Magnifer® 53

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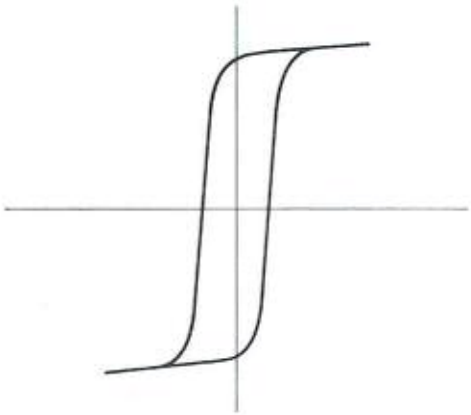

Magnifer 53 is a soft-magnetic nickel-iron alloy with approx. 55 % Ni. It is notable for its high saturation induction of 1.5 T and high initial permeability.

Typical applications of Magnifer 53 are:

- LF transducers
- Integrating current transformers for earth-leakage circuit-breakers

Magnetic properties

The magnetic properties of Magnifer 53 are obtained by the application of specific rolling and annealing conditions followed by a special thermo-magnetic treatment. By this means, initial permeabilities of 40000 to 80000 and maximum permeabilities of 100000 to 160000 (Table 1) can be attained.

The shape of the hysteresis loop and the temperature dependence of the permeability can be influenced by varying the thermo-magnetic process. This results in the following special grades of Magnifer 53:

Magnifer 53
Grade with a rectanguluar hysteresis loop and grades as shown in Table 1.

Magnifer 53 F
Grade with a flat hysteresis loop and thus a greater unipolar rise in induction (see. Fig. 1) as shown in Table 2.

Magnifer 53 TK, F TK
Grade with restricted temperature coefficients.

Material	Grade	Permeability (50 Hz)		Magnetic induction (mT) at H_{eff} =		
		μ_4	$\mu_{max.}$	10 mA/cm	50 mA/cm	70 mA/cm
Magnifer 53	MG 40	≥ 40000	≥ 100000	≥ 110	≥ 800	≥ 1100
	MG 60	≥ 60000	≥ 130000	≥ 160	≥ 1000	≥ 1200

Table 1 – Magnetic properties of Magnifer 53 (strip thickness 0.1 mm).

Material	$\hat{H}$ (mA/cm)	Magnetic properties (mT)		
		$\hat{B}_{sin}$	ΔB_{stat}	ΔB_{dyn}
Magnifer 53 F	50	> 350	> 200	> 120
	100	> 700	> 400	> 240

Table 2 – Magnetic properties of Magnifer 53 F (strip thickness 0.1 mm).

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Magnifer® 53

Chemical properties (nominal data)

Ni 55%	Mn 0.4%	Si 0.2%	C 0.02%	balance Fe

Standards and material numbers

DIN 17745	NiFe 44

Physical properties (nominal data)

Saturation induction	1.5 T	Density	8.3 g/cm³
Curie temperature	530 °C	Thermal conductivity	16.5 W/K/m
Saturation magnetostriction	$+25 \cdot 10^{-6}$	Mean coefficient of thermal expansion (20–100 °C)	$12 \cdot 10^{-6} K^{-1}$
Electrical resistivity	0.45 Ωmm²/m		

Forms supplied

Strip and toroidal tape-wound cores.

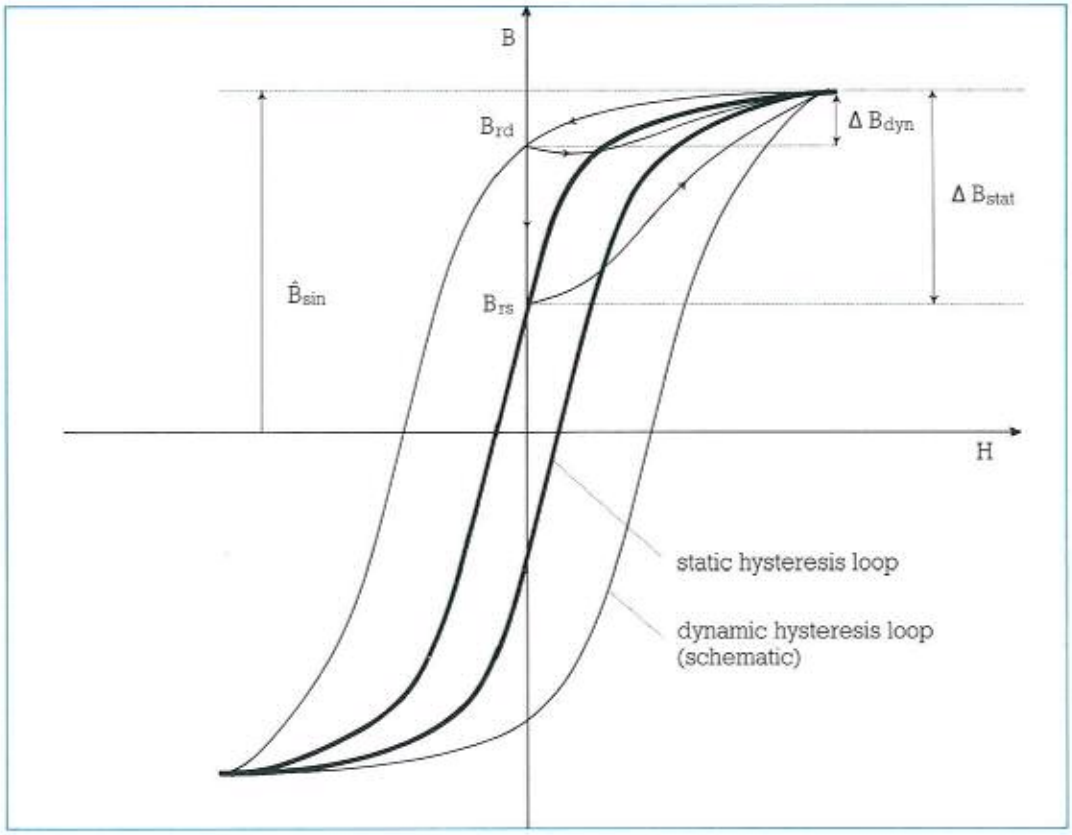

Fig. 1 – Explanation of terms

With sinusoidal current, the entire dynamic hysteresis loop is travelled. The full magnetic induction $\hat{B}_{sin}$ is available.
With half-wave rectified current, in the dead interval the magnetic induction falls from the dynamic remanence point B_{rd} to the static remanence point B_{rs}. Therefore magnetization proceeds from the static remanence point B_{rs}. The unipolar rise in induction ΔB_{stat} is available.
With full-wave rectified current, magnetization proceeds from the dynamic remanence point B_{rd}. ΔB_{dyn} is available.

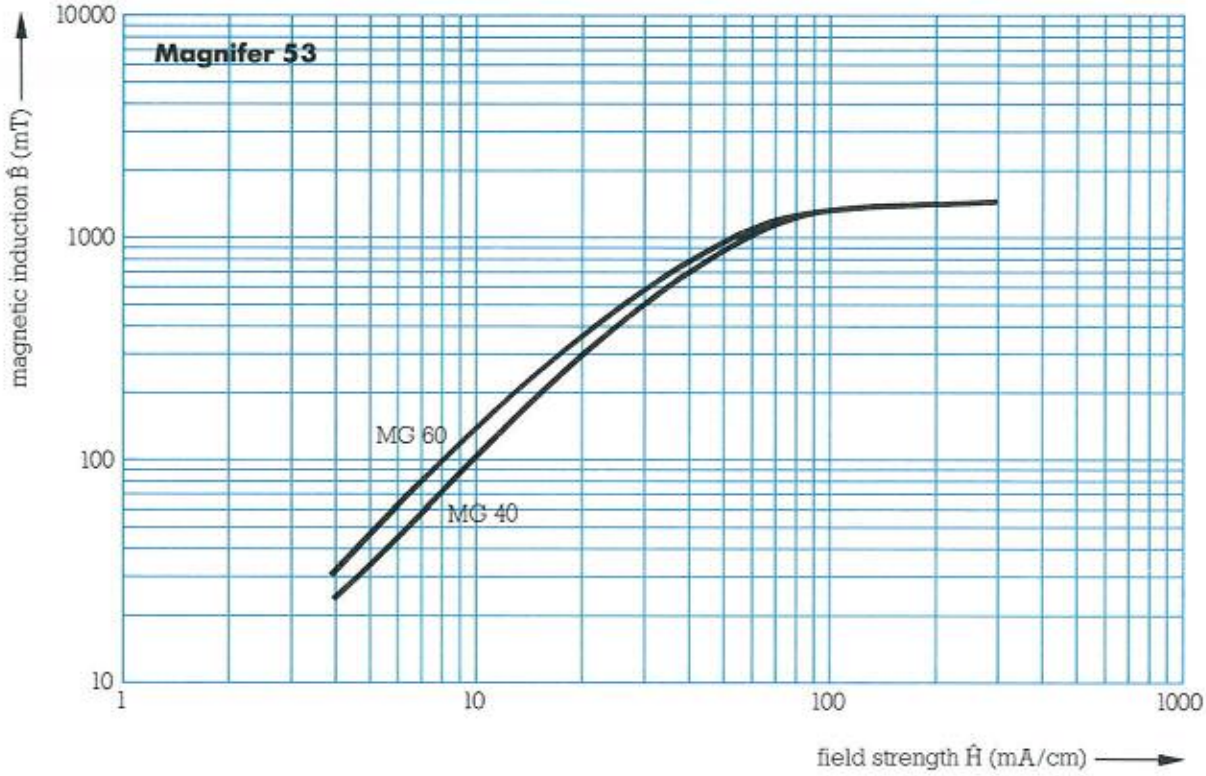

Fig. 2 – Typical induction/field-strength curves in grades MG 40 and MG 60, measured on toroidal tape-wound cores of 0.1 mm strip thickness at 50 Hz.

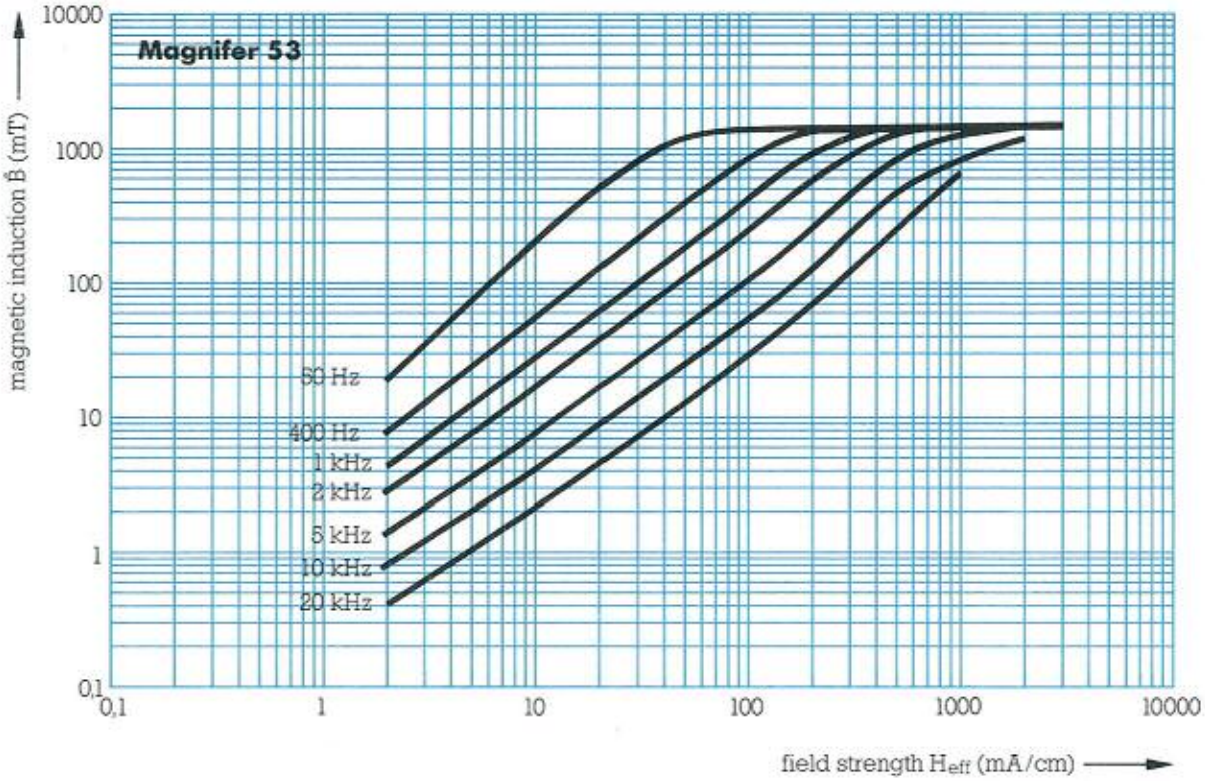

Fig. 3 – Typical induction/field-strength curves in grade MG 60, measured on toroidal tape-wound cores of 0.1 mm strip thickness at various frequencies.

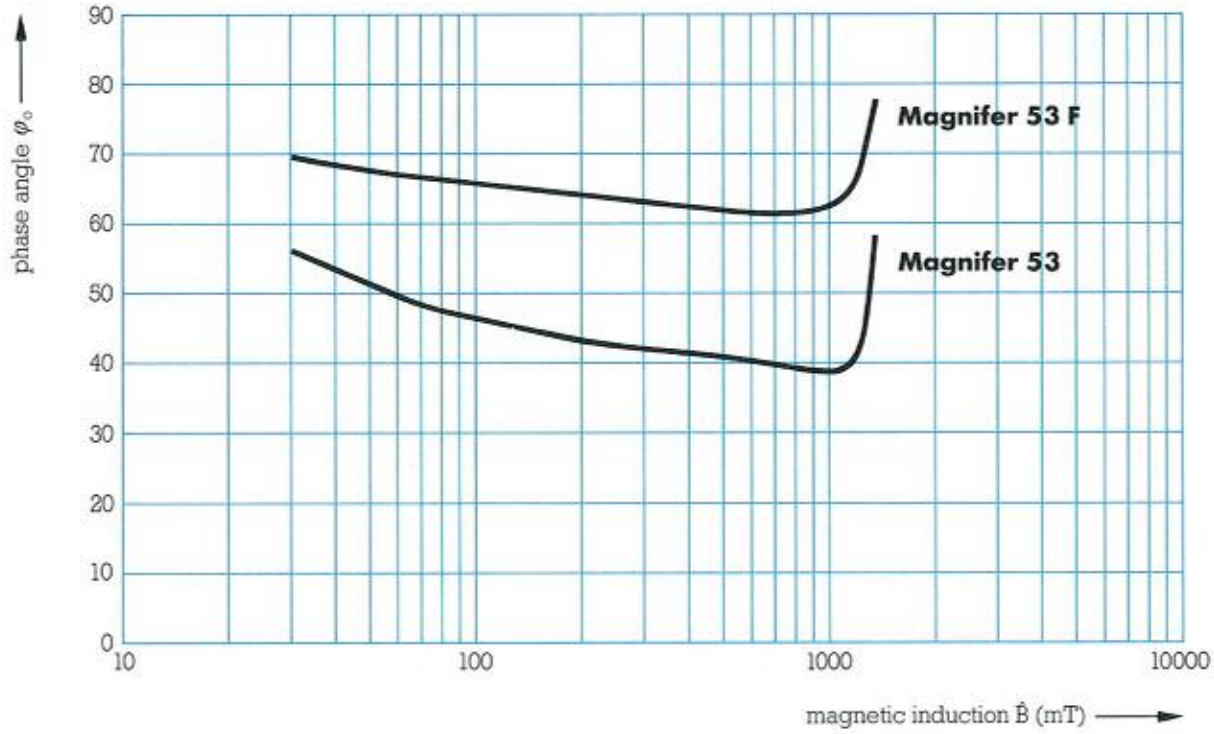

Fig. 4 – Phase angle φ_o of Magnifer 53 and Magnifer 53 F, measured on toroidal tape-wound cores of 0.1 mm strip thickness at 50 Hz.

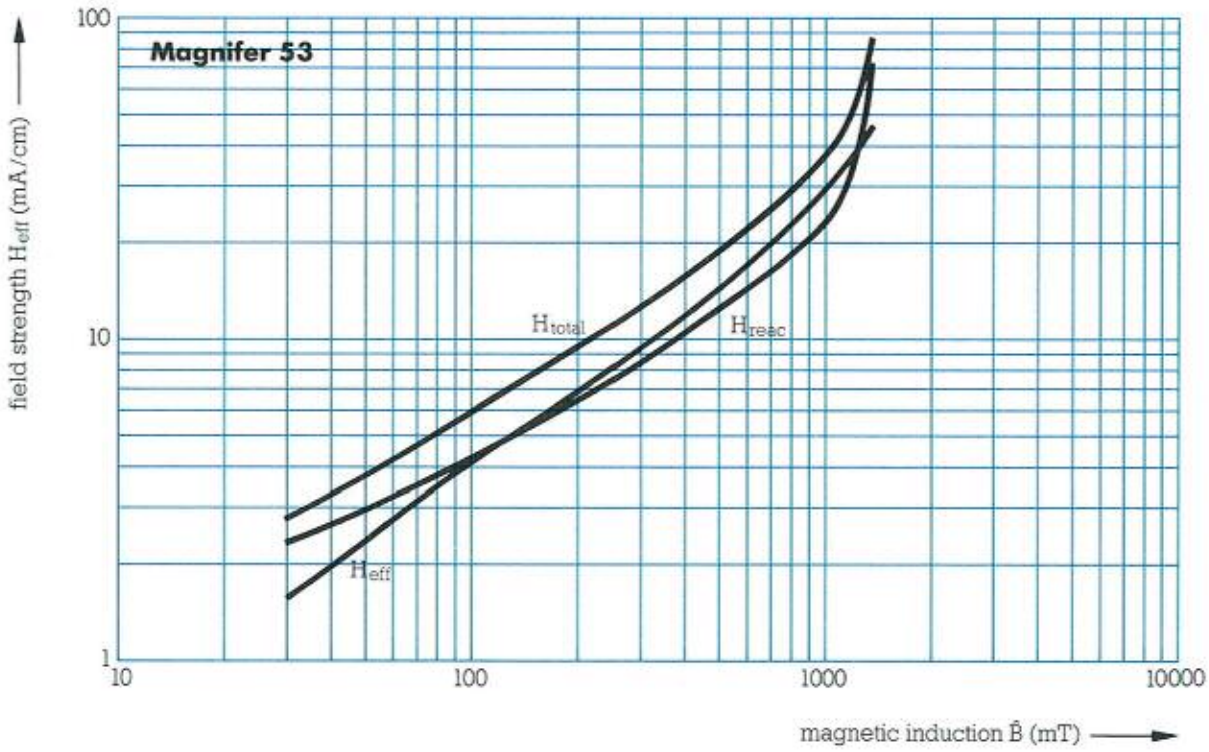

Fig. 5 – Components of the magnetization curve of Magnifer 53 in grade MG 60, measured on toroidal tape-wound cores of 0.1 mm strip thickness at 50 Hz.

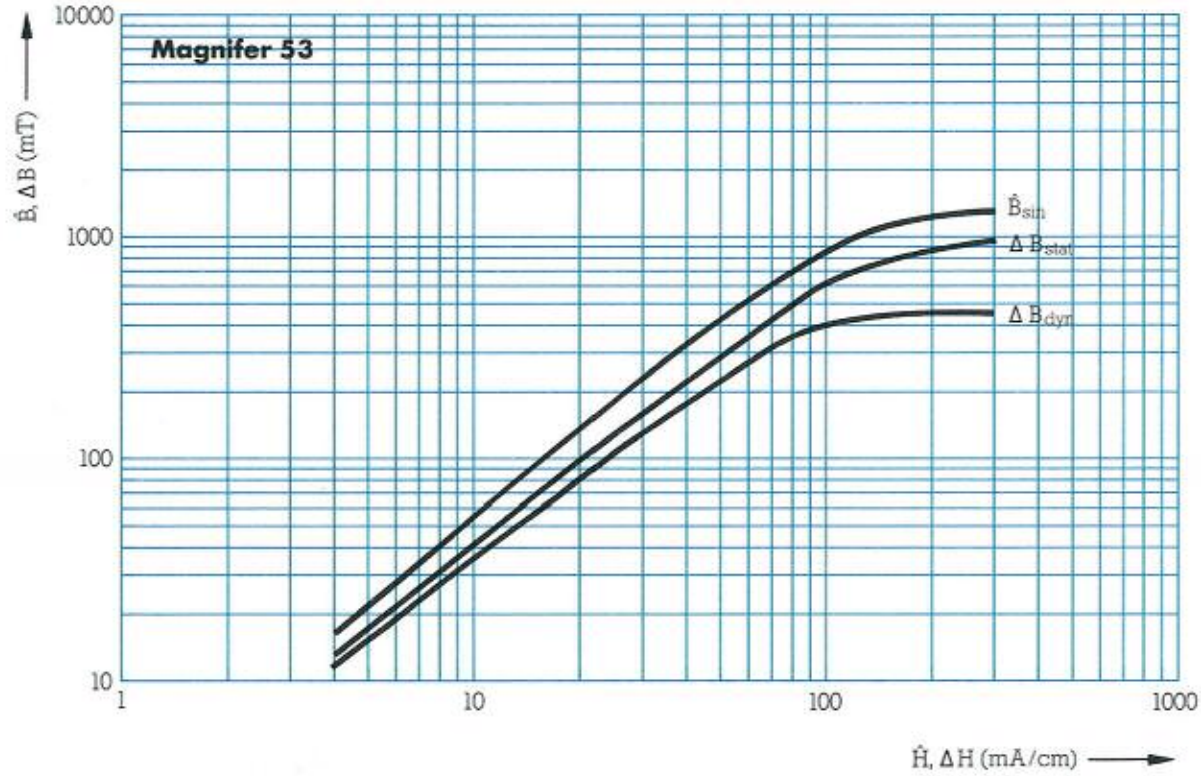

Fig. 6 – Typical variation of $\hat{B}_{sin}$, ΔB_{stat} and ΔB_{dyn} (see Fig. 1) with field strength of Magnifer 53 F, measured on toroidal tape-wound cores of 0.1 mm strip thickness.

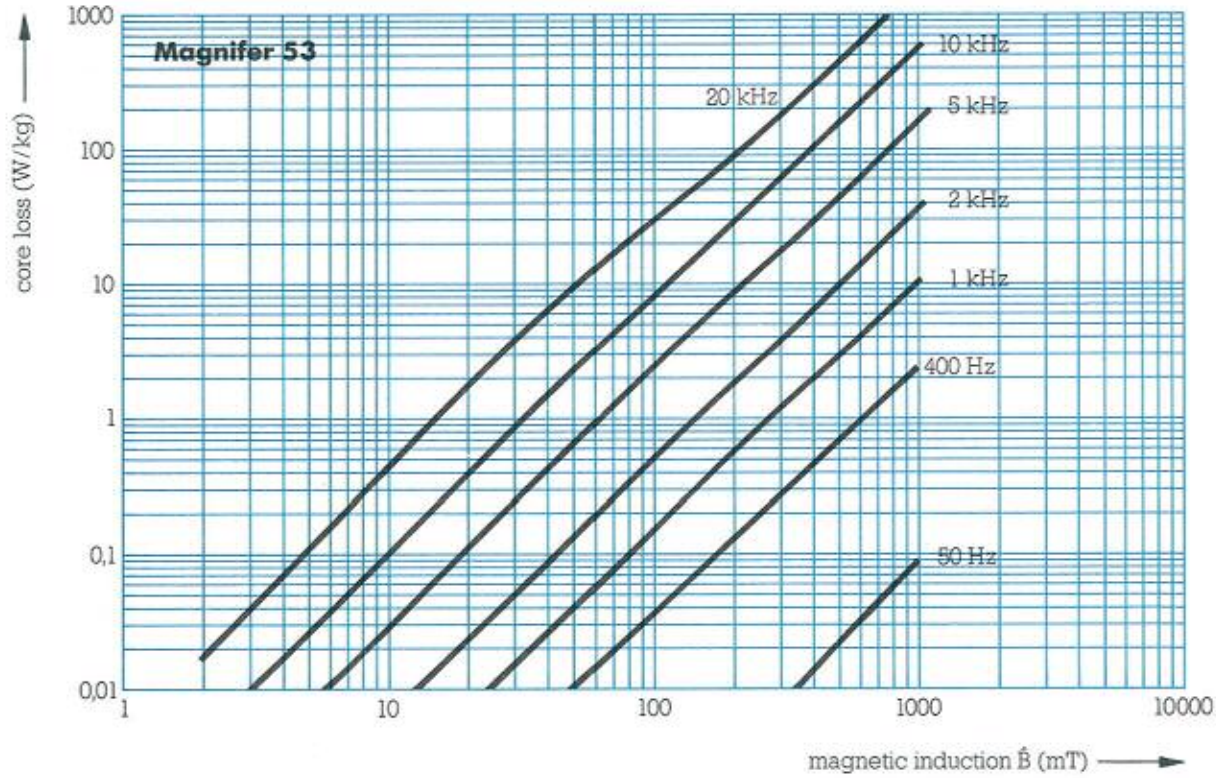

Fig. 7 – Core loss of Magnifer 53 in grade MG 60, measured on toroidal tape-wound cores of 0.1 mm strip thickness at various frequencies.

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