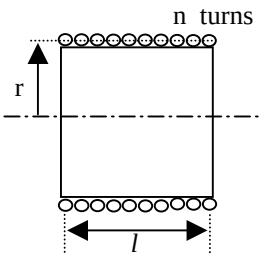
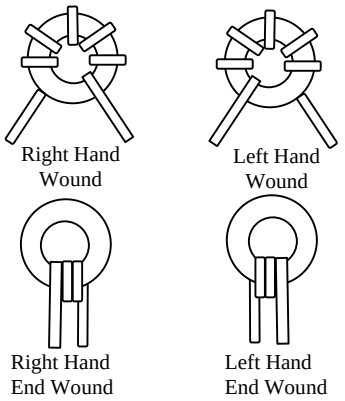
Air-Core Inductor Formulas (Wheeler Approximations)

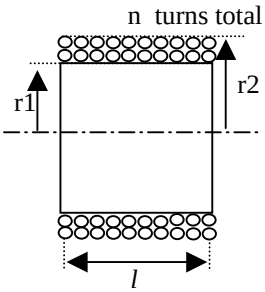


$$L = \frac{r^2 \cdot n^2}{9 \cdot r + 10 \cdot l}$$

L = inductance in microhenries
r = coil radius in inches
l = coil length in inches
n = # of turns

Single-layer Air Core Solenoid

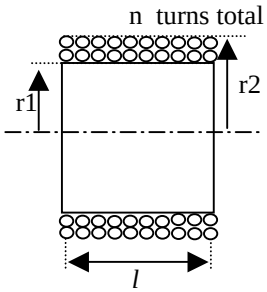




$$L = \frac{31.6 \cdot r1^2 \cdot n^2}{6 \cdot r1 + 9 \cdot l + 10 \cdot (r2 - r1)}$$

L = inductance in microhenries
r1 = inside coil radius in meters
r2 = outside coil radius in meters
l = coil length in meters
n = # of turns total

Multi-layer Air Core Solenoid



L = inductance in microhenries
r1 = inside coil radius in inches
r2 = outside coil radius in inches
l = coil length in inches
n = # of turns total
a = average winding radius in inches
c = diff. between r2 and r1 in inches

$$a = \frac{r1 + r2}{2}$$

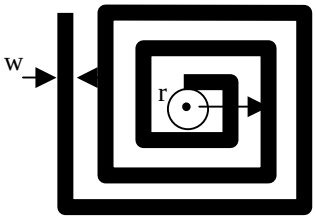
$$c = r2 - r1$$

$$L = \frac{0.8 \cdot a^2 \cdot n^2}{6 \cdot a + 9 \cdot l + 10 \cdot c}$$

Multi-layer Air Core Solenoid (alternate expression)

Pancake Air-core Planar Spiral Inductor

$$L = \frac{r^2 \cdot n^2}{8 \cdot r + 11 \cdot w}$$



L = inductance in microhenries
r = radius to center of windings in inches
w = width of the conductor in inches
n = # of turns