CONTROLLED-EXPANSION ALLOYS

KOVAR

Iron–nickel–cobalt sealing alloy / UNS K94610

Kovar is used for glass-to-metal seals in electronic packages. For a capillary or sleeve, match its expansion to the specified glass over the sealing and operating temperatures.

01 Chemical composition

Mass fraction (%)

ELEMENT	CONTENT	ELEMENT	CONTENT
Iron (Fe)	**53 nominal**	Copper (Cu)	**0.20 max.**
Nickel (Ni)	**29 nominal**	Chromium (Cr)	**0.20 max.**
Cobalt (Co)	**17 nominal**	Molybdenum (Mo)	**0.20 max.**
Carbon (C)	**0.03 max.**	Aluminum (Al)	**0.10 max.**
Phosphorus (P)	**0.02 max.**	Magnesium (Mg)	**0.10 max.**
Sulfur (S)	**0.02 max.**	Zirconium (Zr)	**0.10 max.**
Manganese (Mn)	**0.5 max.**	Titanium (Ti)	**0.10 max.**
Silicon (Si)	**0.30 max.**	Al + Mg + Zr + Ti (total)	**0.20 max.**

Fe, Ni and Co are nominal; their proportions may be adjusted to meet the expansion requirement.

Specifying a Kovar capillary

State the mating glass or ceramic, the sealing temperature and the required expansion interval.

Specify the tube dimensions and delivery condition separately on the drawing.

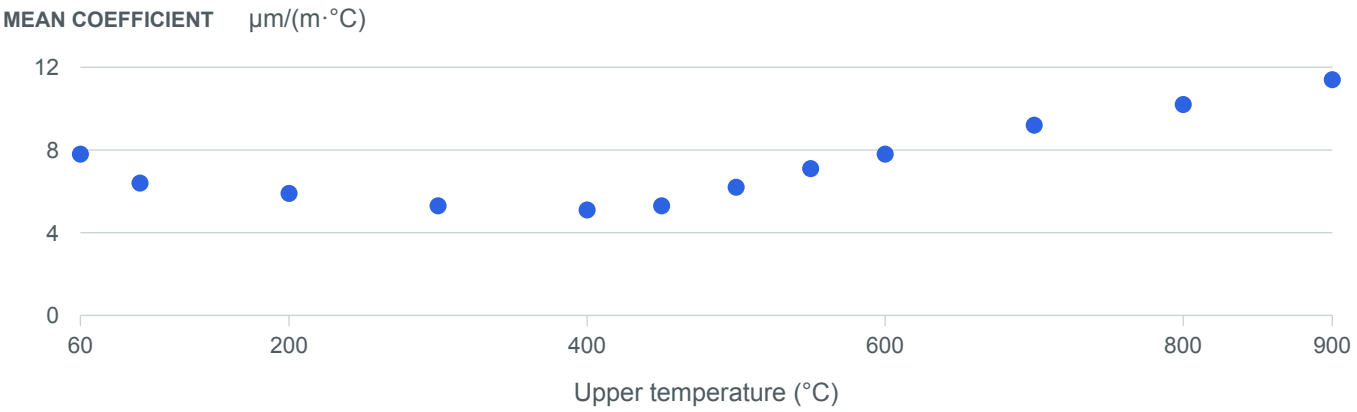
CONTROLLED-EXPANSION ALLOYS

THERMAL PROPERTIES

Kovar / Expansion, heat conduction and electrical resistance

02 Mean Coefficient of Linear Thermal Expansion

Each coefficient is the mean from 20 °C to the stated upper temperature.



INTERVAL (°C)	MEAN, μm/(m·°C)
20 to 60	**7.8**
20 to 100	**6.4**
20 to 200	**5.9**
20 to 300	**5.3**
20 to 400	**5.1**
20 to 450	**5.3**

INTERVAL (°C)	MEAN, μm/(m·°C)
20 to 500	**6.2**
20 to 550	**7.1**
20 to 600	**7.8**
20 to 700	**9.2**
20 to 800	**10.2**
20 to 900	**11.4**

03 Thermal conductivity

Thermal conductivity at each temperature.

TEMPERATURE (°C)	W/(m·°C)
100	**20.6**
200	**21.5**
300	**22.7**
400	**23.7**
500	**25.4**

04 Resistance coefficient

Temperature coefficient of electrical resistance.

INTERVAL (°C)	mΩ/(Ω·°C)
20 to 50	**3.7**
20 to 85	**3.7**
20 to 100	**3.9**
20 to 200	**3.9**
20 to 300	**3.7**
20 to 400	**3.3**