Carpenter Super Invar 32-5

Category : Metal , Electronic/Magnetic Alloy , Ferrous Metal , Superalloy , Iron Base

Material Notes:

Carpenter Super Invar 32-5, a magnetic, austenitic, solid solution alloy containing iron, nickel and cobalt, is designed to provide minimum thermal expansion at room temperatures. This alloy also exhibits austenite stability to service temperatures at least -67°F (-55°C) and thermal expansion properties less than those of Carpenter Invar "36"® alloy (36% nickel-iron) when used in the -67/203°F (-55/95°C) temperature range. Applications for Super Invar 32-5 have included structural components for supports and substrates in optical and laser systems requiring precision measurements. This alloy has also been used in wave guide tubes and other systems requiring metals in conjunction with low expansion glass/quartz assemblies.Fabricating practices such as machining, forming, and deep drawing introduce stresses in this alloy which promote variation in thermal expansion behavior. Consequently, parts should be heat treated at or as close to finish size as possible. Heat Treating for Lowest Thermal Expansion and Optimum Stability: The recommended heat treating practice for lowest thermal expansion and optimum stability is to heat at 1550°F (843°C) for 1 hour, water quench, followed by a stress relieving operation at 600°F (316°C) for 1 hour, air cool and age at 200°F (93°C) for 24 hours, then air cool. Because this alloy oxidizes readily at heat treating temperatures above about 1000°F (538°C), it is recommended parts be heat treated in a protective environment such as vacuum, hydrogen, dissociated ammonia, or inert gases. Heat to 1450°F (790°C) and hold at heat 30 minutes per inch of thickness, then air cool. Heating to temperatures above 1000°F (538°C) relieves the presence of cold work stresses.Data provided by Carpenter Technology Corporation.

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http://www.lookpolymers.com/polymer_Carpenter-Super-Invar-32-5.php

Physical Properties	Metric	English	Comments
Density	8.14 g/cc	0.294 lb/in³	

Mechanical Properties	Metric	English	Comments
Hardness, Rockwell B	75	75	Annealed
	90	90	Cold Worked
Tensile Strength, Ultimate	483 MPa	70000 psi	
Tensile Strength, Yield	276 MPa	40000 psi	
Elongation at Break	40 %	40 %	in 2 inches (50.8 mm)
Modulus of Elasticity	145 GPa	21000 ksi	
Poissons Ratio	0.23	0.23	
Machinability	25 %	25 %	AISI B1112 = 100%. Machined chips can be gummy/stringy
Shear Modulus	58.9 GPa	8540 ksi	Calculated

Thermal Properties	Metric	English	Comments
CTE, linear	0.630 µm/m-°C @Temperature -55.0 - 95.0 °C	0.350 µin/in-°F @Temperature -67.0 - 203 °F	
	2.50 µm/m-°C @Temperature 20.0 - 200 °C	1.39 µin/in-°F @Temperature 68.0 - 392 °F	

Component Elements Properties	Metric	English	Comments
Carbon, C	0.020 %	0.020 %	
Cobalt, Co	5.5 %	5.5 %	
Iron, Fe	62 %	62 %	as remainder
Manganese, Mn	0.40 %	0.40 %	
Nickel, Ni	32 %	32 %	
Silicon, Si	0.25 %	0.25 %	

Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.00008001 ohm-cm	0.00008001 ohm-cm	

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