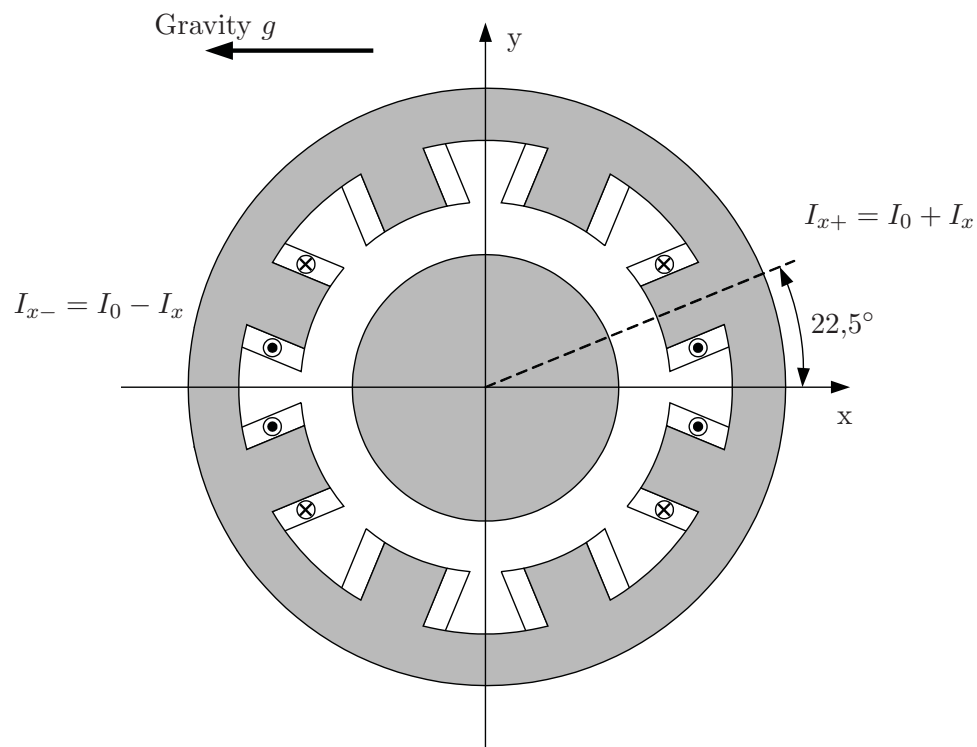


## Exercise 6: Radial Bearing

Given are the following details of a 8-pole radial bearing:



Every pole of this arrangement has a cross sectional area  $A_{P0l} = 1,2\text{cm}^2$  and a winding with  $N = 300$  turns. These windings are excited with a premagnetization current  $I_0 = 2,2\text{A}$ . The air gap  $\delta$  between the poles and the 9kg rotor is 0,8 mm. For the calculations a relative permeability of  $\mu_{r,\text{Fe}} = \infty$  can be assumed for the stator material.

- Calculate the flux density in the air gap, when the windings are excited only with the premagnetization current.
- Calculate the flux density in the left- ( $B_-$ ) and right ( $B_+$ ) air gap, when the windings are excited with a additional current  $I_x = 1,2\text{A}$ .
- What is the resulting force?
- Calculate the required additional current  $I_x$  to compensate the gravity of the rotor. (Assume:  $g \approx 10 \frac{\text{m}}{\text{s}^2}$ )
- Calculate the Force-Current coefficient  $C_i$ .
- Calculate the Force-Displacement coefficient  $S_i$ .