Terminology

$$\mu_\Delta = \frac{\Delta B}{\Delta H}$$

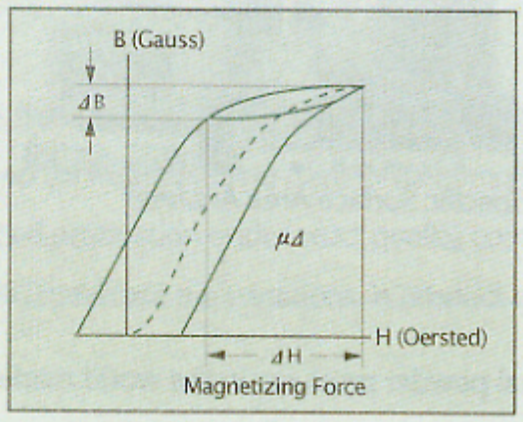

Figure 5. Incremental Permeability

Effective Permeability (μ_e)
If a magnetic circuit is not homogeneous (i.e. contains an air gap), the effective permeability is the permeability of a hypothetical homogeneous (ungapped) structure of the same shape, dimensions, and reluctance that would give the inductance equivalent to the gapped structure.

Relative Permeability (μ_r)
Permeability of a material relative to that of free space.

Maximum permeability (μ_{max})
Slope of a straight line drawn from the origin tangent to the curve at its knee. (Figure 6)

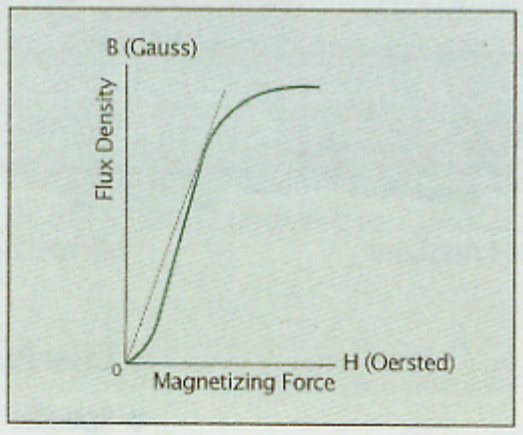

Figure 6. Maximum Permeability

Rated Current
Continuous DC current that can flow in the inductor.
It is determined by the maximum temperature rise at the maximum storage temperature range. As rated current is related to power loss of the inductor, DC resistance of the inductor should be lowered or size of the inductor should be increased in order to increase the rated current.

Saturation Current
Current at which the inductance decreased below a critical percent inductance (10% or 20% of the initial inductance) by applying DC current to a inductor. In general the critical percent inductance is 10% for ferrite core, 20% for metal powder core. The decrease of inductance is caused by the magnetic characteristics of core. Core can store a certain amount of flux density, but above that flux density the permeability and inductance of core decrease.

Self Resonant Frequency, SRF
Frequency at which the resonance appears between distributed capacitance and inductance of an inductor. At this frequency, inductance and capacitance are canceled out and the inductor is almost a resistor having high impedance. Distributed capacitance that arise between wires and between wire and core is parallel with inductance in circuit. Above the self resonant frequency the capacitive reactance is dominant and the inductor works like the capacitor.

Skin Effect
As the frequency is higher, current flow is limited to the surface of the wire because the magnetic field in the center of wire increases. The depth from the wire surface at which the current density at the wire surface decreases by 1/e (37%) is called "skin depth", and this is determined by the conductivity of wire. As the frequency is higher, skin depth decreases and reactance of wire increases and current flow is interfered. Litz wire may be used in order to decrease the skin effect.

Storage Temperature Range
Temperature range in which the characteristics of a device can be preserved.

Remanence, Br [Gauss ; Tesla] Refer to Hysteresis Curve.

Saturation
The point at which the flux density B in a magnetic material does not increase with further applications of greater magnetization force H. At saturation, the slope of a material's B-H characteristic curve becomes extremely small, with the instantaneous permeability approaching that of free space. (relative permeability = 1.0)

Saturation Flux Density, Bs [Gauss ; Tesla]
The maximum intrinsic induction possible in a material. This is the flux level at which additional H-field produces no additional B-field.

Temperature Rise (ΔT)
The increase in surface temperature of a component in free-standing air due to the total power dissipation (both copper and core loss).
Approximate temperature rise is as follows ;

$$\Delta T(^\circ C) = \left[\frac{\text{Total Power Dissipation(Miliwatts)}}{\text{Surface Area}(cm^2)}\right]^{0.833}$$

Total Power Dissipation = Copper Losses + Core Losses