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## Updated Curve Fit Equation Tool Eases Magnetics Design

<u>Magnetics</u> has updated their Curve Fit Equation tool to include the new EQ and LP shape powder cores, the new Kool M $\mu$  Hf and Edge powder core materials, and multiple new permeabilities. Equations have been updated to reflect performance improvements across multiple product lines. The tool is an Excel file for design engineers working on calculations from the formulas in the 2020 Magnetics Powder Core catalog.

Using this tool, magnetic component engineers can compare core performance including permeability vs. dc bias, core loss density, normal magnetization, permeability vs. frequency, and permeability vs. temperature (see the figure). Magnetics provides five comparison tables in this file for various core shapes based on eight different powder core materials: MPP, High Flux, Kool Mu, XFlux, Kool M $\mu$  MAX, Kool M $\mu$  Hf, Edge, and the 75 series.

To download the Excel file, see the Magnetics web <u>page</u>.

В	С	D	Ε	P.	G	н	1 1	к	L	м	N	0	P Q	R	\$	T	U	٧	v	x	Y
$\%\mu_i = \frac{1}{a + bH^i}$ Enter Drive Level (H) in Oersteds: $50$							<b>MAGNETICS</b> 2. Core Loss Density $P_L = aB^b f^c$					MAGNE	TICS			3. Normal Magnetization $B = \left[\frac{a + bH + cH^2}{1 + dH + sH^2}\right]^{2}$					
							nter Flux Density (B) in TesliEnter frequency in Kilohertz:  0.1  50						Input Drive Level (H) below in Oersteds 95								
Material:	Permeabi	a	ь	С	Roll-off (%	Roll-off (μ)	Material:	Permeabi	a	b	С	Loss (mV/oc)	Material	ermeabilit	a	b	С	d	e	*	B (Tes
МРР	14	0.01	4.357E-09	2,385	99.5%	13.93		14	266.220	2.103	1.316	361.48	мрр	14	3.918E-02	1.824E-02	4.911E-04	1.331E-01	4.502E-04	1.938	0.1
	26 60	0.01	1.090E-08	2.505 2.436	98.1% 86.2%			26 60	146.940 72.150	2.103	1,357	234.23		26 60	5.340E-02 3.933E-02	1.144E-02 1.371E-02	5.419E-04 5.727E-04	8.772E-02 5.100E-02	5.000E-04 5.216E-04	1,699 1,528	0.2
	125	0.01	4.061E-07	2.518	56.5%			125	62,220	2.103	1561	220.30		125	3.423E-02	2.092E-02	5.477E-04	3.371E-02	4.941E-04	1.364	01
	147	0.01	9.118E-07	2.430	45.0%		*****	147	56.510	2.103	1,598	231.25		167	2.888E-02	2.651E-02	5.290E-04	3.462E-02	5.025E-04	1.396	0
	160	0.01	9.525E-07	2.477	39.4%	62.99	MPP	160	56.510	2.103	1.598	231.25		160	2.843E-02	2.738E-02	5.121E-04	3.243E-02	5.052E-04	1.365	00
	173	0.01	8.078E-07	2.563	35.3%			173	56.510	2.103	1.598	231.25		173	2.933E-02	2.707E-02	4.917E-04	2.795E-02	5.130E-04	1.325	01
	200	0.01	1.496E-06	2.477		Out of		200	53.710	2.103	1.624	243.32		200	2.257E-02	3.252E-02	5.097E-04	3.170E-02	5.225E-04	1.316	0
	300 550	0.01	4.913E-06 5.597E-04		Out of	Out of		300 550	53.710 74.760	2.103 2.103	1,624	243.32 367.68		300 550	2.880E-03 1.681E-03	5.179E-02 7.555E-02	5.787E-04 1.118E-10	4.904E-02 9.743E-02	5.100E-04 1.754E-03	1254	0
	14	0.01	3.389E-08	1.923	99.4%			14	968.560	2.103	1,189	614.05		14	3.981E-02	2.174E-02	4.745E-04	1.733E-01	3,407E-04	1.749	0.
High Flux	26	0.01	4.205E-09	2,426	99.4%	25.86	High Flux	26	492.310	2.218	1,240	381.03	High Flux	26	3.969E-02	1.964E-02	5.931E-04	1.163E-01	4.025E-04	1,828	0.2
	40	0.01	1,841E-08	2,409	97.8%			40	492.314	2,218	1,240	381.04		40	3.900E-02	1.717E-02	6.527E-04	8.595E-02	4.671E-04	1,725	0.
	60	0.01	6.413E-08	2.291	95.2%	57.15		60	246.540	2.218	1.311	251.91		60	3.828E-02	1.800E-02	7.012E-04	7.063E-02	4.502E-04	1.630	0.
	125	0.01	1.403E-07	2,465	82.2%			125	181.080	2.218	1.378	240.46		125	3.790E-02	2.126E-02	7.080E-04	4.139E-02	4.223E-04	1,433	0.
	147	0.01	1.207E-06	2.131	66.5%			147	405.590	2.218	1.393	571.15		147	3.498E-02	2.404E-02	6.777E-04	3.915E-02	4.373E-04	1.366	0.5
	160			2.094	61.9%			160	390.920	2.218	1.401	568.00		160	3.413E-02	2.449E-02	6.798E-04	3.699E-02	4.411E-04	1.326	00
		9, 58167, 58620, 58070, 58740, 58866,					1		67, 58620, 5						58339	,58167,58620,	58070, 58740,	58866, 58906, 5	58778, 58098, 58		
	60 125	0.01	1.574E-07 9.008E-07	2.166	93.0%			125	47.507 47.507	1,585 1,585	1431	333.41		60 125	9.216E-02 4.715E-02	1.978E-02 1.831E-02	8.634E-04 1.235E-03	7.622E-02 6.364E-02	6.309E-04 7.843E-04	1.799	0.5
	26	0.01	3.646E-11	3.192	99.9%			26	278,593	2,218	1,236	212.27		26	4.715E-02 4.247E-02	2.153E-02	6.192E-04	1.157E-01	4.154E-04	1.951	0.8
Edge pol Mμ H <i>j</i>	60	0.01	9.202E-10	3,844	98.7%		Edge Kool Mµ H <i>j</i>	60	181.147	2.218	1,267	155.82	Edge Kool Mµ H <i>j</i> i	60	4.753E-02	1.352E-02	7.586E-04	7.251E-02	4.368E-04	1,538	0.5
	26	0.01	3,556E-08	2.213	98.0%			26	32.220	1,988	1541	137.48		26	5.241E-02	1.534E-02	5.564E-04	9.843E-02	4.635E-04	1,770	8.2
	60	0.01	4.064E-07	2.131	85.5%			60	26.180	1.988	1541	111.71		60	3.621E-02	1.674E-02	5.950E-04	5.718E-02	5.134E-04	1,599	0.
Κοοί Μμ	14	0.01	4.938E-08	2.000	98.8%			14	80.550	1.988	1.541	343.70	Kool Mµ	14	3.918E-02	1.856E-02	4.812E-04	1.390E-01	4.478E-04	1.875	0.
	26	0.01	5.266E-07	1,819	93.9%			26	52.360	1,988	1.541	223.42		26	3.763E-02	1.712E-02	5.155E-04	9.190E-02	4.909E-04	1.812	0.
	40	0.01	2.177E-06	1.704	85.4%		Kool Mμ	40	52.360	1,988	1541	223.42		40	3.789E-02	1.632E-02	5.355E-04	7.365E-02	5.110E-04	1.665	0.
	60 75	0.01	2,142E-06 3,885E-06	1.855	76.7% 67.6%			60 75	44.300 44.300	1,988 1,988	1,541	189.02		60 75	3.601E-02 3.111E-02	1.721E-02 2.286E-02	5.401E-04 5.343E-04	5.624E-02 5.568E-02	5.156E-04 4.982E-04	1,577	0.
	90	0.01	5,830E-06	1,819	58.2%			90	44,300	1,988	1541	189.02		90	2.965E-02	2.538E-02	5.142E-04	5.305E-02	4.867E-04	1578	0.
	125	0.01	2.209E-05	1,636	42.9%			125	44.300	1,988	1541	189.02		125	2.730E-02	2.946E-02	5.038E-04	5.274E-02	4.639E-04	1471	0.
	19	0.01	4.976E-09	2.236	99.7%			19	509.271	2.015	1.194	525.43		19	3.986E-02	2.164E-02	5.311E-04	1.504E-01	3.344E-04	1,783	8
XFlux	26	0.01	6.304E-10	2.714	99.7%	25.93	3	26	581.542	2.015	1.194	600.00	XFlux	26	4.042E-02	2.042E-02	5.962E-04	1.164E-01	3.934E-04	1.872	8.
	40	0.01	1.843E-08	2.358	98.2%		100000	40	581.540	2.015	1.194	600.00		40	5.119E-02	1.602E-02	6.640E-04	9.034E-02	4.405E-04	1,679	0.
	60	0.01	1.489E-08	2.613	96.1%		XFlux	60	542.773	2.015	1.194	560.00		60	3.880E-02	1.648E-02	6.982E-04	6.611E-02	4.705E-04	1.623	0.
	75	0.01	2.269E-08	2.649	93.3%			75	542.773	2.015	1.194	560.00		75	4.142E-02	1.414E-02	7.119E-04	5.584E-02	4.648E-04	1.461	0.
	90	0.01	9.841E-08 2.687E-07	2.477	86.3%	77.64		90	542.773 542.773	2.015	1.194	560.00 560.00		90 125	3.621E-02	1.987E-02	6.675E-04	4.921E-02	4.657E-04	1.542	0
	125 26	0.01	5.822E-07	1,659	69.7% 96.3%		2 .	125	271.000	2.016	1,194	705.48	75- Series	26	3.814E-02 1.935E-02	1.729E-02 1.821E-02	6.277E-04 4.074E-04	3.363E-02 9.162E-02	4.649E-04 2.952E-04	1.307	0.0
75-	40	0.01	1.358E-06	1,651	92.0%		75- Series	40	309,000	2,031	1,440	676.79		40	3.627E-02	1.821E-02 2.148E-02	6.972E-04	9.162E-02 1.029E-01	5.175E-04	1.748	0.
Series	60	0.01	1101E-06	1819	88 1%			60	251400	2.066	1410	536.92		60	6.047E-02	2.081E-02	8.582E-04	8,427E-02	6.352E-04	1,686	0.
Kool Mμ MAX	14	0.01	8.274E-09	2.239	99.5%		Kool Mµ MAX	14	144.490	2.072	1.379	269.60	Kool M <sub>µ</sub> MAX	14	3.945E-02	1,922E-02	4.882E-04	1,430E-01	4.217E-04	1,895	0.
	19	0.01	3.136E-08	2.111	98.8%			19	128.837	2.072	1.379	240.00		19	3.915E-02	1.866E-02	5.237E-04	1.225E-01	4.368E-04	1.859	0.
	26	0.01	3,444E-08	2.205	98.1%			26	113,530	2.072	1,379	211.49		26	6.405E-02	1.572E-02	5.541E-04	9.685E-02	4.568E-04	1.813	8.3
	40	0.01	5.919E-07	1.855	92.2%			48	113.530	2.072	1.379	211.49		40	3.810E-02	1.720E-02	5.982E-04	8.225E-02	4.852E-04	1.684	8.
	60	0.01	5.917E-07	2.000	87.1%			60	113,530	2.072	1.379	211.49		60	3.589E-02	1.862E-02	6.201E-04	6.341E-02	4.897E-04	1,630	0.
Cool M <sub>µ</sub> E	14 26	0.01	3.066E-07 4.581E-07	1.850	95.9%		Kool M <sub>µ</sub>	26	29.3 32.22	1,988	1.541 1.541	125.02 137.48	Kool M <sub>µ</sub>	14 26	5.216E-02 2.710E-02	1.507E-02 9.151E-03	4.323E-04 4.036E-04	1.036E-01 7.636E-02	5.174E-04 3.986E-04	1.952 1.515	0.1
core, U-	40	0.01	7.684E-07	1,904	88.4%		E-core, U	40	34.23	1,988	1541	146,06	E-core, U-	40	4.990E-02	1.537E-02	5.792E-04	7.263E-02	5.542E-04	1,689	0.2
core,	60	0.01	3.371E-06	1.736	76.9%		Block	60	42.29	1,988	1541	180.45	Block	60	4.286E-02	1.787E-02	6.044E-04	6.335E-02	5.529E-04	1586	0.4

Figure. Equations in Magnetics' Curve Fit Equation tool been updated to reflect performance improvements across multiple product lines including the new EQ and LP shape powder cores, the new Kool Mµ Hf and Edge powder core materials, and multiple new permeabilities.