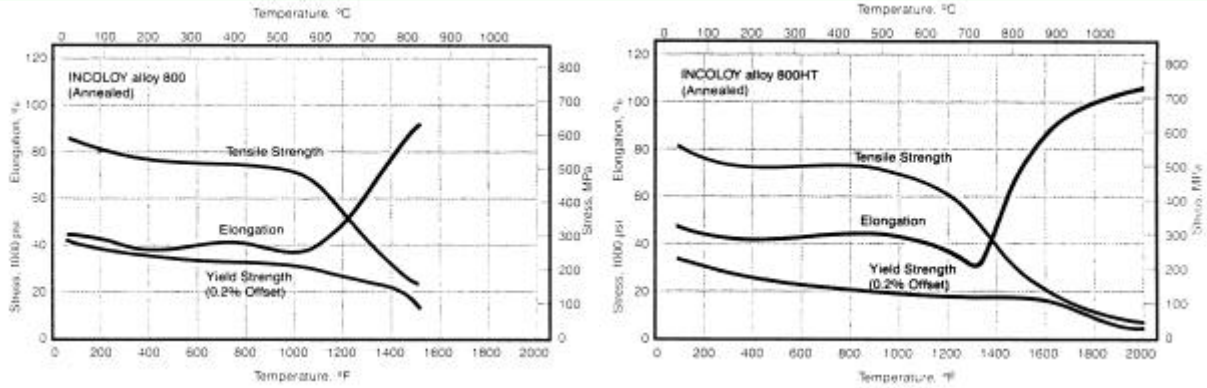
Incoloy 800 is a solid solution strengthened alloy of nickel, chromium and iron with small additions of aluminium and titanium. Incoloy 800H and Incoloy 800HT are developments of Incoloy 800, which give better performance at high temperature. ASME design codes give significantly higher design strengths for Incoloy H and HT than Incoloy 800, and allow their use to higher temperatures. AS1210 prequalifies Incoloy 800 for use to 800°C. ASME specifications allow the use of Incoloy 800 to 815°C, and of Incoloy 800H and 800HT to 982°C.

Typical Applications Thermal processing equipment in industrial applications, such as baskets, trays, and fixtures. In chemical or petrochemical processing it is used for heat exchangers and piping systems in nitric acid media, especially where resistance to chloride stress corrosion cracking is required.

Description Incoloy 800/800H/800HT are solid solution nickel chromium iron alloys with small additions of aluminium and titanium to improve corrosion and oxidation resistance. They are used for high temperature service, where resistance to oxidation and carburisation are required. For optimum stress rupture properties, or for pressure vessel service above 815°C, Incoloy 800H or Incoloy 800HT should be used.

Austral Wright Metals can supply these alloys as plate, sheet and strip, rod and bar, seamless and welded tube and pipe, fittings, condenser & heat exchanger tube, forgings and forging stock.

Oxidation Resistance The chromium and nickel contents of the alloy give excellent oxidation resistance, good resistance to carburisation and resistance to sulphidation at low concentrations of oxidising and reducing sulphur. The alloy also has reasonable resistance to nitridation in cracked ammonia, but falls short of the resistance of Inconel 600.



Variation of tensile properties with temperature for Incoloy 800 (left) and 800HT (right)

Corrosion Resistance Incoloy 800/800H/800HT is generally free from both chloride stress corrosion cracking and intergranular corrosion caused by sensitisation. The alloy can be used in sea water. Incoloy 800/800H/800HT has resistance to acids similar to austenitic stainless steels. It has excellent resistance to both oxidising and non oxidising salts, except for halide salts, where pitting may occur. Please consult Austral Wright Metals for advice on your specific application.

Fabrication Incoloy 800/800H/800HT can be readily hot worked. Forging is finished above 870°C, and air cooled. The work is then solution annealed. The alloys can be cold formed similarly to stainless steel but deformation forces are higher.

Machinability Incoloy 800/800H/800HT are "C" class alloys, difficult to machine. Heavy machines, sharps, slow speeds and deep cuts to remove the work hardened layer are needed.

Welding Incoloy 800/800H/800HT are readily welded by the SMAW (manual), GMAW (MIG), GTAW (TIG) and SAW processes. Preheat or post heat and post weld heat treatment are not needed. Contamination of the weld pool should be prevented. Argon is used as the shielding gas.

Welding Consumables

	Incoloy 800			Incoloy 800HT	
	SMAW	GTAW, GMAW	Cored wire	SMAW	GTAW, GMAW
Recommended	INCO WELD A	Inconel FM 82	INCO CORED 82DH	Inconel WE 117	Inconel FM 617
Higher strength	Inconel WE 112	Inconel FM 625	INCO CORED 625DH	Inconel WE 117	Inconel FM 617
Better corrosion resistance	Inconel WE 182	Inconel FM 82	INCO CORED 82DH	Inconel WE 117	Inconel FM 617

Heat Treatment Incoloy 800 is solution annealed at 980°C, then rapidly cooled. Appreciable grain growth will occur if this temperature is exceeded. Incoloy 800H and 800HT are annealed at is 1150 – 1200°C to grow the grain size to ASTM 5.

Physical Properties (Incoloy 800)

Property	at	value	unit	Property	at	value	unit	
Density	20°C	7,940	Kg/m ³	Melting Range		1357 - 1385	°C	
Modulus of Elasticity	Tension	20°C	196.5	GPa	Specific Heat	20°C	460	J/Kg. °C
	Torsion	20°C	73.4	GPa	Coefficient of Expansion	20°C	14.4	x 10 ⁻⁶ /°C
Poisson's Ratio	20°C	0.339		Thermal Conductivity	20°C	11.5	W / m. °C	
Electrical Resistivity	20°C	0.989	micro - ohm.m					
Magnetic Permeability	2000e	1.014		Curie Temperature		- 115	°C	

ASTM Product Specifications

Specification	Title
B163	Seamless Nickel and Nickel Alloy Condenser and Heat-Exchanger Tubes
B366	Factory-Made Wrought Nickel and Nickel Alloy Fittings
B407	Nickel-Iron-Chromium Alloy Seamless Pipe and Tube
B408	Nickel-Iron-Chromium Alloy Rod and Bar
B409	Nickel-Iron-Chromium Alloy Plate, Sheet, and Strip
B514	Welded Nickel-Iron-Chromium Alloy Pipe
B515	Welded UNS N08120, N08800, N08810, and UNS N08811 Alloy Tubes
B564	Nickel Alloy Forgings
B751	General Requirements for Nickel and Nickel Alloy Welded Tube
B775	General Requirements for Nickel and Nickel Alloy Welded Pipe
B829	General Requirements for Nickel and Nickel Alloys Seamless Pipe and Tube

Equivalent Grade Specifications

Country	Body	Grade
USA	UNS	N08800
GB	BS	NA 15
France	AFNOR	Z 8 NC 32.21
Germany	DIN	1.4876