

Alloy 42

Alloy 42 (K94100/ASTM F30) is a nickel iron alloy contains 41% nickel featured with low and constant coefficient of thermal expansion from 20°C to 300°C. The thermal coefficient of expansion of this alloy matches that of silicon, beryllia, alumina. As a result, it is used for glass-to-metal and ceramic sealing applications. **Alloy 42** is also used as the core of Dumet wire, for sealing into glass envelopes of electric bulbs, radio valves, television tubes and fluorescent lights. This alloy is also used for thermostats and thermo switches.

Specifications

UNS K94100, ASTM F30, Werkstoff Nr. 1.3917, AFNOR NF A54-301, NILO 42

Chemical Composition

Grade	C%	P%	S%	Mn%	Si%
	Max 0.05	Max 0.02	Max 0.02	Max 0.80	Max 0.30
Alloy 42	Al%	Co%	Cr%	Ni%	Fe%
	Max 0.10	Max 1.0 ^B	Max 0.25	42 ^A	Bal.

^AWe will adjust the the percentage to achieve the requirements for coefficient of thermal expansion

^BCobalt is as an incidental element

Heat Treatment

900 °C ± 20 °C in hydrogen atmosphere for 1 hour, cooled in furnace to 200 °C at the rate of Max 5 °C / min

Physical Properties

Properties	Alloy 42
Resistivity at 20°C (micro ohm · meter)	0.61
Density (gram/cm ³)	8.12
Specific heat (J/kg · °C)	502
Thermal conductivity (W/m · °C)	14.6
Melting temperature (°C)	1430

Average Coefficient Of Linear Expansion

Temperature °C	10 ⁻⁶ °C ⁻¹	Temperature °C	10 ⁻⁶ °C ⁻¹
20-100	5.6	20-400	5.9
20-200	4.9	20-450	6.9
20-300	4.8	20-500	7.8
20-350	4.95	20-600	9.2

Hardness of Hard Drawn Strip

Condition	Thickness	Hardness HV
Hard Drawn	>2.5	<=170
	<=2.5	<=165

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Tensile Strength of Strip

Condition	σ_b MPa
Soft Annealed	<590
Hard	>820

Heat Treatment of Finished Parts

- 1, Stress-relief annealing: In order to eliminate the residual stress of parts after machining, 430-540°C, for 1-2h, air cool
- 2, Intermediate annealing: In order to eliminate the hardening caused by cold rolling, cold drawing and cold stamping, 700-800°C in dry hydrogen or vacuum, for 30min-1h, air or water cool
- 3, Oxidation treatment before sealing, A uniform and dense oxide film is formed on the surface of the alloy. The oxide film is firmly bound to the matrix and can infiltrate well into the molten glass. 800°C in air, for 5-10min, weight gain of finished parts: 0.1-0.3 mg/cm²

Surface Treatment

Before heat treatment, welding or glass sealing, it is necessary to remove dirt and grease from the alloy surface. When there is thick oxide layer, it may be sandblasted or first immersed in molten alkali, and then pickled. Thin oxide layer can be pickled with 25% hydrochloric acid solution at 70 °C

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