

A handy use for the Elektor coil meter

In the 'Practical use' section of the 'Coil Clinic' article (*Ed.*: June 2007 issue, p. 62), it was mentioned that this meter could be used to measure the A_L spec of a ferrite ring core, for example by winding 10 turns on the core.

Some other formulas that yield the same A_L value are the nH-per-turn and mH-per-1000-turns versions. I personally find the latter version more convenient in actual use.

$$n = \sqrt{L / A_L}$$

where $A_L = L / n^2$ and $L = A_L \times n^2$
(L in nH)

$$n = 1000 \times \sqrt{L / A_L}$$

where $A_L = 10^6 \times L / n^2$ and $L = A_L \times n^2 / 10^6$
(L in mH)

Square roots and squares always give 'odd' numbers, which means you may need a calculator – except with 10^2 or $\sqrt{100}$ and variants of these numbers. You can put this to good use.

If you do a lot of ring core calculations, you will notice that the A_L value obtained with 10 turns is the same as 10 times the μH value, or in other words the μH value with an extra zero tacked on.

For example, consider a 26-mm orange-red 3E25 core (TN26/15/10 from Yageo ferroxcube, formerly Philips) with an A_L value of 6420. With $n = 10$ you have:

$$L = A_L \times n^2 / 10^6 = 0.642 \text{ mH} = 642 \mu\text{H}$$

This means that the A_L value is **only** the same as the μH value with an extra zero **if the coil has 10 turns**.

If you want to use the *Elektor* coil meter for quick and easy measurement of unknown ring cores at radio swap meets or flea markets, the ideal method is to pass a bundle of 10 wires

through the core in one go, use a plug and socket to link the turns together, connect this arrangement to the meter, and read the value.

The reading proves to be too high in practice, but passing a bundle of 5 wires through the core twice and connecting them together with a plug and socket (DIL) yields excellent results (see drawing and photo).

This is a fast and convenient method for cores with diameters of 20 mm or larger. For smaller and even larger material (such as ferrite clamps), you can take along a bundle of 0.5-mm wire just in case.

The stray capacitance of the bundle of wires proves to affect the reading (the higher the capacitance, the higher the inductance reading). It's best to use five separate wires in a loose bundle instead of flat cable. Even then you have to recalibrate the meter or subtract 2 to 3 μH from the measured μH value in order to obtain the correct A_L value (which means a difference of 20 to 30 in A_L).

Ferrite cores for the highest possible usable frequency range (nickel-zinc (NiZn) ferrite) and small-diameter cores (less than 23 mm) give A_L values between 50 and 100. This is more or less the practical lower limit – not sufficiently accurate but suitable as an indication.

Small powdered-iron rings have even lower A_L values and thus also give inaccurate readings with this method, but it is a convenient way to identify them quickly.

The coil meter uses a 'digital' measurement method (frequency

counting with a resolution of 100 ms), which means it has a specific step size. As a result, the count **does not** follow a nice 1, 2, 3, ... sequence, but instead proceeds in steps of less than 2% of the indicated value. Adding a zero to the indicated value makes the A_L step resolution less than 20% of the full-range value. As ring cores can easily have a tolerance variation of 25%, this is not an especially large objection.

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Thanks Walter, that's a very practical suggestion for anyone who regularly uses ferrite cores and the like!

