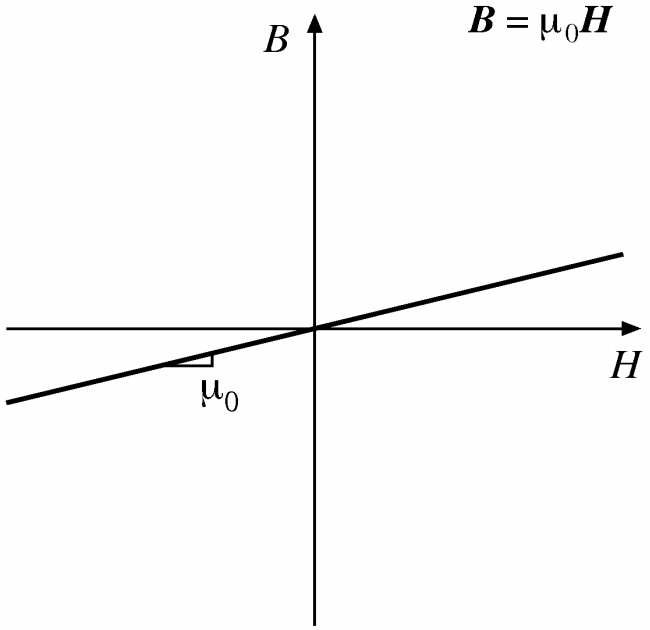
Core Material Characteristics

Free space

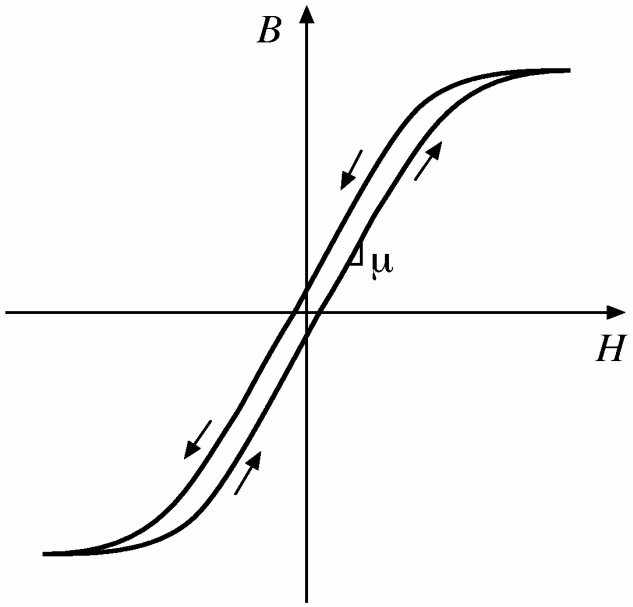


$\boldsymbol{B} = \mu_0 \boldsymbol{H}$

μ_0 = permeability of free space

$= 4\pi \cdot 10^{-7}$ Henries per meter

A magnetic core material



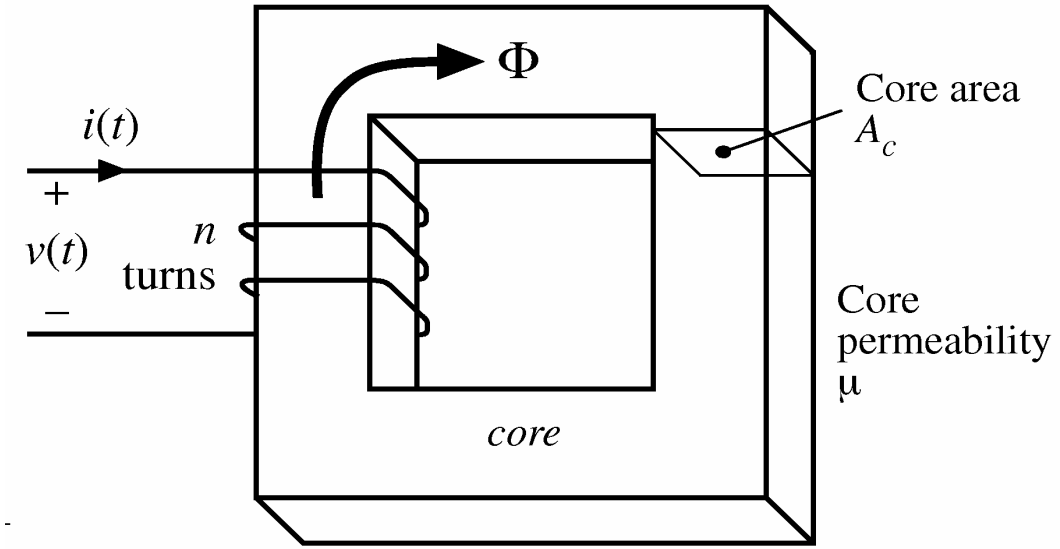
Highly nonlinear, with hysteresis and saturation

Units

Table 12.1. Units for magnetic quantities

quantity	*MKS*	*unrationalized cgs*	*conversions*
core material equation	$B = \mu_0 \mu_r H$	$B = \mu_r H$	
B	Tesla	Gauss	$1\text{T} = 10^4\text{G}$
H	Ampere / meter	Oersted	$1\text{A/m} = 4\pi \cdot 10^{-3}$ Oe
Φ	Weber	Maxwell	$1\text{Wb} = 10^8$ Mx $1\text{T} = 1\text{Wb} / \text{m}^2$

Inductor Example

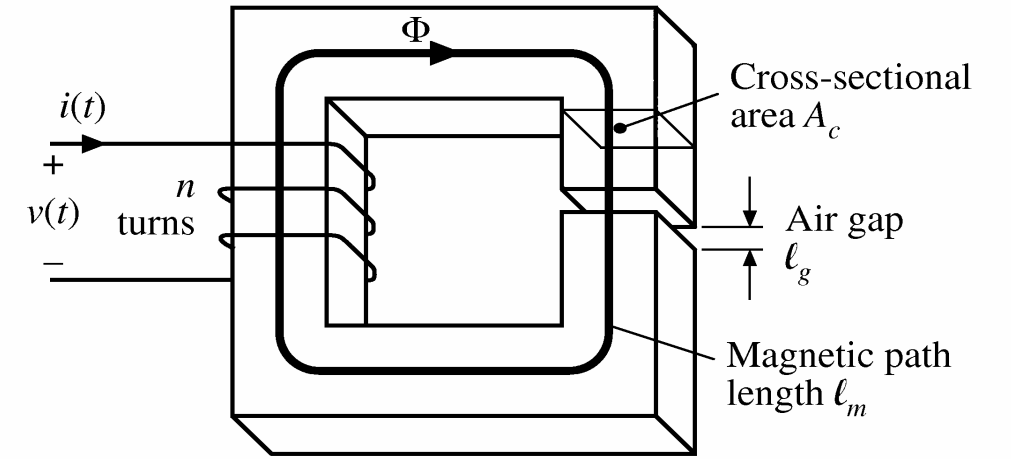


Magnetic Circuits

Inductor Magnetic Circuit Model

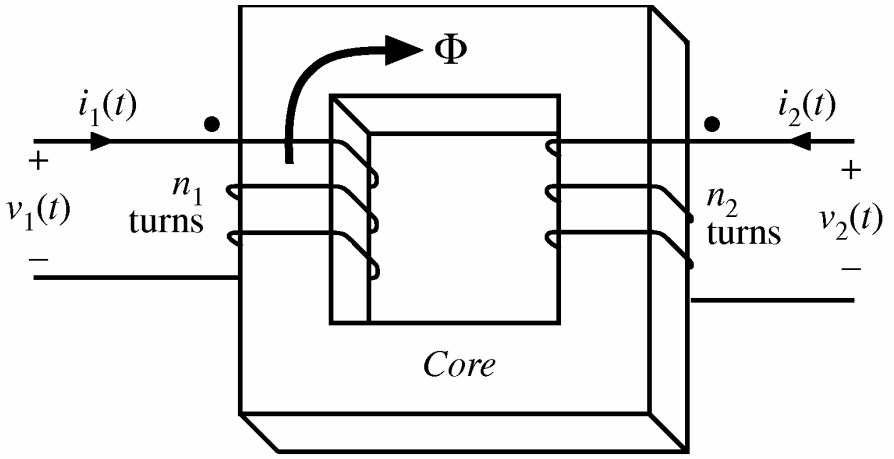
Saturation Limits

Example: Gapped Inductor



Gapped Inductor Magnetic Circuit

Transformer Example



Nonideal Transformer