

Udregning af varmestrøm for Al til luft

$$b = 20 \quad a = 25.5 \quad d = 0.5 \quad A_{\text{tot}} = 93733.73 \quad A_{\text{lam}} = a \cdot b \cdot 2 = 1.02 \cdot 10^3$$

$$m = 315.8 \quad \lambda_{\text{al}} = 229 \quad \delta = 0.5 \quad c_{\text{pal}} = 0.896 \quad c_{\text{luf t}} = 4$$

$$\beta_{\text{luf t}} = 3.2 \quad \nu = 18.88 \quad \eta = 16.92$$

$$t_{\text{lam}} = 80 \quad t_{\text{luf t}} = 20 \quad \Delta t = t_{\text{lam}} - t_{\text{luf t}} = 60$$

$$t_{\text{ref}} = \frac{t_{\text{lam}} + t_{\text{luf t}}}{2} = 30$$

$$L_{\text{hyd}} = 0.5$$

$$\text{Gr}_L = \frac{9.82 \cdot a^3 \cdot \beta_{\text{luf t}} \cdot \Delta t}{\nu^2} = 8.771 \cdot 10^4$$

$$\text{Pr} = 0.69$$

$$\text{Re} = \frac{c_{\text{luf t}} \cdot L_{\text{hyd}}}{\nu} = 0.106$$

$$\text{D} = \frac{4 \cdot (b - a)}{(2 \cdot a + 2 \cdot b)} = 22.418$$

$$L_{\text{lam}} = \frac{a}{1000}$$

$$A_{\text{lamim}} = \frac{A_{\text{lam}}}{10^6} = 0.001$$

$$I_{\text{løb}} = 0.05 \quad \text{Re} \cdot \text{D} = 0.119$$

$$\text{Ra} = \text{Gr}_L \cdot \text{Pr} = 6.052 \cdot 10^4$$

hvilket tyder på laminar strømning

tvungen indvendig strømning : Nu_{tvi}

$$Nu_{tis} = 3.66 + \frac{0.0668 \frac{D}{L_{lam}} Re Pr}{1 + 0.004 \frac{D}{L_{lam}} Re Pr^{\frac{2}{3}}} = 7.694$$

$$a_{tis} \quad Nu_{tis} = \frac{a_{tl} L_{hyd}}{\lambda_{al}} \xrightarrow{\text{solve, } a_{tl}} 3523.658613846236571$$

$$\Phi_{tis} \quad a_{tis} \quad A_{lamim} \quad t_{lam} \quad t_{luft} = 215.648$$

$$I_{løb} = 0.119$$

Fri konvektion

$$Re = 0.106$$

$$Pr = 0.69$$

$$Nu_{fri} = \frac{Gr_L^{\frac{1}{4}}}{4} \frac{0.75 Pr^{\frac{1}{2}}}{0.609 + 1.221 Pr^{\frac{1}{2}} + 1.238 Pr^{\frac{1}{4}}} = 6.043$$

$$a_{fri} \quad Nu_{fri} = \frac{a_{fri} L_{hyd}}{\lambda_{al}} \xrightarrow{\text{solve, } a_{fri}} 2767.5278460911167854 = 2.768 \cdot 10^3$$

$$\Phi_{fri} \quad a_{fri} \quad A_{lamim} \quad t_{lam} \quad t_{luft} = 169.373$$