

Fair-Rite Offerings:



Board Components:

- EMI Suppression Beads
- Bead on Leads
- Through Hold (PC) Beads
- Wound Beads
- Multi-Aperture Cores
- SM Beads (Differential and Common Mode)
- Chip Beads
- Chip Arrays

Cable Components:

- Round and Flat Suppression Cores
- Round and Flat Cable Snap-Its
- Connector Plates

Inductive Components:

- Rods
- Bobbins
- Toroids
- Planar Cores
- Pot Cores
- RM Cores
- PQ Cores
- E Cores
- EFD/ETD/EER Cores
- U Cores
- EP Cores

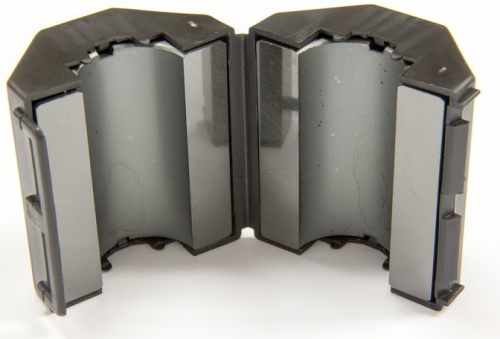
Shielding Components:

- Flexible Ferrite Sheets
- Rigid Plates

Ask about our custom machining and winding services! With our state-of-the-art machine shop, Fair-Rite will meet your design needs!



EMC Design Reference Guide



Fair-Rite's Solution:

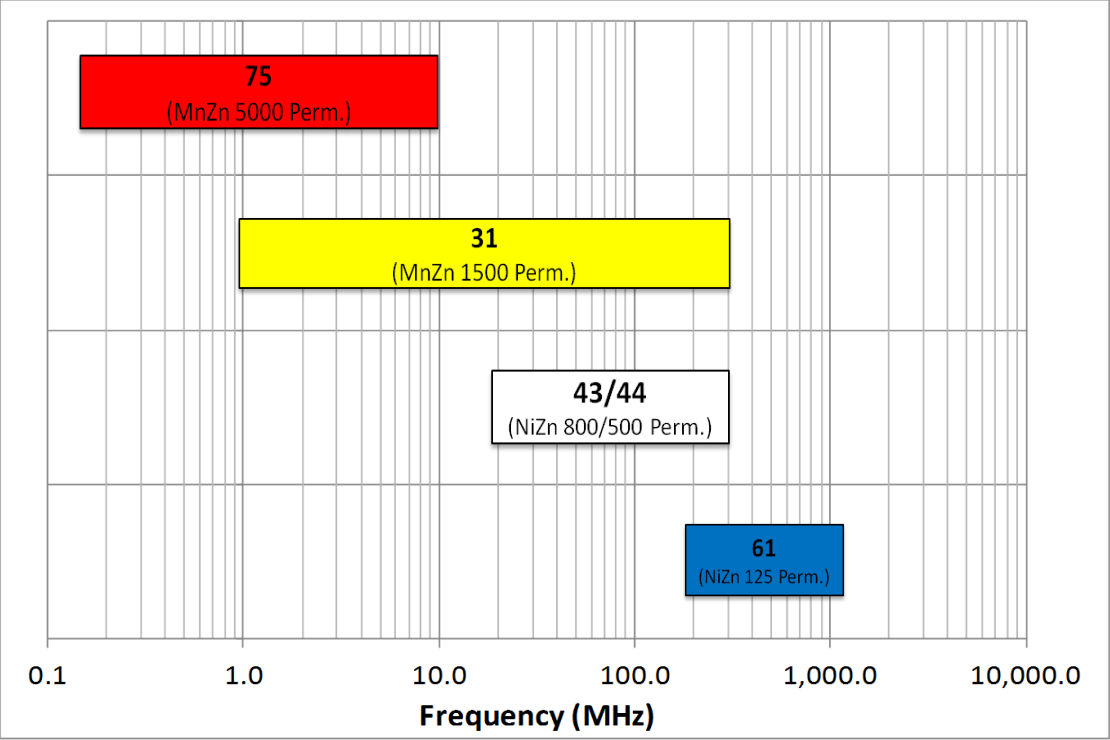
Notes:

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Suppression Material Reference Chart



Material	μ_i	Frequency Range	Notes
75	5000	150 kHz — 10 MHz	Superior low-frequency suppression.
31	1500	1 MHz — 300 MHz	Good broadband impedance with extended low frequency.
43/44	800/500	25 MHz — 300 MHz	Industry standard material. 44 has improved resistivity.
61	125	200 MHz — 1 GHz	For VHF applications. Low sensitivity to temperature and DC bias.

Fair-Rite catalog standard products are RoHS 6/6 compliant as of 1/1/2005, and meet the requirements of the current RoHS Directive 2011/65/EU (aka RoHS2) without exemption and the current Administrative Measure on the Control of Pollution Caused by Electronic Information Products regulation (aka China RoHS).

For more information, please visit our website at www.fair-rite.com

For your reference

Design Guidelines:

Air-Core Inductance:

$$L_o = \frac{4\pi N^2 10^{-9}}{C_1} [H]$$

$$L_o = \frac{\mu_o N^2 A_e}{l_e} [H]$$

$$C_1 = \frac{l_e}{A_e} = \frac{2\pi}{h \ln \left(\frac{OD}{ID} \right)} [cm^{-1}]$$

N = number of turns

h = height

OD = outer diameter

ID = inner diameter

l_e = effective path length [cm]

A_e = effective cross-sectional area

Impedance:

$$Z = j\omega L_o(\mu' - j\mu'')[\Omega]$$

Attenuation:

$$A = 20 \log \frac{|Z_s + Z_L + Z_{SC}|}{|Z_s + Z_L|}$$

Z_s = source impedance

Z_L = load impedance

Z_{SC} = suppression core impedance

Tips:

- Independent of material, Z is proportional to core height and the ratio of OD to ID.
- To increase impedance:
 - Increase the number of turns
 - Increase the length of the part, or place multiple cores in series.
- In general, the higher the permeability the lower the operating frequency of suppression.
- Remember to consider operating conditions such as DC bias, core size, operating temperature and resistance requirements when selecting which Fair-Rite product to use.
- Besides permeability, you may need to think about secondary material characteristics such as Curie temperature and resistivity.
- Common-mode versus differential-mode noise will affect the choice of core configuration.

Snap-It to Solid Core chart:

Snap-It Part Number	Max Cable Diameter	Solid Equivalent Part	<i>o = available, s = solid equivalent exists</i>					
			31	43	44	46	61	75
04XX178181	4.10 mm (.161")	none	o	o			o ^k	
04XX173951	4.90mm (.193")	26XX023002	os ^k	s	o ^k	o		
04XX164951	4.90 mm (.193")	26XX480002	os ^k	s	o ^k	os	os ^k	
04XX181651	4.90 mm (.193")	26XX023002						os ^k
04XX164251	6.30mm (.250")	26XX540002		os ^k		os		
04XX164281	6.30mm (.250")	26XX540002	os ^k	s	o ^k	os	os ^k	os ^k
04XX625006	7.60 mm (.299")	26XX625002		os ^k				
04XX178281	8.70 mm (.343")	26XX665702	os	os			os	os ^k
04XX665806	9.20 mm (.362")	26XX665802		os ^k				
04XX167251	9.85 mm (.388")	26XX626402		os ^k		os		
04XX167281	9.85 mm (.388")	26XX626402	os ^k	s	o	os	os ^k	os ^k
04XX164151	12.75 mm (.500")	26XX102002		os ^k		os		
04XX164181	12.75 mm (.500")	26XX102002	os ^k	s	o ^k	os	os ^k	os ^k
04XX800506	12.80 mm (.504")	26XX800502		os				
04XX806406	15.0 mm (.591")	26XX806402		os ^k				
04XX176451	18.0 mm (.709")	26XX103002	os ^k	s	o ^k	o	o ^k	o ^k
04XX173551	18.5 mm (.728")	26XX103102	o ^k	s	o	o		
04XX177081	25.90 mm (.990")	26XX626202	os ^k	s	o ^k			

^k Parts are available in the Signal Solution Kit
Reference pages 81-83 in our 17th addition catalog

Additional Snap-It Engineering Kits available:

Kit Part Number	Kit Name	Description
0199000030	31 Material Snap-It Kit	Contains a range of parts to support cable diameters from 4.9mm (0.193") to 18mm (0.709").
0199000031	43 Material Snap-It Kit	Contains Snap-It parts to support cable diameters from 6.3mm (0.250") to 15.0mm (0.591").
0199000033	61 Material Snap-It Kit	Contains Snap-It parts to support cable diameters from 4.1mm (0.161") to 12.7mm (0.500").
0199000041	75 Material Snap-It Kit	Contains Snap-It parts to support cable diameters from 4.9mm (0.193") to 18mm (0.709").

Quick Reference Information:

FCC Limits

Conducted Limits (dBμV)		
Frequency	Class A	Class B
150 kHz – 500 kHz	66	56 to 46*
500 kHz – 5 Mhz	66	46
5 MHz – 30 MHz	60	50

Radiated Limits (dBμV/m)		
Frequency	Class A**	Class B***
30 MHz – 88 MHz	39.1	40.0
88 MHz – 216 MHz	43.5	43.5
216 MHz – 960 MHz	46.4	46.0
Above 960 MHz	49.5	54.0

CISPR 22 Limits:

Conducted Limits (dBμV)		
Frequency	Class A**	Class B**
150 kHz – 500 kHz	66	56 to 46*
500 kHz – 5 Mhz	66	46
5 MHz – 30 MHz	60	50

Radiated Limits (dBμV/m)		
Frequency	Class A**	Class B**
30 MHz – 230 MHz	40.0	30.0
230 MHz – 1GHz	47.0	37.0

* Decreases with the logarithm of the frequency

** Measured at 10 meters

*** Measured at 3 meters