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100% RoHS Compliant Products

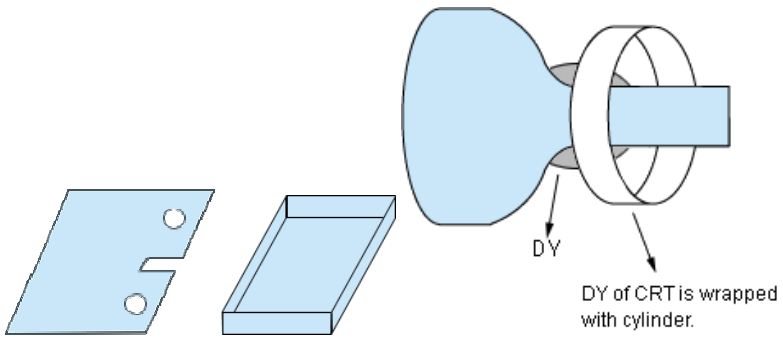
PERMALLOY – MAGNETIC FIELD SHIELING

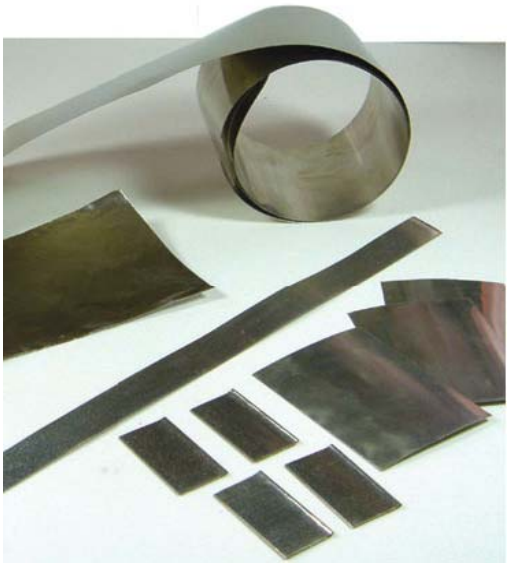
Permalloy has very high magnetic permeability, compared to other materials. Permeability is the degree of magnetization of a material that responds linearly to an applied magnetic field. Permalloy can divert magnetic flux and effectively protect sensitive components from near by magnetic source. Below chart compares permeability of selected materials for reference:

Medium	Susceptibility (χ_m)	Permeability (μ) x10^{-6}	Magnetic field
Mu-metal	20,000[1]	25,000 N/A^2	at 0.002 T
Permalloy	8000[1]	10,000 N/A^2	at 0.002 T
Transformer iron with ρ=0.01 μΩ·m	4000[1]	5000 N/A^2	at 0.002 T
Steel	700[1]	875 N/A^2	at 0.002 T
Nickel	100[1]	125 N/A^2	at 0.002 T
Platinum	2.65 × 10^{-4}	1.2569701 N/A^2	
Aluminum	2.22 × 10−5[2]	1.2566650 N/A^2	
Hydrogen	8 × 10−9 or 2.2 × 10−9[2]	1.2566371 N/A2	
Vacuum	0	1.2566371 N/A^2 (μ_0)	
Sapphire	−2.1 × 10^{-7}	1.2566368 N/A^2	
Copper	−6.4 × 10−6 or −9.2 × 10−6[2]	1.2566290 N/A^2	
Water	−8.0 × 10^{-6}	1.2566270 N/A^2	

An electromagnetic wave can be divided into electric field and magnetic field. Magnetic field is reportedly more harmful to the human body than an electric field. Electric field (RF) can be effectively shielded by conductive material properly grounded, but the magnetic field is not easily shield and requires highly permeable material such as Permalloy or Mu-metal. By heat treating the steel plate (containing nickel) at high temperature, these metals' magnetic shielding performance reaches about 96%, while high performance comes with high price. Our Permalloy, made with a newer technique, is available at reasonable prices.

Our Permalloy is extremely thin nickel alloy and is made with special high temperature to produce superior shielding capability against a magnetic field. It is easily made into many forms and shapes by die-press, soldering and cutting.





Permalloy Material: Ni(78%), Fe, St, Ni, Mn, Mo

Measurement of peak relative permeability according to the frequency and maximum magnetic flux density

Peak magnetic flux density [T]	Measured frequency (Hz)				
	60	100	200	400	1,000
5.000 x 10^3	-	-	-		1.65x 10^4
1.000 x 10^2	-	-	-	2.86x 10^4	1.67x 10^4
2.500 x 10^2	-	-	4.35x 10^4	3.01x 10^4	1.73x 10^4
5.000 x 10^2	6.95x 10^4	6.27x 10^4	4.59x 10^4	3.16x 10^4	1.82x 10^4
7.500 x 10^2	7.58x 10^4	6.65x 10^4	4.86x 10^4	3.31x 10^4	1.90x 10^4
1.000 x 10^1	8.17x 10^4	7.02x 10^4	5.06x 10^4	3.43x 10^4	1.98x 10^4
1.250 x 10^1	8.61x 10^4	7.32x 10^4	5.24x 10^4	3.54x 10^4	2.05x 10^4
1.500 x 10^1	9.08x 10^4	7.63x 10^4	5.42x 10^4	3.68x 10^4	2.11x 10^4
1.750 x 10^1	9.47x 10^4	7.89x 10^4	5.59x 10^4	3.79x 10^4	2.15x 10^4
2.000 x 10^1	9.85x 10^4	8.11x 10^4	5.72x 10^4	3.89x 10^4	2.20x 10^4
2.500 x 10^1	1.06x 10^5	8.57x 10^4	6.01x 10^4	4.03x 10^4	2.16x 10^4
3.000 x 10^1	1.12x 10^5	8.95x 10^4	6.19x 10^4	4.02x 10^4	1.98x 10^4
3.500 x 10^1	1.12x 10^5	9.24x 10^4	6.21x 10^4	3.91x 10^4	-
4.000 x 10^1	1.20x 10^5	9.31x 10^4	6.08x 10^4	3.69x 10^4	-

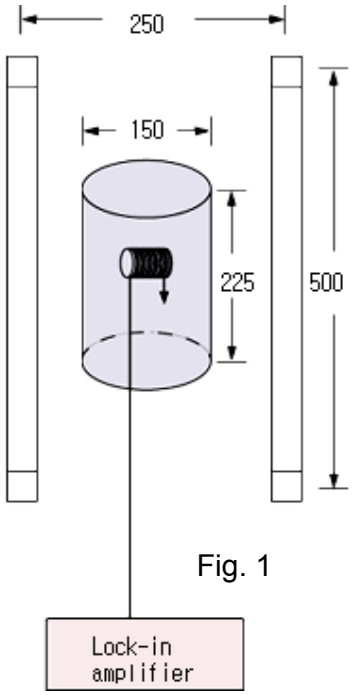


Fig. 1

Fig. 1: Magnetic field of 60 Hz and 0.5 Oe is generated with Helmholz coil with interval of 250 mm. Magnetic field is measured using a detection coil (37 mm dia x 50 mm long, total number of windings at effective face: 8.57x10^3 cm^2) and coil amplifier (EG&G PAR, model 5210) inside Helmholz coil. Then the detection coil is wrapped with shielding agent of 150 mm dia x 225 mm long in order to measure shielding ratio. Finally, magnetic field was measured.

MEASUREMENT RESULT

Strength of magnetic field when there is no shielding agent (H_o): 4.00 x 10^1 A/m (5.01 x 10^{-1} oe)

Strength of magnetic field when there is a shielding agent (H_i): 1.48 A/m (1.86 x 10^{-2} oe)

Shielding ratio: 26.9 = $\frac{H_o}{H_i} = \frac{4.00 \times 10}{1.48} = \frac{100}{3.7}$ (Magnetic field permeability)

Magnetic field permeability : 3.7 %

Magnetic field blocking ratio : 96.3 %

NOTE

- H/Hi equation was used in the calculation of shielding ratio. Hi and H indicates strength of magnetic field respectively when shielding agent exists and does not exist.
- 1 A/m = 4π x 10 $^{-3}$ oe.
- The above-mentioned measurement results are limited to the submitted samples.

Available Part Numbers:

Part No.	SPMEA010	SPMEA020	SPMEA030	SPMEA035	PMEA035
Gauss	7,700	7,700	7,700	15,000	17,000
Frequency	0Hz-100KHz	0Hz-100KHz	0Hz-100KHz	0Hz-50KHz	0Hz-1KHz
Thickness(mm)	0.1	0.2	0.3	0.35	0.35
Width(mm)	100	208	240	240	500
Magnetic Shielding Effectiveness (%)	80	96	99	85	20
Density	8.8	8.8	8.8	8.8	7.7
Resistance(λΩm)	0.6	0.6	0.6	0.6	0.7

Test method : IEC 404-2, ASTM A889-88, KS C4006

Sample Applications:

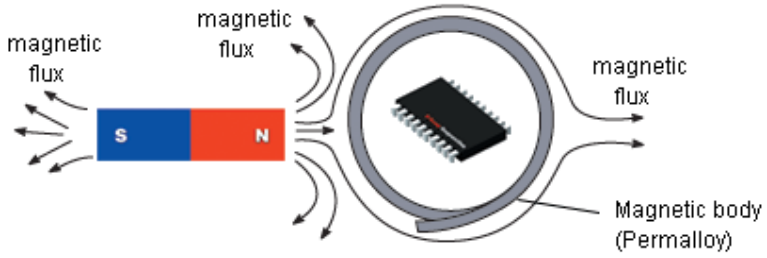
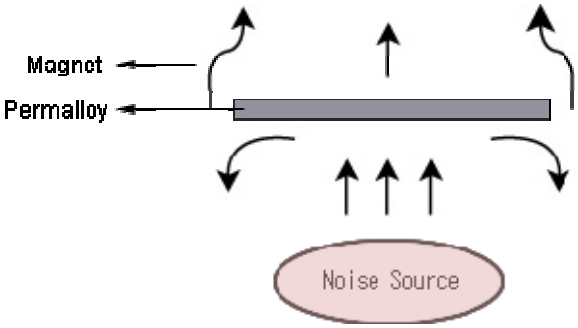
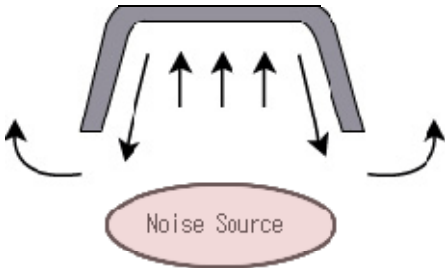


Plate type : effectiveness 40%



U type : effectiveness 60%



Round type : effectiveness 90%