ELECTRONIC AG

we make things work.

New Generation of Magnetic Materials, an optimum Selection for Power Electronics

Dr. Helko Meuche - Sales Manager MAGNETICS

About us

Specialized Distribution und Engineering for Magnetics and Cooling solutions

- founded 1985
- Location: Munich, Germany
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- Phone: +49 89 30626-0

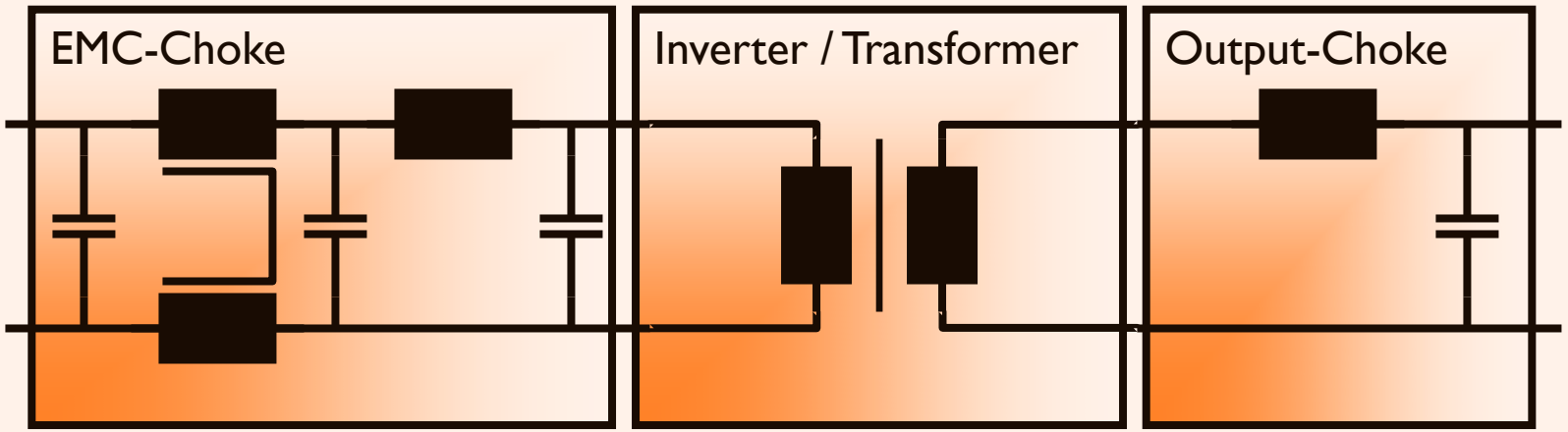
Typical Inductive Components

Current Compensated Choke

Lineare Choke

PFC-Choke
Transformer
(Flyback-, Flux converter)

Output Choke
(DC, AC, Sinus Choke)



Typical Inductive Components

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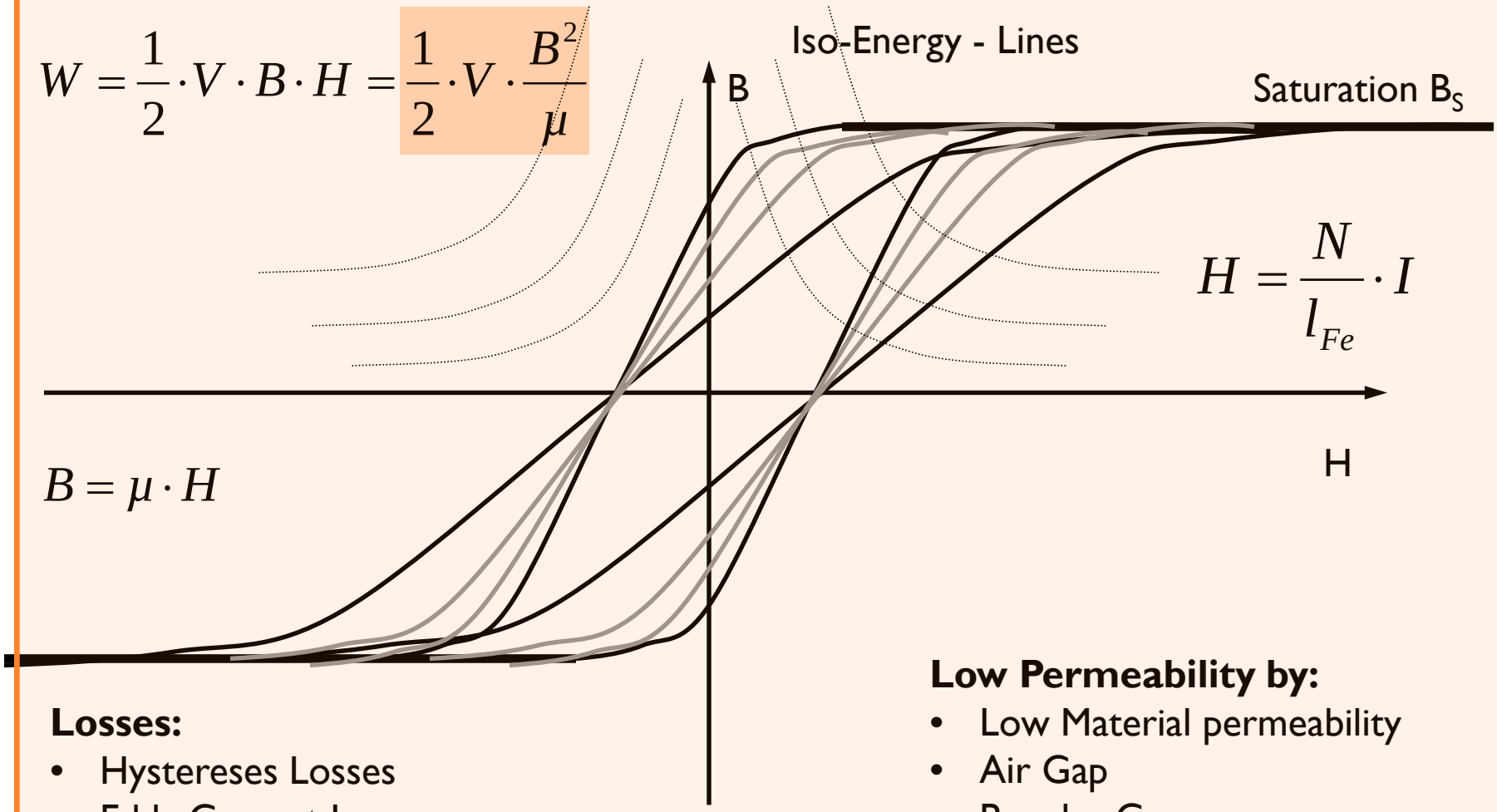
Component	L	Pv	Characteristics
EMI-Choke	low	high	Energy storage / high Impedance
DC-Choke	medium	medium	Energy storage
AC-Choke (PFC)	high	low	Energy storage
Resonance-Choke	medium	low	Energy storage
Flyback-Converter	Depends on transmissible power!	low	Energy storage and transmission
Flux-Converter	high	low	Energy storage
Current Compensated Choke	high	n.n.	Special case

BH-Curve

$$W = \frac{1}{2} \cdot V \cdot B \cdot H = \frac{1}{2} \cdot V \cdot \frac{B^2}{\mu}$$



$$H = \frac{N}{l_{Fe}} \cdot I$$

$$B = \mu \cdot H$$

Losses:
- Hystereses Losses
- Eddy Current Losses

Low Permeability by:
- Low Material permeability
- Air Gap
- Powder Cores

Magnetic Material Categories

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Ferrites	Iron Powder	Alloy Powder	Amorphous and Nanocrystalline Band	MAGMENT (new class of Material)
Ceramic pressed and sintered	Powder mixed with binder pressed	Powder with oxide layer pressed at high pressure	Wound Bands very thin layers (about 17µm)	Concrete Magnetic Cement disruptive technology
wide range of different shapes	many different shapes possible	some different shapes possible	limited wound shapes possible	every size and shape possible
shrinking during sintering => large mech. tolerances	no shrinking during sintering => small mech. tolerances	no shrinking during sintering => small mech. tolerances	only U, E, Ring and Block cores	magnetizable grains embedded in ce-ment matrix in a pressure-less process
magnetic homogeneous => no internal air gap	internal distributed air gap	internal distributed air gap	no internal distributed air gap high permeability	internal distributed air gap
degassing of binder before sintering	organic binder => thermal aging possible!	no organic binder => no thermal aging possible		no organic binder => no thermal aging possible

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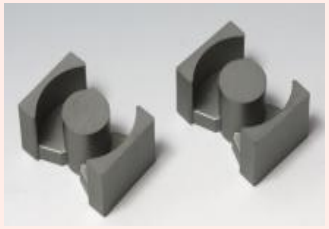	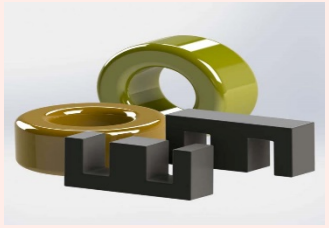	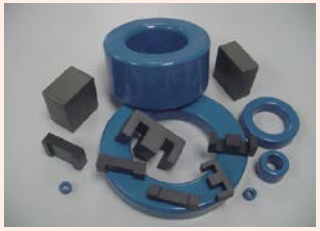	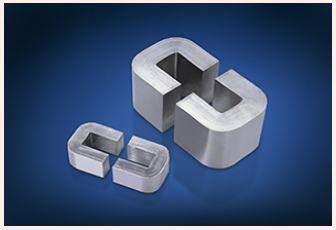	
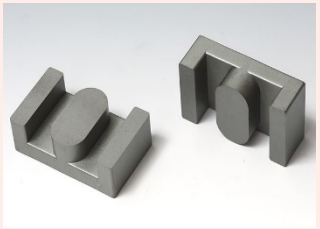		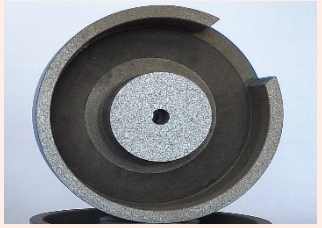	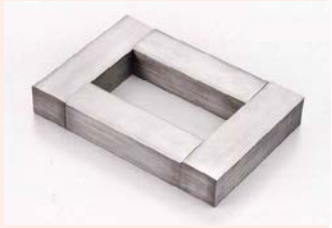	

New Magnetic Materials:

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MAGMENT

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

MAGMENT = MAGnetic ce**MENT**

- Highest performance: L(I) & low loss
- Design to any size and shape
- Very large effective area A_e
- Coil completely surrounded by MAGMENT
- High hermal conductivity

- **“Wind & Magnetic Pour”**

New Magnetic Materials:

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A revolution in Powder Pot Cores

Large Pot cores in ALLOY power materials

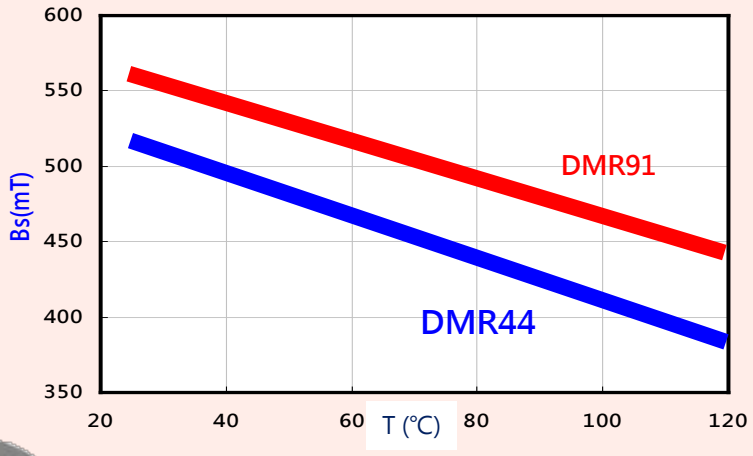
- 80% reduced losses in comparison to market standard
- Core sizes between **60mm up to 320mm** diameter available
- available in:
  - **Super-MSS™ Sendust**
  - **FluxSan™ Silicon Iron**
  - **HI-FLUX™**
  - **Optilloy™**

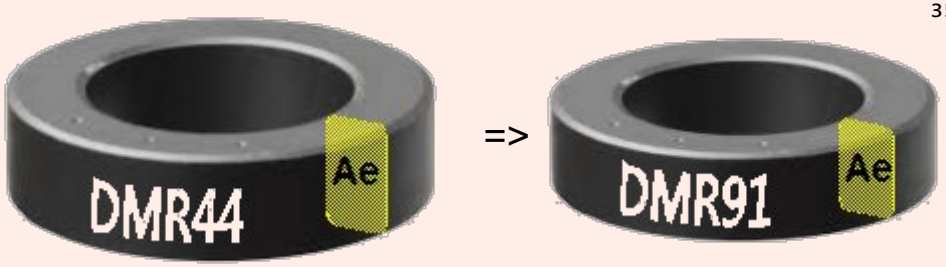
New Magnetic Materials:

A new class in Power Ferrite Materials

DMR91: Highest Saturation with lowest Losses

- Saturation: 460mT at 100°C
- Losses: 300kW/m³ at 100kHz, 200mT, 100°C
- available in standard and customized core shapes





Magnetic Materials
Main Characteristics

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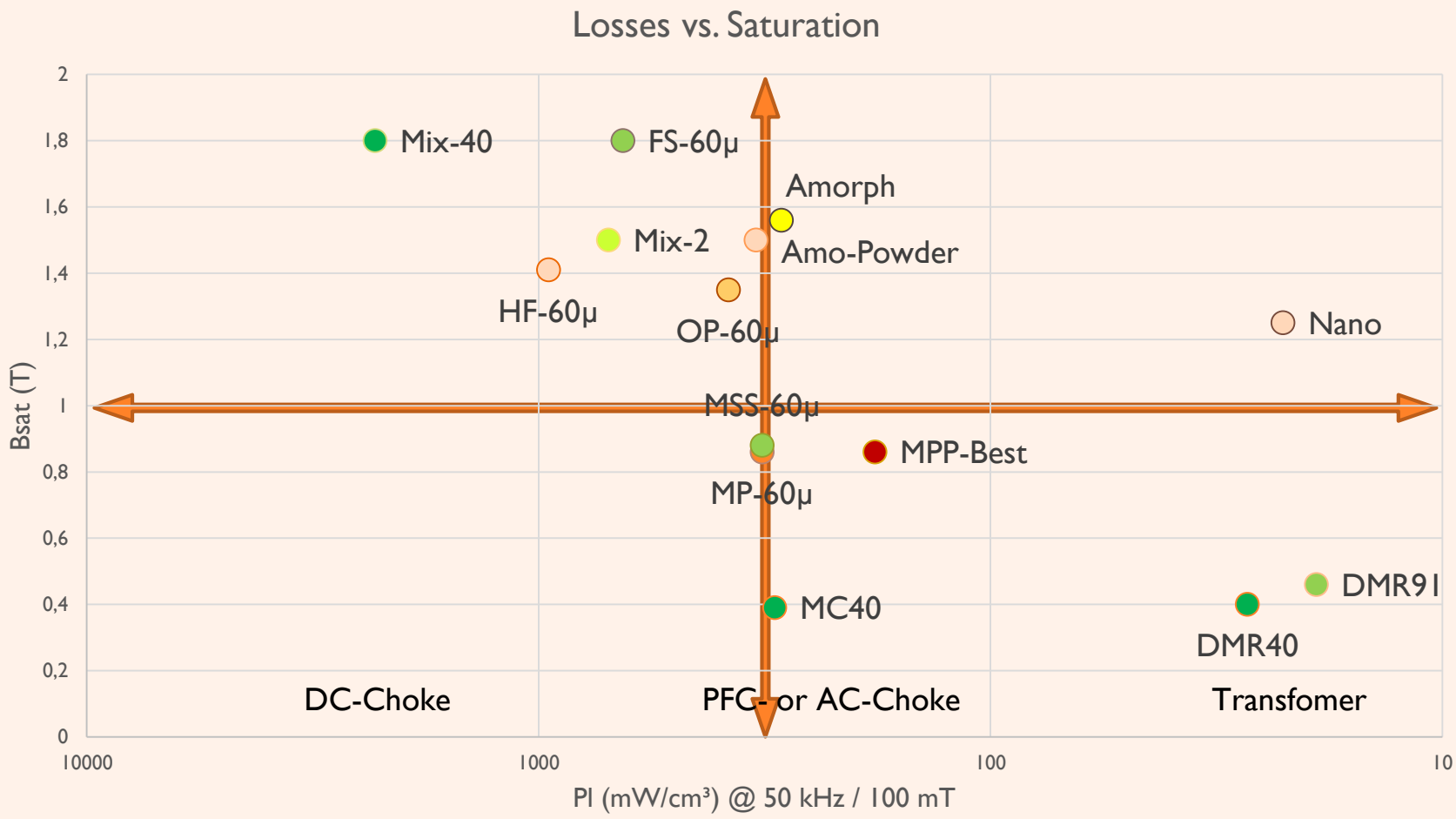
	Ferrites		MAG-MENT	Iron Powder		MSS Sendust	MPP	FS FluxSan	HF Highflux	OP Optilloy	Amo-Pulver	Amo	Nano
Material	DMR40	DMR91	MC40	Mix-40	Mix-2	85% Fe 9% Si 6% Al	81% Ni 17% Fe 2% Mo	93,5% Fe 6,5% Si	50% Ni 50% Fe	Fe Si Al Ni	>90% Fe	>90% Fe	
μ	2000	1500	40	60	10	14-160	14-250	14-90	14-160	14-125	26-90	10.000	5.000- 100k
Bsat (T)	0,40	0,46	0,39	1,8	1,5	0,88	0,86	1,8	1,41	1,35	1,5	1,56	1,2
Losses 50kHz/ 100mT	27	19	300	2300	700	320	320 (180)	650	950	380	330	290	22
Losses 100kHz/ 50mT	11	8	8	1650	340	200	200 (120)	370	630	220	110(?)	251	22
Price US$/kg	7	12	8	7	17	11	45 (55)	14	36	27	35	20	35 (70)

Losses vs. Saturation



Color: Price (green yellow red)

Parasitic Properties

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	MAGMENT	Ferrites			Powder Cores			Amo / Nano	
	all flexible customized shapes possible no size limitation	Ring	E, ETD, EFD, U	RM, PM etc.	Ring	E	Pot	Ring	E, C
Spreading Choke	++	++	--	O	++	O	+	++	-
Spreading Transformer	++	++	O	+	na	na	na	++	+
Magnetostriction	++	++			++	MS: + FS: -		Amo: O Nano: ++	Amo: -- Nano: +
Temperature stability µ	+	-			O MPP: ++			+	
Temperature stability Bsat	-	--			++			++	
Pressure sensitivity	++	Power ferrite: + High perm.: --			++			--	

Typical Inductive Components

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Component	L	Pv	Characteristics	Material
EMI-Choke	low	high	Energy storage / high Impedance	Iron Powder, Ferrite, MAGMENT
DC-Choke	mediu m	medium	Energy storage	Iron Powder, Ferrite with gap, MAGMENT
AC-Choke (PFC)	high	low	Energy storage	Ferrite with gap, MAGMENT MSS; FS; OP; Amo-Cut-Core with gap
Resonance-Choke	mediu m	low	Energy storage	Mix-2 (Iron Powder) MSS; MPP (Saturation!)
Flyback-Converter	Depends on transmissibl e power!	low	Energy storage and transmission	Ferrite with gap MAGMENT
Flux-Converter	high	low	Energy storage	Ferrite Nano (kW-Range)
Current Compensated Choke	high	n.n.	Special case	Ferrite Nano

Thank you very much!

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