

Stirnfräsen Aufgabe 1

gegeben: C45

$$\kappa = 45^\circ$$

$$v_c = 150 \frac{\text{m}}{\text{min}}; f_z = 0,3 \text{ mm}; a_p = 4 \text{ mm}$$

$$D = 125 \text{ mm}$$

$$B = 100 \text{ mm} = a_e \Rightarrow$$

$$L = 425 \text{ mm}$$

$$r = 40$$

$$L_a/L_v = 1,5 \text{ mm}$$

$$\begin{aligned} a_1 &= \frac{D-B}{2} = \frac{125 \text{ mm} - 100 \text{ mm}}{2} = 12,5 \text{ mm} \\ a_2 &= B + a_1 = 100 \text{ mm} + 12,5 \text{ mm} = 112,5 \text{ mm} \end{aligned}$$

gesucht: F_{cm} ; P_c ; Q_w

$$a) h_m = f_z \times \sin(\kappa) \times \sqrt{\frac{a_e}{D}} = 0,19 \text{ mm}$$

$$k_{c1.1} = 2220 \frac{\text{N}}{\text{mm}^2}; m_c = 0,14 \quad \text{[siehe Formelsammlung]}$$

$$K_r = 1 - \frac{r - r_\kappa}{66,7^\circ} = 1 - \frac{40 - 6^\circ}{66,7^\circ} = 1,15$$

$$F_{cmz} = k_{c1.1} \times b \times h_m^{1-m_c} \times K_r$$

$$= 2220 \frac{\text{N}}{\text{mm}^2} \times 4 \text{ mm} \times 0,19^{1-0,14} \times 1,15$$

$$= 3462,2 \text{ N}$$

$$F_{cm} = F_{cmz} \times z_e = 3462,2 \text{ N} \times 3,54 = 12256,2 \text{ N}$$

$$b) P_c = F_{cmz} \times v_c \times z_e$$

$$= 3462,2 \text{ N} \times \frac{150 \text{ m}}{60 \text{ s}} \times 3,54$$

$$= 30640,5 \text{ W} = \underline{\underline{30,64 \text{ kW}}}$$

$$\varphi_A = \arccos\left(1 - \frac{2 \times a_1}{D}\right) = \arccos\left(1 - \frac{2 \times 12,5 \text{ mm}}{125 \text{ mm}}\right) = 36,9^\circ$$

$$\varphi_E = \arccos\left(1 - \frac{2 \times a_2}{D}\right) = \arccos\left(1 - \frac{2 \times 112,5 \text{ mm}}{125 \text{ mm}}\right) = 143,1^\circ$$

$$\varphi_s = \varphi_E - \varphi_A = 143,1^\circ - 36,9^\circ = 106,2^\circ$$

$$z_e = \frac{2 \times \varphi_s}{360^\circ} = \frac{2 \times 106,2^\circ}{360^\circ} = 3,54$$

$$\begin{aligned} c) Q_w &= a_e \times a_p \times z \times f_z \times \eta = a_e \times a_p \times z \times f_z \times \frac{v_c}{\pi \times D} \\ &= 100 \text{ mm} \times 4 \text{ mm} \times 12 \times 0,3 \times \frac{150 \times \frac{1000 \text{ mm}}{60 \text{ s}}}{\pi \times 125 \text{ mm}} = \underline{\underline{9167,3 \frac{\text{mm}^3}{\text{s}}}} \end{aligned}$$