d	Serie 01		Serie 02		Serie 03		Serie 04	
	C_0 (daN)	C (daN)	C_0	C	C_0	C	C_0	C
30	695	1020	980	1500	1430	2160	2280	3250
35	865	1220	1340	1960	1730	2550	3000	4250

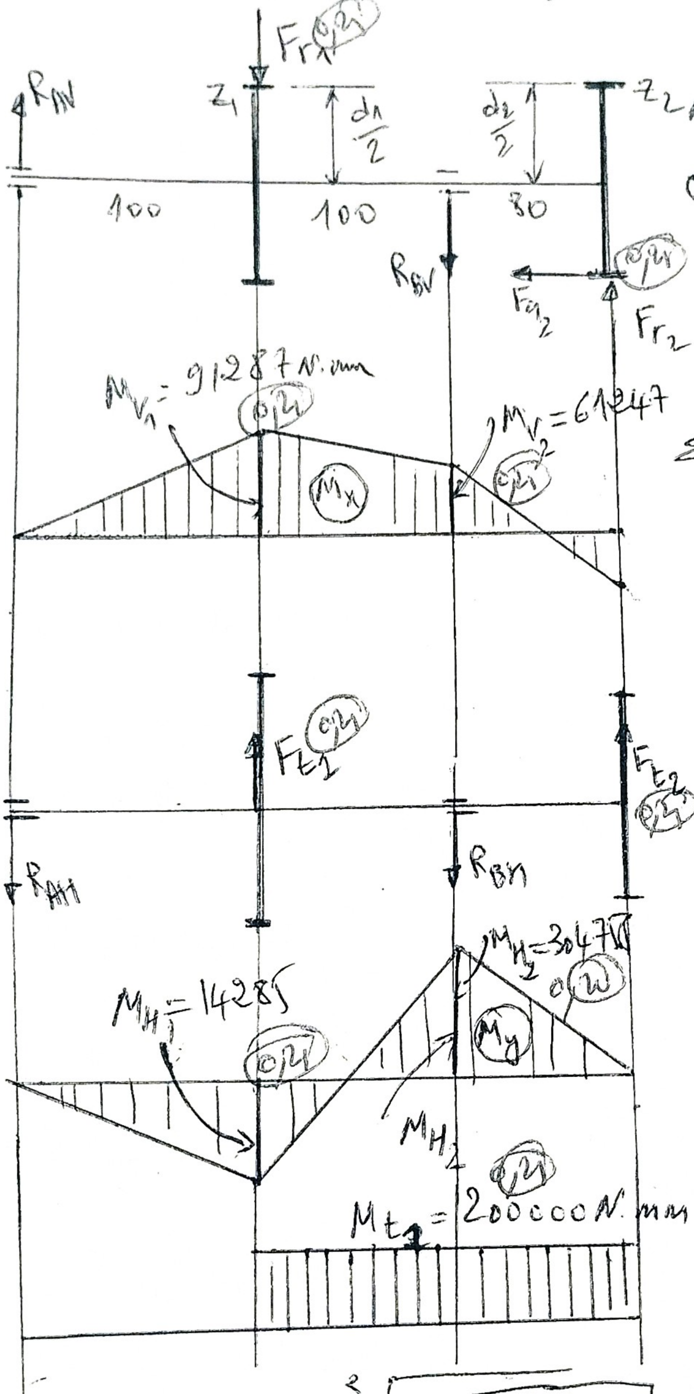
<table>
<tr><th rowspan="2" colspan="2"></th><th colspan="2">$\frac{F_a}{V \cdot F_r} \leq e$</th><th colspan="2">$\frac{F_a}{V \cdot F_r} > e$</th><th rowspan="2">e</th></tr>
<tr><th>X</th><th>Y</th><th>X</th><th>Y</th></tr>
<tr><td rowspan="6">$\frac{F_a}{C_0}$</td><td>0,025</td><td rowspan="6">1</td><td rowspan="6">0</td><td rowspan="6">0,56</td><td>2</td><td>0,22</td></tr>
<tr><td>0,04</td><td>1,8</td><td>0,24</td></tr>
<tr><td>0,07</td><td>1,6</td><td>0,27</td></tr>
<tr><td>0,13</td><td>1,4</td><td>0,31</td></tr>
<tr><td>0,25</td><td>1,2</td><td>0,37</td></tr>
<tr><td>0,5</td><td>1</td><td>0,44</td></tr>
</table>

Exercice N°2: $d_1 = m.Z_1 = 3.40 = 120\,mm$, $d_2 = m\,Z_2 = 3,5.30 = 105\,mm$

$F_{t_1} = \frac{2M_t}{d_1} = \frac{2.200.10^3}{120} = 3333,33\,N$, $F_{r_1} = F_{t_1}\,tg\alpha = 12133\,N$

$F_{t_1}\cdot\frac{d_1}{2} = F_{t_2}\cdot\frac{d_2}{2} \Rightarrow F_{t_2} = F_{t_1}\cdot\frac{d_1}{d_2} = 3809,5\,N$, $F_{r_2} = F_{t_2}\cdot\frac{tg\alpha}{\cos\beta} = 1431,4\,N$

$F_{a_2} = F_{t_2}\cdot tg\beta = 1020,7\,N$



Plan Vertical

$\Sigma M_B = 0$

$R_{AV}.200 - F_{r_1}.100 - F_{r_2}.80 + F_{a_2}\cdot\frac{d_2}{2} = 0$

$R_{AV} = 912,87\,N$

$\Sigma M_A = 0 \Rightarrow R_{BV}.200 - F_{r_2}.280 + F_{a_2}\frac{d_2}{2} + F_{r_1}.100 = 0$

$R_{BV} = 1134,97\,N$

$M_{V_1} = R_{AV}.100 = 91287\,N.mm$

$M_{V_2} = F_{r_2}.80 - F_{a_2}\cdot\frac{d_2}{2} = 61247\,N.mm$

Plan horizontal

$\Sigma M_B = 0$; $R_{AH}.200 - F_{t_1}.100 + F_{t_2}.80$

$R_{AH} = 142,85\,N$

$\Sigma M_A = 0$; $R_{BH}.200 - F_{t_2}.280 - F_{t_1}.100 = 0$

$\Rightarrow R_{BH} = \cancel{3666}\ 6999,96\,N$

$M_{H_1} = R_{AH}.100 = 14285\,N.mm$

$M_{H_2} = F_{t_2}.80 = 304758\,N.mm$

$M_{f_{max}} = \sqrt{M_{V_2}^2 + M_{H_2}^2} \simeq 310851,5\,N.mm$

$$d \geq \sqrt[3]{\frac{32\sqrt{M_{f_{max}}^2 + M_t^2}}{\pi\,[\sigma]_t}} = \sqrt[3]{\frac{32\sqrt{310851,5^2 + 200000^2}}{\pi\cdot 160}} \simeq 29\,mm$$

Suite Exercice N°2

$$R_A = \sqrt{R_{AV}^2 + R_{AH}^2} = \sqrt{912{,}97^2 + 142{,}85^2} = 923{,}91\,N$$

$$R_B = \sqrt{R_{BV}^2 + R_{BH}^2} = \sqrt{1134{,}97^2 + 6999{,}9^2} = 7091{,}32\,N$$

$$F_a = F_{a_2} = 1020{,}7\,N$$

Le roulement ① est le moins chargé, il supporte alors la charge axiale. $, V = 1 , K = 3$

$$P_1 = X_1 \cdot V\, R_A + Y \cdot F_a \quad , \quad P_2 = R_B \quad , \quad n = 300\ tr/mn.$$

$$L_{h_2} = \frac{16666}{300}\left(\frac{C_2}{P_2}\right)^k \Rightarrow C_2 = \sqrt[3]{\frac{L_h \cdot n}{16666}} \cdot P_2 \quad , \quad P_2 = 709{,}13\ daN.$$

$C_2 = 3177{,}94\ daN$. on prend la série 04 $C = 3250$

* Pour le roulement ① on suppose $\frac{F_a}{V.F_r} > e$

$$X_1 = 0{,}56 \quad , \quad Y_1 = 1{,}6$$

$$P_1 = X_1 \cdot V \cdot R_A + Y_1\, F_a = 0{,}56 \cdot 1 \cdot 92{,}4 + 1{,}6 \cdot 102{,}07 \simeq 215{,}05\ daN$$

$$C_1 = \sqrt[3]{\frac{L_h \cdot n}{16666}} \cdot P_1 = \sqrt[3]{\frac{5000 \cdot 300}{16666}} \cdot 215{,}05 = 963{,}73$$

on prend la série 02 $C = \cancel{980}\ 1020$, $C_0 = 695\ daN$

Vérification: $\frac{F_a}{C_0} = \frac{102{,}07}{695} = 0{,}146 \Rightarrow e \simeq 0{,}3$

$$\left.\begin{array}{l} 0{,}13 < 0{,}146 < 0{,}25 \\ \frac{F_a}{V.R_A} \simeq 1{,}1 > e \end{array}\right\} \Rightarrow X_1 = 0{,}56 \ , \ Y_1 \simeq 1{,}4$$

$$P_1 = X_1\, R_A + Y_1\, F_a \simeq 194{,}6$$

Cela donne le même résultat.

10/05/2026

Exercice N°1 — Contrôle de Construction mécanique II

$K_{12} = \frac{w_2}{w_1} = \frac{d_1}{d_2} = \frac{200}{800} = \frac{1}{4} \Rightarrow d_2 - 4d_1 = 0 \quad (1)$

or $a = \frac{1}{2}(d_1 + d_2) = 300 \Rightarrow \frac{1}{2}(d_1 + 4d_1) = 300 \quad (2) \Rightarrow d_1 = 120$, $d_2 = 480$ mm

* module réel et module apparent : $T' = \frac{60P}{\pi d_1 N_1 \cos\beta} = \frac{60 \cdot 4000}{\pi \cdot 120 \cdot 10^{-3} \cdot 800 \cdot \cos 25°}$

$T' = 878,48\,N \Rightarrow M_r \geq 2,34\sqrt{\frac{T'}{K \cdot \sigma_{pe}}}$, $K \geq \frac{\pi}{\sin\beta} = 7,24$; $K = 8$

$\Rightarrow M_r \geq 2,34\sqrt{\frac{878,48}{8 \cdot 30}} = 4,47$ choisissons $M_r = 4,5$

alors $M_a = \frac{M_r}{\cos\beta} = 4,965 \Rightarrow d_1 = M_a Z_1 \Rightarrow Z_1 = \frac{120}{4,965} = 24,169$

$Z_1 = 24 \Rightarrow Z_2 = 4 \cdot Z_1 = 96$, $d_1 = M_a Z_1 = 119,16$

$d_2 = M_a Z_2 = 476,64$ mm, d'où $a = \frac{d_1 + d_2}{2} = 297,9$ mm.

entraxe exacte : $\cos\beta = \frac{M_r}{2a}(Z_1 + Z_2) = \frac{4,5}{600}(24 + 96) = 0,9$

$\Rightarrow \beta = 25,841°$

$d_{a1} = d_1 + 2M_r = 128,16$, $d_{a2} = d_2 + 2M_r = 485,64$

$d_{f1} = d_1 - 2,25\,M_r = 110,16$, $d_{f2} = 466,515$

$h_a = 4,5$, $h_f = 5,625$, $e = \frac{\pi M_r}{2} = 14,13/2 = 7,065$

$F_t = T = T' \cos\beta = \frac{60P}{\pi \cdot d_1 10^{-3} \cdot 800} = 801,79\,N$

$F_r = T \cdot tg\,\alpha / \cos\beta = 324,24\,N$, $F_a = T \cdot tg\,\beta = 388,29\,N$.

$\frac{7,5}{7,5}$