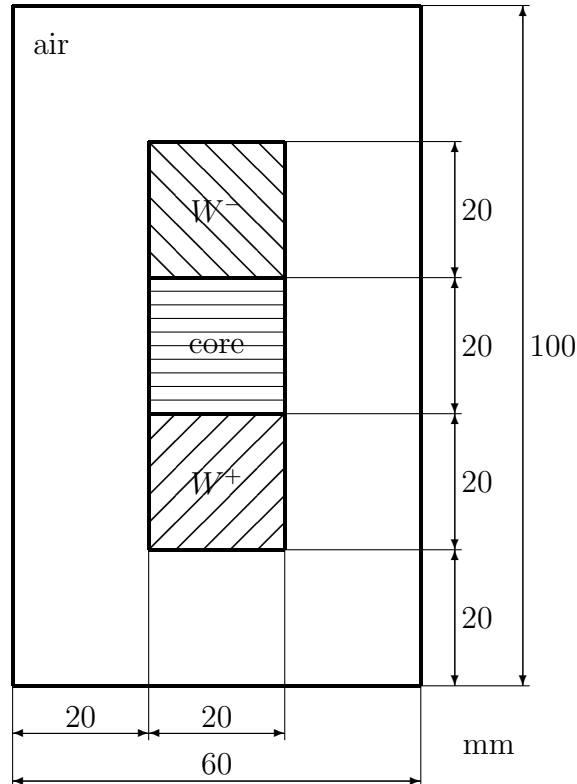


PA04 “MAGNET”: Magnetic field computation

Compute the electromagnetic potential



$$\mu_0 = 1.257 \cdot 10^{-6} \frac{\text{V}\cdot\text{s}}{\text{A}\cdot\text{m}}$$

$$\mu_r = \begin{cases} 1 & \text{air} \\ 1.5 & \text{coils } \begin{array}{|c|} \hline \text{diagonal lines} \\ \hline \end{array} \\ 1000 & \text{core } \begin{array}{|c|} \hline \text{horizontal lines} \\ \hline \end{array} \end{cases}$$

$$f(x, y) = \begin{cases} -318 \text{ A} \cdot \text{m}^{-2} & \text{in } W^- \\ +318 \text{ A} \cdot \text{m}^{-2} & \text{in } W^+ \\ 0 \text{ A} \cdot \text{m}^{-2} & \text{else} \end{cases}$$

Tasks:

- Derive the mathematical model. If possible use symmetries or reduction in the dimension
- Give the variational formulation
- Analysis: discuss existence and uniqueness of solutions
- Discretize the domain Ω
- Numerical analysis: provide an error estimate
- Choose a solver for the system of equations you obtain
- Implementation
- Visualize the results and (if possible) compare them to analytical solutions

- 1 Mathematical model
- 2 Variational formulation
- 3 Analysis
- 4 Discretization
- 5 Solver
- 6 Numerical analysis
- 7 Implementation
- 8 Numerical results