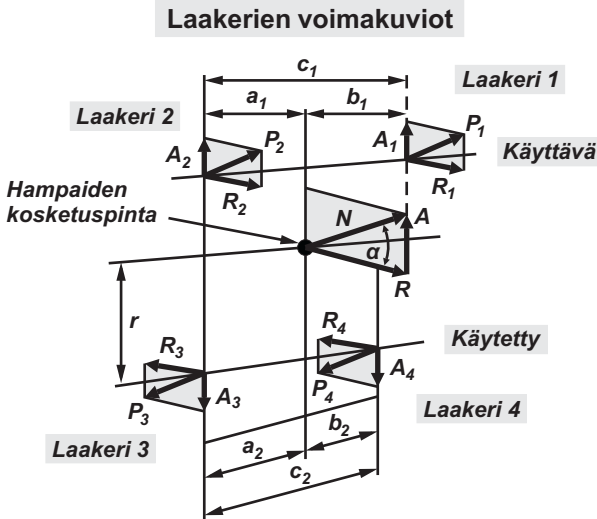
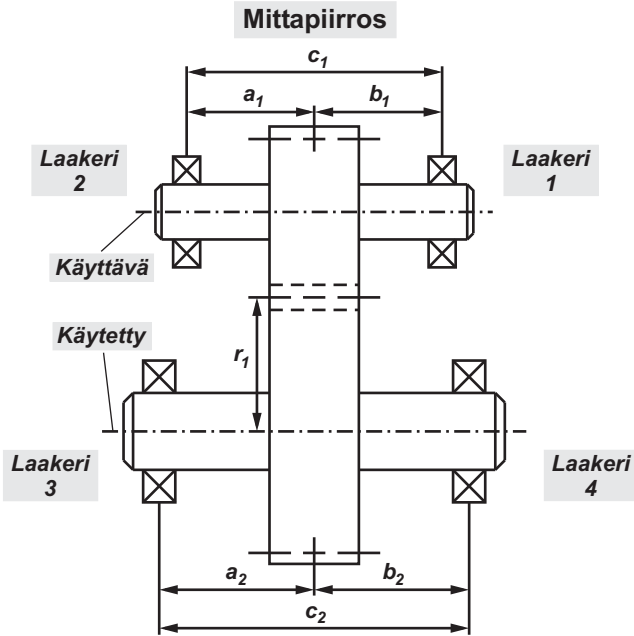


## 2. Hammasvaihdeiden voimien laskenta

### 2.1 Suorahampaiset lieriöhammaspyörät

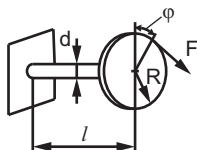


## 5.2 Vääntöjouset pyörötanko

$$M = \frac{\pi d^3}{16} \cdot \tau$$

$$c = \frac{M}{\varphi} = \frac{\pi d^4}{32l} \cdot G$$

$$\varphi = \frac{32l}{G\pi d^4} \cdot M$$



$$M = FR$$

# 6. Kierrejousia

## 6.1 Kierrejousi (pyörölanka)

$$M = \frac{1}{k} \cdot \frac{\pi d^3}{32} \cdot \delta_{sall}$$

$$c = \frac{M}{\varphi} = \frac{d^4}{64Di} \cdot E$$

$$\varphi = \frac{64Di}{Ed^4} \cdot M$$

$D$  = jousen halkaisija

$d$  = jousen langan halkaisija

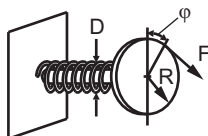
$k$  = katso nomogrammista,  $h/D$ ,  $d/D$

$\varphi$  = kiertymäkulma

$M$  = momentti =  $FR$

$c$  = jousivakio

$\delta_{sall}$  = sallittu jännitys

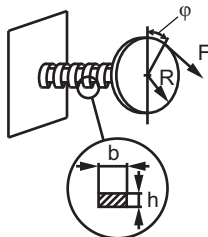


## 6.2 Kierrejousi (suorakaide)

$$M = \frac{1}{k} \cdot \frac{bh^2}{6} \cdot \delta_{sall}$$

$$c = \frac{M}{\varphi} = \frac{bh^3}{12\pi di} \cdot E$$

$$\varphi = \frac{12\pi di}{Eb h^3} \cdot M$$



Merkinnät kuten tapauksessa 1

## 6.3 Tasokierukkajousi

### Pyörölanka

$$M = \frac{1}{k} \cdot \frac{\pi d^3}{32} \cdot \delta_{sall}$$

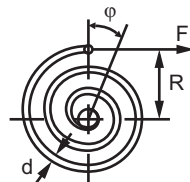
$$c = \frac{1}{64} \cdot \frac{\pi d^4}{l} \cdot E$$

$$\varphi = \frac{64l}{E\pi d^4} \cdot M$$

$$M = FR$$

$l$  = langan pituus

$k$  saadaan käyrästä



### Suorakaide

$$M = \frac{1}{k} \cdot \frac{bh^2}{6} \cdot \delta_{sall}$$

$$c = \frac{1}{12} \cdot \frac{bh^3}{l} \cdot E$$

$$\varphi = \frac{12l}{Eb h^3} \cdot M$$

$$M = FR$$

$k$  saadaan käyrästä

