

6.1 $T_{an} = 9550 \cdot \frac{P}{n} = 9550 \cdot \frac{267}{1500}$
 $T_{an} = 1700 \text{ Nm}$

$T_{ab} = T_{an} \cdot i_{ges} \cdot z_{ges} = 1700 \cdot 106 \cdot 10,98$ (3 Stufen)
 $T_{ab} = 169603 \text{ Nm}$

$n_{ab} = \frac{n_{an}}{i_{ges}} = \frac{1500}{106}$

$n_{ab} = 14,15 \text{ min}^{-1}$

6.2 a_{dmin} bei z_{g1} !

$z_{g1} = 14 \cdot \cos^3 3 = 14 \cdot \cos^3 18^\circ$

$z_{g1} = 12,04$

$\Rightarrow z_{g1} = 12$

$u = \frac{z_2}{z_1}$

$a_{dmin} = \frac{m_n}{2} (z_1 + z_2) = \frac{m_n}{2 \cdot \cos 3} (z_1 + u \cdot z_1)$

$a_{dmin} = \frac{z_1 \cdot m_n}{2 \cdot \cos 3} \cdot (u + 1) = \frac{12 \cdot 3,5}{2 \cdot \cos 18^\circ} \cdot 7$

$a_{dmin} = 154,56 \text{ mm}$

6.3

$d_{f1} \geq d_{sh}$

$d_{f1} = d - 2,5 \cdot m_n \geq d_{sh}$

$d_1 \geq d_{sh} + 2,5 \cdot m_n \geq 64 + 2,5 \cdot 3,5$

$d_1 \geq 72,75 \text{ mm}$

$d_1 = \frac{z_1 \cdot m_n}{\cos 3}$

$\Rightarrow z_1 \geq 19,77 \Rightarrow z_1 = 20$

$z_2 = u \cdot z_1 = 6 \cdot 20$ $z_2 = 120$

$$7.1 \quad F_E = \frac{2 \cdot T_{an}}{d_1} = \frac{2 \cdot 1700}{73,6 \cdot 10^{-3} \text{ m}}$$

$$\underline{F_E = 46,2 \text{ kN}}$$

$$7.2 \quad \sigma_H = \sigma_{H0} \cdot v_{H \text{ ges}} = 1071 \cdot 1,3$$

$$\underline{\sigma_H = 1392 \text{ N/mm}^2}$$

$$7.3 \quad \sigma_{HP} = \frac{\sigma_{H \text{ min}} \cdot z_L \cdot z_v \cdot z_R \cdot z_n \cdot z_x \cdot z_{NT}}{S_{H \text{ min}}} = \sigma_H$$

setze $z_x = 1$, weil $m < 5$

$z_n = 1$, weil Zahnräder gleicher Werkstoff

$$\Rightarrow z_n = 1,07$$

$$\rightarrow N_L = 2 \cdot 10^7$$

TiS 21-23 d

$$7.4 \quad \text{setze } z_{NT} = 1$$

auflösen nach z_R

$$\Rightarrow z_R = 1,04$$

$$\rightarrow R_{z100} = 1,8 \mu\text{m}$$

TiS 21-23 c

$$R_{z1} + R_{z2} = \frac{R_{z100}}{0,5 \cdot \sqrt{\frac{100}{z}}}$$

$$\rightarrow R_{z1} + R_{z2} = 5 \mu\text{m}$$

$$\underline{R_{z1} = R_{z2} = 2,5 \mu\text{m}}$$

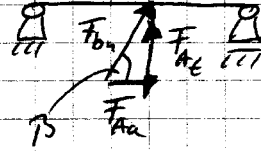
8.1

$$F_{Aa} = F_E \cdot \tan \beta$$

$$F_{bt} = 2 \cdot F_{Ar}$$

$$F_E = F_{bt} \cdot \cos \alpha_{WE}$$

$$F_{Aa} = 2 \cdot F_{Ar} \cdot \cos \alpha_{WE} \cdot \tan \beta = 2 \cdot 25 \cdot \cos 22^\circ \cdot \tan 18^\circ$$



$$\underline{F_{Aa} = 15,06 \text{ kN}}$$

8.2

$$f_L = \frac{C}{P} \cdot f_n$$

$$f_n = 0,28 \quad \text{TIS 14-4}$$

$$C = 93 \text{ kN} \quad \text{TIS 14-2}$$

$$P = X \cdot F_{Ar} + Y \cdot F_{Aa}$$

$$\rightarrow \text{TIS 14-3 a mit } F_{Aa}/C_0 \quad C_0 = 60 \text{ kN TIS 14-2}$$

$$\frac{F_{Aa}}{C_0} = 0,251 \quad \rightarrow e = 0,51 \cdot 0,251^{0,253}$$

$$e = 0,37$$

$$\frac{F_{Aa}}{F_{Ar}} = 0,6 > e \quad \rightarrow X = 0,56$$

$$Y = 0,866 \cdot 0,251^{-0,229}$$

$$Y = 1,19$$

$$P = 0,56 \cdot 25 + 1,19 \cdot 15$$

$$P = 31,9 \text{ kN}$$

$$f_L = \frac{93}{31,9} \cdot 0,28$$

$$f_L = 0,81 < 2 \quad \rightarrow \underline{\underline{\text{nicht erfüllt!}}}$$

$$8.3 \quad \text{Einschlag} : \left. \begin{array}{l} C = 270 \text{ kN} \\ c = 0,35 \\ Y = 1,74 \\ C_0 = 345 \text{ kN} \end{array} \right\} \text{TB 14-2}$$

$$\text{Lagerpaar} : \left. \begin{array}{l} C = 1,715 \cdot 270 \\ C = 463 \text{ kN} \end{array} \right\}$$

$$\frac{F_{A2}}{F_{A1}} = 0,67e$$

$$\Rightarrow P = 0,67 \cdot F_{A1} + 1,68 \cdot Y \cdot F_{A2}$$

$$P = 0,67 \cdot 25 + 1,68 \cdot 1,74 \cdot 15,06$$

$$P = \underline{60,8 \text{ kN}}$$

$$L_{10h} = \left(\frac{C}{P} \right)^3 \cdot \frac{1 \cdot 10^6}{60 \cdot h} = \left(\frac{463}{60,8} \right)^3 \cdot \frac{10^6}{60 \cdot 1000}$$

$$L_{10h} = \underline{9653 \text{ h}}$$

$$9.1 \quad F_{Rt} = u_k \cdot S_H \cdot F_E = 1 \cdot 1,5 \cdot \frac{8,5 \cdot 10^4 \cdot 2}{500 \cdot 10^{-3}}$$

$$\underline{F_{Rt} = 510 \text{ kN}}$$

$$9.2 \quad \begin{array}{l} \ddot{u}_u = E_s - e_i \\ E_s = 63 \mu\text{m} \\ e_i = 252 \mu\text{m} \end{array} \left. \vphantom{\begin{array}{l} \ddot{u}_u = E_s - e_i \\ E_s = 63 \mu\text{m} \\ e_i = 252 \mu\text{m} \end{array}} \right\} \text{TB 2-2 \& TB 2-1}$$

$$\underline{\ddot{u}_u = -189 \mu\text{m}}$$

$$z_k = |\ddot{u}_u| - G = 189 - 0,8 \cdot 6$$

$$\underline{z_k = 184 \mu\text{m}}$$

$$P_{F_k} = \frac{F_{Rt}}{A_f \cdot \mu} = \frac{510}{(500 \cdot 75 \cdot \pi) \cdot 0,2} \quad \underline{P_{F_k} = 21,65 \frac{\text{N}}{\text{mm}}}$$

$$9.3 \quad z_u = \frac{P_{FK} \cdot D_F}{E_K} \cdot u$$

Seite 5/6

$$\rightarrow u = \frac{184 \cdot 10^{-3} \cdot 21 \cdot 10^5}{21,65 \cdot 500} = 3,57$$

$$\Rightarrow \text{aus TB 12-7} \quad Q_A = 0,68$$

$$Q_A = \frac{D_F}{D_{Aa}}$$

$$D_{Aa} = \frac{500}{0,68}$$

$$\underline{\underline{D_{Aa} = 735 \text{ mm}}}$$