

INVAR 36 – DATASHEET

SUMMARY PROPERTIES

Property	Value
Name	Alloy 36 / Invar 36
Type	Controlled Expansion Alloy
Chemical Sign	FeNi36, 64FeNi

COMPOSITION - INVAR 36 / ALLOY 36

Substance	Symbol	%
Nickel	Ni	36
Chromium	Cr	0.25
Manganese	Mn	0.50
Silicon	Si	0.25
Carbon	C	0.05
Aluminium	Al	0.10
Magnesium	Mg	0.10
Zirconium	Zr	0.10
Titanium	Ti	0.10
Phosphorus	P	0.020
Sulphur	S	0.020
Iron	Fe	Balance

THERMAL EXPANSION - INVAR 36 / ALLOY 36

Range (°C)	Value (cm/cm. C X 10(-6))
30 to 100	1.18
30 to 200	1.72
30 to 300	4.92
30 to 350	6.60
30 to 400	7.82
30 to 425	n/a
30 to 450	8.82
30 to 500	9.72
30 to 550	n/a
30 to 600	11.35
30 to 700	12.70
30 to 800	13.45
30 to 900	13.85
30 to 1000	n/a

TENSILE STRENGTH & HARDNESS - INVAR 36 / ALLOY 36

Property	Tensile Strength (PSI)	Hardness (Rockwell B)
Annealed	85,000 max	70 max
1/4 Hard	90,000 to 115,000	78 to 83
1/2 Hard	105,000 to 125,000	84 to 88
Hard	120,000 min	-

MACHINING - ALLOY 36 / INVAR 36

This alloy can be machined employing most common methods. It is known to produce "gummy" chips and is best machined at slow speeds with positive and constant feeds.

Invar alloy can not be hardened by heat treatment but through cold working only. The annealed hardness for invar alloy is typically around RB 70/80, whereas the 1/4 H to 1/2 H range for invar, can run in the range RB 80/96.

In the annealed condition, invar is more difficult to machine because it is soft and 'gummy'. Tools tend to plow instead of cutting into the alloy. Surface scale oxide tightly adheres to and penetrates the surface more than stainless steels. Machining effectiveness is considerably improved by descaling the material firstly.

FORGING:

The principal precaution to observe in forging is to heat quickly and avoid soaking in the furnace. Long soaking may result in a checked surface due to absorption of sulfur from the furnace atmosphere and/or oxide penetration. A forging temperature of 2000/2150°F (1100/1180°C) is preferred.

Invar alloy 36 may also be swaged and cold upset.

GRINDING:

A silicon carbide wheel is desirable, preferably a soft wheel which will wear without loading. For finish grinding, a satisfactory grade to start with is No. 80 grit.

WELDING:

Invar 36 can be welded by the conventional methods. Caution must be taken so as not to overheat the molten metal. This will avoid spattering of the molten metal and pits in the welded area. When filler rod is required, Invar rod has been used.

BRAZING:

Silver and zinc-free alloys have been used for brazing Invar 36. This alloy should be annealed prior to brazing. Joints should be designed to avoid placing material in tension during brazing.

PLATING:

Invar 36 can be chromium, cadmium and nickel plated or zinc coated by the usual methods used for ferrous alloys.

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