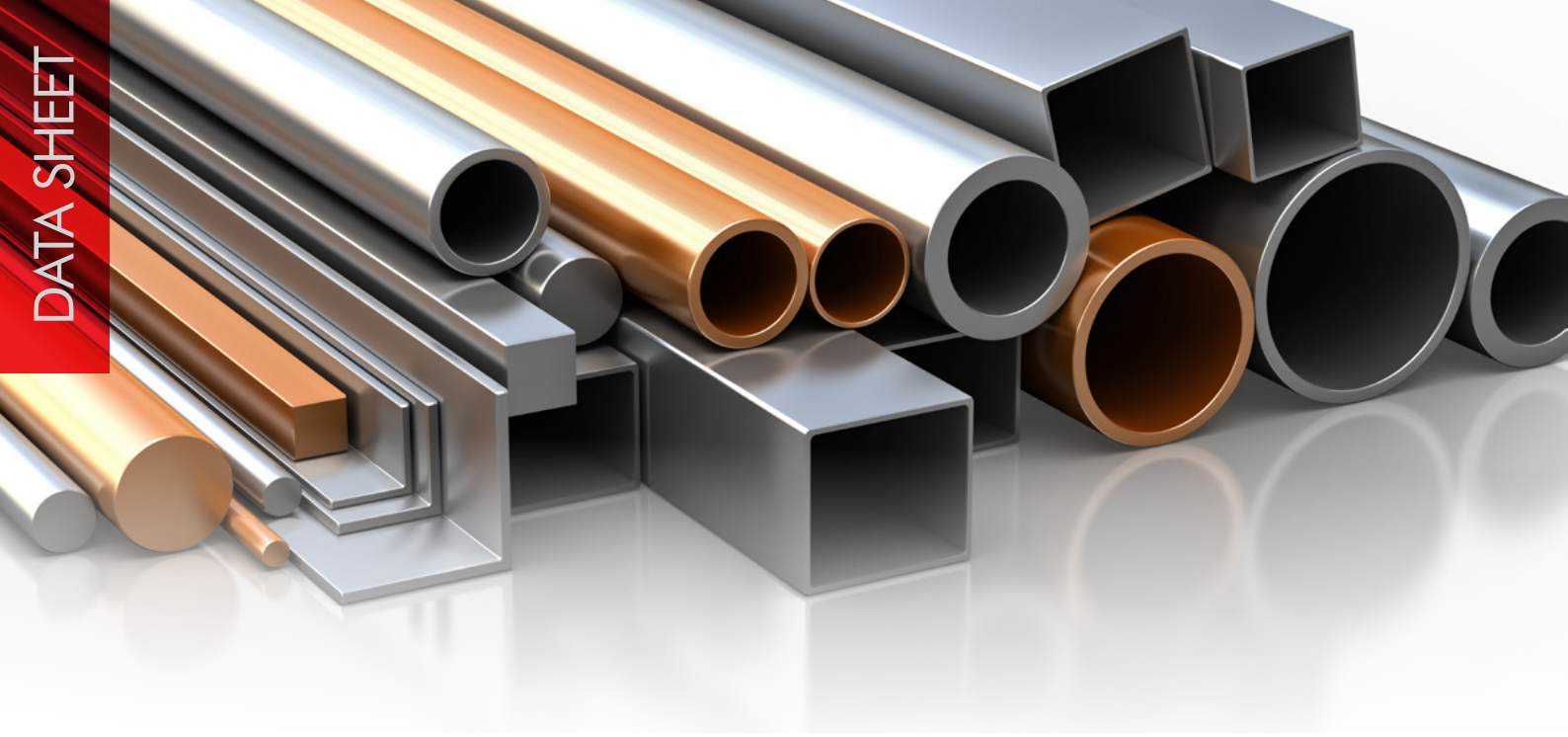
DATA SHEET



INCOLOY® 825

UNS NO - N08825

Other common names: Alloy 825

Incoloy 825 is a nickel-iron-chromium alloy with increments of molybdenum and copper. This nickel steel alloy chemical composition is intended to give exceptional resistance to numerous corrosive situations. It is like alloy 800 however, has enhanced resistance to aqueous corrosion. It has magnificent resistance to both decreasing and oxidizing acids, to stretch-corrosion splitting and to restricted assault, for example, pitting and crevice corrosion. Alloy 825 is particularly resistant to sulfuric and phosphoric acids. The Nickel steel alloy is utilized for acid production, chemical processing, oil and gas well piping, pollution-control equipment, nuclear fuel reprocessing and pickling equipment.

Applications

- Chemical Processing
- Pollution-control
- Oil and gas well piping
- Nuclear fuel reprocessing
- Components in Pickling equipment like heating coils, tanks, baskets and chains
- Acid production

Characteristics

- Excellent resistance to reducing and oxidizing acids
- Good resistance to stress-corrosion cracking
- Satisfactory resistance to localized attack like pitting and crevice corrosion
- Very resistant to sulfuric and phosphoric acids
- Good mechanical properties at both room and elevated temperatures up to approximately 1020° F
- Permission for pressure-vessel use at wall temperatures up to 800°F

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Corrosion Resistance

Alloy 825 has a high level of corrosion resistance. It opposes general corrosion, pitting, crevice corrosion, intergranular corrosion and anxiety-corrosion cracking in both decreasing and oxidizing situations.

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 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.

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Heat Treatment
Anneal at 1750 F and fast air cool.

Forging
The alloy is promptly produced in the temperature scope of 2000 F to 1800 F. However a last anneal at 1750 F is then required to restore ideal corrosion properties.

Hot Working
It might be done yet should be refined at temperatures less than 1700 F to maintain optimum corrosion resistance of the alloy.

Cold Working
Cold forming might be done utilizing standard tooling albeit plain carbon tools steel 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
Anneal at 1750 F followed by fast air cooling.

Hardening
Hardens are due to cold working only.

Chemical Properties

C	Al	Si	S	Ti	Cr	Mn	Fe	Ni	Cu	Mo
0.05 max	0.2 max	0.5 max	0.03 max	0.6 - 1.2	19.5 - 23.5	1.0 max	22.0 min	38.0 - 46.0	1.5 - 3.0	2.5 - 3.5

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Mechanical Properties

Typical room temperature Tensile Properties of Annealed Material

Tensile Strength (ksi)	0.2% Yield Strength (ksi)	Elongation% in 2 inches
85	35	30

Alloy 825 has good mechanical properties from cryogenic temperatures to moderately high temperatures. However, exposure to temperatures above 1000° F can result in microstructural changes that significantly lower ductility and impact strength. Alloy 825 should not be used at temperatures where creep-rupture properties are design factors.

Physical Properties

*All Properties at typical Room Temperature.

Properties	Units	Temperature in °C
Density	8.14 g/cm^3	Room
Specific Heat	0.105 Kcal/kg.C	Room
Melting Range	1370 - 1400 °C	-
Modulus of Elasticity	196 KN/mm^2	20°
Electrical Resistivity	113 µΩ.cm	25°
Coefficient of Expansion	14.1 µm/m °C	25 - 100°
Thermal Conductivity	11.1 W/m -°K	25°

ASTM Specifications

Pipe (SMLS)	Sheet / Plate	Bar	Forging	Fitting
B 423	B 424	B 425	B 564	B 366, B 564

Availability

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

RAW MATERIALS
Pipes
Bars
Sheets
Plates
-
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