Technical Datasheet

# CarTech® Low Expansion "42"® Dumet Core Rod

## Identification

UNS Number

• K94101

## Type Analysis

*Single figures are nominal except where noted.*

| | | | |
|---|---|---|---|
| **Carbon (Maximum)** | 0.05 % | **Manganese** | 1.00 % |
| **Silicon** | 0.20 % | **Nickel** | 42.00 % |
| **Iron** | Balance | | |

## General Information

Description

CarTech Low Expansion "42" Dumet Core Rod is a 42% nickel-iron alloy possessing a virtually constant low rate of thermal expansion at temperatures up to approximately 650°F (343°C).

This product has been used as core rod material by manufacturers of copper coated wire. After copper coating, the composite is redrawn to wire sizes that have been used for glass seal lead wires in incandescent lamps.

The thermal expansion of the composite wire provides a suitable match for glass sealing to soft glass. Typically, this core rod is uniformly coated with an 18 to 28 volume % copper sheath.

## Corrosion Resistance

**Important Note:** *The following 4-level rating scale is intended for comparative purposes only. Corrosion testing is recommended; factors which affect corrosion resistance include temperature, concentration, pH, impurities, aeration, velocity, crevices, deposits, metallurgical condition, stress, surface finish and dissimilar metal contact.*

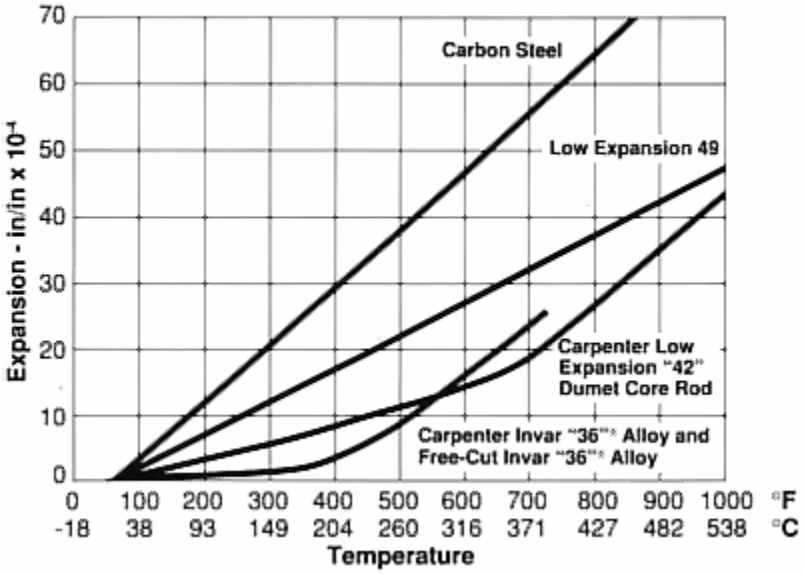
| | | |
|---|---|---|
| Humidity | Good | |

## Properties

### Physical Properties

| | | |
|---|---|---|
| Specific Gravity | 8.12 | |
| Density | 0.2930 | lb/in³ |
| Mean Specific Heat | 0.1200 | Btu/lb/°F |
| Mean CTE (73 to 752°F, Annealed) | 3.50 to 4.00 | x $10^{-6}$ in/in/°F |
| Thermal Conductivity (68 to 212°F) | 74.50 | BTU-in/hr/ft²/°F |
| Modulus of Elasticity (E) | 21.5 | x $10^{3}$ ksi |
| Electrical Resistivity (70°F) | 430.0 | ohm-cir-mil/ft |
| Curie Temperature | 716 | °F |
| Melting Range | 2600 | °F |

**Comparative Average Expansion Curves - Various Carpenter Low Expansion Nickel-Iron Alloys vs. Carbon Steel**




## Typical Mechanical Properties

**Typical Mechanical Properties - Carpenter Low Expansion "42" Dumet Core Rod**
As annealed

| Tensile Strength | | Yield Strength | | % Elongation in 2" (50.8 mm) | Hardness Rockwell B |
|---|---|---|---|---|---|
| ksi | MPa | ksi | MPa | | |
| 75 | 517 | 40 | 276 | 30 | 76 |

## Heat Treatment

Annealing

Heat to 1450°F (788°C) and hold at heat for at least 30 minutes per inch of thickness, air cool.

## Workability

Forging

The forging temperature should be 2150/2200°F (1177/1204°C). Avoid prolonged soaking to prevent sulfur absorption from the furnace atmosphere.

Cold Heading

Carpenter Low Expansion "42" Dumet Core Rod may be swaged or cold upset.

Blanking and Forming

For clean blanking of Carpenter Low Expansion "42" Dumet Core Rod, a Rockwell hardness of about B 90 is suggested. Where any sharp bends are involved in forming finished parts from strip or rods, a hardness of not over Rockwell B 93 is suitable.

Grinding and Polishing

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.

Weldability

Any of the conventional welding methods can be used. When filler rod is required, Carpenter Low Expansion "42" Dumet Core Rod is suggested.

Brazing

Copper and zinc-free brazing alloys are suggested.

Plating

This alloy can be electroplated or zinc coated by the usual methods for ferrous alloys.

# Other Information

## Applicable Specifications

Carpenter Low Expansion "42" Dumet Core Rod is manufactured to ASTM F29-78 and fully conforms to the requirements of this specification.

- ASTM F29

## Forms Manufactured

- Wire
- Wire-Rod

## Technical Articles

- After 100 Years, the Uses for Invar Continue to Multiply
- Selecting Controlled Expansion Alloys



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