

Alloy 42-6

Alloy 42 (ASTM F31 Alloy) is a iron nickel alloy with 6% chromium, it is used primarily for glass sealing applications in electronic devices. This alloy develops a tight green oxide film during wet hydrogen annealing and finds applications in relatively large glass seals and vacuum tight windows.

Common Trade Names

H42X6, UNS K94760, 42Ni-6Cr

Chemical Composition

Grade	C%	P%	S%	Mn%	Si%
Alloy 42-6	Max 0.05	Max 0.02	Max 0.02	Max 0.25	Max 0.30
	Al%	Cr%	Ni%	Fe%	
	Max 0.20	5.4-6.3	41.5-42.5	Bal.	

Heat Treatment

1100 °C ± 20 °C in hydrogen for 15min, cooling in furnace at the rate less than 5°C/min to 200°C

Physical Properties

Properties	
Resistivity at 20°C (micro ohm · meter)	0.92
Density (gram/cm ³)	8.15
Specific heat (J/kg · °C)	504
Thermal conductivity (W/m · °C)	13.4
Melting temperature (°C)	1430

Average Coefficient Of Linear Expansion

Temperature °C	10-6°C -1	Temperature °C	10-6°C -1
20-100	6.8	20-500	11.7
20-200	7.0	20-550	11.7
20-300	7.7	20-600	12.2
20-400	9.7		

Typical Mechanical Property

	σ _b /MPa	σ _{P0.2} /MPa	δ/%	HV
Annealed	500	177	33	128

Tensile Strength of Strip

Condition	σ _b /MPa
Soft	<590
Hard	>820

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Heat Treatment of Finished Parts

- 1, Stress-relief annealing: In order to eliminate the residual stress of parts after machining, 470-540°C in protective atmosphere, for 1-2h, cool in furnace or cool in air
- 2, Intermediate annealing: In order to eliminate the hardening caused by cold rolling, cold drawing and cold stamping, 800-900°C in dry hydrogen or vacuum, for 20min, air or water cool
- 3, Pre-oxidation treatment: In order to form a uniform thickness and dense oxide film on the surface of the alloy, the oxide film is firmly bonded to the substrate and can be well infiltrated with the molten glass. The parts are heated to 1150 ~ 1250 °C in saturated wet hydrogen, kept for 30 ~ 50min, air cooled. The weight gain of the parts is preferably in the range of 0.2 to 0.4 mg/cm².

Descaling Treatment

Sandblasting, polishing or pickling can be used. The alloy can be pickled in acetic acid + nitric acid or acetic anhydride + hydrochloric acid before sealing.

Machining

High-speed steel or carbide tools are used for machining, low-speed machining, and coolant can be used for cutting. Good grinding performance

Available Forms

- 1, Sheet/Plate
Condition: Hot rolled, cold rolled, annealed, pickled
- 2, Disc/Ring
Condition: Hot rolled, forged, pickled, machined
- 3, Wire
Condition: Bright annealed, 1/4Hard-Hard Drawn, dia. 0.01-15mm, in coil or cut lengths
- 4, Bar
Condition: Hot rolled, forged, annealed, pickled, ground
- 5, Strip/Ribbon
Condition: Cold rolled, thickness 0.01-5mm
- 6, Tube/Capillary Tube
Condition: OD 0.2-15mm, Wall 0.015-3mm