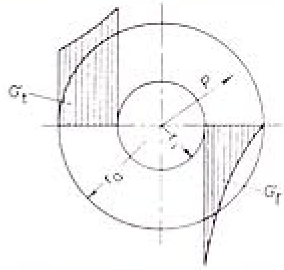
HUB CALCULATION

Thick wall cylinders and tubings may be calculated in accordance with an equation by Lame.



$$\sigma_t = p \cdot \frac{r_i^2}{r_a^2 - r_i^2} \left(1 + \frac{r_a^2}{r^2}\right)$$

$$\sigma_r = p \cdot \frac{r_i^2}{r_a^2 - r_i^2} \left(1 - \frac{r_a^2}{r^2}\right)$$

From these, the following equations are derived for the hub calculation:

$$(1) \quad \sigma_{tiN} \approx p_N \frac{(a_N^2 + 1)}{a_N^2 - 1} \quad \text{u.} \quad (2) \quad \sigma_{taN} \approx \frac{2p_N \cdot C}{a_N^2 - 1}$$

Legend:

$a_N = \dfrac{D_N}{D}$ — D_N outer hub diameter, D bore diameter

C = constant, depending on hub width

For full hub section over the width of the locking assembly

$C = 0.6$ if hub width $B \geqq 2\,L_1$
$C = 0.8$ when using several locking assemblies, with $B \geqq L_3 (1+n)$; n = number of l. ass.
$C = 1.0$ for $B \geqq L_1$

As $\sigma_{tiN} > \sigma_{taN}$, equation (1) will be used for the calculation. Solved for D_N

$$D_N \approx D \cdot \sqrt{\frac{\sigma_{tiN} + p_N \cdot C}{\sigma_{tiN} - p_N \cdot C}}$$

as σ_{tiN} should be $\leqq \sigma_S$
using $\sigma_S = \sigma_{0.2}$:

$$D_N \geqq D \cdot \sqrt{\frac{\sigma_{0.2\,N} + p_N \cdot C}{\sigma_{0.2\,N} - p_N \cdot C}}$$

If the hub is weakened (e. g. bores or threads), the hub diameter should be enlarged correspondingly (e. g. by the bore diameter)

For hollow shafts the equation is:

$$d_B \leqq d \cdot \sqrt{\frac{\sigma_{0.2w} - 2p_W \cdot C}{\sigma_{0.2w}}}$$

General application:
Hollow shaft longer than 2 L_1,
i. e.: $C = 0.6$

d_B = internal diameter of hollow shaft

Example:
A hub made of GS-52 with a width of $B \geqq 2\,l_1$ to be connected with a shaft d = 100 mm diameter by means of locking assembly TAS 3020

GS-52 → $\sigma_{0.2} \approx 250$ N/mm²
$B \geqq 2\,l_1$ corresponds to $C = 0.6$

Shaft diameter d = 100 mm requires a locking assembly 100 x 145; therefore

$D = 145$ mm $\quad p_N \approx 157$ N/mm²

$$D_N \geqq 145 \sqrt{\frac{250 + 157 \cdot 0.6}{250 - 157 \cdot 0.6}} \geqq 215.5$$

i. e. $\quad D_N = 220$ mm