



INVAR 36 Technical Data Sheet

Nominal Chemical Composition: 36 % Nickel, Balance Iron

Expansion:

| | | | | | |
|-----------------|------|-----------------|------|-----------------|-------|
| cm/cm/°C x 10-6 | | 25° C to 350° C | 6.60 | 25° C to 600° C | 11.35 |
| 25° C to 100° C | 1.18 | 25° C to 400° C | 7.82 | 25° C to 700° C | 12.70 |
| 25° C to 200° C | 1.72 | 25° C to 450° C | 8.82 | 25° C to 800° C | 13.45 |
| 25° C to 300° C | 4.92 | 25° C to 500° C | 9.72 | 25° C to 900° C | 13.85 |

Physical Properties

| | | | |
|-------------------------------|--|--|------------------|
| Density | .291 lbs/in | Temperature coefficient of Resistance | .001 per degree |
| Specific Gravity | 8.05 | | 20° to 100° C |
| Curle Temp. | 535°F/279°C | | .0006 per degree |
| Melting Point | 2600°F/1427°C | | 70°C to 212°F |
| Heat of Fusion | .515 kj/kg/k | Specific Heat | .123 BTU/lb °F |
| Thermal Conductivity | 72.6 BTU/IN/ft/hour/°F | | |
| Electrical Resistivity | 495 ohms/clr.mil ft 820 microohm/mm | | |

Mechanical Properties

| | | | | | |
|-----------------|------------|-------------------|------------|------------------------------|------------------------|
| Hardness | 70 HRB | Yield | 30,000 PSI | Modulus of Elasticity | 20.5 x 10 ⁶ |
| Tensile | 65,000 PSI | Elongation | 35% in 2" | | |

Working and Forming

Invar may be worked using any conventional working method. Annealed material, that is material with an RB hardness of less than Rockwell B 70, is desirable for material involving deep drawing, hydro-forming or spinning. For blanking, material between 1/4 and 3/4 hard will usually present a cleaner cut. Invar may be chemically etched. For operation where there is a large quantity of machining. Free Cutting Invar is available in round rod.

Heat Treatment for Invar

Invar can be heat treated using one of the following methods. Heating and cooling rates shall be controlled to prevent damage to the parts (cracking, warpage, etc)

Annealing Method 1

Heat parts to 1525°F +- 25°F and hold at temperature one-half hour per inch of thickness, then furnace cool at a rate not to exceed 200°F per hour to 600°F. No additional machining should be performed on these parts

Annealing Method 2

1. Rough Machine
2. Heat parts to 1525°F +- 25°F and hold at temperature one-half hour per inch of thickness, then furnace cool at a rate not to exceed 200°F per hour to 600°F. Still air cool is acceptable below 600°F
4. Heat Parts for one hour at 600°F +- 20°F followed by air cooling
5. Heat parts for 48 hours at 205°F followed by air cooling
6. Finish Machine.

Annealing Method 3 - Annealing plus water quench and stabilization method

1. Rough Machine
2. Heat parts to 1525°F +- 25°F and hold at temperature one-half hour per inch of thickness, then water quench
3. Semi finish machine
4. Heat Parts for one hour at 600°F +- 20°F followed by air cooling
5. Heat parts for 48 hours at 205°F followed by air cooling
6. Finish Machine

Welding

Conventional welding methods can be used with Invar. Invar filler rod is recommended for those welds requiring filler rod.

Brazing

First anneal the material as above. Avoid over stressing joints during brazing. Use silver and zinc free brazes for brazing Invar.

Disclaimer: All information is presented in good faith based on manufacturer supplied details. Professional Plastics assumes no liability for the accuracy of this information or the suitability of any material for a particular application. It is the responsibility of the customer to assess the suitability of any material for their application.

Invar Product Page Available at:

<http://www.professionalplastics.com/INVAR36ALLOYBARRODPLATE>

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