TECH ALERT

MAGDEV LTD

F9C material offers superior common mode filtering

F9C from MagDev achieves optimum combination of high permeability and high saturation resulting in higher impedance for filtering compared to conventional 10000 permeability materials.

Common mode (balanced 4-terminal) chokes comprise of ring cores having two windings inserted into the forward and return current conductors in such a manner that the magnetic flux generated by one winding opposes, and ideally cancels, the flux induced by the other. This generally requires the selection of high permeability materials to maximize the “turns-coupling” between windings.

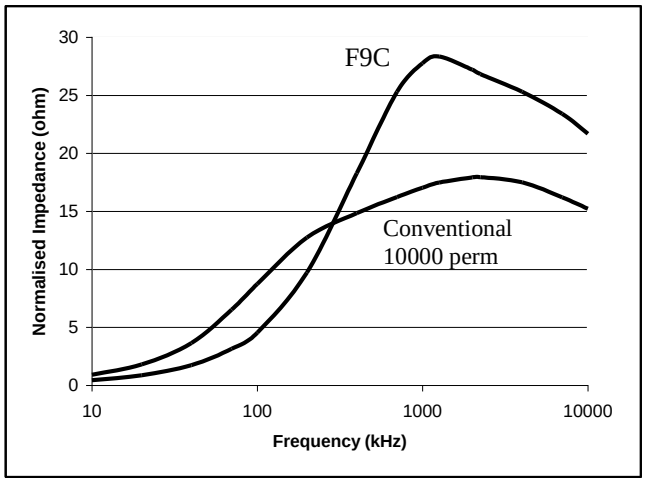
This type of choke acts like a low pass filter and should present small impedance to the load currents, but very high impedance to higher frequency signals, protecting the device and mains from pollution.

Because of imperfections in the cancelling effects (leakage inductance from the load) there is some residual flux in the core, which in cases of large current and small component size could drive the core towards saturation. For this reason it is desirable to use a material with high saturation induction.

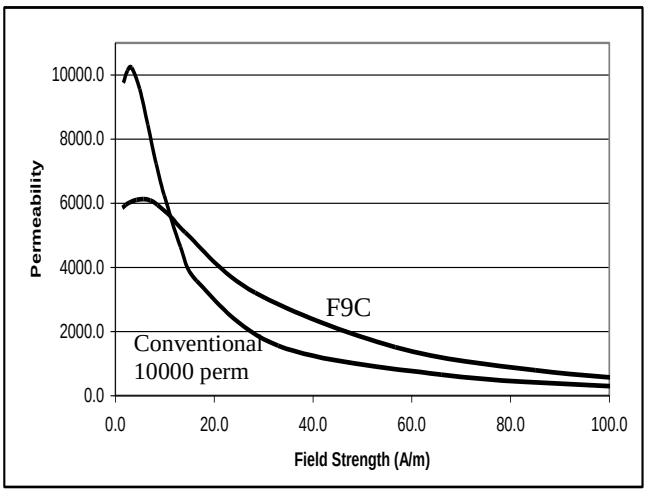
MagDev has developed F9C material specifically for common mode filters. The material features the optimum balance of high permeability (5000) and highest saturation (up to 480mT, or 4800 gauss), properties which were previously considered to be “mutually exclusive”

The stability of the magnetic ordering within F9C ferrites, which is necessary to achieve high saturation, also gives stable permeability (or inductance) with increasing frequency and with increasing current. The result is a component with better inductance at higher current levels and an impedance characteristic more efficient for low frequency pass/high frequency suppression.

Impedance vs. frequency



Permeability vs. Field/Current



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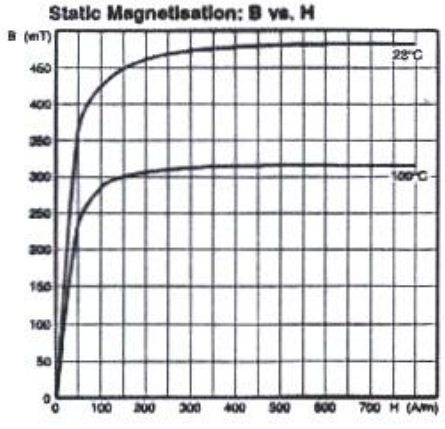
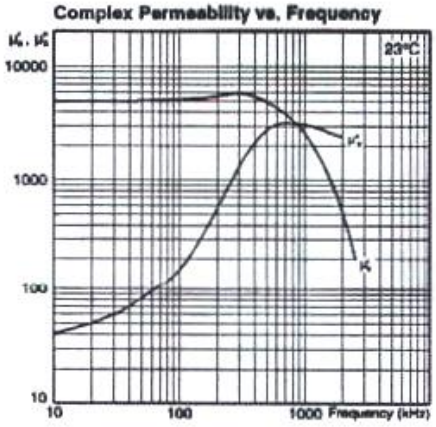
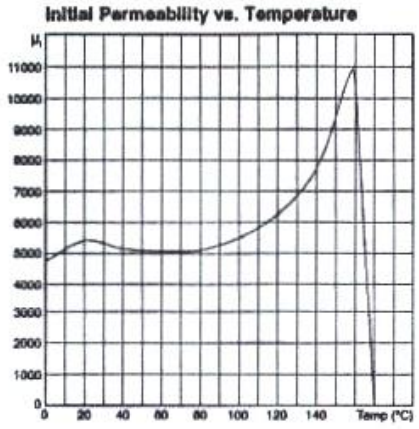
F9C Material Characteristics

Parameter	Symbol	Standard Conditions of Test	Unit	F9C
Initial Permeability *(nominal)*	μ_i	f =25kHz B<0.1mT 25°C	-	5000 +/-20%
Saturation Flux Density *(typical)*	B_{sat}	H=796A/m=10 Oe 25°C	mT	460
Remnant Flux Density *(typical)*	B_r	H→ 0 (from near saturation) 10kHz 25°C	mT	170
Coercivity *(typical)*	H_c	B→ 0 (from near saturation) 10kHz 25°C	A/m	13
Loss Factor (maximum)	$\frac{\tan\delta_{(r+e)}}{\mu}$	f=100kHz B<0.1mT 25°C	10^{-6}	20
Hysteresis Material Constant (typical)	η_B	f =10kHz B from 1.5 to 3 mT 25°C	10^{-6} / mT	0.2
Temperature Factor		f =10kHz B<0.1mT 25°C to 55°C	10^{-6} / °C	-1 to +2
Curie Temperature *(minimum)*	θ_c	B< 0.1mT 10kHz	°C	160
Resistivity *(typical)*	ρ	1V/cm 25°C	ohm-cm	100







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