DATA SHEET

INCOLOY® 800H / 800HT®

UNS NO - N08810 / UNS - N08811

Incoloy 800H and 800HT are a nickel-iron-chromium alloy with very good strength and excellent resistance to oxidation and carburization in high-temperature environments. These nickel steel alloys are indistinguishable aside from the large amount of carbon in alloy 800H and the expansion of up to 1.20 percent aluminium and titanium in alloy 800HT. Incoloy 800 was the first of these alloys and it was altered into Incoloy 800H. This change was to control carbon (.05-.10%) and grain size to improve stress rupture properties. Incoloy 800HT has further adjustments to the consolidated titanium and aluminum levels (.85-1.20%) to guarantee ideal high temperature properties. The nickel alloy is double certified (800H/HT) and joins the properties of both structures. Incoloy 800H/HT alloy was proposed for high temperature structural applications. The nickel content makes the alloy exceptionally resistant to both chloride stress-corrosion cracking and to embrittlement from precipitation of sigma stage. The general corrosion resistance is brilliant. In the solution annealed condition, alloy 800H and 800HT have prevalent creep and stress rupture properties. Incoloy 800H and 800HT are ordinarily utilized as a part of temperatures above 1100° F where resistance to creep and rupture is required. The chemical balance permits the nickel steel alloy to display magnificent resistance to carburization, oxidation and nitriding atmospheres. Incoloy 800HT won't get to be embrittled even after long stretches of use in the 1200-1600° F range where numerous stainless steels get to be brittle. Excellent cold shaping qualities normally connected with the nickel-chromium alloys are shown with 800HT. At the point when cold shaped, broadly the grain size delivers an obviously undulated surface called "orange peel". Incoloy 800HT can be welded by the normal process utilized on stainless steels.

Applications

- Ethylene furnace quench boilers
- Hydrocarbon cracking
- Valves, fittings and other components exposed to corrosive attack from 1100-1800° F
- Industrial furnaces
- Heat-treating equipment
- Chemical and petrochemical processing
- Super-heater and re-heaters in power plants
- Pressure vessels
- Heat exchangers

Characteristics

- High temperature strength
- High creep rupture strength
- Resistant to oxidation and carburization in high temperature environments
- Good corrosion resistance in many acidic environments
- Good resistance to many sulfur-containing atmospheres

Alloys 800H/HT are utilized as a part of applications including an introduction to corrosive situations and high temperatures, for example, heat treating equipment, chemical and petrochemical processing, nuclear power plants and the paper pulp industry. Heat-treating equipment, for example, baskets, trays and fixtures employ Incoloy 800H/HT. Chemical and petrochemical processing commercial enterprises utilize the alloys for heat exchanges and other piping system in nitric acid media, particularly where resistance to chloride stress-corrosion splitting is required. Power plants use them for super-heater and re-heater tubing.

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shaping exotic metals

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Corrosion Resistance

Incoloy 800H/HT have predominant corrosion resistance in such oxidizing corrosive situations as nitric acid and nitric acid sulfuric acid. They perform comparably well in sodium salt and other liquid salt situations and give stress corrosion crack affectability surpassing standard austenitic stainless steels.

Machining

Standard machining methods utilized for iron based alloys might be utilized. This alloy works harden during machining and has higher strength and “gumminess” not typical of steels. Heavy duty machining equipment as well as tooling should be utilized to minimize chatter or work-hardening of the alloy in front of the cutting. Most any business coolant might be utilized as a part of the machining operations. Water-base coolants are favored for high speed operations, for example, turning, grinding or milling. Heavy lubricants work best for tapping, drilling, broaching or boring. Turning: Carbide tool is recommended for turning with a nonstop cut. High speed steel tooling should be utilized for interfering with slices and for smooth completing to close resilience. Tools should have a positive rake angle. Cutting speeds and feeds are in the accompanying reaches: For High-Speed Steel Tools For Carbide Tooling Depth Surface Feed Depth Surface Feed of cut pace in inches of cut rate in inches feet/min. per rev. Inches feet/min. per rev. 0.250” 25-35 0.030 0.250” 150-200 0.020 0.050” 50-60 0.010 0.050” 325-375 0.008 Drilling: Steady feed rates must be utilized to maintain a strategic distance from work hardening because of harping of the drill on the metal. Rigid set-ups are crucial with as short a stub drill as practical. Heavy duty, high speed steel drills with heavy web is recommended. Feeds fluctuate from 0.0007 inches for each rev. for holes of less than 1/16” measurement, 0.003 inches for each rev. for 1/4” dia., to 0.010 inches for each rev. for holes of 7/8”diameter. Processing: To acquire great exactness and a smooth completion, it is fundamental to have unbending machines and fixtures and sharp cutting devices. High speed steel cutters, for example, M-2 or M-10 work best with cutting speeds of 30 to 40 feet per minute and feed of 0.004”- 0.006” per cutting tooth. Grinding: The alloy should be wet ground and aluminium oxide wheels or belts are favored.

Forming

This alloy has good ductility and might be promptly formed by every standard technique. Since the alloy is more powerful than consistent steel it need more power to perform forming. Heavy-duty lubricants should be utilized during cold forming. It is crucial to altogether clean the part of all traces of lubricant to shaping as embrittlement of the alloy might occur at high temperatures if lubricant is left on.

Welding

The usually utilized welding strategies work well with this alloy. The coordinating alloy filler metal should be utilized. In the event that coordinating alloy is not available, then the closest alloy richer in the essential chemistry (Ni, Co, Cr and Mo) should be utilized. All welds dots should be marginally curved. It is not important to utilize preheating. Surfaces to be welded must be perfect and free from oil, paint or crayon marking. The cleaned area should stretch out no less than 2” past either side of a welded joint. Gas-Tungsten Arc Welding: DC straight polarity (electrode negative) is recommended. Keep as short an arc length as could be expected under the circumstances and use consideration to keep the hot end of filler metal dependably inside of the protected environment. Shielded Metal-Arc Welding: Electrodes should be kept in dry storage and if dampness has been grabbing the electrodes should be prepared at 600 F for one hour to safeguard dryness. Current settings shift from 60 amps for material (0.062” thick) up to 140 amps for material of 1/2” and thicker. It is best to weave the electrode marginally as this alloy weld metal does not tend to spread.
Cleaning of slag is finished with a wire brush (hand or powered). Complete evacuation of all slag is essential before progressive weld passes furthermore after final welding. Gas Metal-Arc Welding: Reverse-polarity DC should be utilized and best results are acquired with the welding weapon at 90 degrees to the joint. For Short-Circuiting-Transfer GMAW a typical voltage is 20-23 with a current of 110-130 amps and a wire feed of 250-275 inches per minute. For Spray-Transfer GMAW voltage of 26 to 33 and current in the scope of 175-300 amps with wire feed rate of 200-350 inches per minute, relying on filler wire diameter. Submerged-Arc Welding: Matching filler metal, the same concerning GMAW, should be utilized. DC current with either turn around or straight polarity might be utilized. Convex weld globules are favored.

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Heat Treatment
The alloy might be annealed however is not hardenable by heat treatment.

Forging
Forging might be done within the scope of 2250 F to 1850 F.

Hot Working
Hot working might be done within the scope of 2200 F to 1600 F.

Cold Working
Cold forming might be done utilizing standard tooling albeit plain carbon tool steels are not recommended for shaping as they tend to produce galling. Soft die materials (bronze, zinc alloy, and so forth.) minimize galling and deliver great completions, yet the die life is to some degree short. For long production runs the alloy tool steels (D-2, D-3) and high speed steels (T-1, M-2, M-10) give great results particularly if hard chromium plated to decrease galling. Tooling should be, for example, to take into consideration liberal clearances and radii. Heavy duty lubricants should be utilized to minimize galling in all forming operations. Twisting of sheet or plate through 180 degrees is for the most part constrained to a twist sweep of 1 T for material up to 1/8” thick and 2 T for material thicker than 1/8”.

Annealing
Annealing after cold work hardening might be required. In the event so that anneal at 1800 F for 15 minutes at temperature and air cool. Try not to heat above 1800 F or grain development will happen with a debasement of strength. Anneal of Alloys 800HT is done at 2100 F and air cool.

Hardening
Hardens are due to cold working only.

Chemical Properties

Grade	C	Al	Si	S	Ti	Cr	Mn	Fe	Ni	Cu
800H	0.05-0.10 max	0.15 - 0.60	1.0 max	0.015 max	0.15 - 0.60	19.0 - 23.0	1.5 max	39.5 min	30.0 - 35.0	0.75 max
800H	0.06-0.10 max	0.15 - 0.60	1.0 max	0.015 max	0.15 - 0.60	19.0 - 23.0	1.5 max	39.5 min	30.0 - 35.0	0.75 max

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Mechanical Properties

Tensile Strength (ksi)	0.2% Yield Strength (ksi)	Elongation% in 2 inches
65	25	25

Physical Properties

Properties	Units	Temperature in °C
Density	7.94 g/cm^3	Room
Specific Heat	0.11 Kcal/kg.C	22°
Melting Range	1357 - 1385 °C	-
Modulus of Elasticity	196.5 KN/mm^2	20°
Electrical Resistivity	98.9 µΩ.cm	Room
Coefficient of Expansion	14.4 µm/m °C	20 - 100°
Thermal Conductivity	11.5 W/m -°K	20°

ASTM Specifications

Pipe (SMLS)	Pipe Welded	Tube (SMLS)	Tube Welded	Sheet / Plate	Bar	Forging	Fitting
B 407	B 154	B 163	B 515	B 409	B 408	B 564	B 366

Availability

MANUFACTURING
Refractory Anchors
Fasteners
Custom Machining
Custom Fabrication
Piping / Spools
Stamped Parts
B/W Fittings
S/W Fittings
Flanges
Compression Fittings

RAW MATERIALS
Pipes
Tubes
Bars
Sheets
Plates
-
-
-
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