Electroforming Design Guidelines

Modulus of Elasticity (Young's Modulus)	Average NiCo Sample: 25.260 million pounds per square inch (mp/in2) NOTE: Compare NiCo to: A5 Stainless Steel: 35 mp/in2; Aluminum: 10 mp/in2; CarbonSteel: 30.0 mp/in2
Coefficient of Thermal Expansion (CTE)	11.5 to 14.7 x 10-6 cm/cm/°C (from 0 °C to 1000 °C) [Commercially electroplated nickel= 13.37 x 10-6 cm/cm/°C]
Hardness	Knoop: 576+; Vickers: 560; Rockwell C: 51-53
Flexural Strength	250,000 pounds/in2
Tensile Strength	250,000 pounds/in2
Primary Chemical Composition (Typical)	Nickel: 86% Cobalt: 14% Sulfur: 0.05%
Suitability of Metrigraphics Electroforming Technology	High Precision Applications with irregularly shaped two-or three- dimensional durable metal parts. Micron-Level Mechanical Features and Sizes which are difficult or impossible to make using conventional metal fabrication techniques; e.g., photochemical milling, EDM, etc. Extremely smooth, flat, and fine-grained metal parts that need to be made with tight tolerances and high repeatability.
Small Lot Array Size Range	114.3 x 114.3mm (4.5" x 4.5")
Production Lot Array Size	254.0 x 254.0mm (10.0" x 10.0")
Foil Thickness Range	0.005mm to 0.254mm (0.0002" to 0.0100") Thicker foils are possible, however they may require special procedures
Funnel-Shaped Apertures	Ideal for: Gas Handling, Fluid Control/Jetting, Light Control, Precision Standards
Foil Thickness	0.0125 to 0.254mm (0.0005" to 0.0100") Thinner foils are available however require special procedures
Minimum Aperture Diameter	0.002mm (0.00008")
Minimum Aperture Spacing	2 x Thickness (Foil) + 10microns
Aperture Tolerance	0.0015mm (0.00006") for apertures with diameters > 0.025mm (0.001") Apertures with diameters <0.025mm will generally have smaller tolerances and require special procedures depending on the foil thickness, overall sheet size and other geometries of the foil.
Structure and Edge Quality	Pits, bumps, and other irregularities will not exceed 0.000127mm (0.000005")
Straight-Wall Parts	Ideal For: Micro Embossers, Fluid Control/Jetting, Fiber Optic Clips
Foil Thickness	0.0125 to 0.152mm (0.0005" to .0060") Thicker and thinner foils are available, but will require special procedures.
Minimum Aperture Diameter	1 x Thickness (Foil). Smaller diameters may be available, but will require special procedures.

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Minimum Aperture Spacing	1 x Thickness (Foil). Closer spacing may be available, but will require special procedures.
Aperture Tolerance	0.0025mm (0.0001") per 0.025mm (0.001") of foil thickness for apertures with diameters of > 0.025mm (0.001"). Apertures <0.025mm (0.001") will generally have smaller tolerances and require special procedures regarding foil thickness, overall sheet size and other geometries of the foil
Structure and Edge Quality	Pits, bumps and other irregularities will not exceed 0.000254mm (0.000010")
Multi-Level Structure	Limits and tolerances are similar to those outlined in "Straight-Walled Apertures" above. Tolerances may vary due to the specific construction requirements and therefore the entire multi-level assembly must be considered as a whole from the standpoint of tolerances.
Air Bridges	Technology is available to manufacture these structures

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