

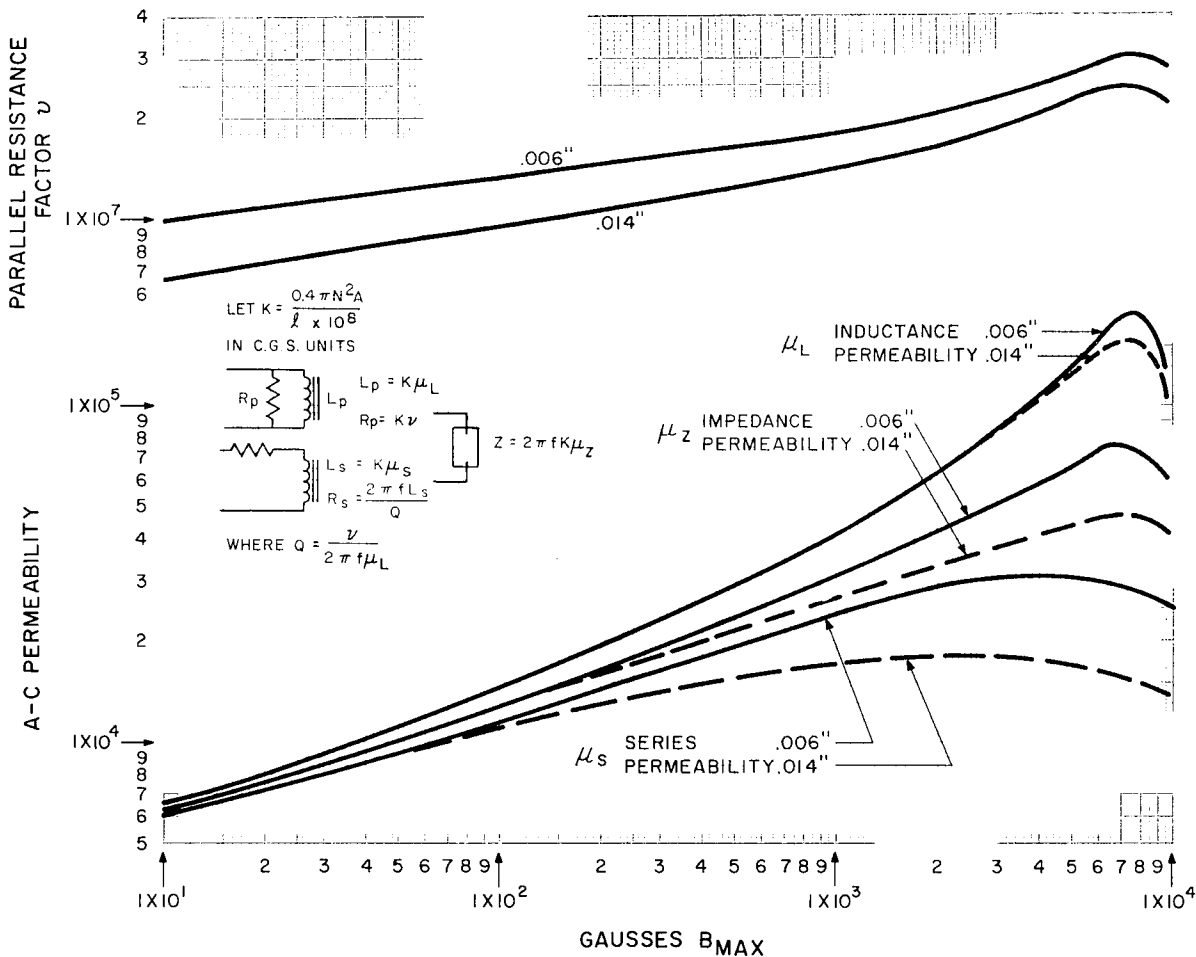
SUPERPERM 49 LAMINATIONS

Superperm 49 Laminations are prepared from high permeability 50% nickel, 50% iron alloy. Careful evaluation of raw material and adequate quality control procedures insure the magnetic component manufacturer the maximum in magnetic performance for this alloy. The magnetic component design engineer will find the data in this bulletin useful for predicting the performance of Superperm 49 laminations.

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Permeability and core loss of typical material used in the manufacture of Superperm 49 lamination. Stamped Ring Laminations at 60 Hertz.



PROPERTIES VS. FREQUENCY

SUPERPERM 49

CORE LOSS. The core loss of material used for the production of Superperm 49 laminations is presented as conventional watts per pound versus induction at various frequencies on page three. Curves showing the variation of the parallel resistance factor, ν , with induction and frequency are found on this page and on

page one. The relationship between ν and watts per pound is

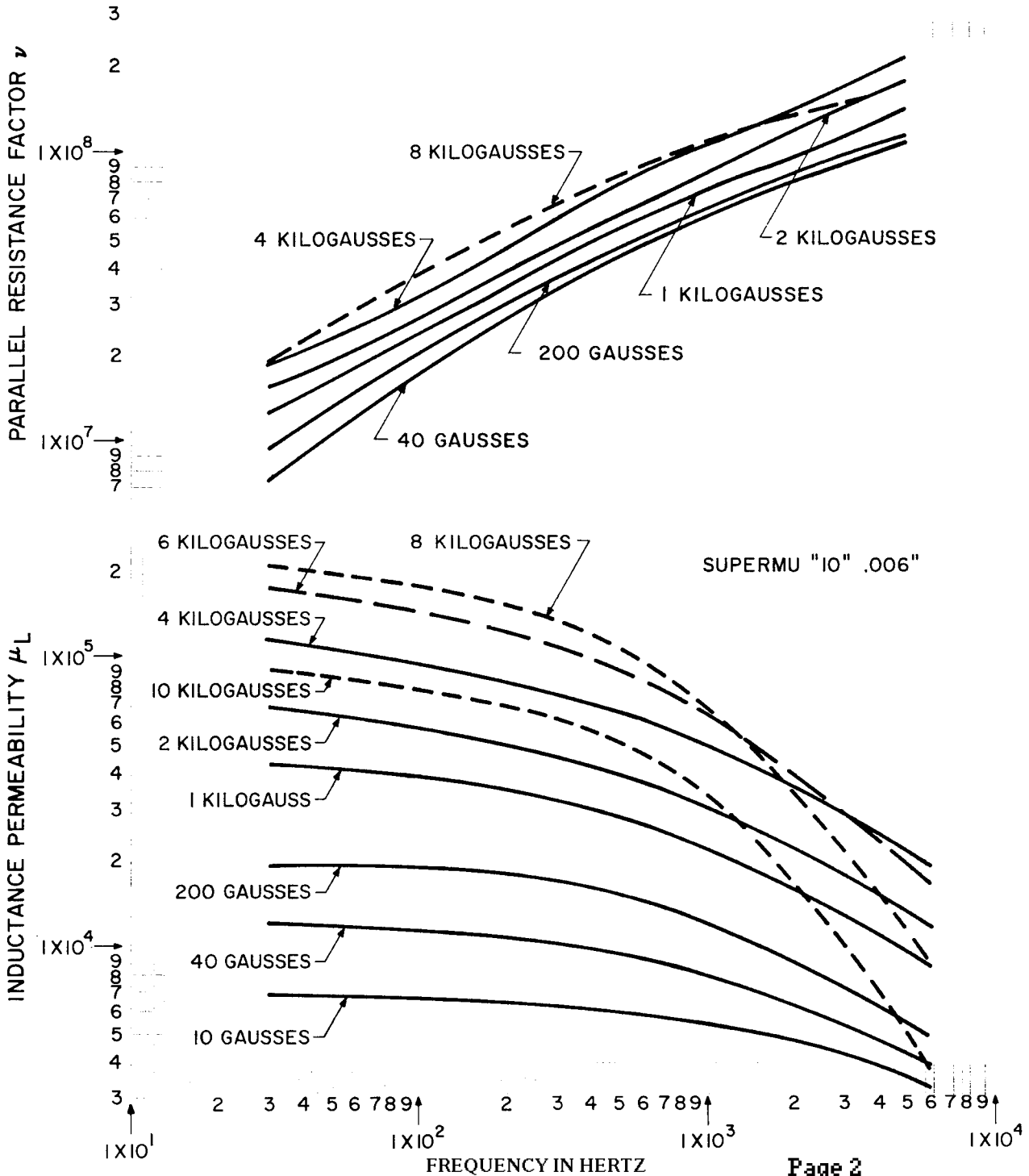
$$\nu = 0.86233 \frac{B_m^2 f^2}{P_s} \times 10^{-5}$$

where B_m is the maximum induction in gauss

f is the frequency in Hertz

P_s is the specific core loss in watts per pound.

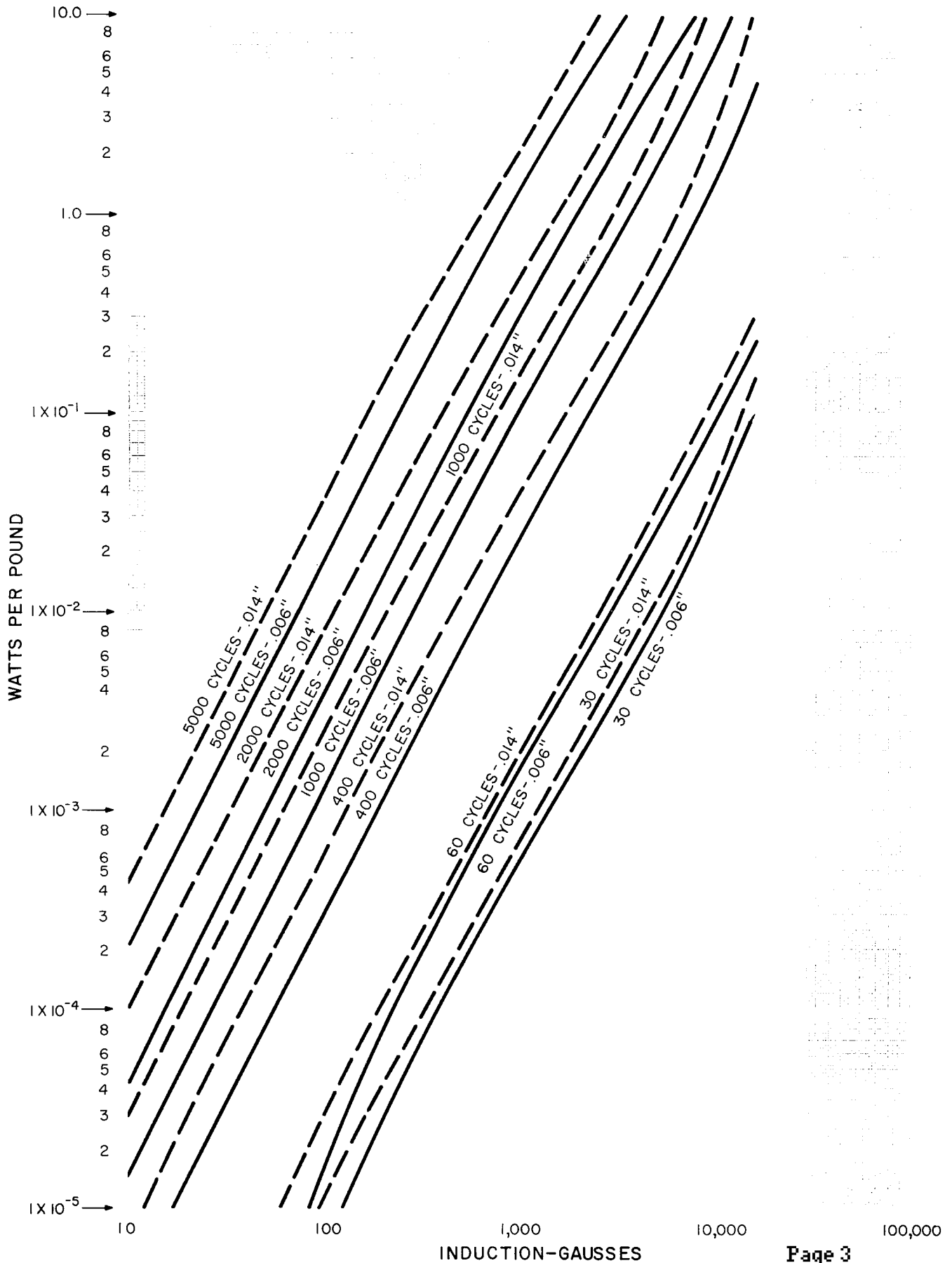
Variation of parallel resistance factor and permeability with frequency; typical material for Superperm 49 laminations; Modified Hay Bridge data using Stamped Ring Laminations.



CORE LOSS

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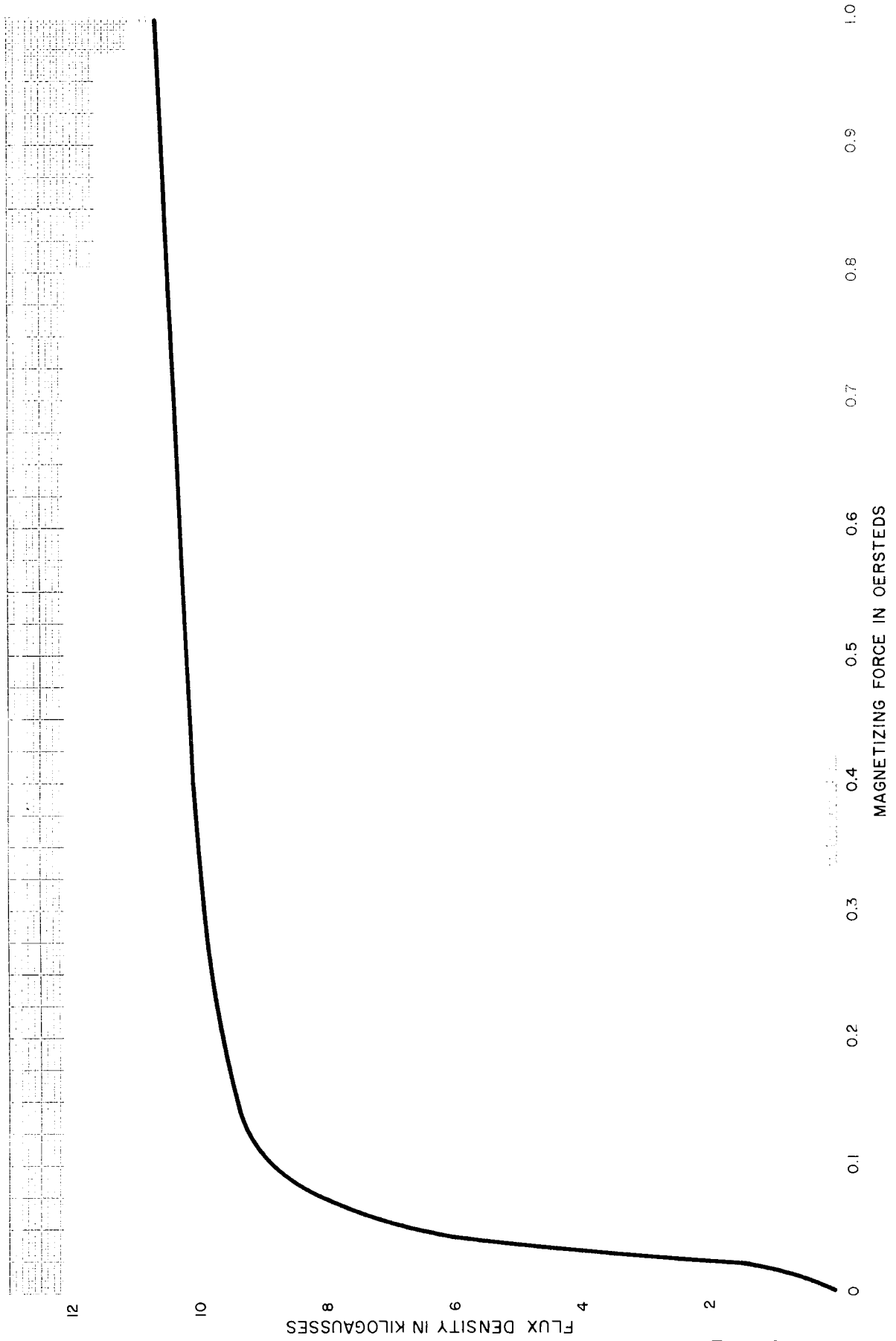
Core loss curves in watts per pound; typical material for Superperm 49 laminations; Stamped Ring Laminations data.



MAGNETIZATION

SUPERPERM 49

D-C magnetization curve, plotted with linear scales for calculation of reactors with direct current. Stamped Ring Lamination data.



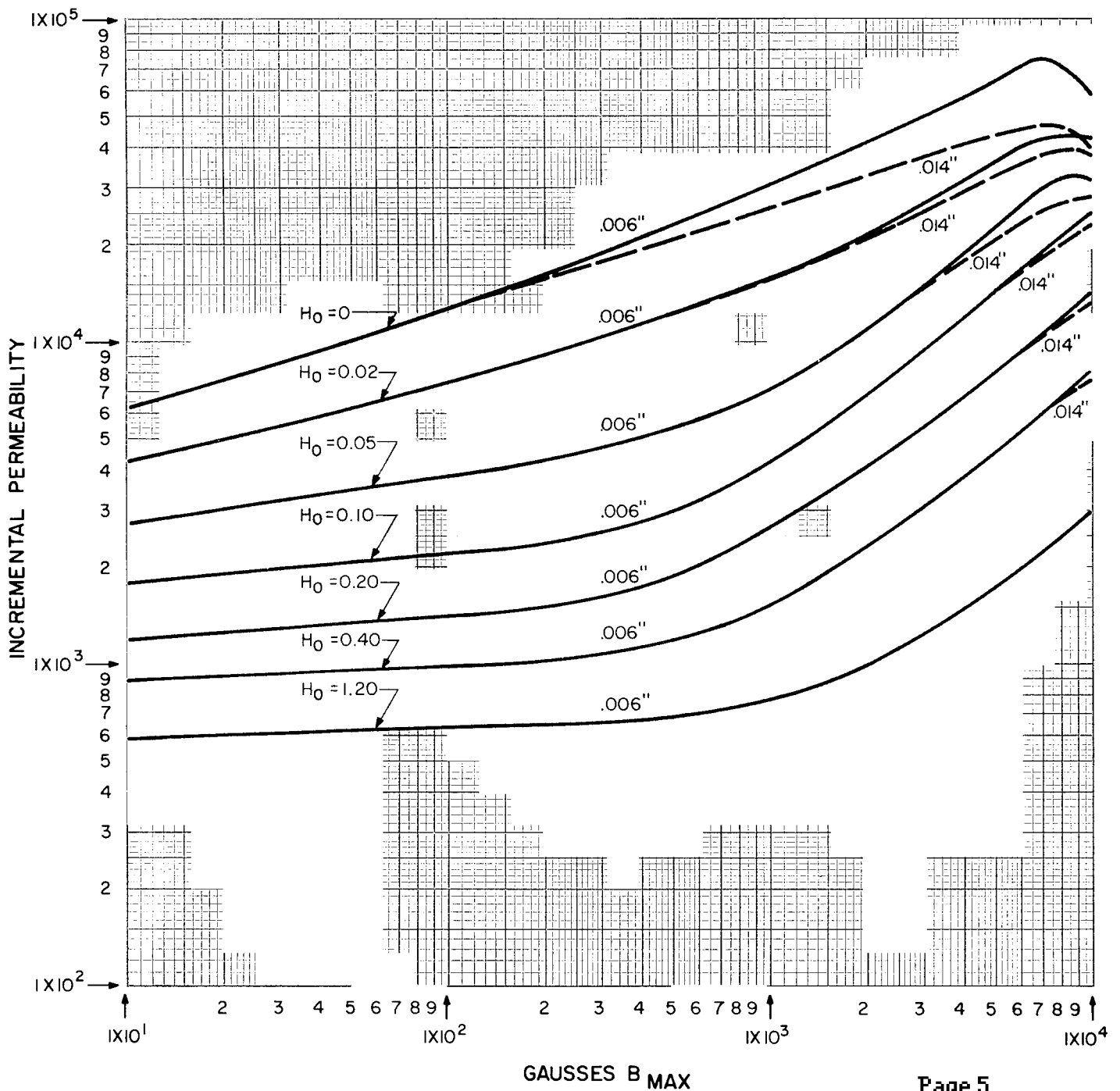
INCREMENTAL PERMEABILITY

SUPERPERM 49

INDUCTANCE CALCULATION. The curves on pages four and five are useful for inductance calculations using the negative air gap line technique. For additional information,

there are many texts on magnetic component design, such as: "Magnetic Circuits and Transformers," M.I.T. Staff, John Wiley and Sons, Inc., 7th printing 1950, p. 202.

Incremental permeability of typical material used in the manufacture of Superperm 49 laminations. Stamped Ring Laminations at 60 Hz.



HANNA CURVES

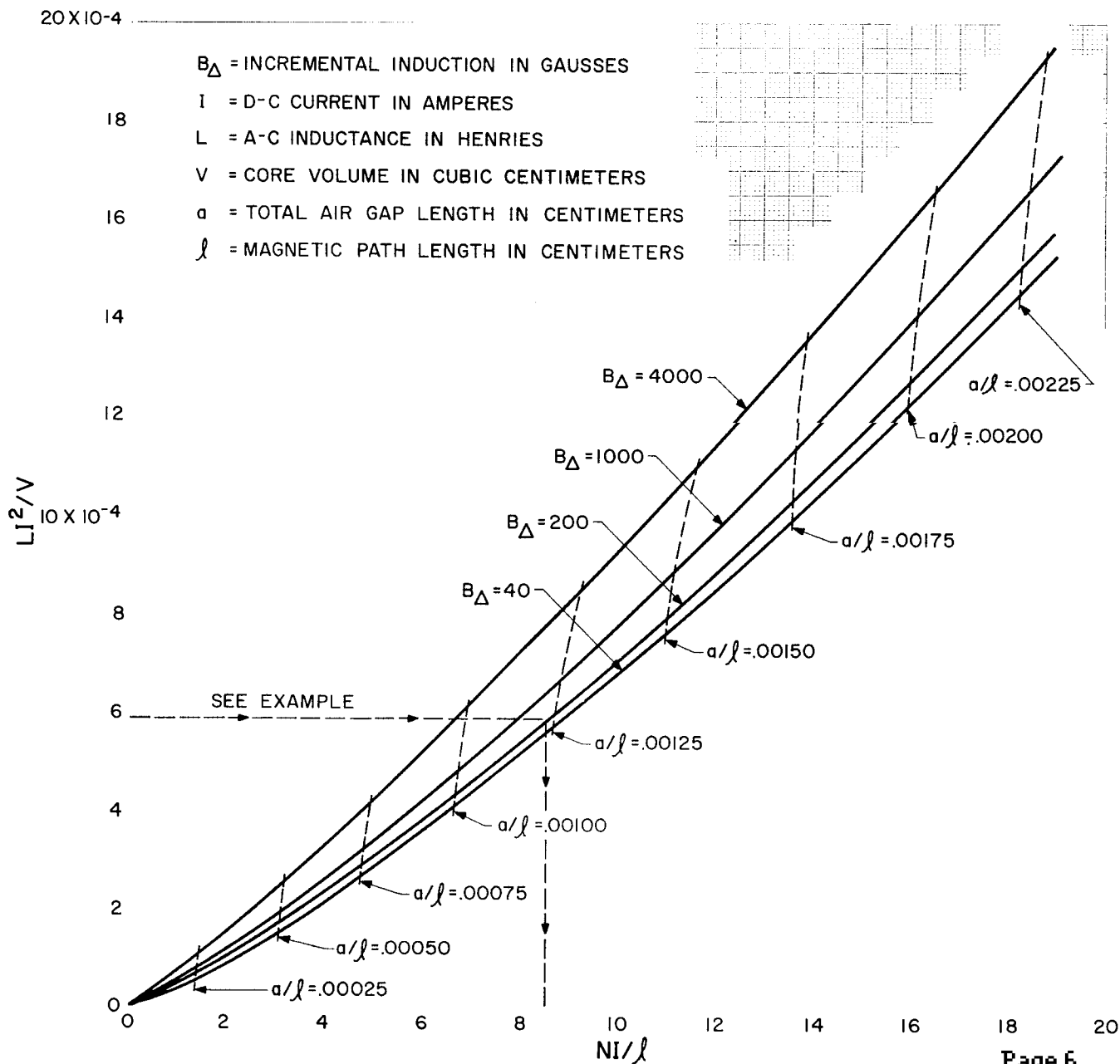
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HANNA CURVES* provide a simplified method of calculating inductances with direct current, and for determining the optimum air gap. Where L is the a-c inductance in henries, I is the d-c current in amperes, and V is the core volume in cubic centimeters; calculate LI^2/V and enter the left side of the chart at that ordinate. Extend to the right along this ordinate to the appropriate B_{Δ} , for a-c induction in gaussses, and select the indicated abscissa for NI/ℓ . Calculate required turns by substituting the centimeters of path length in the core material for ℓ , and for the d-c amperes, I . The optimum ratio of air gap length to path length (a/ℓ) applies to the points indicated.

Example: Required $L = 6.0$ henries in 375EI 49 Mat'l with $I = .025$ amperes d-c. From lamination catalog, $V = 6.63 \text{ cm.}^3$ and $\ell = 7.30 \text{ cm.}$ Calculate $LI^2/V = 5.84 \times 10^{-4}$. For estimated $B_{\Delta} = 200$ gaussses, $NI/\ell = 8.55$ and a/ℓ is approximately .00125. Substituting for I and ℓ , $N = 2500$ turns. The total air gap is approximately $a = .00125 \times 7.30 = .0091 \text{ cm.}$ or .0036 inches. A spacer .0018 inches thick will establish this total air gap.

*"Design of Reactors and Transformers Which Carry Direct Current", C. R. Hanna, Journal AIEE, Vol. 46, February 1927.

Hanna Reactor Design Curves Data prepared from Stamped Ring Lamination measurements at 60 Hz.



IMPEDANCE PERMEABILITY

SUPERPERM 49

Impedance permeability at 60 Hz. of typical lamination shapes.
Curves are drawn through rejection levels at test inductions.

