

ALLOY 52

UNS N14052

Fe–Ni controlled-expansion alloy

Expansion matched to selected soft glasses and ceramics for hermetic sealing.

01 PRODUCT INTRODUCTION

Alloy 52 is an iron-nickel controlled-expansion alloy with approximately 52% nickel. It is used where the thermal expansion curve must match a selected glass or ceramic through sealing and service temperatures. Typical applications include glass-to-metal seals, lead frames, electronic packages, reed switches and feedthroughs. The mating material, surface oxidation, joint geometry and sealing cycle must be qualified together. Final selection should consider the complete expansion curve, mating material, surface preparation, sealing temperature and service environment.

02 ENGINEERING POSITION

Core advantage	Controlled expansion matched to selected sealing material
Applications	Glass-to-metal seals · electronic packages · reed switches · feedthroughs · lead frames
Material class	Fe–Ni controlled-expansion alloy

03 COMMON INDUSTRY USE

Industry focus	Glass-to-metal seals · electronic packages · reed switches · feedthroughs · lead frames
Design note	Specify thermal expansion range, mating material and sealing cycle.

Composition & Physical Data

04 CHEMICAL COMPOSITION

Ni	50–52%	Fe	Balance
C	≤ 0.05%	Mn	≤ 0.50%
Si	≤ 0.30%	Cr	Specification limit
P	Specification limit	S	Specification limit

05 PHYSICAL PROPERTIES

Density	Approx. 8.20 g/cm ³
Thermal expansion	Controlled expansion matched to selected sealing material
Data status	Typical reference; specification controls acceptance

06 MATERIAL IDENTITY

Common name	ALLOY 52
UNS	N14052
Alloy family	Fe–Ni controlled-expansion alloy
Application focus	Glass-to-metal seals · electronic packages · reed switches · feedthroughs · lead frames

Mechanical & Thermal Performance

07 DIMENSIONAL STABILITY

Expansion basis	The coefficient varies with temperature, heat treatment, rolling direction and condition.
Design data	Use measured expansion curves over the complete operating and joining range.

08 SERVICE PERFORMANCE

Primary service	Glass / ceramic matching and precision dimensional control
Joining	Review sealing atmosphere, oxidation, wetting and interfacial reaction.
Thermal cycling	Assess mismatch stress, joint geometry and repeated temperature excursions.
Mechanical loads	Use product-form-specific tensile, yield and fatigue data.

09 APPLICATIONS

Typical use	Glass-to-metal seals · electronic packages · reed switches · feedthroughs · lead frames
Critical review	Confirm mating material, surface finish, joint design and quality criteria.

Fabrication, Sealing & Heat Treatment

10 FORMING & MACHINING

Forming	Use controlled forming practice and account for work hardening.
Machining	Use sharp tools, stable setup and suitable coolant.

11 JOINING GUIDANCE

Cleaning	Remove oil, sulfur, oxides and iron contamination before sealing.
Sealing	Control atmosphere, pre-oxidation, wetting and thermal cycle.
Heat input	Avoid unnecessary reheating and local distortion.
Inspection	Check dimensions, leak rate, seal integrity and surface condition.

12 HEAT TREATMENT

Heat treatment and stress relief must follow the specific product and sealing specification. Controlled annealing is used to stabilize dimensions and restore ductility after forming.

Quality control	Confirm process qualification, leak testing, dimensional inspection and traceability.
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Product Forms, Standards & Procurement

13 PRODUCT FORMS

Forms	Sheet · strip · bar · wire · tube · lead frames · headers · custom parts
Condition	Annealed or stress relieved according to product and sealing route

14 RFQ INFORMATION

Material	ALLOY 52 · N14052 · controlled-expansion specification
Dimensions	Form, thickness, tolerances, length and quantity
Joining	Mating glass / ceramic, sealing temperature, atmosphere and leak rate
Documents	MTR, expansion curve, heat traceability and compliance certificates

15 TECHNICAL DISCLAIMER

Expansion values are temperature- and condition-dependent. They do not replace measured curves, joint qualification, applicable sealing standards or the certified material test report.

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