

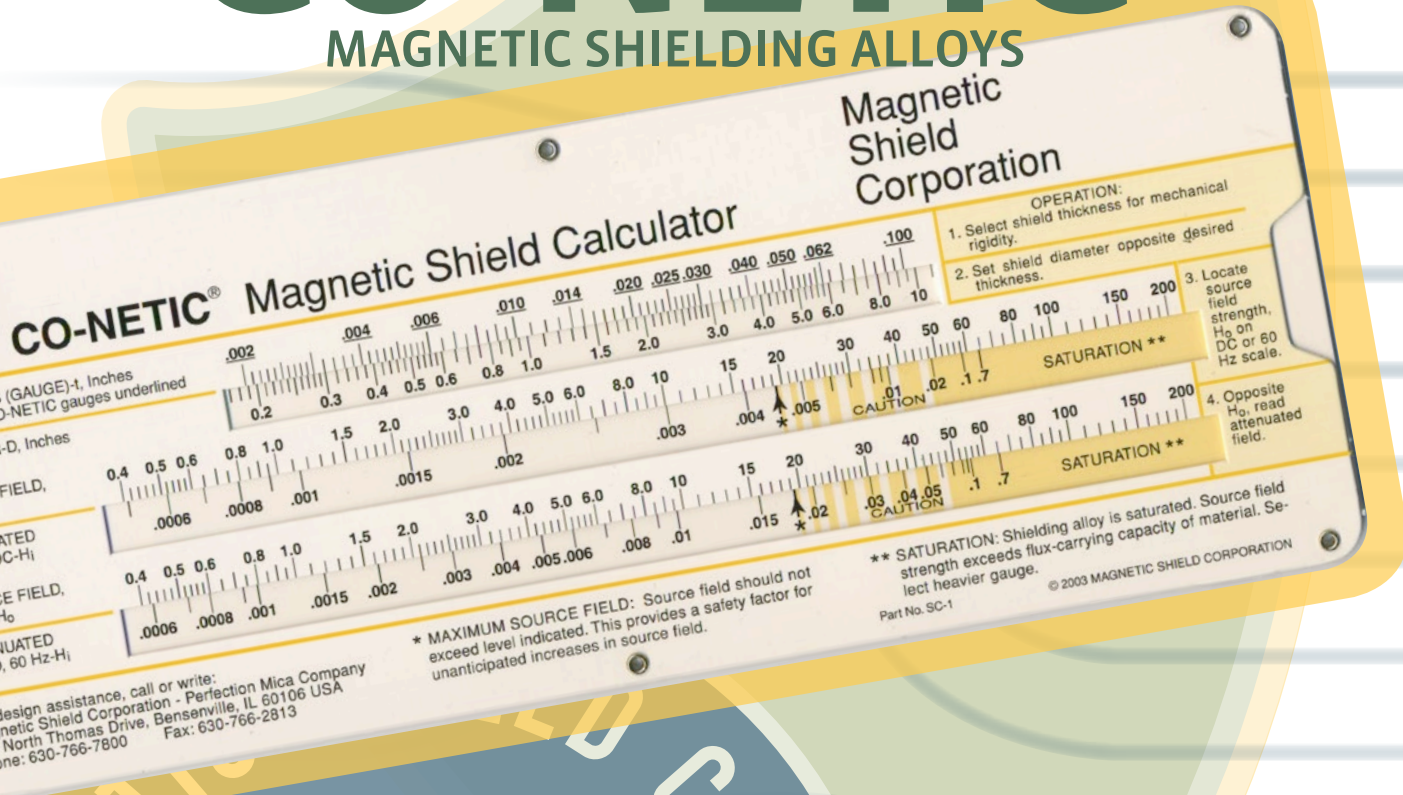
# MAGNETIC SHIELD CORP.

Since 1941



# Co-NETIC®

## MAGNETIC SHIELDING ALLOYS



For design assistance, call or write:  
Magnetic Shield Corporation - Perfection Mica Company  
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Our Lab Kits include Co-NETIC® and NETIC® Material Samples



ORDER ONLINE  
www.magnetic-shield.com

# Co-NETIC® ALLOYS

## High Initial Permeability and High Attenuation



### AVAILABLE PRODUCT TYPES:

Product type	Available Thickness		Available Sizes (inches)		Anneal type
	inches	[mm]	width	length	
Co-NETIC® Foil <sup>(1)</sup>	.002 to .010	[0,05] to [0,25]	up to 15"	sold per foot	Perfection
AA Perfection Sheet	.014 to .062	[0,36] to [1,57]	up to 30"	up to 59"	Perfection
Stress Sheet <sup>(2)</sup>	.014 to .125	[0,36] to [3,18]	up to 30"	up to 120"	Stress

<sup>(1)</sup>Foil is offered as Perfection Annealed (fully annealed) only. <sup>(2)</sup>Stress Sheet typically requires atmospherically controlled, Perfection Anneal after fabrication or welding to provide maximum shielding performance.

## MAGNETIC INTERFERENCE SOLUTIONS

Since 1941, Magnetic Shield Corporation has specialized in solving sensitive electronic problems, becoming a recognized leader in magnetic interference elimination. Our engineers and technical staff concentrate on problems relating to magnetism. We provide professional consultation on problems of magnetic interference without cost or obligation, and are usually able to solve such problems promptly and economically. Frequently our facilities and experience provide "ready-made" solutions, saving time and money for companies whose technical personnel have broader responsibilities.

One of the key components to a successful solution is choosing the correct shielding alloy. As a shield fabricator and worldwide material distributor, we carry a full inventory of our proprietary and specialty alloy materials in foil and sheet forms. We also offer a variety of services, including custom fabrication to your drawings or specifications – as well as stock chambers, custom laboratory instruments, rooms and enclosures.

To provide our manufacturing, OEM, design and research customers the best magnetic shields, we have refined our proprietary brand of Co-NETIC® alloy and our AA Perfection Annealing process over the last few decades. Co-NETIC® has been used in many demanding applications and is one of the most recognized and specified brands of magnetic shielding alloy worldwide - thousands of solutions have been designed and millions of shields have been produced using Co-NETIC® shielding alloy. And, starting with our shielding alloys is easy – many users explore the effects of magnetic shielding through use of our [Magnetic Shielding Lab Kits](#); quickly prototyping, experimenting and testing solutions for their magnetic interference problems. (See our Lab Kit brochure for a list of included Co-NETIC® sample materials).

In addition to Co-NETIC®, we offer two other alloys which are used for similar, but different applications. Depending on source field intensity ( $H_0$ ) and amount of field reduction (attenuation) required, the right shielding alloy can be selected. Our two other proprietary brands are MuMETAL® and NETIC®. The differences are:

MuMETAL® is our most popular brand worldwide for commercial fabrication use. Many people refer to "mu metal" as a generic name, but it is not. It's our proprietary brand, designed to provide high permeability fabricated cylinders, cans, boxes or enclosures (3D shields). Whether we fabricate and final anneal magnetic shields for you, or you purchase the material and fabricate and anneal locally, you will be using the most economical material with high permeability. The only material that out-performs MuMETAL® is our Co-NETIC® AA Perfection Annealed (fully annealed) alloy.

NETIC® is uniquely different from Co-NETIC®. It is an iron alloy that is often applied in fields of high intensity (strong fields) because of its high magnetic saturation characteristics. Frequently, NETIC® is used in conjunction with a layer of Co-NETIC® as layering is proven to provide extra precaution and/or lower risk of electro-magnetic interference. If used in combination, the NETIC® layer is placed closest to the source of interference, with Co-NETIC® or MuMETAL® layer closest to the component being shielded.

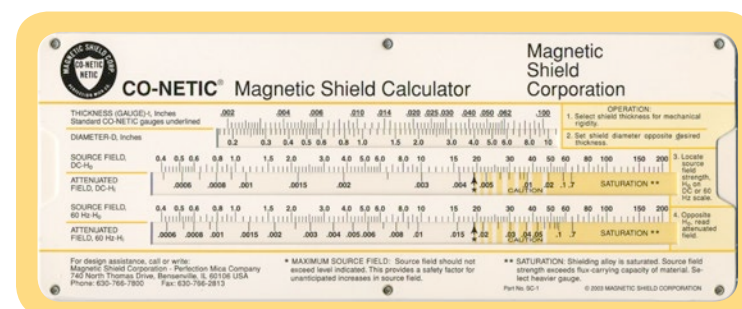
**SPECIAL NOTE:** When space is limited, and to save on costs, our Co-NETIC® B alloy can be used. This alloy is a cross between Co-NETIC® and NETIC® and generally provides properties of both. In certain applications Co-NETIC® B may be used, but only when high initial permeability and highest attenuation are not necessary.

## THICKNESS CALCULATION and SELECTION

Shielding alloy thickness is an important factor in shield design and fabrication. That's why we carry a full inventory of Co-NETIC® alloy in foil & sheet stock gauges from .002" to .062" thickness [0,05mm to 1,57mm]. Formulas are used to determine which materials and thicknesses will provide the most efficient shielding. The interfering source field known as  $H_0$  is measured in Gauss. Knowing  $H_0$ , and estimating the approximate size of your shield, shield thickness can be calculated. Our formulas and further explanation may be found at [www.magnetic-shield.com](http://www.magnetic-shield.com) and in our [Magnetic Shielding Lab Kit](#) brochure.

To simplify these formulas, we have developed the Co-NETIC® Slide-Rule Calculator from calculating and measuring hundreds of applications over decades of study. Our easy to use calculator provides a quick reference for comparing thickness of Co-NETIC® alloy required to effectively shield the source field ( $H_0$ ) vs. diameter (size) of the magnetic

shield you will use (calculated as a theoretical cylinder). A Slide-Rule Calculator is included with Co-NETIC® material samples in each [Magnetic Shielding Lab Kit](#).



NOTE: Used for calculating theoretical size and thickness of a Co-NETIC® cylindrical shield.

## PRODUCT RANGE

Co-NETIC® is considered far superior in shielding performance due to its consistent quality, material composition and Perfection Annealing process. Used primarily in low intensity fields where high attenuation is desired (high initial permeability & high shielding efficiency), it has become our leading brand. Co-NETIC® alloy is readily available from stock in three forms:

**Co-NETIC® AA Perfection Annealed** – AA Perfection Annealed is our most popular Co-NETIC® product as it is stocked fully annealed, ready to use, and provides maximum attenuation without further processing. Available as fully annealed flat sheet, it is used worldwide for rooms, doors, walls or flat rigid shields. Foil is available with or without double-faced PST (pressure sensitive tape) with release coated liner. Both sheet and foil are final annealed to exacting specifications in a quality controlled environment which builds grain structure, an important mechanical property for ultimate shielding performance. Co-NETIC® AA Perfection Annealed alloy is available in foil & sheet stock gauges from .002" to .062" thickness [0,05mm to 1,57mm].

## WHERE IS Co-NETIC® USED?



### EVALUATION LAB KITS

Simply put, "hands-on" use of Co-NETIC® alloy is possible with use of our Magnetic Shielding Lab Kits. Not only do you receive a wide range of selected gauges, you receive a technical binder to guide you through experimentation, sampling and prototyping. Our Lab Kits include an assortment of Co-NETIC® and NETIC® magnetic shielding alloys in our most popular gauges. Many customers start here – our [Magnetic Shielding Lab Kits](#) are an inexpensive alternative which will help save overall project cost down the road. Visit [www.magnetic-shield.com](http://www.magnetic-shield.com) to purchase our Lab Kits.

### CUSTOM FABRICATIONS

Co-NETIC® alloy is formulated and produced to exacting standards which allow consistent fabrication and superior final anneal. As an ISO certified company, we offer a full range of custom fabrication services. From your drawing or sketch we can waterjet, laser, EDM, shear, slit, punch, blank, stamp, chemical etch, form, bend, roll, spot-weld, heliarc weld, and/or laser weld. Using Co-NETIC® Stress Annealed alloy and Perfection Annealing after fabrication, we can produce complete magnetic shields to your drawings or specifications.

### ROOMS & ENCLOSURES

Using a Gaussmeter, field mapping is typically performed to determine the level, source and condition of magnetic interference. After completion of a field survey, Perfection Annealed alloy can be applied directly to walls, floors, and ceilings. Alternatively, chambers or enclosures can be designed and constructed to provide an effective environment. Co-NETIC® AA Perfection Annealed sheet is used to custom fit the target environment along with Co-NETIC® Perfection Annealed foil which is used to seal "leak-points" and joints. NETIC® and RF shielding may also be easily incorporated into these designs.

## CONTACT US TODAY

ORDER ONLINE  
[www.magnetic-shield.com](http://www.magnetic-shield.com)

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P: 630-766-7800

EMAIL US  
[shields@magnetic-shield.com](mailto:shields@magnetic-shield.com)

You are invited to call our Engineering Department to discuss your fabrication and finishing requirements. For a prompt and accurate quotation, send a drawing, sketch, or written description to [shields@magnetic-shield.com](mailto:shields@magnetic-shield.com).



@MagShieldCorp



MagneticShieldCorporation



# MAGNETIC SHIELD CORP.



## SPECIFICATIONS – CERTIFICATIONS *and* SELECTION GUIDE

### Co-NETIC® OR NETIC®?

Co-NETIC® and NETIC® are proprietary alloys, developed by Magnetic Shield Corporation specifically to provide effective magnetic shielding. Both are available in either foil or sheet form in a convenient range of thicknesses. All sizes are available with double-faced Pressure Sensitive Tape (PST) and release coated liner. NETIC®, due to its high iron content, is available with or without electro-tin plating. Typically this alloy is painted or plated after shield fabrication.

In fields of low intensity, Co-NETIC® is used in order to utilize its high initial permeability and corresponding high attenuation characteristics. In strong fields of high intensity, NETIC® is preferred because of its high magnetic saturation characteristics. In some applications, combinations of the two materials may be useful, with NETIC® material always placed closer to the source of magnetic interference.

### SHEET OR FOIL?

Sheet materials, supplied as Perfection or Stress Annealed in thicknesses ranging from .014 to .125 inches [0,36 to 3,18 mm] are used in applications of high magnetic force where greater alloy thickness is necessary. When production tooling, forming or welding are necessary, Stress Annealed material is used. For maximum performance, Perfection Annealing is required after fabrication. Co-NETIC® AA Perfection Annealed flat sheet is most popular due to its superior performance and lowest overall cost.

Foils, supplied in thicknesses ranging from .002 to .010 inches [0,05 to 0,25 mm] provide effective shielding with minimum fabrication, avoiding expensive tooling and extended deliveries. Thus, our foil has become the preferred material for many production, prototype and laboratory evaluation projects. Typical applications include shielding hand-held devices, field-sensitive components, printed circuit boards, instruments, signal leads and power cables.

### MAGNETIC DATA & SPECIFICATIONS

	Co-NETIC® AA PERFECTION ANNEALED	Co-NETIC® STRESS ANNEALED*	Co-NETIC® B STRESS ANNEALED*	NETIC® S3-6 STRESS ANNEALED*
Specific Gravity	8.74	8.74	8.18	7.86
Coefficient of Expansion, per °C x 10 <sup>-6</sup>	12.6	12.6	8.3	13.7
Tensile Strength, PSI x 10 <sup>3</sup>	64	85	80	42
Yield Strength, PSI x 10 <sup>3</sup>	18.5	33	27	27
Modulus of Elasticity, PSI x 10 <sup>6</sup>	25	30	24	30
Hardness, Rockwell B	50 Ref.	70 Ref.	68 Ref.	50 Ref.
Elongation in 2 inches	27%	32%	32%	38%
Melting Point	2650°F/1454°C	2650°F/1454°C	2600°F/1427°C	2790°F/1532°C
Thermal Conductivity (cal/sec/cm <sup>2</sup> /cm/°c) at 20°	.138	.138	.037	.118
Electrical Resistivity Micro-ohm-centimeters	55	55	48	11
Saturation Induction (Gauss)	8,000		15,000	21,400
Initial Permeability	30,000	After required Perfection Annealing is done, magnetic properties are same as those for AA Perfection Annealed Alloy.	8,000	200
Permeability at 40 B	75,000		12,000	300
Permeability at 200 B	135,000		30,000	500
Maximum Permeability	450,000		150,000	4,000
Induction at μ max.	3,000		7,000	8,000
Coercive Force Hc, Oersteds	.015		.05	1.0
Curie Temperature	850°F/454°C	850°F/454°C	840°F/449°C	1420°F/770°C
Minimum Operating Temperature	4°K	4°K	4°K	4°K

Note: Magnetic data is for sheet material measured in a D.C. field.

\*Typically, Stress Annealed material must be annealed after fabrication for optimum magnetic shielding properties.

### CERTIFICATIONS

Physical and chemical certification of Co-NETIC® may be provided upon request with your order. RoHS, DFARS, military, aerospace, industrial and OEM certifications are also available. Co-NETIC® alloy does conform to specifications 1J79, ASTM A-753, Alloy 4 and MIL N-14411C, Composition 1.

