

Problem 1

Calculate the permeance Λ of an inductor with a UI-core.

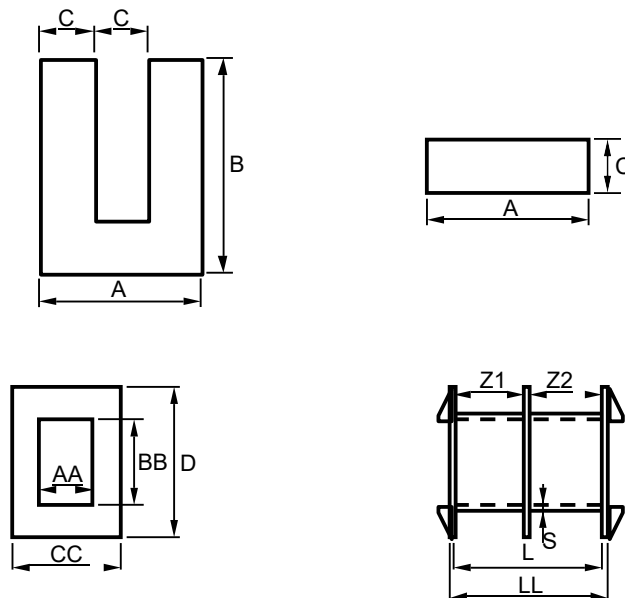
- Construct the reluctance network of the inductor. Calculate the permeance of the inductor if the relative permeability of iron, $\mu_r = \infty$.
- Calculate the permeance of the inductor if the relative permeability of iron, $\mu_r = 1000$. For a flux density of 1.4T, compute the required current at this case. Assume the number of turns equals to one.
- Take the non-linearity of the core material into account and define such a flux density value at which the saturation has reduced the permeance of the inductor by 10%.
- Compute the inductance at each case (a), (b) and (c).
- Compare the results with the FE model in attached for case (b). Draw the flux density contours and compare the inductance values.

The core is a standard UI core with dimensions:

- U-part: width $A = 45$ mm, height $B = 50$ mm, thickness 0.5 mm -
- I-part: width $A = 45$ mm, height $C = 15$ mm, thickness 0.5 mm
- the thickness of the core is 25 mm
- the air gap between the U- and I-parts is 1.5 mm.

Magnetic properties of the core:

- $B = f(H)$ characteristic is given on the next page
- filling factor of the laminated core is 0.95



Magnetointikäyrä levyille V230-50A vuontiheyden
huippuarvo kentänvoimakkuuden huippuarvon funktiona

