MAGNETIC SHIELD CORPORATION FAQs

®Official MAGNETIC SHIELD CORPORATION Document

What are the manufacturing and design considerations for fabricating magnetic shielding?

Temporary tooling is frequently used to fabricate magnetic shields. While reducing costs, this practice requires that print tolerances be no closer than required by design considerations.

Flat Blanks

Shear tolerance of ±.015". Corner details, in order of least cost, are square, chamfered and rounded.

Burrs

Shearing, blanking or perforating burrs are reduced through use of minimum clearance tooling. Standard deburring methods are applicable.

Bend Radius

In short run work, complex shapes are formed on temporary tooling. Relatively sharp corners, with an inside radius of up to twice metal thickness, are preferred. With Perfection Annealed sheet, particularly in the heavier gauges, minimum inside radius of three times material thickness is required to avoid work hardening and fracture.

Angles

Bends of 90 degrees that are not joined to another member have no support during anneal and may distort. A ±5 degree tolerance should be specified for bends that will be supported in assembly. Alternatively, the drawing can specify bends to be restrained at inspection.

Concentricity

Small cylinders, to 3" diameter, should usually be specified for no less than .015" T.I.R. Larger cylinders, and particularly cylinders with a low material thickness to diameter ratio, will show distortion because of annealing and movement in shipping.

Dimensions following Anneal

The full anneal process, essential for optimum magnetic properties, results in some distortion of fabricated parts as stresses are relieved. Some sizing of parts may be required. Because magnetic shields are in a dead soft condition following anneal, the shields will ordinarily conform to a more rigid part in assembly.

Blanking & Stamping

Stress annealed CO-NETIC®, MuMETAL® and NETIC® lend themselves to conventional stamping operations. Normal procedures are used, except that die clearance must be held to a minimum in processing both CO-NETIC® and MuMETAL ®. Normal die clearances are utilized in stamping NETIC®.

Forming

CO-NETIC®, MuMETAL ® and NETIC® are easily formed, using either conventional or urethane tooling. Because of the stress-annealed condition, springback is at a minimum.

Drawing and Spinning

Stress annealed CO-NETIC® and NETIC® can be spun, drawn or Hydroformed. For complex configurations and close tolerances, Hydroforming has proved highly advantageous. This process offers the further advantage of low tool cost and uniformity of gauge. For long runs, conventional tooling is preferred because of lower piece part costs. Some parts may require intermediate anneal.

NOTE: CO-NETIC®, MuMETAL ® and NETIC®, with respect to stamping and fabricating operations, have counterparts in more conventional materials. CO-NETIC® and MuMETAL ® exhibit physical properties which are similar in many respects to those of the 300 series stainless steels. Correspondingly, physical properties of NETIC® are similar to those of low carbon cold rolled steel.

Welding

Heliarc welding provides the ideal means for welding seams and joints in the fabrication of magnetic shields. Heliarc welding maintains continuity of the magnetic circuit and ordinarily provides fusion without use of filler rod. If filler material is required, use strips of the parent material.

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Annealing/NETIC®

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Low cost reducing type furnace atmospheres are adequate for the annealing of NETIC®. If cracked natural or manufactured gas is used, it should be strongly reducing and have a low dew point. With all atmospheres, parts should be cooled sufficiently in the furnace to avoid any oxidation upon removal.

Annealing/CO-NETIC® or MuMETAL ®

To obtain optimum magnetic properties of CO-NETIC® Stress Annealed or MuMetal® material, annealing following fabrication is essential.

A batch furnace permitting careful control of annealing temperature and cooling rate provides optimum magnetic properties. A continuous furnace with careful control of heating and cooling rates is an acceptable alternative.

Furnace atmosphere is critical. Optimum properties are obtained in a pure, dry hydrogen atmosphere. Dissociated ammonia provides good results in continuous furnaces, as does a vacuum atmosphere in batch operations. Optimum magnetic properties of CO-NETIC® and MuMETAL ® materials are obtained by annealing at a temperature of 2050°F. (1121°C) for a period of four hours. Cooling is at the rate of 400°F (Approx. 222°C) per hour until a temperature of 1100°F. (600°C) is reached, after which the cooling rate can be accelerated. Parts can be exposed to normal atmosphere at 600°F (315°C).

To avoid excessive distortion of light gauge shields, an annealing temperature of 1950°F 1065°C) will provide acceptable magnetic properties. Correspondingly, magnetic tests may disclose that an accelerated cooling rate can be adopted without adverse effect.

Painting/NETIC®

Over extended periods, NETIC® material is subject to oxidation. To provide surface protection, the following procedures are recommended:

A. Clean parts thoroughly using vapor degreasing, hot alkaline solution, or solvent bath.
B. Prepare surface by posphatizing, where specified.
C. Apply zinc chromate primer.
D. Apply finish coat of baked enamel, epoxy or a paints as specified.

A light oxide which may appear on NETIC® is easily removed by conventional pickling or sandblasting procedures.

Finishing/CO-NETIC® or MuMETAL ®

CO-NETIC® AA or MuMETAL ®, because of their high nickel content, are highly corrosion resistant. Following annealing in hydrogen atmosphere, the material exhibits a clean and bright surface condition. As a consequence, CO-NETIC® and MuMETAL ® are frequently used as annealed, without further finishing operations. If required for cosmetic purposes, CO-NETIC® and MuMETAL ® readily accept conventional surface finishes.

Plating

Cleaning of parts for plating is similar to that used for ferrous materials. CO-NETIC®, MuMETAL ® and NETIC® respond to conventional cleaning methods. With proper surface preparation, CO-NETIC®, MuMETAL ® and NETIC® provide excellent plated finishes using commercial plating procedures.