



Langley Alloys

Nickel
Alloys

Alloy 825 HS110 (High Strength)

Specifications:

UNS N08825, Werkstoff No. EN: 2.4858, ASTM B425, BS3076 NA16, NACE MR0175 / ISO 15156

Alloy 825 HS110 is a high strength Nickel-Iron-Chromium alloy with additions of Molybdenum, Copper and Titanium (NiCr21Mo), supplied in the hot worked, annealed and cold worked condition. Controlled cold working ensures that the product achieves significantly increased yield strengths over the annealed product, whilst retaining good ductility and toughness. It achieves good mechanical properties from cryogenic to medium-high temperatures (540°C) and can be significantly strengthened through cold working. The high Nickel content ensures resistance to stress corrosion cracking, combined with Molybdenum and Copper to strongly resist reducing environments such as sulphuric and phosphoric acids, Chromium to resist oxidising environments such as nitric acid, Titanium to inhibit intergranular corrosion, and overall resistance to pitting and crevice corrosion.

Key features:

- Excellent corrosion resistance in a wide variety of corrosive environments including seawater and industrial acids
- Readily formable and weldable
- Excellent resistance to stress corrosion cracking

Typical applications:

- Chemical process equipment
- Pollution control systems and wet scrubbers
- Waste heat recovery exchangers
- Tanks, vessels and agitators
- Downhole equipment for corrosive/sour service
- Nuclear reprocessing and handling

Physical Properties:

Density (Kg/m ³)	81.4
Magnetic Permeability (20°C)	1.005
Curie Temperature (°C)	-196
Young's Modulus (N/mm ²)	196
Specific Heat, 20°C (J/(g.K))	440
Specific Electrical Resistance, 20°C (Ω-m)	0.00113
Thermal conductivity, 20°C (W/(m.K))	10.8
Mean coefficient of thermal expansion, 20 - 100°C (/K)	14.1 x 10 ⁻⁶

Product Forms Available:

Bar	✓
Plate	Enquiry
Tube	Enquiry
Fittings	Enquiry
Forgings	To order
Castings	To order

Mechanical Properties:

	Min	Max
0.2% Proof Stress	758 N/mm ² (110ksi)	965 N/mm ² (140ksi)
Tensile Strength	793 N/mm ² (115ksi)	
Elongation, 5.65√S0 and 4D	11%	
Hardness (Rockwell C)		35

Notes:

1. Testing shall be carried out in accordance with ASTM A370 or EN ISO 6892-1 (tensile), EN ISO 6506-1 (hardness)
2. Minimum properties quoted (tested at room temperature in a longitudinal direction)
3. Testing performed on each melt of material per heat treatment batch

Chemical Composition:

	Cr	Ni	Mo	Co	Nb (+Ta)	Ti	W	Cu	C	Mn	N	Si	P	S	Fe	Al
Min	19.5	38.0	2.5			0.6		1.5							22.0	
Max	23.5	46.0	3.5			1.2		3.0	0.05	1.0		0.5		0.03		0.2

Product Comparison:

Alloy Comparisons	Alloy 825 HS110	N06625	N04400	N05500	N07718 (aged)
0.2% Proof Strength (N/mm ²)	324	415	170	690	827
Corrosion Rate (mm/year) - Seawater	< 0.01	0.01	0.25	0.18	<0.01
Corrosion Rate (mm/year) - 10% sulphuric acid at 80°C	0.4	0.15	0.06	0.1	0.15
Corrosion Rate (mm/year) - Boiling 50% nitric acid	0.6	1.8	1.1	<2	1.5

Machining Advice:

Operation	Cutting Speed m/min (ft/min)	Feed Rate mm/rev (in/rev)	Depth of cut mm (in)
Milling	10 (32)	0.08 - 0.15 mm/tooth 0.003 - 0.006 in/tooth	0.2-3.0 (0.007 - 0.12)
Drilling 6.4mm (1/4") dia	6 - 8 (19 - 25)	0.08 (0.003)	
Drilling 12.7mm (1/2") dia	6 - 8 (19 - 25)	0.13 (0.005)	
Drilling 25.4mm (1") dia	6 - 8 (19 - 25)	0.20 (0.008)	
Turning - Roughing	18 - 24 (60 - 75)	0.25 - 0.40 (0.010 - 0.020)	2.5 (0.10)
Turning - Finishing	31 - 38 (100 - 120)	0.10 - 0.20 (0.004 - 0.008)	0.25 (0.01)
Tooling	Milling/Turning: Carbide (SANDVIK GC 235, SECO T25M) Drilling: HSS, point angle 118°, chisel angle 120°		

Production Route:

- Alloy 825 HS110 is produced through high-quality melting processes to ensure cleanliness and consistency.
- a) All material shall be melted by Electric Arc Furnace (EAF) or Electric Induction Furnace (EIF), with Electro Slag Refining (ESR) allowable as a further process
 - b) Annealing shall be carried out at a temperature up to 980°C, allowing sufficient time for full annealing to take place
 - c) Quenching can be either in air or water
 - d) Each complete batch of material is ultrasonically tested, and all bars visually inspected

Further Processing:

- Order processing and stock control is facilitated by a fully-integrated computer system which links to item production and inspection
- Automated band saws are available for accurate stock cutting up to a section size of 650mm (25")
- First-stage processing, including water jet cutting, turning, boring and grinding can be undertaken to help manage your overall supply chain
- Additional documentation and certification can be supplied as required

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