INCOPA & MAGMENT

Power Magnetics

a revolutionary technology for the most economical inductive components

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INCOPA

inductive-components.de

MAGMENT

magment.de

About us...

- Founded 2010 based on 20+ years experience in the industry
- INCOPA develops and produces customised magnetics
- INCOPA is a specialised company on markets such as renewable energies, medical, aerospace, industrial and transport
- Our mission is to react fast and flexible on customer enquiries. We provide prototypes within shortest time
- Furthermore, we provide direct support on magnetic design as well as support on agency approvals
- Technologies: winding, joining, bonding, potting & testing
- Products: transformers (power, signal), chokes (single phase, multi phase, current compensated), special wound components

…and our partner MAGMENT

- Founded 2015 based on 26+ years experience in the industry
- MAGMENT develops and produces magnetizable concretes
- MAGMENT materials and applications are worldwide unique
- Main applications are
  - power inductive components
  - wireless power transmission (static & dynamic)
  - induction cooking & heating
  - shielding (LF) and EMC (HF)
  - electromagnetic locks
  - decorative magnetic concrete

What is a MAGMENT cement concrete?

- Is a composite material with soft magnetic grains with a suitable size distribution embedded in a cement matrix:

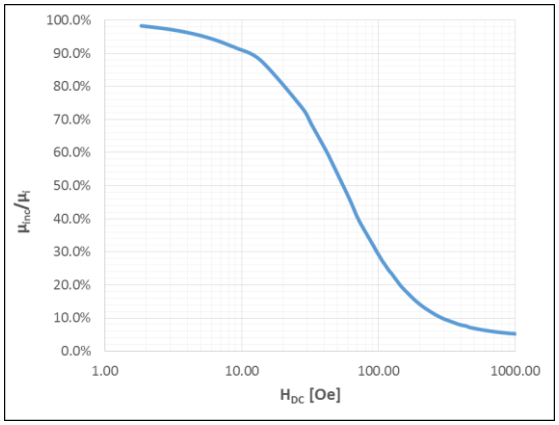
MAGMENT = **MAG**netic ce**MENT**

- Has initial permeabilities of up to 60 opening up a very broad range of electromagnetic applications.
- Does not involve any pressing processes (!) offering manifold possibilities for cost-efficient and size-unlimited parts
- Is very robust and stable with a prolonged lifetime.
- Allows to make mechanically rugged inductive components with high stability to environmental influences.
- …and is the most competitive soft magnetic material

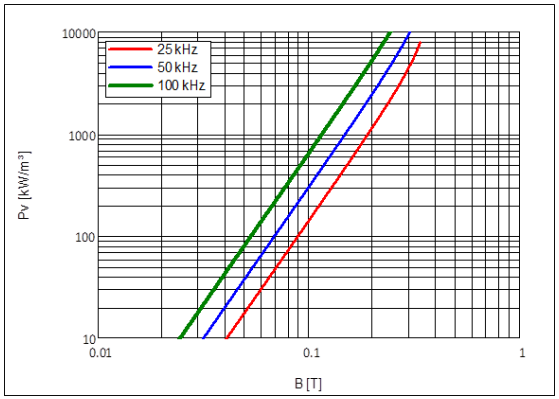
Material properties (MC40)

Initial permeability	@ 25°C	μ_i		40 ± 10%
Curie-Temperature		T_C	[°C]	> 210
Resistivity	DC	ρ	[Ω m]	20
Density		γ	[kg/m³]	3750
Realtive core losses	@ 50kHz 100mT	P_V	[kW/m³]	300
Specific heat		c_p	[J/kg K]	700
Thermal conductivity		λ	[W/mK]	3
Young's modulus		E_c	[MPa]	25000
Compressive strength		f_c	[MPa]	20
Tensile strength		f_t	[MPa]	2

Reversible Permeability vs. DC Bias



Core Loss Density P_V (B)



Designing a power choke: steps

Target parameters: inductance **L**, rated current **I**, resistance **DCR**

Conventional design	MAGMENT design
1. Select core shape (E, RM,…)	**1. Select/design coil former**
2. Select core size (E25, RM8,…)	**2. Layout wire in winding window**
3. Select suitable coil former	**3. Design housing**
4. Layout wire in winding window	**END**
5. Select housing	
6. Select potting material	
END	

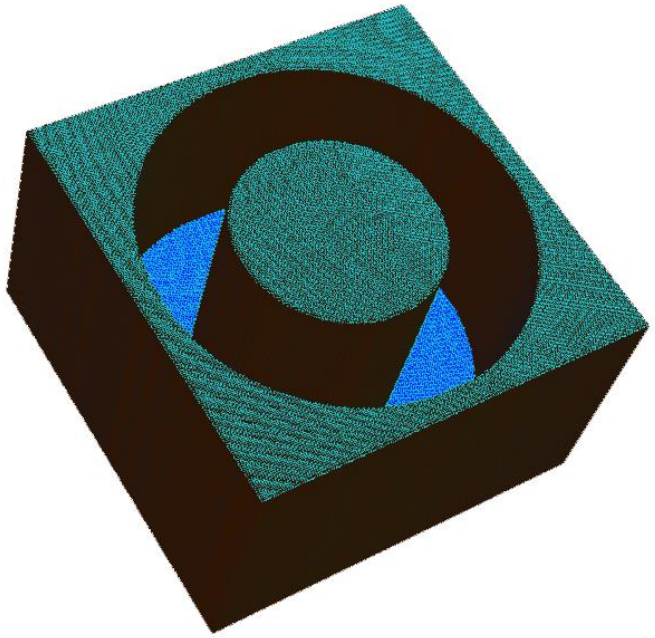
Designing a power choke: differences

Target parameters: inductance **L**, rated current **I**, resistance **DCR**

Conventional design	MAGMENT design
Core sizes available only in steps (E55, E65,..)	No shape or size limitation
Limited size availability	
Stacking for simple shapes only (E, U, R)	
Winding filling factor limited	**Winding 100% surrounded by magnetic material**
Partial magnetic filling of housing	**Potting material = magnetic material**

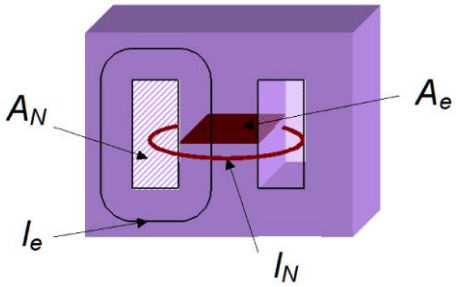
MAGMENT magnetics design

- **Design algorithm** gives dimensions by minimizing the total material cost (MAGMENT, wire, bobbin, housing)
- The optimum shape is rectangular with a square base
- Shape or dimensions can be fitted to any given space by putting a constraint to the design calculation
- The resulting magnetic cross sectional area is very large



Inductor parameters: a comparison

- Compare a MAGMENT inductor to a conventional one with the same inductance
- The design advantage follow from the effective parameters:
  - l_e = effective magnetic path
  - A_e= effective cross sectional area
  - $V_e = l_e \cdot A_e$ = effective volume



- Three different cases yield superior performance and cost:

l_e [mm]	A_e [mm²]	V_e [mm³]	No. of turns	Core loss [W]	Cost [€]
=	>	>	<	<	<
<	=	<	<	<	<<<
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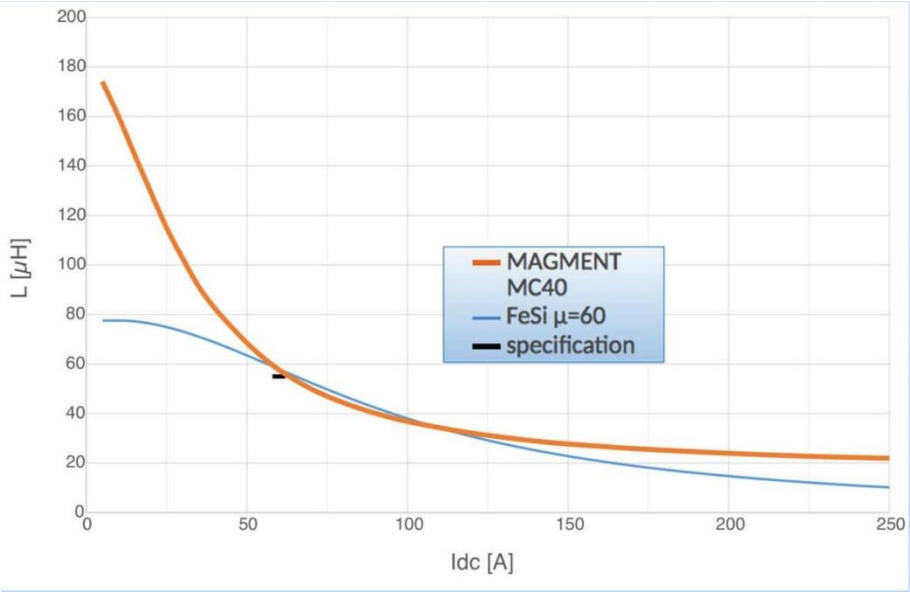
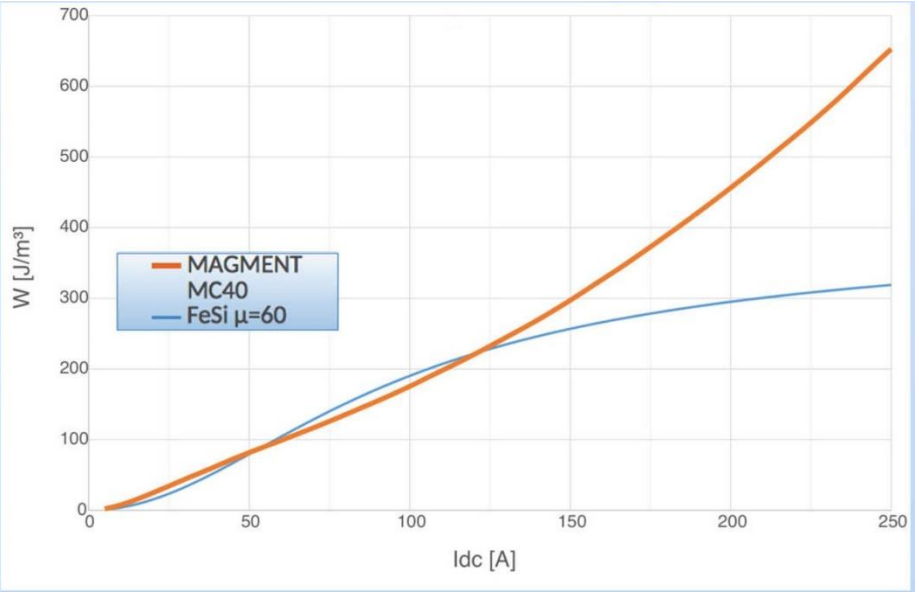
Power choke benchmark

- Example of a L=55µH @ I=60A inverter choke. Conventional powder core design vs. MAGMENT

Inductance vs. DC-Bias current



Stored energy vs. DC-Bias current



Production, Logistics & Costs

- Component manufacturing follows design algorithm results
- All production processes are under one roof
- Short lead times
- Simplified stock holding
- Both design-to-cost and low cost of MAGMENT materials guarantee most economical inductive components

MAGMENT magnetics: a true **revolution**

- Most economical inductive components
- Highest performance (inductance & low loss)
- Design to any size and shape
- Very large A_e
- Coil completely surrounded by magnetic material
- Innovative manufacturing process
  “Wind and Magnetic Pour“
- Highly efficient logistics