

Alloy 42 (ASTM F30)

Smiths Advanced Metals

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Alloy 42

Alloy 42, also known as Iron Nickel 42, is a controlled expansion iron-nickel alloy containing approximately 42% nickel.

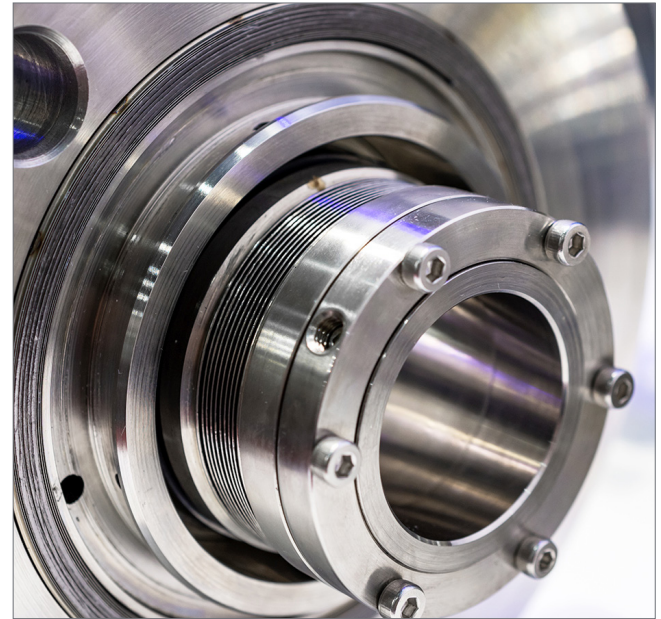
Manufactured in accordance with ASTM F30 and designated as UNS K94100, Alloy 42 is engineered to deliver a consistently low coefficient of thermal expansion over a wide temperature range - typically from 20 °C to 300 °C, and up to 450 °C in some applications.

This predictable thermal expansion makes alloy 42 ideal for hermetic sealing applications involving glass and ceramic materials. Its expansion characteristics closely match those of silicon and advanced ceramics, such as alumina, beryllia, and vitreous glass, ensuring durable, leak-free glass-to-metal and ceramic-to-metal seals.

Thanks to its dimensional stability under thermal cycling, iron nickel 42 is widely specified in electronic, aerospace, and high-reliability industrial applications where precision and long-term performance are critical.

Benefits

- Low and stable coefficient of thermal expansion
- Superior thermal shock and crack resistance
- Compatible with ceramic and selected glass systems
- Ideal for long-lasting hermetic and vacuum seals



Grades/Specifications

- ASTM F30
- UNS K94100

Applications

- Lead frames and precision flexible seals
- Automotive, industrial, and electric lamp assemblies
- Hermetic enclosures and ceramic feed-throughs
- Electronic tubes, CRT electron guns, and vacuum devices

*Chemical Composition (weight, %)

	Fe	**Ni	Mn	P	Si	Cr	Al	C	S
Min	Rem	40							
Max		42	0.80	0.025	0.30	0.25	0.10	0.05	0.025

*As per ASTM F30 ** Nickel Content is a nominal 41%

Average Linear Coefficient of Thermal Expansion (CTE)

Temperature Range 30 to 300 °C	4.0 to 4.7 $\mu\text{m}/\text{m}^\circ\text{C}$
Temperature Range 30 to 450 °C	6.7 to 7.4 $\mu\text{m}/\text{m}^\circ\text{C}$

CTE tested per melt

Machining Guidelines

During machining, iron nickel 42 can work-harden rapidly. Best results are achieved using low cutting speeds, sharp tooling, and effective cooling. Compared to standard stainless steels, alloy 42 may feel softer and more adhesive at the cutting interface, so careful process control is advised.

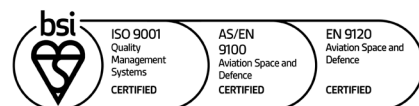
www.smithadvanced.com

info@smithsadvanced.com



Unit 5 Percy Road,
Huntingdon,
Cambridgeshire PE29 6SZ

Tel: +44 (0) 1767 604710



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