CONTROLLED-EXPANSION ALLOYS

INVAR 36

Iron–nickel alloy / FeNi36 / Material No. 1.3912

Invar 36 contains nominally 36% nickel. Its low thermal expansion makes it useful where a tube or sleeve must hold its dimensions as temperature changes.

01 Chemical composition

Mass fraction (%)

ELEMENT	CONTENT
Nickel (Ni)	**35.0–37.0**
Iron (Fe)	**Balance**
Manganese (Mn)	**0.2–0.6**
Carbon (C)	**0.05 max.**
Silicon (Si)	**0.30 max.**

ELEMENT	CONTENT
Chromium (Cr)	**0.50 max.**
Molybdenum (Mo)	**0.50 max.**
Cobalt (Co)	**1.00 max.**
Phosphorus (P)	**0.02 max.**
Sulfur (S)	**0.02 max.**

02 Physical properties

PROPERTY	VALUE
Electrical resistivity at 20 °C	**0.78 μΩ·m**
Density	**8.10 g/cm³**
Specific heat capacity	**515 J/(kg·°C)**
Thermal conductivity	**11 W/(m·°C)**
Melting temperature	**1,430 °C**
Curie temperature	**Approx. 230 °C**

03 Mechanical properties

PROPERTY	TYPICAL VALUE
Tensile strength	**450 MPa**
0.2% proof strength	**272 MPa**
Elongation	**35%**

Specimen geometry and temper are not specified for these typical values.

For material selection

These data describe the alloy, not acceptance limits for a finished tube or a specific lot.

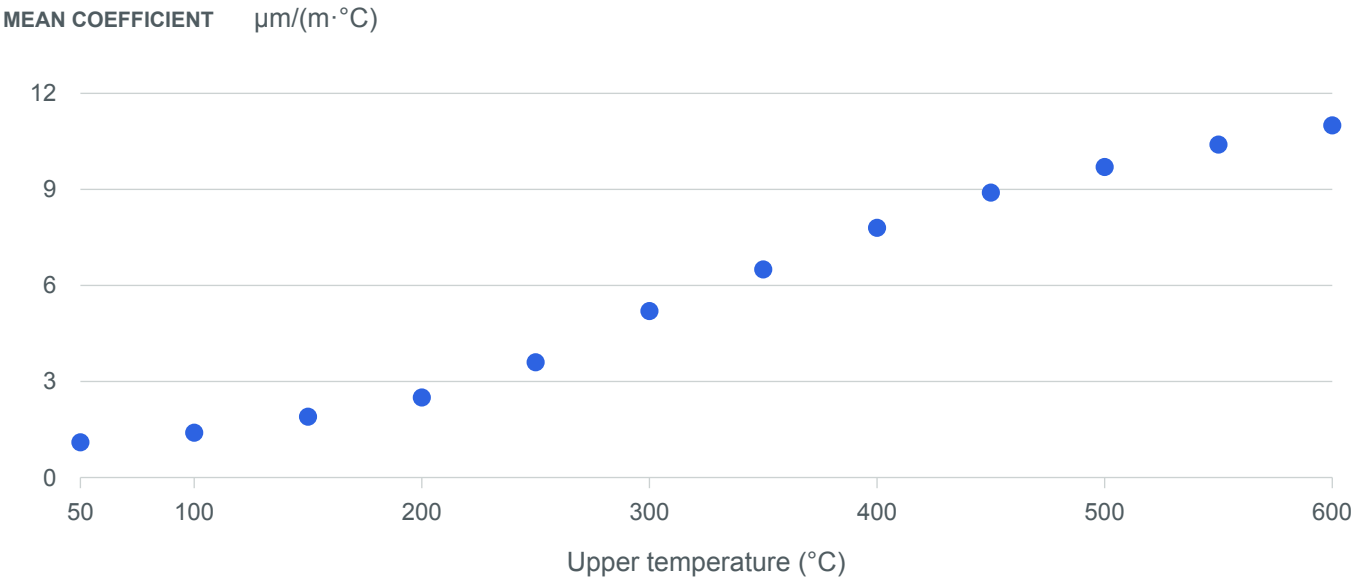
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THERMAL EXPANSION

Invar 36 / Mean coefficient of linear thermal expansion

04 Expansion by temperature interval

Each value is the mean coefficient from 20 °C to the upper temperature shown.
It is not the instantaneous coefficient at that upper temperature.



Mean Coefficient of Linear Thermal Expansion

Mean coefficient in µm/(m·°C)

INTERVAL (°C)	MEAN COEFFICIENT
20 to 50	**1.1**
20 to 100	**1.4**
20 to 150	**1.9**
20 to 200	**2.5**
20 to 250	**3.6**
20 to 300	**5.2**

INTERVAL (°C)	MEAN COEFFICIENT
20 to 350	**6.5**
20 to 400	**7.8**
20 to 450	**8.9**
20 to 500	**9.7**
20 to 550	**10.4**
20 to 600	**11.0**

For a tube inquiry, specify the working temperature interval and the required expansion limit.