

Alloy 52

Alloy 52 is an iron nickel alloy with 51% nickel and balance iron, it has a constant coefficient of thermal expansion from 20°C to 500°C. It is used for soft glass, ceramic seals.

Common Trade Names

52H, NILO 52, Glass Seal 52, Pernifer 50

Chemical Composition

Grade	C%	P%	S%	Mn%	Si%	Ni%	Fe%
Alloy 52	Max 0.05	Max 0.02	Max 0.02	Max 0.80	Max 0.30	51.5-52.5	Bal.

Heat Treatment

850 °C ± 20 °C in hydrogen for 1h, cooling in furnace at the rate less than 300°C/min to 400°C, then out of furnace.

Physical Properties

Properties	Alloy 52
Resistivity at 20°C (micro ohm · meter)	0.43
Density (gram/cm ³)	8.25
Specific heat (J/kg · °C)	502
Thermal conductivity (W/m · °C)	16.7
Melting temperature (°C)	1430

Average Coefficient Of Linear Expansion

Temperature °C	10 ⁻⁶ °C ⁻¹	Temperature °C	10 ⁻⁶ °C ⁻¹
20-100	10.3	20-400	10.3
20-200	10.4	20-450	10.3
20-300	10.2	20-500	10.3
20-350	10.3	20-600	10.8

Typical Mechanical Property

	σ _b /MPa	σ _{P0.2} /MPa	δ/%	φ/%
Annealed	550	276	35	65

Tensile Strength of Strip

Condition	σ _b /MPa
Soft	<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 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, 700-800°C in dry hydrogen or vacuum, for 30min-60min, 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 °C in saturated wet hydrogen, kept for 30min, air cooled, then at 800 °C for 5-10min, the weight gain of the parts is preferably in the range of 0.1 to 0.3 mg/cm².

Descaling Treatment

When there is thick oxide layer, it may be sandblasted or first immersed in molten alkali, and then pickled. The thin oxide layer can be pickled with a 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