

NANOPERM® - Latest Developments on Nanocrystalline Cores



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Overview

- NANOPERM[®] Low μ (LM)
- NANOPERM[®] *Cool*/BLUE (CB)
- NANOPERM[®] Low Cost (LC)

Latest Developments in Nanocrystalline Cores

NANOPERM[®] Low μ - Properties

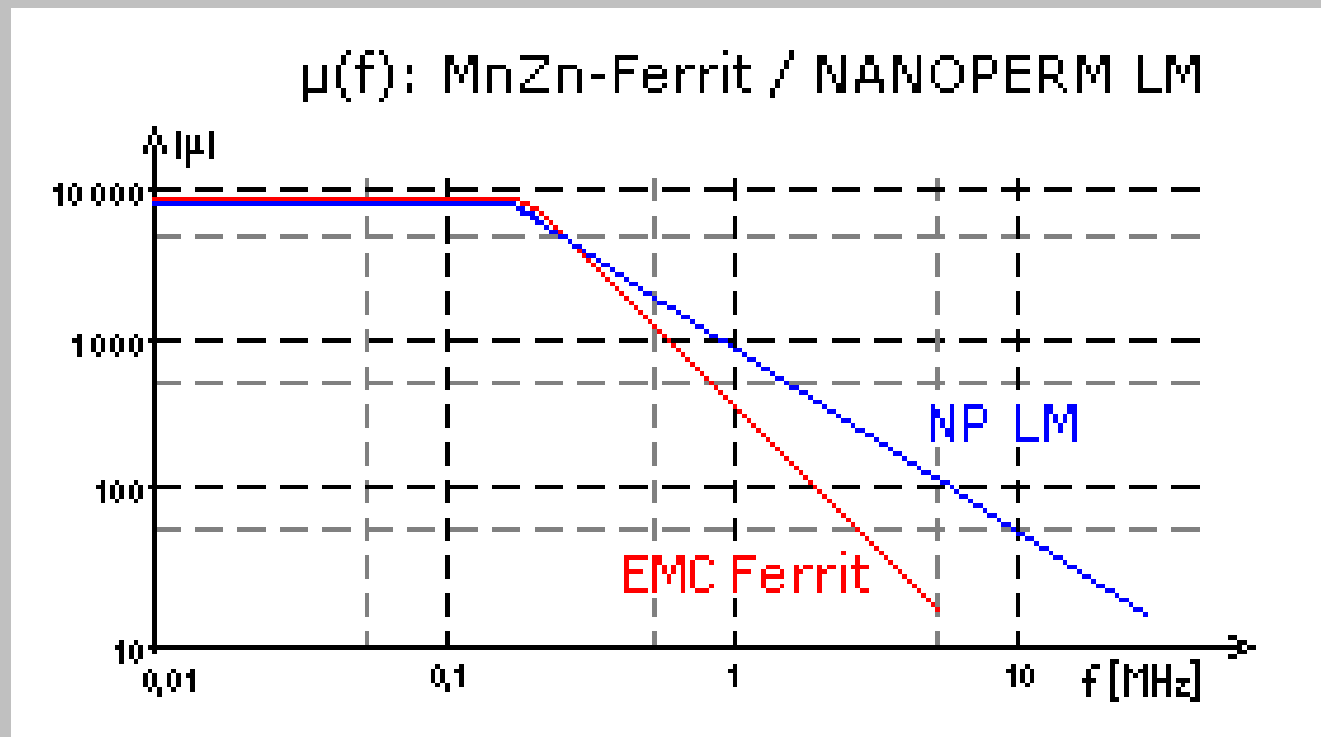
NANOPERM[®] LM cores are very much advantageous in *EMC filters* for applications with a high amount of asymmetric interference current (e.g. inverter drives) compared to the established ferrite materials. The nominal Permeability level is about **8.000**.

Main advantages compared to Ferrites are:

- ✓ 3x higher Bsat at the same permeability level
- ✓ Very broadband and in particular in higher frequency ranges better attenuation performance
- ✓ High permissible working temperature (typ. > 120°C)

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NANOPERM[®] Low μ - Performance



Latest Developments in Nanocrystalline Cores

NANOPERM® Low μ - Standard range

Type	Bare Core Size [mm]	Fixed Core Size [mm]	AL @ 100 kHz [μ H]
M-449	25 x 16 x 10	28,0 x 13,2 x 12,4	3,6 – 6,3
M-450	30 x 20 x 10	32,7 x 17,8 x 12,6	3,3 – 5,7
M-451	40 x 32 x 15	43,0 x 28,8 x 17,2	2,7 – 4,8
M-452	63 x 50 x 30	68,0 x 43,0 x 36,0	5,6 – 9,9
M-453	80 x 63 x 30	84,7 x 57,0 x 35,4	5,9 – 10,2
M-454	102 x 76 x 25	108,2 x 69,8 x 30,2	6,0 – 10,5
M-455	130 x 100 x 30	135,0 x 94,6 x 33,8	6,4 – 11,2
M-456	160 x 130 x 30	165,2 x 121,8 x 36,2	5,0 – 8,8
M-457	200 x 175 x 30	204,2 x 166,8 x 36,0	3,3 – 5,7

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NANOPERM[®] Cool BLUE – Properties



COOL BLUE[®] toroids are being used more and more in modern high power inverter systems to reduce damaging motor bearing currents.

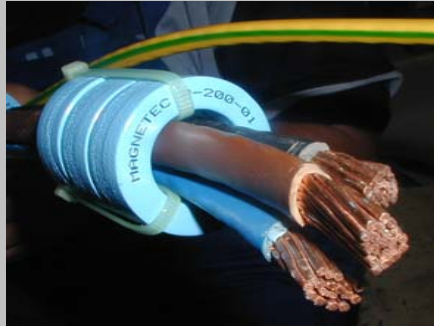
As a result of these unwanted currents the bearings corrugate, leading to electrical break-down in the lubrication and finally to a **standstill of the entire motor!**

The use of **COOL BLUE[®]** cores

- ✓ suppresses the asymmetrical EMI currents which are generated by the parasitic capacities of the motor itself together with the motor cable.
- ✓ reduces significantly over voltage peaks at the motor terminals
- ✓ increases the life time of the motor bearings and thus reduces maintenance costs and standstill periods.



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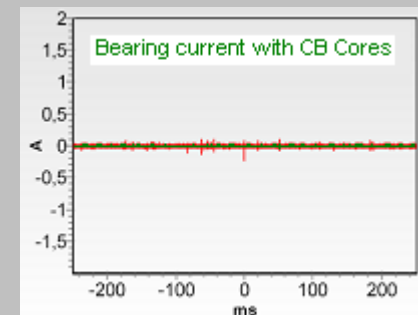
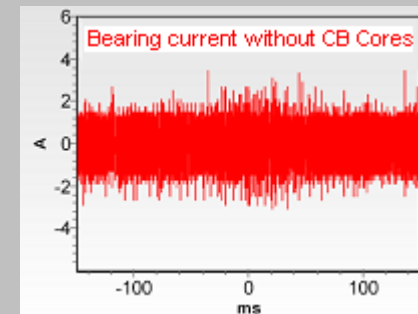


NANOPERM® Cool BLUE – Design



In order to achieve an efficient reduction in the destructive effects mentioned before, **COOL BLUE**® cores have to be placed over the motor cables (as a CM Choke) at the inverter output. Design hints:

- ✓ CM peak current (I_{CM}) to be measured
- ✓ Suitable Cool BLUE Core(s) to be chosen (see table next page)
- ✓ Number of cores to be calculated. If the measured peak current exceeds the I_{CM} value shown in the table, the number of cores has to be increased accordingly.
- ✓ The conductors excl. shielding (PE) have to be put through the stacked cores.
- ✓ Check effect by second measurement of the I_{CM} . Reductions of more than 80% could be achieved.



Latest Developments in Nanocrystalline Cores

NANOPERM[®] Cool/BLUE - Standard range



Type	Bare Core Size [mm]	Fixed Core Size [mm]	AL @ 10 kHz [μH]	I _{CM} [A]
M-112	63 x 50 x 30	68 x 43 x 36	23,3 – 46,6	4
M-113	80 x 63 x 30	86 x 56 x 36	24,1 – 48,2	6
M-114	100 x 80 x 30	105 x 75 x 35	22,5 – 45,0	8
M-115	130 x 100 x 30	135 x 94 x 34	26,4 – 52,9	9
M-116	160 x 130 x 30	164 x 126 x 33	20,9 – 45,0	12
M-302	160 x 130 x 30	OVAL	20,9 – 45,0	12
M-117	200 x 175 x 30	204 x 166 x 36	13,5 – 26,9	16
M-111	240 x 204 x 30	OVAL	14,5 – 29,9	20
M-248	300 x 254 x 30	OVAL	15,8 – 31,2	22
M-205	300 x 250 x 30	304 x 246 x 34	18,0 – 36,0	23

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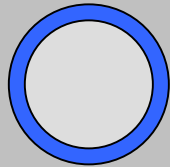
NANOPERM[®] Low Cost - Properties

MAGNETEC's **NANOPERM[®] LC** standard range is specially designed for **CM filter Chokes**. Maximum attenuation is achieved with a minimum of material. It's an interesting alternative to existing Ferrite based solutions.

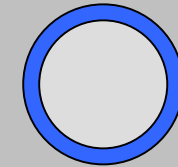
Main advantages:

- ✓ High and uniform attenuation
- ✓ Low earth leakage currents
- ✓ High leakage inductance
- ✓ High working temperature
- ✓ Good mechanical stability
- ✓ Best value for the money

Latest Developments in Nanocrystalline Cores



NANOPERM® Low Cost - Standard range



Type	Bare Core Size [mm]	Fixed Core Size [mm]	Core Weight [g]	AL @ 10 kHz [μH]
M-306	16 x 11 x 5	18,4 x 8,6 x 7,0	3,0	5,9 – 11,8
M-307	20 x 15 x 5	22,4 x 12,6 x 7,5	3,9	4,5 – 9,1
M-308	25 x 20 x 5	27,7 x 17,1 x 7,5	5,0	3,5 – 7,0
M-309	30 x 25 x 5	32,7 x 22,0 x 7,5	6,1	2,8 – 5,7
M-310	40 x 35 x 5	42,5 x 31,8 x 7,5	8,3	2,1 – 4,2
M-333	50 x 45 x 5	52,2 x 41,8 x 7,5	10,2	1,6 – 3,3
M-334	60 x 55 x 5	62,0 x 51,6 x 7,5	12,3	1,3 – 2,8
M-335	70 x 65 x 5	72,0 x 61,4 x 7,5	14,5	1,1 – 2,3

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NANOPERM® - Independent from metal price rallye

NANOPERM: $\text{Fe}_{73,5} \text{Cu}_1 \text{Nb}_3 \text{Si}_{15,5} \text{B}_7$
 Ferrite: $(\text{Fe}_2\text{O}_3)_{50} \text{NiO}_{18} \text{ZnO}_{32}$
 Permalloy: $\text{Ni}_{78} \text{Mo}_5 \text{Fe}_{17}$
 MPP: $\text{Ni}_{81} \text{Mo}_2 \text{Fe}_{17}$
 High Flux: $\text{Ni}_{50} \text{Fe}_{50}$



Ni + 300%



Zn + 400%



in 3 years !



Latest Developments in Nanocrystalline Cores

Thank you for your attention!

For more detailed information
visit us at [booth 432!](#)

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