Les courbes terminales du spiral

Conditions de Phillips et de Keelhoff appliquées au spiral plat

Calcul de la spire immobile

Exemple numérique

$r_1 := 0 \cdot mm$ $\quad r_2 := 5 \cdot mm$ $\quad n := 10$ $\quad p := \frac{r_2 - r_1}{n}$ $\quad a := \frac{p}{2 \cdot \pi}$ $\quad spire := 2 \cdot \pi$

$\alpha_1 := \frac{r_1}{a}$ $\quad \alpha_2 := \frac{r_2}{a}$ $\quad \alpha_1 = 0\, spire$ $\quad \alpha_2 = 10\, spire$ $\quad \psi := \alpha_2 - \alpha_1$ $\quad \psi = 10\, spire$

$\theta_0 := 270 deg$ $\quad h := 0.2 \cdot mm$ $\quad \beta := 20 \cdot deg$ $\quad T := 0.4 \cdot s$ $\quad \omega_0 := \frac{2 \cdot \pi}{T}$ $\quad t := \frac{T}{8}$

$r(\alpha) := a \cdot \alpha$ $\quad ds := a \cdot \alpha \cdot d\alpha$ $\quad s(\alpha) := \int_{\alpha}^{\psi} a \cdot \alpha \, d\alpha$ $\quad s(\alpha) := \frac{a}{2} \cdot \left(\psi^2 - \alpha^2\right)$ $\quad s(\alpha_1) = 0.157\ m$

$L := s(\alpha_1)$ $\quad L := \frac{1}{2 \cdot a} \cdot \left(r_2^{\,2} - r_1^{\,2}\right)$ $\quad L = 15.708\ cm$ $\quad \alpha := \frac{\psi}{2}$

Recherche de la spire immobile

Condition de Phillips $\quad R := a \cdot \psi$ $\quad l := 2 \cdot R$

$x(\alpha) := a \cdot \alpha \cdot cos(\alpha)$ $\quad y(\alpha) := a \cdot \alpha \cdot sin(\alpha)$ $\quad s(\alpha) := \frac{a}{2} \cdot \left(\psi^2 - \alpha^2\right) + l$

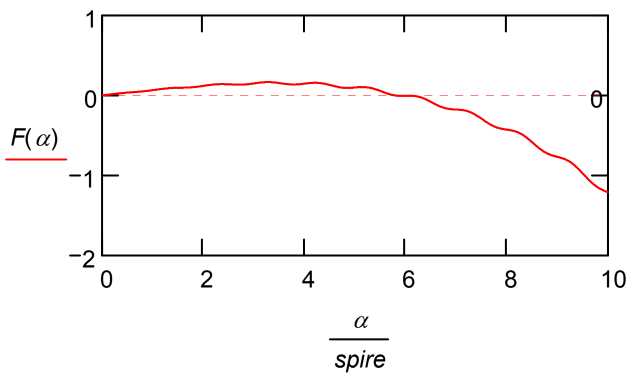
$s\xi_1(\alpha) := a^2 \cdot \left[2 \cdot \psi - 2 \cdot \alpha \cdot cos(\alpha) - \left(\alpha^2 - 2\right) \cdot sin(\alpha)\right]$ $\quad s\xi_1(\alpha) = 3.979 \times 10^{-7}\ m^2$

$s\eta_1(\alpha) := a^2 \cdot \left[2 - \psi^2 - 2 \cdot \alpha \cdot sin(\alpha) + \left(\alpha^2 - 2\right) \cdot cos(\alpha)\right]$ $\quad s\eta_1(\alpha) = -1.875 \times 10^{-5}\ m^2$

$x'(\alpha) := a \cdot cos(\alpha) - a \cdot \alpha \cdot sin(\alpha)$ $\quad y'(\alpha) := a \cdot sin(\alpha) + a \cdot \alpha \cdot cos(\alpha)$

$F(\alpha) := \left[\left(s(\alpha) \cdot x(\alpha) - s\xi_1(\alpha)\right) \cdot x'(\alpha) + \left(s(\alpha) \cdot y(\alpha) - s\eta_1(\alpha) - R^2\right) \cdot y'(\alpha)\right] \cdot 10^7$ $\quad F(\alpha) = 0.098\ m^3$

$\alpha := 0, \frac{\psi}{1000} .. \psi$



$\alpha_0 := \frac{\psi}{\sqrt{3}}$ $\quad \alpha_0 = 36.276$ $\quad \alpha_0 := racine\left(F(\alpha_0), \alpha_0\right)$ $\quad \alpha_0 = 36.326$ $\quad r_0 := a \cdot \alpha_0$

$\alpha_0 = 5.781\, spire$ $\quad r_0 = 2.891 \times 10^{-3}\ m$

Solution approximative $\quad \frac{\psi}{\sqrt{3}} = 5.774\, spire$ $\quad \frac{R}{\sqrt{3}} = 2.887 \times 10^{-3}\ m$