

Incoloy® 825 (UNS N08825) — Material Data Sheet

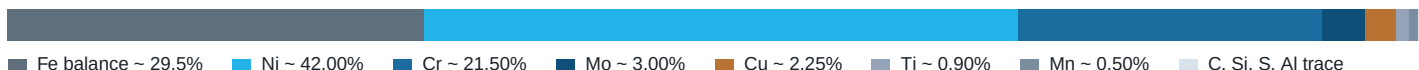
ASTM B425 (bar) · ASTM B564 (forgings) · UNS N08825 · Alloy 825

Nickel-iron-chromium alloy with Mo, Cu and Ti, solution annealed

The acid and sour-gas alloy: nickel-iron-chromium with molybdenum and copper for sulfuric and phosphoric acid, chlorides and hydrogen sulfide — for chemical plant, pollution control and oilfield fasteners.

TENSILE, ANNEALED (B425 MIN)	85 ksi	MOLYBDENUM · COPPER	2.5–3.5 · 1.5–3.0 %
YIELD, ANNEALED (B425 MIN)	35 ksi	AGE HARDENABLE	No (see 925)
NICKEL	38–46 %	MAGNETIC	No

Nominal composition



Midpoints of the specification ranges, for orientation only. Limits are in the table.

Chemical composition — Incoloy® 825 (UNS N08825)

Element	Symbol	Min %	Max %
Carbon	C	—	0.05
Manganese	Mn	—	1.0
Silicon	Si	—	0.5
Sulfur	S	—	0.03
Chromium	Cr	19.5	23.5
Molybdenum	Mo	2.5	3.5
Titanium	Ti	0.6	1.2
Aluminium	Al	—	0.2
Copper	Cu	1.5	3.0
Nickel	Ni	38.0	46.0
Iron	Fe	22.0	—

Limiting chemical composition for UNS N08825 per ASTM B425, matching the producer's datasheet (Special Metals, INCOLOY alloy 825, publication SMC-030, Table 1).

Physical properties (typical)

DENSITY	0.294 lb/in ³ (8.14 g/cm ³)
MODULUS OF ELASTICITY	28.3 × 10 ⁶ psi at 100 °F (196 GPa at 20 °C)
THERMAL EXPANSION (80–200 °F)	7.8 µin/in·°F
MELTING RANGE	2500–2550 °F (1370–1400 °C)
MAGNETIC	No (permeability 1.005 at 200 oersteds)

Heat treatment

Supplied mill annealed for the best balance of stabilization, corrosion resistance and strength. Later anneals are made at 1700–1800 °F (930–980 °C) followed by rapid air cooling or water quenching; the lower end of the range suits stabilization. Not hardenable by heat treatment. If welded parts will see an environment that can cause intergranular corrosion, give them a stabilizing anneal after welding.

Mechanical properties — Incoloy® 825 (UNS N08825)

Condition	Tensile strength (ksi)	Yield strength 0.2% offset (ksi)	Elongation (%)	Reduction of area (%)	Hardness
Annealed rod and bar — ASTM B425 minimum	85	35	30	—	—
Annealed bar — typical (Special Metals)	100	47	45	—	—

ASTM B425 minimums for annealed rod and bar; the elongation requirement does not apply under 3/32 in. Typical values are from the producer's datasheet (Special Metals SMC-030, Table 5). The alloy can be strengthened substantially by cold work.

Applicable standards

ASTM B425	Nickel-iron-chromium-molybdenum-copper alloy rod and bar
ASTM B564	Nickel alloy forgings
NACE MR0175 / ISO 15156-3	Listed for sour service in the annealed condition

Forms we supply in Incoloy 825

- Studs and stud bolts
- Hex and heavy hex bolts
- Nuts and washers
- Socket head cap screws
- Machined components from certified bar

Typical applications

- Sulfuric and phosphoric acid plant
- Flue-gas desulfurization and pollution control
- Sour-gas wellhead and pipeline hardware
- Seawater and brine equipment
- Pickling and chemical process fasteners