DATA SHEET

INCOLOY® 800

UNS NO - N08800

Other common names: Alloy 800

Incoloy 800 is a nickel-iron-chromium alloy. It has very good strength and excellent resistance to oxidation and carburization in high-temperature environments. High chromium content gives Incoloy 800 greater resistance to oxidation. It likewise opposes numerous fluid media and is generally free from stress-corrosion cracking. Incoloy 800 has phenomenal resistance to nitric acid at focuses up to around 70% and at temperatures up to the boiling point. It likewise has magnificent resistance to natural acids, for example, acetic, formic, and propionic. It resists an assortment of oxidizing and non-oxidizing salts, yet not halide salts. Most common places applications are heat treating equipment, petrochemical pyrolysis tubing and piping systems, sheathing for electrical heating components and food processing equipment.

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

- Resistance to prolonged exposure to elevated temperatures
- Excellent resistance to oxidation, sulfidation and carburization
- Added Carbon and annealing treatment allows for higher creep and rupture properties above 600°C
- Resistant to high temperature corrosion
- Readily machined by standard methods
- Best joined/welded using products for high temperature situations
- Resistance to aqueous corrosion at moderate temperatures

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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 setups 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 inch 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

Incoloy 800 has an austenitic structure, and the heat treatment is comparative. Common heat treatments are as per the following:

- Annealing: 980-1100°C Rapid cooling
- Stress relief annealing: 780-870 °C Air cooling

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 growth will happen with degradation of strength.

Hardening

Hardens are due to cold working only.

Chemical Properties

C	Al	Si	S	Ti	Cr	Mn	Fe	Ni	Cu
0.1 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
75	30	30

Physical Properties

Properties	Units	Temperature in °C
Density	7.94 g/cm^3	Room
Specific Heat	0.11 Kcal/kg.C	21°
Melting Range	1357 - 1385 °C	-
Modulus of Elasticity	196.5 KN/mm^2	20°
Electrical Resistivity	98.9 µΩ.cm	20°
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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